



Homeland Security

GRANT AWARD

TERMS AND CONDITIONS

GRANTEE: Trustees of Dartmouth College

AGREEMENT NO: 2006-CS-001-000001 AMENDMENT NO: 1

PROJECT TITLE: Cyber Security Collaboration and Information Sharing

CFDA NO: 97.001

AMENDMENT:

The purpose of this award is to amend Article XIII.J. – GENERAL TERMS AND CONDITIONS - Publications. That section is revised to read as follows:

ARTICLE XIII – GENERAL TERMS AND CONDITIONS

- J. Publications: All publications produced as a result of this funding which are submitted for publication in any magazine, journal, or trade paper shall carry the following:
1. **Acknowledgement.** “This material is based upon work supported by the U.S. Department of Homeland Security under Grant Award Number 2006-CS-001-000001.”
 2. **Disclaimer.** “The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security.”

ALL OTHER ARTICLES IN THE ORIGINAL GRANT AWARD DATED SEPTEMBER 25, 2006 REMAIN IN EFFECT.

(b)(6)

Rosemary Springer, Grants Officer
Grants and Financial Assistance Division
Office of Procurement Operations
Office of the Chief Procurement Officer
Department of Homeland Security

11/1/06
Date



Homeland Security

GRANT AWARD

TERMS AND CONDITIONS

RECIPIENT: Trustees of Dartmouth College

AGREEMENT NO: 2006-CS-001-000001

AMENDMENT NO: n/a

CFDA NO: 97.001

TITLE: Cyber Security Collaboration and Information Sharing

ARTICLE I – AUTHORIZING LEGISLATION

Section 308(b)(1) of the Homeland Security Act of 2002 (Public Law 107-296). P.L. 109-90.

ARTICLE II - PROGRAM DESCRIPTION

The Recipient shall perform the work described in the Program Narrative Statement, which is included as part of the application package and made part of this Award by reference in Article XVI. Governing Provisions.

ARTICLE III – PERFORMANCE AND BUDGET PERIOD

A. Performance Period:

1. The Performance Period shall be for two and one-half years from September 30, 2006 through March 30, 2009, unless extensions have been approved. This is contingent on acceptable performance of the projects by the DHS, acceptance and approval of each non-competing continuation application by the DHS, and available annual DHS appropriations.
2. The Recipient shall only incur costs or obligate funds within the Project Period for approved activities.
3. Sixty days prior to the annual expiration date of each budget period, the Recipient shall submit an amendment application to request the next year's incremental funding. The

application shall include budget and program narrative that describes the activities to be performed in the year which the funding is requested

B. Budget Period:

1. The initial Budget Period is for a period of six months from September 30, 2006 through March 30, 2007.
2. Annual increased funding will be provided for subsequent years for a period of 12 months each contingent on acceptable performance of the projects approved by the DHS under this award, acceptance and approval by the DHS of each noncompeting continuation application, and subject to the availability of appropriated funds. The noncompeting continuation applications must address detailed assessments that thoroughly address the viability of the test bed under Initiative 7, and include an assessment whether or not alternatives should be reviewed. There must be confirmation that there is no duplication in effort of other similar test bed facilities.
3. The Recipient shall not, without the prior written approval of DHS, request reimbursement or incur costs or obligate funds for any purpose pertaining to the operation of the project, program, or activities prior to the approved Budget Period for each year.

ARTICLE IV – AMOUNT OF AWARD

- A. This Award is for the administration and completion of an approved Homeland Security program/project within the Period of Performance. Funds provided by this Award shall not be used for other purposes.
- B. Approved Budget. The approved budget for the budget period September 30, 2006 through March 30, 2007, for this Award by category is:

OBJECT CLASS CATEGORY	FEDERAL PRE-AWARD	FEDERAL APPROVED	TOTAL
Personnel	\$	\$187,367	\$187,367
Fringe Benefits	\$	\$53,625	\$53,625
Travel	\$	\$49,765	\$49,765
Equipment	\$	\$158,992	\$158,992
Supplies	\$	\$14,000	\$14,000
Contractual	\$	\$130,640	\$130,640
Construction	\$	\$0	\$0
Other	\$11,000	\$78,008	\$89,008
Total Direct Charges	\$11,000	\$672,397	\$683,397
Indirect Charges	\$	\$246,603	\$246,603
TOTAL	\$11,000	\$919,000	\$930,000

- C. Cost Share/Match: There is no cost-share or match funding required for this Award. The

Department of Homeland Security will pay up to 100% of the costs identified in the approved budget listed under Article IV, Amount of Award. Subject to Article III of this Award, the maximum funding for this award for the entire project period is \$ 24,300,000.

- D. Pre-Award Costs. The amount of \$11,000 for other costs incurred to secure locations for workshops are included in the approved budget under item B. Federal Pre-Award. Other than the costs listed above, the Recipient shall not, without the prior written approval of DHS, request reimbursement or incur costs or obligate funds for any purpose pertaining to the operation of the project, program, or activities prior to the approved Budget Period

ARTICLE V – SUPPLANTING OF FUNDS

Funds approved under this Award shall be used to supplement and shall not be used to supplant State or local funds dedicated to this effort.

ARTICLE VI – PAYMENT

The Recipient shall be paid in advance using the U.S. Department of Health and Human Services/Payment Management System (SMARTLINK), provided it maintains or demonstrates the willingness and ability to maintain procedures to minimize the time elapsing between the transfer of the funds from the DHS and expenditure disbursement by the Recipient. When these requirements are not met, the Recipient will be required to be on a reimbursement for costs incurred method.

ARTICLE VII – FINANCIAL REPORTS

- A. Quarterly Financial Status Reports: The Recipient shall submit financial reports (SF 269, Financial Status Report) to the DHS Grants Officer within 30 days after end of each calendar quarter.
- B. Final Financial Status Report: The Recipient shall submit the Final Financial Status Report to the DHS Grants Officer within 90 days after the expiration date of the performance period.

ARTICLE VIII – PERFORMANCE REPORTS

- A. Quarterly Performance Reports: The Recipient shall submit performance reports to the DHS Grants Officer.
1. Performance reports are due within 30 days after the end of each calendar quarter.
 2. The performance report shall consist of a comparison of actual accomplishments to the approved project objectives.
- B. Final Performance Report: The Recipient shall submit the Final Performance Report to the DHS Grants Officer within 90 days after the expiration date of the project period.

ARTICLE IX – EQUIPMENT REPORTS

For equipment purchased with grant funds having a \$5,000 or more per unit cost, the Recipient shall submit an annual inventory on a calendar year basis which will include a brief description of the item, and amount of purchase.

ARTICLE X – DOCUMENT REPORTING

Documents and products prepared under this award shall be reviewed for proprietary and sensitive information by NCSD prior to public dissemination. Thirty (30) days prior to publication, the Recipient must submit a draft to the NCSD Program Manager for review.

All documents related to insider threat behavior, network database of insider threat detection, control system security programs, research and demonstration results, and internet security and resilience must be submitted to the NCSD Program Manager thirty (30) days prior to dissemination to the public.

ARTICLE XI – AMENDMENTS AND REVISIONS

A. Budget Revisions:

1. Transfers of funds between direct cost categories in the approved budget when such cumulative transfers among those direct cost categories exceed ten percent require written approval by the DHS Grants Officer prior to execution.
2. The Recipient shall obtain prior written approval for any budget revision which would result in the need for additional resources/funds.

B. Extension Request:

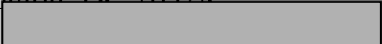
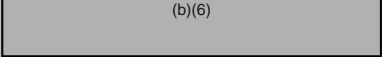
1. Extensions to the Period of Performance can only be authorized in writing by the DHS Grants Officer with the concurrence of the DHS Program Officer.
2. Requests for time extensions to the Period of Performance will be considered but will not be granted automatically and must be supported by adequate justification to be processed. The justification is a written explanation of the reason or reasons for the delay; an outline of remaining resources/funds available to support the extended Period of Performance; and a description of performance measures necessary to complete the project. Without performance and financial status reports current and justification submitted, extension requests shall not be processed. In addition, the noncompeting continuations must provide information that demonstrates that the grantee's initiatives are closely coordinated and integrated with existing NCSD programs particularly NCSD's control system and security program.

3. DHS has no obligation to provide additional resources/funding as a result of an extension.

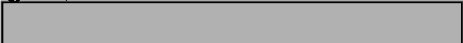
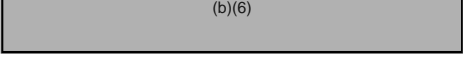
ARTICLE XII – DEPARTMENT OF HOMELAND SECURITY OFFICIALS

DHS officials for the Award are as follows:

- A. The Program Officer shall be the DHS staff member responsible for monitoring the completion of work and technical performance of the projects or activities described in the application under the Program Narrative Statement.

Program Officer: Richard Harris
Attn: National Cyber Security Division/Preparedness Directorate
Department of Homeland Security
Washington, DC 20528
Phone: 
e-mail: 

- B. The Grants Officer is the DHS official that has the full authority to negotiate, administer and execute all terms and conditions of this Award in concurrence with the Program Officer.

The Grants Officer: Rosemary Springer
Grants Management Officer
Grants and Financial Assistance Division
Office of Procurement Operations
Office of Chief Procurement Officer
Department of Homeland Security
245 Murray Lane, S.W., Bldg. 410
Washington, D.C. 20528
Phone: 
e-mail: 

ARTICLE XIII – GENERAL TERMS AND CONDITIONS:

The general terms and conditions of this Award are as follows:

- A. Buy America: The Recipient, subrecipients and contractors receiving funds from this Award are encouraged to comply with the Buy American Act (41 U.S.C. 10a et seq.) unless it is determined that it is inconsistent with the public interest, impracticable to comply with such a requirement or that it would unreasonable increase the cost of articles, materials, or supplies.
- B. Cargo Preference: The recipient agrees that it will comply with the Cargo Preference Act of 1954 (46 U.S.C. 1241), as implemented by Department of Transportation regulations at 46 CFR 381.7, which require that at least 50 percent of equipment, materials or commodities procured or otherwise obtained with U.S. Government funds under this Award, and which may be transported by ocean vessel, shall be transported on privately owned U.S.-flag

commercial vessels, if available.

- C. Contract Provisions: All contracts executed under this Award will contain the contract provisions listed under OMB Circular A-110.
- D. Controlled Unclassified Information: The parties understand that information and materials provided pursuant to or resulting from this Award may be export controlled, sensitive, for official use only, or otherwise protected by law, executive order or regulation. The Recipient is responsible for compliance with all applicable laws and regulations. Nothing in this Award shall be construed to permit any disclosure in violation of those restrictions.
- E. Copyright: The Recipient may publish, or otherwise exercise copyright in, any work first produced under this Award unless the work includes any information that is otherwise controlled by the Government (e.g. classified information or other information subject to national security or export control laws or regulations). For any scientific, technical, or other copyrighted work based on or containing data first produced under this Award, including those works published in academic, technical or professional journals, symposia proceedings, or similar works, the Recipient grants the Government a royalty-free, nonexclusive and irrevocable license to reproduce, display, distribute copies, perform, disseminate, or prepare derivative works, and to authorize others to do so, for Government purposes in all such copyrighted works. The Recipient shall affix the applicable copyright notices of 17 U.S.C. 401 or 402, and an acknowledgment of Government sponsorship (including award number) to any work first produced under this Award.
- F. Environmental Standards: By accepting funds under this Award, the recipient assures that it will:
1. Comply with applicable provisions of the Clean Air Act (42 U.S.C. 7401, et seq.) and Clean Water Act (33 U.S.C. 1251, et. seq.), as implemented by Executive Order 11738 [3 CFR, 1971-1975 comp., p. 799] and Environmental Protection Agency (EPA) rules at 40 CFR Part 15. In accordance with the EPA rules, the recipient further agrees that it will:
 - (i) Not use any facility on the EPA's List of Violating Facilities in performing any award that is nonexempt under 40 CFR 15.5 (awards of less than \$100,000, and certain other awards, exempt from the EPA regulations), as long as the facility remains on the list.
 - (ii) Notify the DHS Grants Officer if it intends to use a facility in performing this Award that is on the List of Violating Facilities or that the recipient knows has been recommended to be placed on the List of Violating Facilities.
 2. Identify to the DHS Grants Officer any impact this Award may have on:
 - (i) The quality of the human environment, and provide help the agency may need to comply with the National Environmental Policy Act (NEPA, at 42 U.S.C. 4321, et seq.) and to prepare Environmental Impact Statements or other required environmental documentation. In such cases, the recipient agrees to take no action that will have an adverse environmental impact (e.g., physical disturbance of a site

such as breaking of ground) until the agency provides written notification of compliance with the environmental impact analysis process.

- (ii) Coastal barriers, and provide help the agency may need to comply with the Coastal Barriers Resource Act (16 U.S.C. 3501, et seq.), concerning preservation of barrier resources.
- (iii) Any existing or proposed component of the National Wild and Scenic Rivers system, and provide help the agency may need to comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. 1271, et seq.).

G. Fly America Act: Preference for U.S. Flag Air Carriers: Travel supported by U.S. Government funds under this Award shall use U.S.-flag air carriers (air carriers holding certificates under 49 U.S.C. 41102) for international air transportation of people and property to the extent that such service is available, in accordance with the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118) and the interpretative guidelines issued by the Comptroller General of the United States in the March 31, 1981, amendment to Comptroller General Decision B138942.

H. Non-Disclosure Agreements. The recipient shall require all employees and sub-recipients having access to information or materials pertaining to this Award to sign a DHS-approved non-disclosure agreement (NDA) to protect against the misuses of information developed, generated, or distributed under this award.

In the event that information is divulged in violation of the terms of the NDA, the Recipient will immediately notify the DHS Grants Officer of the same and take appropriate law enforcement and legal action.

I. Patent Rights and Data Rights: Data rights:

- 1. General Requirements. The Recipient grants the Government a royalty-free, nonexclusive and irrevocable license to reproduce, display, distribute copies, perform, disseminate, or prepare derivative works, and to authorize others to do so, for Government purposes in:
 - i. Any data that first produced under this Award and provided to the Government;
 - ii. Any data owned by third parties that is incorporated in data provided to the Government under this Award.

"Data" means recorded information, regardless of form or the media on which it may be recorded.

- 2. Requirements for subawards. The Recipient agrees to include in any subaward made under this Award the requirements of the *Copyright* and *Data Rights* paragraphs this of this article and of 37 C.F.R. 401.14, if included in this Award by reference

J. Publications: The recipient shall not develop or disseminate any publications as a result of this project unless prior written approval is obtained from the DHS Grants Officer. Should the DHS Grants Officer approve a publication, the following must be included:

In compliance with Section 623 of the Treasury, Postal Service, and General Government Appropriations Act, 1993, and reenacted in Section 621 of the fiscal year 1994 Appropriations Act requires that all recipients disclose the amount and percentage of Federal funding and funding from non-governmental sources when making public announcements about Federally-funded projects in the amount of \$500,000 or more.

K. Security Requirements:

1. All work performed and information resulting therefrom, under this Award shall be protected through recipient's (and subrecipients of this award) DHS-approved security procedures, unless otherwise **specified in writing** by DHS.
2. The Recipient and sub-recipients of this Award shall use their own security procedures and protections to protect information developed, generated or distributed under this award, including but not limited to, a DHS-approved Non-Disclosure Agreement. A copy of the security procedures and proposed Non-Disclosure Agreement, shall be submitted to DHS for DHS's review and approval within 2 weeks of this Award.
3. The Recipient and sub-recipients shall ensure that sensitive information be protected in such a manner that it is safeguarded from public disclosure in accordance with applicable state or Federal laws and recipients and sub-recipients DHS-approved security procedures.
4. DHS provided information designated as sensitive but unclassified (SBU) or For Official Use Only (FOUO) transmitted to the Recipient and sub-recipients will be safeguarded in accordance with written security guidance provided by DHS.
5. Transmission of information developed, generated or received by this Award designated as SBU or FOUO shall be transported via secure security methods.
6. Any personal information developed, generated or received as a result of this award shall be treated consistent with fair information principles.

L. Site Visits: DHS, through authorized representatives, has the right, at all reasonable times, to make site visits to review project accomplishments and management control systems and to provide such technical assistance as may be required. If any site visit is made by DHS on the premises of the Recipient, or a contractor under this Award, the Recipient shall provide and shall require its contractors to provide all reasonable facilities and assistance for the safety and convenience of the Government representatives in the performance of their duties. All site visits and evaluations shall be performed in such a manner that will not unduly delay the work.

M. Termination: Either the Recipient or DHS may terminate this Award by giving written notice to the other party at least thirty (30) calendar days prior to the effective date of the termination. All notices are to be transmitted to the DHS Grants Officer via registered or certified mail, return receipt requested. The Recipient's authority to incur new costs will be terminated upon arrival of the date of receipt of the letter or the date set forth in the notice.

Any costs incurred up to the earlier of the date of the receipt of the notice or the date of termination set forth in the notice will be negotiated for final payment. Closeout of this Award will be commenced and processed as under OMB Circular A-110.

- N. Travel: Travel required in the performance of the duties approved in this Award must comply with the applicable OMB Cost Principles Circular. Foreign travel is not included in this award.

ARTICLE XIV – NONDISCRIMINATION

- A. This Award and any program assisted thereby are subject to the provisions of Title VI of the civil Rights Act of 1964 (42 U.S.C. 2000d), the regulations issued pursuant thereto and the Assurance of Compliance which the Recipient has filed with DHS. No person on the basis of race, color, national origin, or handicap shall be excluded from participation in, be denied benefits of, or otherwise be subjected to discrimination under this Award. In addition, if the project involves an education activity or program, as defined by Title IX of the Education Amendments of 1972 (20 U.S.C. 1681-1686), no person on the basis of sex shall be excluded from participation in the project. Further, by acceptance of this award, the Recipient assures the DHS that it will comply with Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794).
- B. The Recipient shall obtain from each organization that applies to be or serves as a subrecipient, subgrantee or subcontractor under this Award (for other than the provision of commercially available supplies, materials, equipment or general support services) an Assurance of Compliance with Title VI of the Civil Rights Act of 1964. Civil Rights Act assurances may be filed with the Recipient in one of two ways:
1. By written notification that the appropriate Assurance of Compliance form has been executed and filed either with DHS or the U.S. Department of Health and Human Services; or
 2. The Recipient shall obtain assurances pursuant to Section 504 of the Rehabilitation Act of 1973, as amended, from subrecipients by incorporating into the subagreement a provision that acceptance of the subagreement constitutes assurance.
- C. The Recipient agrees to comply with the Age Discrimination Act of 1975 (42 U.S.C. 6101 et. seq.) as implemented by the Department of Health and Human Service regulations at 45 CFR 90. In the event the Recipient passes on DHS financial assistance to subrecipients, this provision shall apply to the subrecipients, and the instrument under which the Federal financial assistance is passed to the subrecipient shall contain a provision identical to this provision.

ARTICLE XV – AUDIT REQUIREMENTS

The Recipient must follow the audit requirements under OMB Circular No. A-133, Audits for States, Local Governments and Non-Profit Organizations. Non-Federal entities that expend

\$500,000 or more of Federal funds in their fiscal year shall have a single or program-specific audit conducted for that year in accordance with the provisions of A-133.

ARTICLE XVI – GOVERNING PROVISIONS

The following are hereby incorporated into this Award by this reference:

- 31 CFR 205 Rules and Procedures for Funds Transfers
- OMB Circular A-110 Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations
- OMB Circular A-21 Cost Principles for Educational Institutions
- OMB Circular A-133 Audits of States, Local Governments, and Non-Profit Organizations
- Application Grant Application and Assurances dated August 25, 2006.

(b)(6)

Rosemary Springer, Grants Officer
Grants and Financial Assistance Division
Office of Procurement Operations
Office of the Chief Procurement Officer
Department of Homeland Security

9/25/06
Date

**DEPARTMENT OF HOMELAND SECURITY
OFFICE OF THE SECRETARY, OFFICE OF THE DEPUTY SECRETARY
CONGRESSIONAL NOTIFICATION
FOR GRANT AWARDS/COOPERATIVE AGREEMENTS**

NOTIFICATION TRANSMITTAL:

STATE: 2. Notification Date:

3. Congressional District:

4. Program/Project Name:

5. Amount of Funding: 6. Award Date:

7. Award Type:

8. Brief Description of Program/Projects:

a. Recipient(s):

b. Address:

c. Program/Project Objectives/Goals:

The purpose of this grant is to strengthen homeland security through research, education and outreach programs that focus on technology critical for cyber security and emergency preparedness and response. It will also identify and address critical research problems in information infrastructure protection and work to build a community of researchers focused on infrastructure security.

9. Award Process:

10. Program Contact:

11. E-Mail: 12. Telephone No.

13. Grant Officer:

14. E-Mail: 15. Telephone No.

NOTIFICATION RESPONSE: 15. Telephone No.

17. ___ Congressional Notification required for individual Grants or Cooperative Agreements
under these conditions:

18. Contact:

19. E-Mail: 20. Telephone No.

Application for Federal Assistance SF-424

Version 02

* 1. Type of Submission: <input type="radio"/> Preapplication <input checked="" type="radio"/> Application <input type="radio"/> Changed/Corrected Application	* 2. Type of Application: <input checked="" type="radio"/> New <input type="radio"/> Continuation <input type="radio"/> Revision	* If Revision, select appropriate letter(s): _____ * Other (Specify) _____
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* 3. Date Received: 08/25/2006	4. Applicant Identifier: _____
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5a. Federal Entity Identifier: _____	* 5b. Federal Award Identifier: _____
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State Use Only:

6. Date Received by State: _____	7. State Application Identifier: _____
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8. APPLICANT INFORMATION:

* a. Legal Name: Trustees of Dartmouth College	
* b. Employer/Taxpayer Identification Number (EIN/TIN): (b)(6)	* c. Organizational DUNS: 041027822

d. Address:

* Street1: 11 Rope Ferry Road, #6210
Street2: _____
* City: Hanover
County: _____
* State: NH: New Hampshire
Province: _____
* Country: USA: UNITED STATES
* Zip / Postal Code: 03755-1404

e. Organizational Unit:

Department Name: 3P/ISTS	Division Name: Provost
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f. Name and contact information of person to be contacted on matters involving this application:

Prefix: Dr.	* First Name: (b)(6)
Middle Name: (b)(6)	
* Last Name: (b)(6)	
Suffix: _____	
Title: Vice Provost for Research	
Organizational Affiliation: _____	
* Telephone Number: (b)(6)	Fax Number: _____
* Email: (b)(6)	

Application for Federal Assistance SF-424

Version 02

9. Type of Applicant 1: Select Applicant Type:

Private Institution of Higher Education

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Office of Procurement Operations - Grants Division

11. Catalog of Federal Domestic Assistance Number:

97.001

CFDA Title:

One-Time Projects

*** 12. Funding Opportunity Number:**

DHS-06-CS-001-001

* Title:

Cyber Security Collaboration and Information Sharing

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Hanover, NH; Nationwide

*** 15. Descriptive Title of Applicant's Project:**

Cyber Security Collaboration and Information Sharing

Attach supporting documents as specified in agency instructions.

Application for Federal Assistance SF-424

Version 02

16. Congressional Districts Of:

* a. Applicant

* b. Program/Project

Attach an additional list of Program/Project Congressional Districts if needed.

17. Proposed Project:

* a. Start Date:

* b. End Date:

18. Estimated Funding (\$):

* a. Federal	<input type="text" value="24,300,000.00"/>
* b. Applicant	<input type="text" value="0.00"/>
* c. State	<input type="text" value="0.00"/>
* d. Local	<input type="text" value="0.00"/>
* e. Other	<input type="text" value="0.00"/>
* f. Program Income	<input type="text" value="0.00"/>
* g. TOTAL	<input type="text" value="24,300,000.00"/>

* 19. Is Application Subject to Review By State Under Executive Order 12372 Process?

- a. This application was made available to the State under the Executive Order 12372 Process for review on
- b. Program is subject to E.O. 12372 but has not been selected by the State for review.
- c. Program is not covered by E.O. 12372.

* 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes", provide explanation.)

- Yes
- No

21. *By signing this application, I certify (1) to the statements contained in the list of certifications** and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)

** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: * First Name:
Middle Name:
* Last Name:
Suffix:

* Title:

* Telephone Number: Fax Number:

* Email:

* Signature of Authorized Representative: * Date Signed:

Application for Federal Assistance SF-424

Version 02

*** Applicant Federal Debt Delinquency Explanation**

The following field should contain an explanation if the Applicant organization is delinquent on any Federal Debt. Maximum number of characters that can be entered is 4,000. Try and avoid extra spaces and carriage returns to maximize the availability of space.

Attachments

AdditionalCongressionalDistricts

File Name

Mime Type

AdditionalProjectTitle

File Name

Mime Type

BUDGET INFORMATION - Non-Construction Programs

OMB Approval No. 4040-0006
Expiration Date 04/30/2008

SECTION A - BUDGET SUMMARY						
Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Budget Period I	97.001			\$930,000.00		\$930,000.00
2. Budget Period II	97.001			\$11,007,642.00		\$11,007,642.00
3. Budget Period III	97.011			\$12,362,358.00		\$12,362,358.00
4.						\$0.00
5. Totals		\$0.00	\$0.00	\$24,300,000.00	\$0.00	\$24,300,000.00
SECTION B - BUDGET CATEGORIES						
6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)	
	(1) Budget Period I	(2) Budget Period II	(3) Budget Period III	(4)		
a. Personnel	\$187,367.00	\$1,344,808.00	\$1,955,298.00		\$3,487,473.00	
b. Fringe Benefits	\$53,625.00	\$399,818.00	\$663,684.00		\$1,117,127.00	
c. Travel	\$49,765.00	\$254,775.00	\$406,950.00		\$711,490.00	
d. Equipment	\$158,992.00	\$321,000.00	\$78,458.00		\$558,450.00	
e. Supplies	\$14,000.00	\$205,747.00	\$197,943.00		\$417,690.00	
f. Contractual	\$130,640.00	\$6,639,650.00	\$6,798,450.00		\$13,568,740.00	
g. Construction	\$0.00	\$0.00	\$0.00		\$0.00	
h. Other	\$89,008.00	\$264,058.00	\$274,607.00		\$627,673.00	
i. Total Direct Charges (sum of 6a-6h)	\$683,397.00	\$9,429,856.00	\$10,375,390.00	\$0.00	\$20,488,643.00	
j. Indirect Charges	\$246,603.00	\$1,577,786.00	\$1,986,968.00		\$3,811,357.00	
k. TOTALS (sum of 6i and 6j)	\$930,000.00	\$11,007,642.00	\$12,362,358.00	\$0.00	\$24,300,000.00	
7. Program Income					\$0.00	

Standard Form 424A (Rev. 7-97)
Prescribed by OMB Circular A-102

SECTION 6: NON-FEDERAL RESOURCES					
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS	
8. Budget Period I					\$0.00
9. Budget Period II					\$0.00
10. Budget Period III					\$0.00
11.					\$0.00
12. TOTAL (sum of lines 8-11)		\$0.00	\$0.00	\$0.00	\$0.00
SECTION 7: FORECASTED EXPENSES					
13. Federal	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
	\$930,000.00	\$465,000.00	\$465,000.00		
14. Non-Federal	\$0.00				
15. TOTAL (sum of lines 13 and 14)	\$930,000.00	\$465,000.00	\$465,000.00	\$0.00	\$0.00
SECTION 8: INDUSTRY ESTIMATE OF FEDERAL FUNDS NEEDED FOR FINANCING OF THE PROJECT					
(a) Grant Program	FUTURE FUNDING PERIODS (Years)				
	(b) First	(c) Second	(d) Third	(e) Fourth	
16. Budget Period II	\$2,751,910.50	\$2,751,910.50	\$2,751,910.50	\$2,751,910.50	
17. Budget Period III	\$3,090,589.50	\$3,090,589.50	\$3,090,589.50	\$3,090,589.50	
18.					
19.					
20. TOTAL (sum of lines 16-19)	\$5,842,500.00	\$5,842,500.00	\$5,842,500.00	\$5,842,500.00	
SECTION 9: OTHER FUNDING INFORMATION					
21. Direct Charges: \$20,489,204			22. Indirect Charges: predetermined \$3,811,357		
23. Remarks: predetermined indirect rate of 59.9% and 35.0% depending on the projects funded \$2,459,006 x 35% AND 4,926,050 x 59.9%					

BUDGET JUSTIFICATION

DHS-06-CS-001-001
Dartmouth College

The following 14 budgets are presented. The Budget Narrative (from Attachment 2 --Project Narrative) has also been included in this document for easy reference for how amounts and calculations were derived. We respectively request pre-award spending for 90 days. In order to secure location space for upcoming workshops, expenses will be incurred as early as August 2006.

Detailed budgets are outlined for Budget Period I (\$930,000):

I3P

Cyber Security Workshops - Budget Period I

ISTS

Internet Security Test bed - Budget Period I

Hardware Based Security - Budget Period I

PKI Research - Budget Period I

Autonomic Computing for Real People - Budget Period I

ISTS Fellows - Budget Period I

Estimated budgets are outlined for Budget Periods II and III (\$23,370,000):

I3P

I3P Research (Initiatives 1-6) - Budget Period II

I3P Research (Initiatives 1-6) - Budget Period III

I3P Management - Budget Period II

I3P Management - Budget Period III

ISTS

ISTS Cyber Research (Initiative 7) - Budget Period II

ISTS Cyber Research (Initiative 7) - Budget Period III

ISTS Cyber Education (Initiative 8) - Budget Period II

ISTS Cyber Education (Initiative 8) - Budget Period III

Notes

All personnel are Dartmouth Employees.

Most faculty members have nine-month appointments, and therefore, the percent effort is based on nine months for those individuals. Those with nine-month appointments are noted in the budget detail worksheets.

Note that the Budget Period I runs for six months, and detailed descriptions are included with the budget justification worksheets. Budget Periods II and III run for an additional two years. Final detail budgets will be submitted in subsequent amendments. Initial estimates are included in this

request in an effort to give an overview of how Dartmouth envisions spending the money; we will provide detailed budgets in subsequent amendments.

The Dartmouth Fiscal Year is as follows:

July 1, 2006 to June 30, 2007 (six months of period I and three months of Budget Period II)

July 1, 2007 to June 30, 2008 (three months of Budget Period II and nine months of Budget Period III)

July 1, 2008 to June 30, 2009 (nine months of period III)

Annual raises take affect on July 1 of each year.

Travel is reimbursed per the approved Dartmouth Travel Policy.

Summary - breakdown by categories

Object Class Categories:		TOTAL	Budget Period I	Estimated Budget Period II	Estimated Budget Period III
a.	Personnel	3,487,473	187,367	1,344,808	1,955,298
b.	Fringe Benefits	1,117,127	53,625	399,818	663,684
c.	Travel	711,490	49,765	254,775	406,950
d.	Equipment	558,450	158,992	321,000	78,458
e.	Supplies	417,690	14,000	205,747	197,943
f.	Contractual	13,568,740	130,640	6,639,650	6,798,450
g.	Construction	-	-	-	-
h.	Other	627,673	89,008	264,058	274,607
i.	Total Direct Charges	20,488,643	683,397	9,429,856	10,375,390
j.	Indirect Charges	3,811,357	246,603	1,577,786	1,986,968
k.	TOTAL	24,300,000	930,000	11,007,642	12,362,358

I3P Cyber Security Workshops - Budget Period I

Dates: October 1, 2006 to March 31, 2007

Dartmouth FY07

Item (Labor (Dartmouth))	Base salary	Dartmouth FY07				Total
		# of months	% effort	% effort	subtotal	
Staff						
AP (b)(6) e (Chair)		6.00	0%	0.00%	\$0	\$0
AP (b)(6) f Research	\$250,000	4.00	0%	0.00%	\$0	\$0
AP (b)(6) Associate Dir	\$88,683	6.00	4%	2.00%	\$1,774	\$1,774
AP (b)(6) Dir for Research & Analysis	\$75,705	6.00	5%	2.50%	\$1,893	\$1,893
AP (b)(6) r Asst. Dir for Informatics Services	\$80,500	6.00	4%	1.96%	\$1,574	\$1,574
AP (b)(6) min Assit	\$38,220	6.00	10%	5.00%	\$1,911	\$1,911
AP (b)(6) ett (Event Manager)	\$43,446	6.00	10%	5.00%	\$2,172	\$2,172
AP (b)(6) earch Coordinator	\$37,000	6.00	5%	2.50%	\$925	\$925
AP (b)(6) ommunication	\$60,000	6.00	5%	2.50%	\$1,500	\$1,500
AP (b)(6) Manager, Web and Print Content)	\$38,934	6.00	5%	2.50%	\$973	\$973
AP (b)(6) Data Specialist)	\$31,836	6.00	5%	2.50%	\$796	\$796
Students						
Students	Rate per hour	hours/week	# of weeks	# of students		
Dartmouth students to perform various admin duties	\$8.00	5.00	15	2	\$1,200	
Subtotal, without fringe					\$14,718	\$14,718
AP Fringe on AP I and AP II				38.0%	\$5,137	\$5,137
Total fringe					\$5,137	\$5,136
Subtotal, including fringe					\$19,854	\$19,854
Indirects on people	33.00%				\$6,949	\$6,949
Direct materials						
Computation						Total
Travel						
Workshop #1: Travel for Cyber Security Awareness Forum (Jan 30, 2007, Washington, DC)						
I3P Staff	Airfare \$600				\$4,800	\$4,800
No. of travelers	8 Hotel \$180 / day				\$3,040	\$3,040
No. of Trips	1 Meals \$50 / day				\$800	\$800
No. of nights	2 Mileage/tax/parking (\$80+\$20+\$20) \$100				\$1,600	\$1,600
Workshop #2: Travel for PCS Security Workshops (Feb 2007, Texas)						
I3P Staff	Airfare \$600	speaker			\$3,000	\$3,000
No. of travelers	5 Hotel \$100 / day				\$1,500	\$1,500
No. of Trips	1 Meals \$50 / day				\$750	\$750
No. of nights	3 Mileage/tax/parking (\$80+\$20+\$20) \$100				\$1,500	\$1,500
Workshops #3 & #4: Travel for I3P Session at Industry Events (Feb 2007 & March 2007)						
I3P Staff	Airfare \$600				\$1,200	\$1,200
No. of travelers	1 Hotel \$175 / day				\$1,050	\$1,050
No. of Trips	2 Meals \$50 / day				\$300	\$300
No. of nights	3 Mileage/tax/parking (\$80+\$20+\$20) \$100				\$600	\$600
Capital equipment						
Breakdown of Equipment						
Non-Capital equip, supplies						
By Type						
computation						
Supplies for Workshop #1	160 \$10/person				\$1,500	\$1,500
Supplies for Workshop #2	120 \$10/person				\$1,200	\$1,200
Supplies for Workshop #5	60 \$10/person				\$600	\$600
Other Costs						
By Type						
computation						
Workshop #1 (Jan 30, 2007)						
Food for Forum	100 Meals (\$90/ day)				\$9,000	\$9,000
Set-up room Forum	\$2,000 per meeting (cassels, markers, tele conf, etc.)				\$2,000	\$2,000
Room rental for Forum	\$5,000 per meeting				\$5,000	\$5,000
A/V equipment for Forum	\$4,000 per meeting				\$4,000	\$4,000
Postage	\$150 for materials to and from venue				\$300	\$300
	Paper Invitations 800 x .75				\$600	\$600
	Paper Invitations 800 x .50				\$400	\$400
	I3P promo posters (3 x \$500)				\$1,500	\$1,500
	Session information and documents to distribute				\$400	\$400
	200 copies at \$2 per copy				\$4,000	\$4,000
Transcription or video recording (Forum)						

Workshop #3 (Feb 2007)					
	Food for Industry Event #1	30 Meals (\$50/day)		\$1,500	\$1,500
	Room rental for Industry Event #1	\$1,500 per meeting		\$1,500	\$1,500
	Postage	\$80 to and from the venue for session materials		\$160	\$160
	Printing	Session information and documents to distribute 30 copies at \$2 per copy		\$60	\$60
Workshop #4 (March 2007)					
	Food for Industry Event #2	not anticipated for this event			\$0
	Room rental for Industry Event #2	not anticipated for this event			\$0
	Postage	\$80 to and from the venue for session materials		\$160	\$160
		Mail 100 packets, 40 pages, \$2 per packet		\$400	\$400
	Printing	Session information and documents to distribute 30 copies at \$2 per copy		\$60	\$60
Workshop #5: Critical Infrastructure Protection Conference (March 19-21 2007, Hanover, NH)					
	Breakfast (\$21/person)	60 3 days		\$3,780	\$3,780
	Breaks (\$15/person)	60 3 days		\$2,700	\$2,700
	Lunch (\$32/person)	60 3 days		\$5,760	\$5,760
	The Hanover Inn (\$51/person)	60		\$3,060	\$3,060
	Jesse's Restaurant (\$21/person)	60		\$1,260	\$1,260
	The Quechee Club (\$42/person)	60		\$2,520	\$2,520
	Postage	Mail 60 packets, 40 pages, \$2 per packet		\$120	\$120
	Printing	60 packets outlining meeting x \$2 per copy		\$120	\$120
	AV equipment & setup	2 1/2 days, provided by Dartmouth Services		\$1,500	\$1,500
	Bus Service	2 nights		\$700	\$700
Workshop #2 (Feb 2007)					
	Food for PCS Workshop	120 Meals (\$80/day)		\$9,600	\$9,600
	Room rental for workshop	\$4,000 per meeting		\$4,000	\$4,000
	AV equipment for workshop	\$8,000 per meeting		\$8,000	\$8,000
	Postage	\$80 to and from the venue for session materials		\$160	\$160
		Mail 120 packets, 40 pages and CD, \$2 per packet		\$240	\$240
	Printing	Workshop information and documents resulting from session Printing/burning of CD's with label - 120 at \$3 each Print session information 120 at \$2 per copy		\$360	\$360
				\$240	\$240
	Workshop registration software	3	\$250	\$750	\$750
	Indirects on travel, supplies, other costs (NOT equipment or tuition)		35.00%	\$34,773	\$34,773
Consultants			Base price		Total
	Workshop #1: Panel participants & speakers travel	Airfare \$600		\$4,800	\$4,800
	No. of travelers	8 Hotel \$100 / day		\$1,520	\$1,520
	No. of Trips	1 Meals \$50 / day		\$400	\$400
	No. of nights	1 Mileage/tax/parking (\$80+\$20+\$20) \$100		\$800	\$800
	Workshop #1: I3P Consortium members travel	Airfare \$600		\$18,000	\$18,000
	No. of travelers	30 Hotel \$100 / day		\$5,700	\$5,700
	No. of Trips	1 Meals \$50 / day		\$1,500	\$1,500
	No. of nights	1 Mileage/tax/parking (\$80+\$20+\$20) \$100		\$3,000	\$3,000
	Workshop #1 Speaker and panel experts	\$1,000 fee (x 5)		\$5,000	\$5,000
	Designer	web and posters (graphics)		\$3,000	\$3,000
	Workshop #2 Speaker (Feb 2007)	\$1,000 fee		\$1,000	\$1,000
	Indirect on consultants		35.00%	\$15,652	\$15,652
Subgrantees			Base price		Total
Subgrants for additional work and expenses related to:					
	Workshop #1:				
	Sandia National Labs	test bed shipping and technicians		\$17,984	\$17,984
	Mitre	risk map		\$7,083	\$7,083
	Workshop #3 & #4:				
	Sandia National Labs	1 for staff time, travel and shipping		\$20,718	\$20,718
	Pacific Northwest National Labs	1 for staff time, travel and shipping		\$19,755	\$19,755
	SRI International	1 for staff time, travel and shipping		\$14,980	\$14,980
	Indirect on figt \$25k each subcontract	subcontracts	35.00%	\$28,182	\$28,182
Total directs				\$244,444	\$244,444
Total indirects				\$85,556	\$85,556
Total				\$330,000	\$330,000

Internet Security Test bed - Budget Period I

Dates: October 1, 2006 to March 31, 2007

Dartmouth 2006-07

Item	Labor (Dartmouth)	Base salary	# of months	% effort		subtotal	Total	
Faculty	(b)(6) (month base salary)	9 Professor	\$150,000	1.00	100%	11.11%	\$16,667	\$16,667
Staff	AP Technician programmer	12 Technician	\$80,000	5.00	100%	41.67%	\$33,333	\$33,333
Subtotal, without fringe						\$50,000	\$50,000	
FAC	Fringe on Faculty					38.0%	\$6,333	\$6,333
AP	Fringe on AP I and AP II					38.0%	\$12,667	\$12,667
Total fringe						\$19,000	\$19,000	
Subtotal, including fringe						\$69,000	\$69,000	
	Indirects on people		59.90%				\$41,331	\$41,331
Direct materials								
Computation								
Travel								
Travel to DETER site and DETER workshop								
	Airfare \$800					\$4,000	\$4,000	
	No. of travelers 2 Hotel \$175 / day					\$4,200	\$4,200	
	No. of Trips 4 Meals \$80 / day					\$1,200	\$1,200	
	No. of nights 3 Mileage/tax/parking (\$60+\$20+\$20) \$100					\$800	\$800	
Capital equipment								
Breakdown of Equipment								
	Racks (42U computer racks)		8	\$1,494		\$11,952	\$11,952	
	Uninterruptible power supplies	one per rack, to start	8	\$1,300		\$10,400	\$10,400	
Non-Capital equip, supplies								
By Type								
	Reference books and materials		7	\$100		\$700	\$700	
	Equipment installation (power, cooling, etc)		1	\$9,000		\$9,000	\$9,000	
Other Costs								
By Type								
	Conference registration fees		2	\$500		\$1,000	\$1,000	
	Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%			\$12,519	\$12,519	
Consultants								
Name & Service Provided								
	(b)(6) DETER expert advice		3.00	\$600		\$1,800	\$1,800	
	TBD, DETER expert advice		9.00	\$400		\$3,600	\$3,600	
	Indirect on consultants		59.90%			\$3,235	\$3,235	
Subcontracts								
Base price								
Describe Product or Service								
	Subtotal					\$0	\$0	
	Indirect on firm \$25k each subcontract		59.90%			\$0	\$0	
Total direct						\$117,652	\$117,652	
Total indirects						\$57,085	\$57,085	
Total						\$174,737	\$174,737	

Hardware Based Security - Budget Period I

Dates: October 1, 2006 to March 31, 2007

Dartmouth 2006-07

Item	Labor (Dartmouth)	Base salary	# of months	Effort	Rate	Subtotal	Total
Faculty							
FAC	(b)(6) (month base salary)	9 Professor	0.25	100%	2.78%	\$3,333	\$3,333
FAC	(b)(6) (2-month base salary)	12 Professor	0.33	100%	2.78%	\$2,372	\$2,372
Staff							
Students							
	EE student, as lab tech	Rate per hour \$10.00	hours/week 10.00	# of weeks 20	# of students 1	\$2,000	\$2,000
	Dartmouth CS grad students	Rate per hour \$1,915	# of months 6	# of students 1		\$11,490	\$11,490
Subtotal, without fringe						\$19,195	\$19,195
FAC	Fringe on Faculty				38.0%	\$2,168	\$2,168
AP	Fringe on AP I and AP II				38.0%	\$0	\$0
Total fringe						\$2,168	\$2,168
Subtotal, including fringe						\$21,363	\$21,363
	Indirects on people	59.90%				\$12,797	\$12,797
Direct materials		Computation				Total	
Travel							
Travel to partners		Airfare \$600				\$5,000	\$5,000
	No. of travelers 2	Hotel \$175 / day				\$1,750	\$1,750
	No. of Trips 5	Meals \$50 / day				\$500	\$500
	No. of nights 1	Mileage/tax/perking (\$60+\$20+\$20) \$100				\$1,000	\$1,000
Travel for outreach trips							
	No. of travelers 2	Rental Car (\$160/day)				\$600	\$600
	No. of Trips 4	Meals \$50 / day				\$400	\$400
	No. of nights 1						
Capital equipment							
Breakdown of Equipment		Quantity	Price each			Subtotal	Total
	TPM -laptops (5 for Apu, 1 for camera, 1 for other)	7	\$2,800			\$19,600	\$19,600
	Logic Analyzer (HP 16902A)	1	\$27,394			\$27,394	\$27,394
	Dynamic Probe (HP B4655A)	1	\$3,000			\$3,000	\$3,000
	PCI/PCI-X Bus Analyzer (HP E2997A)	1	\$15,929			\$15,929	\$15,929
	JTAG Emulator and Probes (Arium ECM-50)	1	\$15,000			\$15,000	\$15,000
	Multicore Desktop PCs (DELL XPS 700)	2	\$2,849			\$5,698	\$5,698
	IBM 4764	1	\$12,500			\$12,500	\$12,500
	Host for IBM 4764	1	\$3,459			\$3,459	\$3,459
	Multiprocessor Research Accelerator (RAMP2)	1	\$10,000			\$10,000	\$10,000
	LT-capable Desktop PCs (DELL XPS 700)	2	\$2,849			\$5,698	\$5,698
	VT-capable Desktop PCs (DELL XPS 700)	2	\$2,849			\$5,698	\$5,698
	Smartcard development tool (Raisonance)	1	\$7,664			\$7,664	\$7,664
Non-Capital equip, supplies							
By Type							
	PDA platforms		2	\$500		\$1,000	\$1,000
Other Costs							
By Type							
	Indirects on travel, supplies, other costs (NOT equipment or tuition)	59.90%				\$6,140	\$6,140
Consultants							
Name & Service Provided							
	Indirect on consultants	59.90%				\$0	\$0
Subcontracts							
Describe Product or Service							
	Subtotal					\$0	\$0
	Indirect on first \$25k each subcontract	59.90%				\$0	\$0
Total direct						\$163,253	\$163,253
Total indirect						\$18,936	\$18,936
Total						\$182,189	\$182,189

PKI Research - Budget Period I

Dates: January 1, 2007 to March 31, 2007

Dartmouth 2006-07

Item	Labor (Dartmouth)	Base salary	# of months	% effort		subtotal	Total	
Faculty								
FAC	(b)(6) 9-month base salary	9 Professor	\$120,000	0.25	100%	2.78%	\$3,333	\$3,333
Staff								
RAB	(b)(6) Postdoc	12 month base salary	\$60,000	3.00	100%	25.00%	\$15,000	\$15,000
RAC	(b)(6) Researcher	12 month base salary	\$134,608	3.00	25%	6.25%	\$8,413	\$8,413
Students								
	Ugrad Intern	Rate per hour	\$10.00	hours/week	# of weeks	# of students		
				10.00	20	1	\$2,000	\$2,000
	Dartmouth CS grad students	Rate per hour	\$1,915	# of months	# of students		\$0	\$0
Subtotal, without fringe						\$28,746	\$28,746	
FAC	Fringe on Faculty					38.0%	\$1,267	\$1,267
RAB	Fringe on AP I and AP II					24.5%	\$3,675	\$3,675
RAC	Fringe on AP I and AP II					38.0%	\$3,197	\$3,197
Total fringe						\$8,139	\$8,139	
Subtotal, including fringe						\$36,885	\$36,885	
	Indirects on people	59.90%					\$22,094	\$22,094
Direct materials		Computation					Total	
Travel								
Travel to partners		Airfare \$500				\$2,000	\$2,000	
	No. of travelers	2	Hotel \$175 / day			\$700	\$700	
	No. of Trips	2	Meals \$50 / day			\$200	\$200	
	No. of nights	1	Mileage/taxi/parking (\$60+\$20+\$20) \$100			\$400	\$400	
Travel for outreach trips		2 Rental Car (\$150/day)				\$300	\$300	
	No. of travelers	2	Meals \$50 / day			\$200	\$200	
	No. of Trips	2						
	No. of nights	1						
Capital equipment								
Breakdown of Equipment				Quantity	Price each	subtotal		
	Laptop for postdoc			1	\$2,500	\$2,500	\$2,500	
Non-Capital equip, supplies								
By Type								
Other Costs								
By Type								
	Indirects on travel, supplies, other costs (NOT equipment or tuition)	59.90%					\$2,276	\$2,276
Consultants				Days	Daily rate	subtotal	Total	
	Name & Service Provided							
	Indirect on consultants	59.90%						
Subcontracts		Base price					Total	
	Describe Product or Service							
	Indirect on first \$25k each subcontract	59.90%				\$0	\$0	
Total directs						\$43,185	\$43,185	
Total indirects						\$24,370	\$24,370	
Total						\$67,555	\$67,555	

Autonomic Computing for Real People - Budget Period I

Dates: October 1, 2006 to March 31, 2007

Dartmouth 2006-07

Item	Labor (Dartmouth)	Base salary	# of months	% effort	subtotal	Total
Faculty						
FA	(b)(6) 5-month base salary	\$120,255	0.50	100%	10.00%	\$12,026
Staff						
RAC	(b)(6) Researcher	\$100,152	2.00	100%	16.67%	\$16,692
Students						
	Dartmouth ENGS grad students (includes health insurance)	\$2,040	6		1	\$12,240
Subtotal, without fringe					\$40,958	\$40,958
FAC	Fringe on Faculty				38.0%	\$4,570
RAC	Fringe on AP I and AP II				38.0%	\$6,343
Total fringe					\$10,913	\$10,913
Subtotal, including fringe					\$51,870	\$51,870
	Indirects on people	59.90%			\$31,070	\$31,070
Direct materials		Computation				Total
Travel						
Travel to partners						
	Airfare \$500				\$1,500	\$1,500
	No. of travelers 1 Hotel \$176 / day				\$1,575	\$1,575
	No. of Trips 3 Meals \$50 / day				\$450	\$450
	No. of nights 3 Mileage/Taxi/parking (\$60+\$20+\$20) \$100				\$300	\$300
Travel for outreach trips						
	No. of travelers 0 Rental Car (\$150/day)				\$0	\$0
	No. of Trips 0 Meals \$50 / day				\$0	\$0
	No. of nights 0				\$0	\$0
Capital equipment						
Breakdown of Equipment						
	Quantity	Price Each			Subtotal	
Non-Capital equip, supplies						
By Type						
Other Costs						
By Type						
	Thayer School Tuition	\$22,195		50%	\$11,098	\$11,098
Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%			\$2,291	\$2,291
Consultants						Total
Name & Service Provided			Rate	Daily rate	Subtotal	
Indirect on consultants		59.90%			\$0	\$0
Subcontracts		Base price				Total
Describe Product or Service						
Subtotal						
Indirect on first \$25k each subcontract		59.90%			\$0	\$0
Total direct						\$66,793
Total indirect						\$33,361
Total						\$100,154

ISTS Fellows - Budget Period I

Dates: October 1, 2006 to March 31, 2007

Dartmouth 2006-07

Item	Labor (Dartmouth)	Base salary	# of months	Number	Rate	Amount	Total	
Faculty								
Staff	RAB Post-doc (fellow)	12 month base salary	\$67,500	6.00	100%	50.00%	\$33,750	\$33,750
Subtotal, without fringe						\$33,750	\$33,750	
FAC	Fringe on Faculty					38.0%	\$0	\$0
RAB	Fringe on AP I and AP II					24.5%	\$8,269	\$8,269
RAC	Fringe on AP I and AP II					38.0%	\$0	\$0
Total fringe						\$8,269	\$8,269	
Subtotal, including fringe						\$42,019	\$42,019	
	Indirects on people	59.90%				\$25,169	\$25,169	
Direct materials								
Computation								
Travel								
Travel to partners								
		Airfare \$500				\$1,000	\$1,000	
	No. of travelers	1 Hotel \$175 / day				\$1,050	\$1,050	
	No. of Trips	2 Meals \$60 / day				\$300	\$300	
	No. of nights	3 Mileage/taxi/parking (\$50+\$20+\$20) \$100				\$200	\$200	
Capital equipment								
Breakdown of Equipment								
	Laptop		1	\$2,500		\$2,500	\$2,500	
Non-Capital equip, supplies								
By Type								
Other Costs								
By Type								
	Conference Registration Fees		2.00	\$500		\$1,000	\$1,000	
	Indirects on travel, supplies, other costs (NOT equipment or tuition)	59.90%				\$2,126	\$2,126	
Consultants								
Name & Service Provided								
	Indirect on consultants	59.90%				\$0	\$0	
Subcontracts								
Base price								
	Describe Product or Service					\$0	\$0	
Subtotal						\$0	\$0	
	Indirect on first \$25k each subcontract	59.90%				\$0	\$0	
Total directs						\$48,069	\$48,069	
Total indirects						\$27,296	\$27,296	
Total						\$75,365	\$75,365	

I3P Management - Budget Period II

Dates: April 1, 2007 to March 31, 2008

Item	Labor (Dartmouth)	Base salary	Dartmouth FY07				Dartmouth FY08				Total	Inflation
			# of months	Salary	Travel	Subtotal	# of months	Salary	Travel	Subtotal		
Faculty												
Staff												
AF	(Clean)	\$222,000				1.00	10%	2.50%	\$5,828	\$5,828	5.0%	
AF	Research	\$240,000				3.00	90%	12.50%	\$31,496	\$31,496	5.0%	
AF	Associate Dir.	\$88,683				3.00	100%	25.00%	\$23,279	\$23,279	5.0%	
AF	Dir. of Research & Analysis	\$75,765				3.00	100%	25.00%	\$19,873	\$19,873	5.0%	
AF	Asst. Dir. for Informatics Services	\$89,572				3.00	100%	25.00%	\$21,150	\$21,150	5.0%	
AF	(b)(6)	\$73,665				3.00	90%	12.50%	\$9,661	\$9,661	5.0%	
AF	(b)(6)	\$45,760				3.00	50%	12.50%	\$6,096	\$6,096	5.0%	
AF	(b)(6)	\$38,220				3.00	100%	25.00%	\$10,033	\$10,033	5.0%	
AF	(b)(6)	\$43,450				3.00	20%	5.00%	\$2,281	\$2,281	5.0%	
AF	(b)(6)	\$36,400				3.00	100%	25.00%	\$9,555	\$9,555	5.0%	
AF	(b)(6)	\$60,250				3.00	100%	25.00%	\$15,816	\$15,816	5.0%	
AF	(b)(6)	\$70,000				3.00	100%	25.00%	\$18,375	\$18,375	5.0%	
AF	(b)(6)	\$45,000				3.00	100%	25.00%	\$11,813	\$11,813	5.0%	
AF	(b)(6)	\$34,000				3.00	100%	25.00%	\$8,925	\$8,925	5.0%	
Students												
Subtotal, without fringe									\$194,089	\$194,089		
	FAC Fringe on Faculty			38.0%	\$0			39.0%	\$0	\$0		
	AP Fringe on AP I and AP II			38.0%	\$0			39.0%	\$75,695	\$75,695		
Total fringe									\$75,695	\$75,695		
Subtotal, including fringe									\$269,784	\$269,784		
	Indirect on people	35.00%			\$0				\$94,424	\$94,424		
Direct materials												
Competition												
Travel												
Conferences, Meetings and Coordination												
	Airfare \$600								\$3,000	\$3,000		
	No. of travelers: 3	Hotel \$175 / day							\$5,250	\$5,250		
	No. of Trips: 2	Meals \$50 / day							\$900	\$900		
	No. of nights: 3	Mileage/tax/parking (\$80+\$20+\$20) \$100							\$1,800	\$1,800		
Consortium meeting (1)												
I3P Staff												
	Airfare \$600								\$2,500	\$2,500		
	No. of travelers: 5	Hotel \$175 / day							\$1,750	\$1,750		
	No. of Trips: 1	Meals \$50 / day							\$500	\$500		
	No. of nights: 2	Mileage/tax/parking (\$80+\$20+\$20) \$100							\$1,000	\$1,000		
Capital equipment												
Breakdown of Equipment												
Non-Capital equip. supplies												
By Type												
	Replacement laptops	\$0	2	\$2,000					\$4,000	\$4,000		
	Cables, batteries, replacement parts	\$0	10	\$500					\$5,000	\$5,000		
	Supplies for Consortium meeting (1)	\$0	1	\$1,000					\$1,000	\$1,000		
	Printing of documents	\$0	1	\$15,000					\$15,000	\$15,000		
Other Costs												
By Type												
	Conference registration fees	\$0	3	\$750					\$2,250	\$2,250		
	Food, A.V. set up for consortium meeting	\$0	1	\$7,000					\$7,000	\$7,000		
	Phone to meetings	\$0	2	\$150					\$300	\$300		
	Conference Calls	\$0	6	\$40					\$240	\$240		
	Executive Committee payments	\$0	1	\$7,938					\$7,938	\$7,938		
	Advertising for open positions	\$0	1	\$5,000					\$5,000	\$5,000		
	Indirect on travel, supplies, other costs (NOT equipment or tuition)	35.00%		\$0					\$21,815	\$21,815		
Consultants												
Base price												
	Name & Service Provided	computation			\$0				\$0	\$0	5.0%	
Consortium meeting (1)												
Consortium members												
	Airfare \$500								\$12,500	\$12,500		
	No. of travelers: 25	Hotel \$175 / day							\$8,750	\$8,750		
	No. of Trips: 1	Meals \$50 / day							\$2,500	\$2,500		
	No. of nights: 2	Mileage/tax/parking (\$80+\$20+\$20) \$100							\$5,000	\$5,000		
	Review Committee for research proposals	6 reviewers @ \$250 each							\$1,500	\$1,500		
	Indirect on consultants	35.00%			\$0				\$10,588	\$10,588		
Subgrants												
Base price												
	Describe Product or Service				\$0				\$0	\$0	5.0%	
Subtotal									\$0	\$0		
	Indirect on first \$25k each subcontract	35.00%			\$0				\$0	\$0		
Total direct									\$362,362	\$362,362		
Total indirect									\$126,826	\$126,826		
Total									\$489,188	\$489,188		

I3P Management - Budget Period III

I3P Management - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total	Inflation
			FTE	months	Staffing	Salary	FTE	months	Staffing	Salary		
Faculty												
Staff												
	(Title)	\$233,190	3.00	100%	2.50%	\$5,828	9.00	100%	2.50%	\$18,357	\$24,184	5.0%
	Research	\$252,000	3.00	90%	12.50%	\$31,500	9.00	50%	37.50%	\$9,225	\$130,725	5.0%
	Associate Dir.	\$93,117	3.00	100%	25.00%	\$23,279	9.00	100%	75.00%	\$23,310	\$95,499	5.0%
	Dir for Research & Analysis	\$79,490	3.00	100%	25.00%	\$19,873	9.00	100%	75.00%	\$25,599	\$82,473	5.0%
	Dir for Informatics Services	\$84,691	3.00	100%	25.00%	\$21,150	9.00	100%	75.00%	\$26,623	\$87,773	5.0%
	Assoc.	\$77,285	3.00	90%	12.50%	\$9,661	9.00	50%	37.50%	\$10,411	\$46,092	5.0%
	(b)(6)	\$48,048	3.00	90%	12.50%	\$6,096	9.00	50%	37.50%	\$10,319	\$24,925	5.0%
	(b)(6)	\$40,131	3.00	100%	25.00%	\$10,033	9.00	100%	75.00%	\$31,693	\$41,656	5.0%
	Event Manager	\$45,623	3.00	20%	5.00%	\$2,281	6.60	20%	15.00%	\$7,186	\$9,467	5.0%
	Perch. Coordinator	\$38,226	3.00	100%	25.00%	\$9,555	9.00	100%	75.00%	\$20,798	\$30,653	5.0%
	Perch. Manager	\$63,263	3.00	100%	25.00%	\$15,816	9.00	100%	75.00%	\$29,819	\$65,635	5.0%
	Communications	\$73,500	3.00	100%	25.00%	\$18,375	9.00	100%	75.00%	\$37,881	\$76,256	5.0%
	Manager, Web and Print Content	\$47,280	3.00	100%	25.00%	\$11,813	9.00	100%	75.00%	\$37,269	\$49,022	5.0%
	Data Specialist	\$35,700	3.00	100%	25.00%	\$8,925	9.00	100%	75.00%	\$28,114	\$37,039	5.0%
Subtotal, without fringe						\$194,093				\$611,293	\$985,487	
	Faculty						39.0%		\$0		\$0	
	Staff						39.0%		\$75,696	40.0%	\$244,557	\$320,254
Total fringe						\$75,696				\$244,557	\$320,254	
Subtotal, including fringe						\$269,789				\$855,851	\$1,325,740	
	Indirect on people	15.00%				\$94,426				\$279,583	\$394,009	
Direct materials												
Travel												
	Conferences, Meetings and Other	Airfare \$500			\$4,500				\$4,500	\$0,000		
	No. of travelers	3 Hotel \$175 / day		\$4,725		\$4,725			\$4,725	\$3,456		
	No. of trips	6 Meals \$50 / day		\$1,350		\$1,350			\$1,350	\$2,000		
	No. of nights	3 Mileage/taxiparking (\$60+\$20-\$20) \$100		\$2,700		\$2,700			\$2,700	\$3,400		
	Consortium meeting (4)	Airfare \$500		\$5,000		\$5,000			\$5,000	\$10,000		
	I3P Staff Travel	No. of travelers	6 Hotel \$175 / day	\$3,590		\$3,590			\$3,590	\$7,660		
	No. of trips	4 Meals \$50 / day		\$1,000		\$1,000			\$1,000	\$2,000		
	No. of nights	2 Mileage/taxiparking (\$60+\$20-\$20) \$100		\$2,000		\$2,000			\$2,000	\$4,000		
Capital equipment												
Breakdown of Equipment												
	Servers		2	\$2,707		\$5,413				\$5,413		
Non-Capital equip, supplies												
By Type												
	Replacement laptops		1	\$2,000		\$6,000	0	\$2,000		\$0	\$6,000	
	Cables, batteries, replacement parts		10	\$500		\$5,000	6	\$500		\$1,000	\$6,000	
	Supplies for Consortium meeting (4)		2	\$1,000		\$2,000	2	\$1,000		\$2,000	\$4,000	
	Printing of documents		1	\$15,000		\$15,000	2	\$15,000		\$35,000	\$45,000	
Other Costs												
By Type												
	Conference registration fees		4	\$750		\$3,000	3	\$750		\$2,250	\$5,250	
	Food, A.V., set up for consortium meeting		2	\$7,000		\$14,000	2	\$7,000		\$14,000	\$28,000	
	Postage to meetings		2	\$150		\$300	2	\$150		\$300	\$600	
	Conference Calls		5	\$40		\$200	4	\$40		\$160	\$360	
	Executive Committee payments					\$5,000				\$17,750	\$31,750	
	Advertising for open positions		1	\$5,000		\$5,000				\$31,750	\$5,000	
	Indirect on travel, supplies, other costs (NOT equipment or tuition)	15.00%			\$26,346					\$37,882	\$64,229	
Commodities												
Name & Service Provided												
	Consortium meeting (4)	air transportation										
	Consortium members	Airfare \$500		\$27,000		\$27,000			\$27,000	\$54,000		
	No. of travelers	27 Hotel \$175 / day		\$18,900		\$18,900			\$18,900	\$37,800		
	No. of trips	4 Meals \$50 / day		\$5,400		\$5,400			\$5,400	\$10,800		
	No. of nights	2 Mileage/taxiparking (\$60+\$20-\$20) \$100		\$10,800		\$10,800			\$10,800	\$21,600		
	Communication Services			\$30,000		\$30,000			\$30,000	\$30,000		
	Indirect on commodities	15.00%			\$32,235				\$21,734	\$53,973		
Subgrants												
Describe Product or Service												
	Subtotal				\$0				\$0	\$0		
	Indirect on first \$2.5M each subcontract	15.00%			\$0				\$0	\$0		
Total direct						\$442,577			\$1,026,286	\$1,468,863		
Total indirect						\$183,898			\$359,201	\$512,306		
Total						\$626,475			\$1,385,486	\$1,981,071		

ISTS Cyber Research (Initiative 7) - Budget Period II

Date: April 1, 2007 to March 31, 2008

Name / Labor (Department)			Department FTE*				Department \$**				Total	Inflection					
Year	Rate	Base Salary	FTE	FTE	FTE	FTE	FTE	FTE	FTE	FTE	FTE	FTE	Total	Inflection			
Faculty																	
FAC	(b)(6)	9 Professor	0.00	100%	0.00%	\$0	0.50	100%	18.89%	\$61,250	\$61,250	5.0%					
FAC	(b)(6)	9 Associate Professor	0.00	100%	0.00%	\$0	0.50	100%	5.56%	\$7,642	\$7,642	5.0%					
FAC	(b)(6)	9 Associate Professor	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$14,069	\$14,069	5.0%					
FAC	(b)(6)	12 Professor	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$9,062	\$9,062	5.0%					
FAC	(b)(6)	9 Associate Professor	0.00	100%	0.00%	\$0	0.50	100%	5.56%	\$7,350	\$7,350	5.0%					
FAC	(b)(6)	9 Associate Professor	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$9,017	\$9,017	5.0%					
FAC	(b)(6)	9 Professor	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$15,667	\$15,667	5.0%					
FAC	(b)(6)	9 Professor	0.50	100%	10.00%	\$14,026	0.50	100%	10.00%	\$14,027	\$28,053	5.0%					
Staff																	
R.M.	(b)(6)	12 month base salary	3.00	100%	25.00%	\$16,750	20.00	100%	166.67%	\$115,333	\$132,083	4.0%					
R.M.	(b)(6)	12 month base salary	3.00	100%	25.00%	\$0	20.00	100%	166.67%	\$112,333	\$125,333	4.0%					
R.M.	(b)(6)	12 month base salary	3.00	100%	25.00%	\$17,500	15.00	100%	125.00%	\$91,000	\$108,500	4.0%					
R.M.	(b)(6)	12 month base salary	3.00	100%	25.00%	\$27,500	6.00	100%	50.00%	\$57,000	\$84,500	4.0%					
Students																	
		Rate per hour	hour/week	# of weeks	# of students	hour/week	# of weeks	# of students	hour/week	# of weeks	# of students	hour/week	# of weeks	# of students			
IFT student as lab tech			\$10.00	10.00	20	1	\$2,000	10.00	20	1	\$2,000	\$4,000					
CS undergrad part-time			\$10.00	10.00	10	5	\$5,000	10.00	15	3	\$5,000	\$6,000	3.5%				
CS grad students			Min. Salary	# of months	# of students	# of months	# of students	# of months	# of students	# of months	# of students	# of months	# of students	# of students			
Kozl & Caspell			\$1,915	3	0	\$46,215	3	0	\$12,366	2	1	\$18,900	\$185,083	3.5%			
Cybank			\$2,040	3	10	\$12,240	3	2	\$78,298	3	2	\$78,298	\$78,298	3.5%			
Subtotal, without fringe												\$133,231		\$692,953	\$826,184		
Subtotal, including fringe																	
Indirect on people			59.90%			\$79,498			\$528,399		\$607,897		\$1,434,081				
Direct materials																	
Travel																	
Conferences, Meetings and Costs																	
General \$500						\$70,000					\$70,000		\$70,000				
No. of travel: 70,000						\$70,000					\$70,000		\$70,000				
14 Month \$50,000						\$21,000					\$21,000		\$21,000				
No. of travel: 3						\$14,000					\$14,000		\$14,000				
1 Manufacturing (ISO 14001-ISO 9001)						\$14,000					\$14,000		\$14,000				
Capital equipment																	
Replenishment of Equipment																	
Quantity Price per unit																	
Server nodes, server, laptops (4S phase 2)																	
Back Mounted Nodes, servers, firewalls, laptops (IS1)																	
Laptop																	
\$116,000															\$0	\$116,000	
\$2,500															\$0	\$2,500	
Non-Capital equip, supplies																	
By Type																	
soft no. cables, storage (4S phase 2)																	
Internet connectivity, installation fees (N4)																	
Upgrades and Maintenance to ISTS Cluster (ACRP)																	
Computer Equipment and Supplies (DVS)																	
Workshop (Info Risk)																	
\$20,000															\$97,000	\$117,000	
\$8,000															\$8,000		
\$3,500															\$3,500		
\$25,237															\$25,237		
\$0															\$0		
Other Costs																	
By Type																	
Indirect on travel, supplies, other costs (NOT equipment or tuition)																	
\$240			4.00	\$960	9.00	\$5,040	9.00	\$5,040	44,000		\$49,080		\$49,080				
Indirect (based on Thayer School rate)			\$22,196	0.50	\$11,098	1.50	\$3,329			\$14,427		\$14,427					
Indirect on travel, supplies, other costs (NOT equipment or tuition)			59.90%			\$148,695			\$81,515		\$230,210		\$230,210				
Consultants																	
Name & Service Provided																	
Contractor - Computer																	
Contractor - Computer																	
3.00			\$600		\$1,800						\$1,800		\$1,800				
9.00			\$400		\$3,600						\$3,600		\$3,600				
Indirect on consultants			59.90%			\$3,225					\$0		\$3,225				
Subcontractors																	
Name & Service Provided																	
Subcontractor																	
Indirect on first 52% each subcontract			59.90%			\$0					\$0		\$0				
Total Directs																	
						\$743,500			\$1,018,459		\$1,761,959						
Total Indirects						\$247,827			\$590,114		\$837,941		\$837,941				
Total						\$991,327			\$1,608,573		\$2,600,000		\$2,600,000				

ISTS Cyber Education (Initiative 8) - Budget Period II

Dates: April 1, 2007 to March 31, 2008			Dartmouth FY07				Dartmouth FY08				Total	Inflation	
Line	Labor (Dartmouth)	Base salary	Unit months	Number	Unit cost	Unit months	Number	Unit cost	Unit months	Number			Unit cost
Faculty													
	FAC TRA (9-month base salary)	9 Faculty Coordinator	\$120,000	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$14,000	\$14,000	5.0%
	FAC TRA (9-month base salary)	9 Faculty Coordinator (fringe)	\$140,000	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$16,333	\$16,333	5.0%
Staff													
	RAC TRA (12-month base salary)	12 Fellowship	\$67,500	3.00	100%	25.00%	\$16,875	2.00	100%	75.00%	\$52,625	\$69,525	4.0%
	RAC TRA (12-month base salary)	12 Fellowship	\$67,500	100%	0.00%	\$0	100%	0.00%	\$0	\$0	\$0	\$0	4.0%
	AP TRA (12-month base salary)	12 Program Coordinator	\$66,000	100%	0.00%	\$0	5.00	100%	41.67%	\$26,000	\$26,000	\$26,000	4.0%
Students													
	US undergrad part-time		\$10.00	\$0	0.00	0	0	\$0	0.00	0	\$0	\$0	3.5%
	US grad students											\$0	3.5%
	US grad students											\$0	3.5%
Subtotal, without fringe													
Subtotal, including fringe													
Direct materials													
Travel													
Fellow to attend conferences													
Arden \$500													
No. of travelers: 1 Hotel \$175 / day													
No. of trips: 1 Meals \$50 / day													
No. of nights: 2 Mileage/transporting (\$50-\$20-\$20) \$100													
Summer prof to visit (traveler for plane) Arden \$600													
No. of travelers: 1 Hotel \$175 / day													
No. of trips: 1 Meals \$50 / day													
No. of nights: 2 Mileage/transporting (\$50-\$20-\$20) \$100													
Fallon to attend conferences													
Arden \$600													
No. of travelers: 1 Hotel \$175 / day													
No. of trips: 2 Meals \$50 / day													
No. of nights: 2 Mileage/transporting (\$50-\$20-\$20) \$100													
Capital equipment													
Breakdown of Equipment													
Summer-school equipment													
leptop for summer prof													
1 \$2,500													
Non-Capital equip, supplies													
By Type													
Summer-school equipment													
Summer-school supplies													
Other Costs													
By Type													
Tuck Program for cyber-educating executive ed cost. Tuck rate for 50 participants													
Conference registration													
FELLOW 1 \$469													
Indirect on travel, supplies, other costs (NOT equipment or intang)													
59.90%													
Consultants													
Name & Service Provided													
consultation													
Summer-school professor													
Summer-school instructor													
Indirect on consultants													
59.90%													
Subcontracts													
Describe Product or Service													
Subtotal													
Indirect on first \$25k each subcontract													
59.90%													
Total direct													
Total indirect													
Total													

ISTS Cyber Education (Initiative 8) - Budget Period III

Dates: April 1, 2008 to March 31, 2009			Dartmouth FY08				Dartmouth FY09				Total	Inflation
Item	Labor (Dartmouth)	Base salary	# of months	FTE	Salary	# of months	FTE	Salary	# of months	FTE		
Faculty												
FAC	TBA (9-month base salary)	9 Faculty Coordinator		100%	0%	\$0	0.75	100%	0%	\$11,025	\$11,025	5.0%
FAC	TBA (9-month base salary)	9 Faculty Coordinator (Fick)		100%	0%	\$0	0.00	0%	0%	\$0	\$0	5.0%
Staff												
RAC	TBA (12-month base salary)	12 Fellowship	1.60	100%	25%	\$17,550	9.00	100%	75%	\$54,750	\$72,300	4.0%
RAC	TBA (12-month base salary)	12 Fellowship		100%	0%	\$0	0.00	100%	0%	\$0	\$0	4.0%
AP	TBA (12-month base salary)	12 Program Coordinator	1.00	100%	25%	\$15,000	2.00	100%	17%	\$10,400	\$25,400	4.0%
Students												
UN	undergrad part-time	\$10.00	0	0	0	\$0	40.00	4	2	\$3,312	\$3,312	3.5%
UN	grad students	summer-school teaching assistant				\$1,982				\$4,103	\$4,103	3.5%
Subtotal without fringe						\$32,558				\$83,596	\$116,146	
FAC	Fringe on Faculty				39.0%	\$0			40.0%	\$4,410	\$4,410	
AP	Fringe on AP and AP II				39.0%	\$5,850			40.0%	\$4,160	\$10,010	
UG	Fringe on full-time undergraduates				9.0%	\$0			5.0%	\$0	\$0	
RAC	Fringe on Research Associate A				9.0%	\$0			9.0%	\$0	\$0	
RAC	Fringe on Research Associate B				25.5%	\$0			26.5%	\$0	\$0	
RAC	Fringe on Research Associate C				19.0%	\$6,844			40.0%	\$21,902	\$28,747	
Total fringe						\$12,694				\$28,472	\$43,167	
Subtotal, including fringe						\$45,244				\$114,808	\$159,313	
Indirect on people					59.90%	\$27,101				\$68,127	\$95,428	
Direct materials												
Travel												
Fellow	to attend conferences	Airfare \$500				\$2,000					\$2,000	
	No. of travelers	2 Hotel \$175 / day				\$1,400					\$1,400	
	No. of Trips	2 Meals \$20 / day				\$400					\$400	
	No. of nights	2 Mileage/transporting (\$80 + \$20 + \$20) \$100				\$400					\$400	
Summer prof	to visit Hanover for planning	Airfare \$500				\$500					\$500	
	No. of travelers	1 Hotel \$175 / day				\$175					\$175	
	No. of Trips	1 Meals \$50 / day				\$100					\$100	
	No. of nights	2 Mileage/transporting (\$80 + \$20 + \$20) \$100				\$100					\$100	
Fellow	to attend conferences	Airfare \$500				\$2,000				\$2,000	\$2,000	
	No. of travelers	2 Hotel \$175 / day				\$1,400				\$1,400	\$2,800	
	No. of Trips	2 Meals \$50 / day				\$600				\$600	\$600	
	No. of nights	2 Mileage/transporting (\$80 + \$20 + \$20) \$100				\$1,200				\$1,200	\$1,200	
Capital equipment												
Breakdown of Equipment												
Non-Capital equip, supplies												
By Type												
Summer-school equipment						\$500				\$500	\$500	
Summer-school supplies									\$943	\$943	\$943	
Other Costs												
By Type												
Summer-school for students			10	students at 3k participant cost	\$3,000	\$0	10	\$3,000	\$0	\$0	\$3,000	
Summer-school for professors			10	prof at 2k participant cost	\$2,000	\$0	10	\$2,000	\$0	\$0	\$2,000	
Conference registration fee				FELLOW	\$2,000	\$2,000		\$2,000	\$2,000	\$4,000	\$4,000	
Indirect on travel, supplies, other costs (NOT equipment or tuition)					59.90%	\$4,642				\$35,247	\$39,889	
Consultants												
Name & Service Provided					Days	Daily rate	Subtotal	Days	Daily rate	Subtotal	Total	Inflation
Summer-school professor					10	\$400	\$4,000	10	\$400	\$4,000	\$8,000	5.0%
Summer-school instructor					5	\$250	\$1,250	28	\$250	\$7,000	\$8,250	
Indirect on consultants							\$3,145			\$11,341	\$14,536	
Subcontracts												
Describe Product or Service												
Subtotal						\$0	\$0			\$0	\$0	5.0%
Indirect on firm \$25k each subcontract					59.90%	\$0	\$0			\$0	\$0	
Total direct						\$58,244				\$191,911	\$250,154	
Total indirect						\$34,888				\$114,954	\$149,844	
Total						\$93,133				\$306,867	\$400,000	

Budget Period I

Initiative #3: I3P Cyber Security Workshops & Forum (\$330,000)

This budget represents costs for two workshops, two session presentations and one forum to be held between October 1, 2006, and March 31, 2007. Costs include a portion of personnel time, travel costs for key participants and organizers, food, room rental, audio visual costs, along with printing, postage and supply expenses. In addition, consultants and sub-agreements are budgeted for help with key aspects of the workshops and forum.

Personnel: All personnel are Dartmouth employees. An estimated time percentage is listed in the budget worksheet for each individual over the six month period of performance, in relation to work being done on the Cyber Security Workshops & Forum initiative.

Chair/Director: The Chair has overall responsibility for oversight and performance of all I3P activities. The Chair leads the Institute, its programs and activities; provides guidance to and collaborates with the Institute's staff, researchers and Consortium members; develops strategy and vision for the Institute and is responsible for implementation; represents the Institute nationally and interacts with key stakeholders in government, industry, and in the non-profit sector. Dr. (b)(6) currently holds the position of Chair and is also Vice-Provost for Research at Dartmouth College. Dr. (b)(6) compensation for the effort is covered from other sources during Budget Period I.

Director of Research: The Director of Research reports to the Chair and, in collaboration with the Chair, is responsible for providing the vision and leadership for the I3P Consortium's research portfolio. The Director of Research works closely with the Chair, the Executive Committee and the I3P membership to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. The Director of Research oversees the implementation of new research programs and activities, and works with the Chair and the Consortium to secure research funding to meet the research goals. The Director of Research represents the work of the Institute internally and externally, cultivates strong ties to government agencies, industry, and academia. (We expect to fill this vacant position in the near future.) The effort is covered from other sources during Budget Period I.

Associate Director: The Associate Director is responsible for the day-to-day management and strategic direction of the Institute. This person will handle oversight for the Forum and will be centrally involved in research administration and execution.

Senior Assistant Director for Informatics Services: This position provides programmatic and strategic leadership in the development, implementation, and management of information services operations for the I3P.

Assistant Director for Research and Analysis: The Assistant Director oversees and leads I3P research programs by collaborating with research teams, monitoring progress, and guiding teams in organizational and substantive capacities. This person will be the driving force in developing and keeping all workshops on track with the proposed activities. This person will

be fully involved in the day-to-day planning, organization, coordination, execution, and presentation of the proposed research.

Administrative Assistant: The position provides administrative support to the Institute's management and staff; coordination for as well as the planning and execution of meetings, conferences, symposia, reports, and other major outreach events.

Events Manager (shared position with ISTS): This position supports the I3P staff and researchers in the coordination for as well as the planning and execution of meetings, conferences, symposia, reports, and other major outreach events.

Research Coordinator: This position supports the Assistant Director for Research and Analysis by coordinating presentations, publications, and general workshop planning related tasks.

Communications Manager: The person in this position manages and cultivates I3P external relations, including those with government agencies, executives in private industry, and various aspects of the public media. The person serves as a public information and program information liaison for the workshop activity.

Manager, Web and Print Content: The person in this position provides direct oversight for coordination and execution of internal and external information provided via the I3P website and the Institutes' hard-copy publications.

Data Specialist: The person in this position will handles data input and maintains internal databases, performs proofreading and data quality reviews, generates reports from multiple data sources, and updates information on the web pages.

In addition, students are expected to be hired for specific administrative tasks during surge periods. 150 hours at \$8.00 per hour is anticipated.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of members from outside the Dartmouth area. 53 trips are anticipated in total, with details outlined in the attached budget worksheets.

Travel to Cyber Security Awareness Forum (to be held in Washington, D.C.), the PCS Security workshop (to be held in Houston, TX), and two sessions at key industry events (locations TBA) is budgeted for key participants, consortium members, and event planners and organizers.

Supplies: Budgeted expenditures are for the supplies for the events. Costs are calculated based on an average from historical data based on actual workshops hosted by the I3P. Name tags, folders, labels, pens, pads, tent cards, and lanyards are supplied to participants. When applicable, CDs with presentations are included in the supply costs.

Other Costs: Costs associated with the workshops, sessions, and forums include renting space and facilities for the workshops, food (including tax and gratuities), audio/video set up with technical support, postage for materials to and from the venue, and printing costs for proceedings. Printing charges for materials (such as workshop agenda and speaker biographies) and handouts to be distributed before and during the event as well as invitations to the Forum are budgeted. Printing and design of Forum posters is also anticipated. Costs are calculated based on historical data, location, workshop needs, and the number of expected participants.

A workshop registration vendor is also budgeted in order to process registrations. A cost of \$250 for 3 workshops is consistent with prior use of said vendors.

A transcription service or some type of video recording to be used at the Forum is anticipated. A budgeted amount of \$4,000 will cover this type of service.

Additional expenses related to Workshop #5: Critical Infrastructure Protection Conference (March 19-21 2007, Hanover, NH) and Workshop #1: Cyber Security Awareness Forum (Jan 30, 2007, Washington, DC) may be supplemented with funds from additional sources.

Consultants: A web and poster designer will be utilized to effectively convey the message for the events. Speakers and panelist payments are included for participation in the Forum and a speaker for the PCS meeting is anticipated. These experts will help create an interactive environment and will bring the necessary subject matter expertise for successful events.

Sub-agreements: Sub-agreements for work to complete the proposed work are detailed below.

Two sub-agreements will be set up for presentations and demonstrations of current I3P research activity at the Forum. These costs will include personnel time for preparation and presentation, travel to the venue, and equipment shipping.

1. Sandia National Labs: Sandia will need to prepare and execute a demonstration at the I3P Forum in January 2007. This will require effort on behalf of two Sandia employees, as well as travel for those employees, supplies, and freight charges to ship demonstration equipment, including a test bed.

Personnel

(b)(6)	\$312,000	2%	6,240.00
Other Staff Member (TBD)	\$312,000	1%	3,744.00

Travel

Airfare		\$1,500 x 2	3,000.00
Lodging (total number of nights for both people)	\$300 x 5		1,500.00
Subsistence		\$250 x 2	500.00

Other

Test Bed Shipment (each way) \$1,500 x 2 3,000.00

Total - \$17,984

Note: all above numbers are fully loaded based on approved Sandia pricing

2. Mitre Corporation will prepare and present the RiskMap risk assessment methodology, in conjunction with the current PCS security project. Preparation and presentation time is budgeted at **\$7,083**.

Three sub-agreements will be set up to run sessions at two key industry PCS security workshops/conferences. These costs will include personnel time for preparation and presentation, travel to the venue, and equipment shipping.

1. Sandia National Labs:

Personnel

(b)(6)	312,000	2%	4,680.00
	312,000	1%	3,744.00
Other Staff Member (TBD)	312,000	1%	3,744.00

Travel

Workshop (three people)	TBD (likely Sacramento, CA)		
Airfare	1,500 x 3		4,500.00
Lodging (total number of nights for both people)	300 x 2		600.00
Subsistence	150 x 3		450.00

Other

Test Bed Shipment (each way)	1,000 x 2	2,000.00
Preparation	1,000 x 1	1,000.00

Total - \$20,718

2. Pacific Northwest National Lab: PNNL will conduct an I3P technology session at an additional major industry meeting. Personnel tasks include; conduct initial planning for an I3P PCS Cyber Security Technology; prepare lecture and demonstration materials for the meeting based on material prepared for the final I3P workshop; coordinate demonstrations with other I3P task teams and technology developers; conduct final testing of the products to demonstrated at the meeting, and pack up, ship, and assemble the technology hardware at the meeting site; travel to and from the meeting, attend the conference and make presentations; follow-up.

Personnel

The following personnel will devote time to the project. A total cost for personnel has been provided.

(b)(6)	5,560.00
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Fringe

In accordance with approved PNNL rate	1,923.00
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Travel

Assume two people traveling by plane to the conference destination (presumably on the west coast of the U.S.). Travel costs include roundtrip airfare, lodging (within government per diem), meals, and conference registration fees. This assumes travel to the meeting site on a Sunday, and travel home in the late afternoon or evening after the last day at the conference.

WA-West Coast Travel 1 Trip/2 people for a total of 8 days	3,022.00
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Other

Shipping	361.00
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Indirect

In accordance with approved PNNL rate.	8,889.00
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Total - \$19,755

Note: all above numbers are fully loaded based on approved PNNL pricing

3. SRI International: SRI will support the I3P in preparing and executing the participation in a session at one selected industry event on PCS security, expected to take place in the U.S. during the first three months of calendar year 2007. SRI will assist in the planning of the session, including supporting the preparation of presentations and demonstrations. Two SRI staff members will participate in the event and the execution of the session. This work is limited to the presentation and demonstration of material developed previously in the I3P PCS Security Research Project or related efforts; no new research or development will be performed by SRI under this statement of work.

Personnel

(b)(6)	(Program Director)	5,641.00
	Computer Scientist	5,273.00

Travel

2 staff, 3 days, 1 trip	3,376.00
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Other

Shipping and computer usage	690.00
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Total - \$14,980.00

Note: all above numbers are fully loaded based on approved SRI pricing

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Initiative #7: ISTS Internet Security and Resilience Initiative (\$524,636)

This budget represents costs for research projects conducted between October 1, 2006, and March 31, 2007. Costs include faculty, students, travel, equipment, supplies, tuition, and consultants. We propose four distinct projects, totaling \$524,636: Internet Security Test bed (IST), Hardware-based security (HBS), PKI Research (PKI), and Autonomic Computing for Real People (AC).

Initiative #7, project 1: Internet Security Test bed (IST)

Personnel (b)(6) will lead this project. As Professor of Computer Science, Director of the Center for Mobile Computing, and Executive Director of the ISTS, (b)(6) brings extensive experience in wireless networks, pervasive computing, and computer security to the project. He also has experience leading several large research projects. The budget includes a technician/programmer (at standard Dartmouth rates), and a computer science graduate student (with salary in accordance with A-21 and A-110) to assist with the planning and design of the test bed.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budget allows Dartmouth personnel to attend DETER workshops and to visit other universities with similar test beds. Collection and dissemination of research information is also expected. Four trips are expected: one trip for both the PI and the technician to visit UC Berkeley DETER facility, two trips to attend a DETER workshop or to revisit a DETER site, and one trip for the consultants to visit Dartmouth.

Equipment: In this first budget period we expect to lay the groundwork for the test bed, most of which will be purchased in Budget Period II and III once a more detailed plan is developed during Budget Period I and presented in the amendments filed for the later Budget Periods.

Specifically, we plan to buy eight industry-standard computer-equipment racks (full 42U height) and one uninterruptible power supply for each rack. We estimate the price based on typical market rates for these commodity parts.

Supplies and installation: Reference materials and equipment installations (included power, cooling, etc.) will be needed. We also anticipate the need to expand the capacity of the

electrical power systems in the machine room hosting this test bed; the estimate of \$9,000 was provided by Dartmouth's Computing Services department after a look at our initial plans.

Other Costs: Specifically, registration fees for conferences.

Consultants: Since this project depends critically on the advice and experience of existing DETER site leaders and technical staff, we plan to hire Professor (b)(6) (leader of UCB's DETER project) and one of his technical staff as a consultant. These individuals are rare experts and the consulting rate is necessarily high.

Sub-agreements: none.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Initiative #7, project 2: Hardware-Based Security (HBS)

Personnel: The project will directly fund two faculty researchers and two students for the first phase. Professor (b)(6) and Professor (b)(6) will lead this project. Professor (b)(6) has extensive experience in trusted computing hardware, having been a key player on the IBM team that developed the 4758, the first product ever to achieve FIPS level 4 certification. Professor (b)(6) will add experience and expertise in hardware engineering. Student researchers will include an engineering upperclassman, to work part-time to help set up and maintain the lab and one grad student (CS, and perhaps engineering) to help do the research. (This salary is in accordance with A-21 and A-110).

We plan to leverage the synergy this project has with other ongoing work. In our NSF TCIP project, we're looking at hardware aspects of security for the power grid's cyber infrastructure. We plan to leverage that project's student support for (b)(6) and (b)(6). As part of our Sun "Center of Excellence" collaboration, (b)(6) is being supported to work on hardware-based security.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops, and to interact with key project stake holders (such as Intel) is budgeted. Collection and dissemination of research information is also expected.

Equipment:

- 1 Logic Analyzer (HP 16902A), to provide signal-level diagnosis and debugging information for the dedicated hardware such as modules on an FPGA board, and supporting the ability to prototype and analyze hardware-based security solutions within FPGAs.

- 1 Dynamic Probe (HP B4655A), which, when coupled with a logic analyzer, enables probing of the internal wires of off-the-shelf microprocessors such as those from Intel and AMD.
- 1 PCI/PCI-X Bus Analyzer (HP E2997A), which gives signal-level information about communication through PCI/PCI-X bus. This tool is necessary to examine activity on the bus, a backbone component of all standard PC platforms.
- 1 JTAG Emulator and Probes (Arium ECM-50), which together provide debugging information about devices with JTAG support. These tools permit debugging of chip-level solutions and permit research into using JTAGs for dynamic roots of trust within CPUs, a promising avenue for coprocessor-based rootkit suppression.
- 2 Multicore Desktop PCs (DELL XPS 700), to serve as a test bed for security research on multi-core systems. Multicore systems are becoming standard, and open new opportunities in security-relevant industrial CPU work.
- 1 IBM 4764 secure coprocessor and a PC host for it, which form a test bed for experiments on security solutions using trusted hardware. The 4764 is the (larger) follow-on to the 4758, which was the base of earlier work in the ISTS PKI/Trust Lab. It has specific host machine requirements; not just any PC will do. IBM also requires purchasing the “training” package to get a developers’ toolkit. Our cost figures are based on the educational discount already offered by IBM.
- 1 Multiprocessor Research Accelerator (RAMP2), which is hardware dedicated to provide prototyping possibility of multiprocessor architectures. This new technology enables experiments with hardware designs (such as modifying large CPU cores) too big for standard FPGAs.
- 2 LT-capable Desktop PCs (DELL XPS 700), and 2 VT-capable Desktop PCs (DELL XPS 700), which provide the hardware to experiment with Intel’s security technologies, namely its LeGrande Technology and its Virtualization Technology.
- 1 Smartcard development tool (Raisonance), to collect experimental data on smart-card solutions for various security problems.
- 7 TPM-based laptops: five to build a test bed for exploring hardened anonymizing networks, one for image processing in the Trusted Camera experiments, and one for software development.

Supplies: Two personal digital assistants (PDA), such as those from Palm Computing or various Windows Mobile vendors.

- 1 PDA for the trusted camera project, since camera vendors make it hard to prototype on a real camera, but a PDA with camera functionality will work just fine.
- 1 PDA for experimenting with other TCG applications of handheld devices. The initial application we see here would be an extension of Portable Key Infrastructure project.

Other Costs: none

Consultants: none

Sub-agreements: none

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Initiative #7, project 3: PKI Research (PKI)

Personnel: Dr. (b)(6) will lead this project. An Associate Professor of Computer Science, Dr. (b)(6) brings extensive experience in Public-Key Infrastructure (PKI); he was the founding program chair (and continuing program committee member) of NIST's annual *PKI Research Workshop*, and also served on the founding program committee of *EuroPKI*, the European response to NIST's effort. He founded the PKI Lab at Dartmouth, which has been instrumental in developing a production-quality PKI for Dartmouth College. Sun Microsystems, Cisco Systems, and Intel Corporation have recognized his work with gifts and grants to support his PKI research. He also has experience leading several large research projects. A post-doctoral researcher (most likely (b)(6)) will play a key role in developing and implementing the outreach effort (b)(6) is the designer of the original OpenCA software and has been project manager of OpenCA since its creation. Researcher (b)(6) brings critical expertise as the lead organizer of the Higher-Education Bridge Certificate Authority (HEBCA) at Dartmouth College, and in reaching out to other universities and to The America's Grid Policy Management Authority (TAGPMA). An undergraduate student is budgeted to assist with programming tasks.

We plan to leverage the synergy this project has with other ongoing work

- (b)(6) NSF CAREER grant will support graduate student (b)(6)
- (b)(6) Intel URC will support graduate student (b)(6) and staffer (b)(6)
- (b)(6) Dartmouth Computing Services) and EDUCAUSE have been supporting (b)(6) and will continue to provide the rest of his support.
- We anticipate that Phase II of the Sun collaboration will fund (b)(6)

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with key project stake holders is budgeted (both domestic and foreign). Collection and dissemination of research information is also expected. A few trips will involve drives to a regional university to give presentations on the PKI research. We foresee HEBCA evangelism trips, PKI standards and working group trips, as well as the usual conference trips. In particular we envisage the collaboration with the IETF for the standardization efforts (PRPQ). Discussions with TERENA working groups will also be considered to promote the project results and increase its impact over the PKI world community.

Equipment: A laptop for the post-doctoral researcher will be required.

Supplies: none

Other Costs: none
Consultants: none
Sub-agreements: none

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Initiative #7, project 4: Autonomic Computing for Real People (AC)

Personnel: Dr. (b)(6) will lead this project. As the Dorothy and Walter Gramm Professor of Engineering, Professor (b)(6) brings extensive experience in computer security, mobile computing, wireless networks, agent-based computing, sensor fusion, and parallel computing. He also has experience leading several large research projects. His primary role is in setting the project direction and oversight. Senior Researcher (b)(6) will be the primary technical lead in conducting the research. He too has extensive experience in computer security and sensor fusion. The budget includes six months of a Thayer School of Engineering graduate student, with salary in accordance with A-21 and A-110.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with key project stake holders is budgeted. Collection and dissemination of research information is also expected.

Equipment: none

Supplies: none

Other Costs: Additional costs for tuition remission (in lieu of wages) are anticipated for graduate students – in accordance with A-110 and A-21.

Consultants: none

Sub-agreements: none

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Initiative #8: ISTS Education and Curriculum Development Initiative (\$75,364)

This budget represents costs to be used between October 1, 2006 and March 31, 2007. Costs include a fellowship appointment and travel totaling \$75,364.

ISTS Fellows – Budget Period I

Personnel: Fellowship Program: A post-doctoral researcher will be recruited and hired in an effort to augment the overall research capacity of the ISTS. We expect to recruit a recently graduated Ph.D with expertise in wireless networks, mobile ad hoc networks, or sensor networks, and to have that individual work with the ongoing ISTS research teams in those areas.

The researcher will be hired with an initial 12-month appointment, contingent upon receiving additional funds from Budget Period II and III. The budgeted salary is the approximate market rate for a post-doctoral researcher in Computer Science.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budgeted travel supports participation in various conferences, workshops, and research related coordination (both domestic and foreign).

Equipment: A computer workstation for the fellow will be required.

Other Costs: The fellow will need to register and pay for conference attendee fees.

Indirect Costs: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Budget Periods II & III

I3P Management Costs

I3P management costs will begin around January 1, 2008, when the current management funding is exhausted. Detailed budgets will be submitted with amendments for Budget Periods II and III.

Personnel: All personnel are Dartmouth employees. The following is a list of job descriptions found in the accompanying budget detail worksheet.

Chair/Director: The Chair has overall responsibility for oversight and performance of all I3P activities. The Chair leads the Institute, its programs and activities; provides guidance to and collaborates with the Institute's staff, researchers and Consortium members; develops strategy and vision for the Institute and is responsible for implementation; represents the Institute nationally and interacts with key stakeholders in government, industry and in the non-profit sector. Dr. (b)(6) currently holds the position of Chair and is also Vice-Provost for Research at Dartmouth College. Up to a maximum of 10% of Dr. (b)(6) compensation will be charged to the grant.

Director of Research: The Director of Research reports to the Chair of the I3P and, in collaboration with the Chair, is responsible for providing the vision and leadership for the I3P Consortium's research portfolio. The Director of Research works closely with the Chair, the Executive Committee, and the I3P membership to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. The Director of Research oversees the implementation of new research programs and activities, and works with the Chair and the Consortium to secure research funding to meet the research goals. The Director of Research represents the work of the Institute internally and externally, and cultivates strong ties to government agencies, industry, and academia. (We expect to fill this vacant position before the start of Budget Period II.)

Associate Director: The Associate Director is responsible for the day-to-day management and strategic direction of the Institute. On behalf of the I3P Chair, the Associate Director works to advance the I3P mission and goals, fosters a cohesive and collaborative membership, and helps to build and sustain an effective research consortium. The Associate Director also supports and develops a close working relationship with and among the members of the I3P Executive Committee and enables the Executive Committee to conduct its work on behalf of the Consortium.

Senior Assistant Director for Informatics Services: The Senior Assistant Director provides programmatic and strategic leadership in the development, implementation and management of information services operations for the I3P, including the acquisition, licensing, organization, preservation, protections, and accessibility of information assets in all formats; fosters a collaborative approach to providing web-based access to relevant research materials produced and held by I3P Consortium members; and is responsible for the development of the I3P Digital Commons. The Assistant Director actively participates in the strategic

development of the I3P and is a member of the senior management staff, and represents the I3P at conferences and meetings.

Assistant Director for Research and Analysis: The Assistant Director oversees and leads I3P research programs by collaborating with research teams, monitoring progress and guiding teams in organizational and substantive capacities. The Assistant Director coordinates reports on I3P research to government sponsors, and initiates and implements centrally-driven I3P activities in pursuit of the institute's mission to identify and address cyber security research challenges and facilitate cooperation and information sharing among industry, academia, and government on the I3P Chair's behalf. This includes hosting workshops and events, conducting studies, and liaising with subject matter experts on a variety of information security topics. The Assistant Director actively participates in the strategic development of the I3P and is a member of the senior management staff, and represents the I3P at conferences and meetings with industry, academia, and government in coordination with the I3P Chair and Associate Director.

ISTS Assistant Director, Finance and Administration (position shared with I3P): The Assistant Director, Finance and Administration is responsible for the administrative and business affairs of the I3P, including facility management, space, equipment, hiring, and finance; manages day-to-day activities of the Institute's operational staff; and ensures achievement of Institute goals and objectives. The person in this position reviews budgetary aspects of grant proposals, monitors grant and contract expenditures, handles relations with relevant personnel at Dartmouth's Office of Sponsored Projects and other universities regarding financial matters, and develops and monitors the Institutional budgets.

ISTS Financial Services Account Specialist (position shared with I3P): The Financial Services Account Specialist is responsible for post-award administration of grants and contracts. In close association with the Assistant Director for Finance and Administration, the person in this position oversees the financial management of sponsored projects, including monitoring expenses for authorization, allocability and consistency with Principal Investigators and sponsor objectives, and determines appropriate expenditure levels to avoid cost overruns.

Administrative Assistant: The Administrative Assistant provides administrative support to the Institute's management and staff; assists in the collection, production, and archiving of material for research; supports the I3P staff and researchers in the coordination for as well as the planning and execution of meetings, conferences, symposia, reports, and other major outreach events; performs secretarial functions, and acts as liaison between the office and students, staff, faculty, and individuals outside the College in the area of administrative support services; and creates and maintains departmental files and records.

ISTS Manager, Communications and Events (position shared with I3P): This position supports all aspects of I3P events planning.

Research Coordinator: The Research Coordinator provides support to the Assistant Director for Research and Analysis in the form of program and workshop coordination, record keeping, reports, and planning. The Research Coordinator investigates and assembles supporting

information to facilitate the development and assessment of current and new research initiatives and written materials associated with I3P research projects and tracks and documents the progress, adjustments, and achievements of I3P research initiatives from the inception of a project to its close.

Information Technology Manager: The IT Manager manages all information and communication systems for the I3P; provides information technology support to I3P staff; monitors and maintains LAN and WAN equipment and forecasts infrastructure needs; and is responsible for system security and troubleshooting.

Communications Manager: The Communications Manager manages and cultivates I3P external relations, including those with government agencies, executives in private industry, and various aspects of the public media. The Communications Manager serves as a public information and program information liaison to current and potential sponsors, and in addition provides administrative support in relation to I3P policy (by-laws, membership, elections) and assists the Director with strategic planning.

Manager, Web and Print Content: The person in this position provides direct oversight for coordination and execution of internal and external information provided via the I3P website and the Institutes' hard-copy publications.

Data Specialist: The Data Specialist provides data input and maintains internal databases, performs proofreading and data quality reviews, generates reports from multiple data sources, and updates information on the web pages.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of members from outside the Dartmouth area.

External conferences, coordination, training, and reporting: Trips are required to participate in meetings, conferences, and seminars in the process of developing research and overall I3P development requirements, collaborating technical solutions, leveraging capabilities and opportunities, and promoting outreach and technical support. The I3P will send people to receive training in the fields of information technology, software applications, and business development, operations and processing.

The I3P Consortium Meetings: Working groups, composed of Consortium members and industry and government partners will meet throughout the performance periods to work on defined tasks. Current proposed level is four meetings per year, with an estimate of 30-35 participants. In addition, speakers and guest participants may be invited from time to time. Note that travel for consortium members is budgeted under the consultant category, since they are not Dartmouth employees. I3P employee travel is in the travel category.

Supplies: Budgeted expenditures are for the purchase of minor expendable equipment, including software and computer related components, postage, books, and research materials. Supplies for Consortium meetings are based on averages from past meetings hosted by the I3P and include agenda and meeting information, name tags, folders, labels, pens, pads, and tent cards for meeting participants. Computers, printers, and workstations will be procured for new and existing employees on an as-needed basis.

Equipment: Equipment that is anticipated includes one new server to support the functionality of the Institute.

Consultants: The Rath Group will be retained in order to implement a comprehensive communications plan for the I3P. This group has been working closely with the I3P since April 2006.

Sub-agreements: Sub-agreements for work that will not be performed at the I3P will be required to complete the proposed work.

Subject matter experts: The I3P will use subject matter experts to act as Review Board Members for potential projects funded by the I3P.

The I3P Consortium Meetings: Working groups, composed of Consortium members and industry and government partners will meet throughout the performance periods to work on defined tasks. Current proposed level is four meetings per year, with an estimate of 30-35 participants. In addition, speakers and guest participants may be invited from time to time. Note that travel for consortium members is budgeted under the consultant category, since they are not Dartmouth employees. I3P employee travel is in the travel category.

Other Costs: Costs included in this section include Executive Committee payments made according to the I3P bylaws; as well as costs associated with the Consortium meetings, research planning meetings, and research review meetings (including postage and conference calls). In addition, training for employees and advertising for open positions is included in this category. Finally, publication costs for all research papers and proceedings, including fact sheets and I3P updates are budgeted.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

I3P Research (Initiatives 1 – 6)

The following research budgets outline all research initiatives. Detailed budgets will be submitted with amendments for Budget Periods II and III.

Initiative 1 – I3P Fellowship Program

Initiative 2 – I3P Human Behavior, Insider Threat, and Awareness Initiative

Initiative 3 – I3P Cyber Security Workshops

Initiative 4 – I3P Control Systems Initiative

Initiative 5 – I3P Business Rationale for Cyber Security Initiative
Initiative 6 – I3P Grand Challenge

Personnel: It is anticipated that two to three Dartmouth faculty will be involved in one or more of the I3P initiatives that will begin in budget periods II and III. Additional staff such as post-doctoral researches, graduate and undergraduate students (in accordance with A-110 and A-21) will be used.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with project teams is budgeted. Collection and dissemination of research information is also expected.

Initiative #3: I3P Cyber Security Workshops – travel by key participants and event organizers are budgeted for 10 workshops.

Supplies: Given the nature of past I3P projects, it is expected that various computer peripherals and related components will be required for the project.

Initiative #3: I3P Cyber Security Workshops – supplies based on historical data from I3P run workshops is budgeted for 10 workshops.

Equipment: none

Other Costs: Costs included in this section are for registration fees for conferences. Additional costs for tuition remission are anticipated for graduate students; this is in accordance with A-110 and A-21.

Initiative #3: I3P Cyber Security Workshops – room rental, audio/visual set up and food (including tax and gratuities), based on historical data from I3P run workshops is budgeted for 10 workshops.

Consultants: Consultants are budgeted for use during the 10 workshops as facilitators, transcription services and key speakers.

Sub-agreements: The I3P consortium will be used to complete work in all of the six I3P initiatives. We envision issuing approximately 23 sub-agreements in support of the work being done in budget periods II & III. Detailed budgets along with a final work plans will be submitted within the first amendment for period II.

Currently consortium members are:

Center for Education and Research in Information Assurance and Security (Purdue University)

Center for Information Security (University of Tulsa)
Center for Secure and Dependable Systems (University of Idaho)
Computer Security Research Laboratory (University of California at Davis)
Cornell University
Critical Infrastructure Protection Project (George Mason University School of Law)
Department of Computer Science (Columbia University)
Georgia Tech Information Security Center (Georgia Tech)
H. John Heinz III School of Public Policy and Management (Carnegie Mellon University)
Information Security Institute (Johns Hopkins University)
Information Security Laboratory (Oregon State University)
Information Technology and Operations Center (United States Military Academy)
Information Trust Institute (University of Illinois Urbana-Champaign)
Institute for Civil Infrastructure Systems (New York University)
Institute for Security Technology Studies (Dartmouth College) – costs budgeted in other categories
Lawrence Berkeley National Laboratory
Los Alamos National Laboratory
MIT/Lincoln Laboratory
Mitretek Systems
Pacific Northwest National Laboratory
Sandia National Laboratory
School of Informatics (Indiana University)
Software Engineering Institute (Carnegie Mellon University)
SRI International
Stanford University Computer Science Department (Stanford University)
The MITRE Corporation
The RAND Corporation
University of California at Berkeley
University of Virginia

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College. Note there are 2 rates, one at the 59.9% research rate and one at the 35% other sponsored activity rate. 35% is used for all workshop activities.

ISTS Initiative 7: ISTS Security and Privacy for Real People

The following research budgets outline anticipated costs for the ISTS research and education initiatives. Detailed final budgets will be submitted with amendments for Budget Periods II and III.

Personnel: It is anticipated that seven Dartmouth faculty will be involved in several ISTS projects that will begin in periods II and III. Additional staff, such as post-doctoral researchers, graduate and undergraduate students (in accordance with A-110 and A-21) will be used.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with key project stake holders is budgeted (both domestic and foreign). Collection and dissemination of research information is also expected.

Supplies: Given the nature of the anticipated ISTS projects, it is expected that various computer peripherals and related components will be required for the projects.

Equipment: Sensor notes, servers, laptops, computer racks, switches, firewalls, and other equipment over \$2,500 will be needed.

Other Costs: Costs included in this section are for registration fees for conferences. Additional costs of tuition remission (in lieu of wages) are anticipated for graduate students, in accordance with A-110 and A-21.

Consultants: Consultants for training, seminars, and subject-matter expertise will be used for several anticipated projects.

Sub-agreements: TBD.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

ISTS Initiative 8: Education and Curriculum Development Initiative

Personnel: All personnel are Dartmouth employees (augmented by some consultants; see below). The following is a list of job descriptions found in the accompanying budget detail worksheet.

- Faculty coordinator: a Dartmouth professor to oversee the educational program, to assist in developing courses and course materials, to select instructors and invited speakers, and to deliver a few lectures.
- Program coordinator: a full-time staff member, to be hired for a six to nine month period, to coordinate all of the planning and preparation of the summer-school courses during 2008.
- Summer-school instructors: listed below, as consultants.
- Graduate student: to serve as a teaching assistant during the summer school in 2008.
- Fellow: a continuation of the post-doctoral fellow, begun in Period I.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of members from outside the Dartmouth area. The budget includes support for the Fellow to take three trips in Period II and four trips in Budget Period III, and for the summer-school lead instructor to visit Hanover twice for coordination and planning.

Equipment: none

Supplies: Some small equipment (laptops, cheap desktop computers) may be necessary; other supplies include course materials (books, workbooks, handouts).

Consultants: We expect to hire two or three faculty from other regional colleges and universities with the necessary security expertise and a track record for excellent teaching. The lead instructor will work with the faculty coordinator and the program coordinator to develop the 2008 summer school programs and all course materials. The other instructors will join the others in Hanover, NH, to help run the course and add specific expertise.

Sub-agreements: none

Other Costs: Conference registration fees for the Fellow; participant costs for the 2007 Tuck summer program and for the 2008 summer-school students.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

SF424B-Assurances, Non Construction Programs
SF-LLL-Disclosure of Lobbying Activities

Both documents have been completed as individual forms in the PureEdge application package. Signatures will be incorporated upon submission.

ASSURANCES - NON-CONSTRUCTION PROGRAMS

OMB Approval No. 4040-0007
Expiration Date 04/30/2008

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

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Prescribed by OMB Circular A-102

9. Will comply, as applicable, with the provisions of the Davis- Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327- 333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93- 205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

<p>* SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL</p> <p style="text-align: center;">(b)(6)</p>	<p>* TITLE</p> <p style="text-align: center;">Assistant Director</p>
<p>* APPLICANT ORGANIZATION</p> <p style="text-align: center;">Trustees of Dartmouth Collge</p>	<p>* DATE SUBMITTED</p> <p style="text-align: center;">08-25-2006</p>

Standard Form 424B (Rev. 7-97) Back

CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions. Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

* APPLICANT'S ORGANIZATION Trustees of Dartmouth Collge	
* PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE	
Prefix:	* First Name: (b)(6)
* Last Name: (b)(6)	Suffix: * Title: Assistant Director
* SIGNATURE (b)(6)	* DATE: 08/25/2006

Pages 48 through 286 redacted for the following reasons:

(b)(6), (b)(4)

Cyber Security Collaboration and Information Sharing
Funding Opportunity
DHS-06-CS-001-001
Revised 08-07-2006



Homeland Security

Preparedness Directorate
National Cyber Security Division (NCSD)

Overview Information

Catalog of Federal Domestic Assistance (CFDA) Number(s):

97.001

Application Deadline:

August 30, 2006

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- II. Award Information
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VII. Department of Homeland Security Contacts

VIII. Other Information

I. FUNDING OPPORTUNITY DESCRIPTION

The National Cyber Security Division (NCSD) was created in June 2003 to serve as a national focal point for cyber security and to coordinate implementation of the *National Strategy to Secure Cyberspace* issued by President Bush. The strategy established five national priorities for securing cyberspace including establishing a National Cyberspace Security Response System, a Threat and Vulnerability Reduction Program, Awareness and Training Programs, a program to secure Governments' cyberspace, and National Security and International Cyberspace Security Cooperation. In Homeland Security Presidential Directive 7 (HSPD-7), President Bush called upon the Department of Homeland Security (DHS) to maintain an organization to serve as a focal point for security of cyberspace, and established a national policy for federal departments and agencies to identify and prioritize United States critical infrastructure and key resources and to protect them from terrorist attacks. The NCSD's mission is to work collaboratively with the public, private, and international entities to secure cyberspace and American's cyber assets.

The purpose of this grant is to strengthen homeland security through research, education and outreach programs that focus on technology critical for cyber security and emergency preparedness and response. It will also identify and address critical research problems in information infrastructure protection, work to build a community of researchers focused on infrastructure security, serve as a trusted partner for industry and government, foster collaborative programs that build links between stove-piped constituencies, and provide a neutral forum for the exchange of ideas and information.

The components of this new program will focus on cyber security collaboration and information sharing activities including:

- Fellowship Program including Undergraduate, Graduate, and Post-Doctoral education/training and opportunities for I3P Fellows to work with DHS and/or Control Systems programs at National Labs;
- Human Behavior, Insider Threat, and Awareness Initiative which includes the development of a database that defines how to identify insider threat behavior and the planning and execution of a multidisciplinary project mapping human actions to the technological and organizational environments;
- Cyber Security Workshops including hosting three workshops on developing a secure organization, process control systems security, and economics of securing the information infrastructure;

- Control Systems including bi-annual reports on university and academic Control Systems efforts and demonstration projects on Supervisory Control and Data Acquisition (SCADA) security and next-generation converged network security;
- Business Rationale for Cyber Security which includes the study of economic incentives vis-à-vis sound security practices;
- Grand Challenge which includes an initiative on nationally recognized research challenges and increased focus on topics such as: Identity Management, Infrastructure Integrity and Metrics. Results will contribute to demonstration projects with stakeholders (owners, operators, vendors);
- Internet Security and Resilience which includes content, communications, and sensor systems; and
- Outreach for Education and Curriculum Development.

II. AWARD INFORMATION

A. **Type of Award:** DHS Preparedness Directorate anticipates awarding one (1) grant to Dartmouth College (Grantee) on or before September 30, 2006.

B. **Authorizing Statute.**

Section 308(b)(1) of the Homeland Security Act of 2002 (Public Law 107-296).
P.L. 109-90

C. **Estimated Funding:**

Up to approximately \$930,000 is estimated to be available for funding in FY06 for a six month budget period. It is also estimated that, subject to availability of funds, approximately \$24.3M may be available for the total project for up to a two and one-half year Performance Period.

D. **Performance Period:**

- The Performance Period will be for a 2 1/2 year period from the date of award and, subject to availability of funds, will be incrementally funded each year. The first budget period will be for 6 months. The 2nd and 3rd budget periods will be for 12 months each. Within 60 days prior to the annual expiration date of each budget year, the recipient must submit an amendment application to request the 2nd and 3rd year of incremental funding and outline the activities that will be completed during the Performance Period.
- Extensions to the Performance Period may be awarded but are not guaranteed, and may not include increased funding. Extension approvals will be based on the availability of funds and the acceptable progress of performance.

III. ELIGIBILITY INFORMATION

- A. **Eligible Applicants:** This funding opportunity is restricted to Dartmouth College, who manages the collaborative group of Institute for Information Infrastructure Protection (I3P) and Institute for Security Technology Studies (ISTS). I3P and ISTS are uniquely qualified to carry out the components of this activity. Descriptions of these organizations are presented below:

The Institute for Information Infrastructure Protection I3P identifies and addresses critical research problems in information infrastructure protection, works to build a community of researchers focused on infrastructure security, serves as a trusted partner for industry and government, fosters collaborative programs that build links between stove-piped constituencies, and provides a neutral forum for the exchange of ideas and information.

- B. **Cost Sharing:** There will be no cost-sharing or match funding requirement associated with this opportunity.

IV. APPLICATION AND SUBMISSION INFORMATION

- A. **Address to Request Application Package.** Application forms and instructions are available at Grants.gov. To access these materials, go to <http://www.grants.gov>, select "Apply for Grants," and then select "Download Application Package." Enter the CFDA and/or the funding opportunity number located on the cover of this announcement. Select "Download Application Package," and then follow the prompts to download the application package. To download the instructions, go to "Download Application Package" and select "Instructions." NOTE: You will not be able to download the Application Package unless you have installed PureEdge Viewer. The application package will be available on Grants.gov and must be submitted through that website. We recommend you visit Grants.gov at least 30 days prior to filing your application to fully understand the process and requirements. If you encounter difficulties, please contact the Grants.gov Help Desk at 1-800-518-4276 to report the problem and obtain assistance with the system. To use Grants.gov, the applicant, must have a DUNS Number and register in the Central Contractor Registry (CCR). You should allow a minimum of five days to complete the CCR registration.

We may request that you provide original signatures on forms at a later date.

- B. **Content and form of Application Submitted through Grants.gov.** You must complete the mandatory forms for this announcement which include SF 424 and Attachments in accordance with the application instructions on Grants.gov and the additional instructions

below. If submitting any information that you deem proprietary, please denote the beginning and ending of such information with asterisks (***)

MANDATORY FILES:

1. SF 424 - Application for Federal Assistance

Applicants must complete an SF 424 application form. This form may be completed while on the Grants.gov Web site or it can be completed offline in its entirety. **NOTE: Applications submitted through Grants.gov must use the SF 424 provided by Grants.gov.** The SF 424 application form can only be viewed and downloaded once PureEdge Viewer has been installed. The SF 424 application form on Grants.gov is formatted so applicants are only required to complete fields which are indicated with an asterisk (*) and color coded in yellow. Once the application is complete, close the document (you will then be prompted to save changes or not).

2. SF 424A – Budget Information – Non-Construction

SF 424A - Applicants must complete a budget for each budget year and, if applicable, a cumulative budget for the total project period. Funds may be requested as long as the item and amount are necessary to perform the proposed work and are not precluded by the cost principles or program funding restrictions (See Part IV.C).

3. Attachments

The following files must be completed and attached to the “Attachments” form under the Mandatory Files in section IV-B of this announcement.

ATTACHMENT NAME	FILENAME
Attachment 1 - Project Summary/Abstract	PROJECT SUMMARY.doc
Attachment 2 – Project Narrative	PROJECT NARRATIVE.doc
Attachment 3 - Budget Justification	BUDGET JUSTIFICATION.doc
Attachment 4 - Certifications/ Assurances	CERTIFICATIONS.doc

Attachment 1 – Project Summary/Abstract. Include the title of the project and provide a summary description that accurately and concisely reflects the project. It should describe the objectives of the project, the approach to be used, and the results or benefits expected. The summary description is limited to 300 words.

Attachment 2 – Project Narrative. This section describes the applicant’s proposal in response to the funding opportunity (refer to Article I). Applicants should organize their

project description in this sequence: 1) Objectives and Need for Assistance; 2) Approach with measurable goals and timelines; 3) Organizational Profile; and, 4) Budget Narrative to support the scope and activities of the project.

Attachment 3 Budget Justification File(s). – Provide a budget with line item detail and detailed calculations for each budget object class identified on the Budget Information Form SF-424A. Detailed calculations must include estimation methods, quantities, unit costs, and other similar quantitative detail sufficient for the calculation to be duplicated. The following budget detail is required. Failure to provide the detailed cost information as described in the instructions will result in an incomplete application. Budget detail is required for:

a. PERSONNEL. Description: Costs of employee salaries and wages.

1. Justification: Identify the project director or principal investigator, if known. For each staff person, provide the title, time commitment to the project (in months), time commitment to the project (as a percentage or full-time equivalent), annual salary, grant salary, wage rates, etc. Do not include the costs of sub-contractors.

2. Stipends: Undergraduate stipend levels will be limited to \$1,000/month for 9 months during the academic year and \$5,000 for 10-week summer internships. Graduate stipend levels are limited to \$2,300/month for 12 months. There will be no tuition or living expenses paid under this award except for the Stipends listed above. Identify how many undergraduate and graduate students will be supported under this award and provide an estimate of the hours they will contribute to the project.

b. FRINGE BENEFITS. Description: Costs of employee fringe benefits unless treated as part of an approved indirect cost rate.

Justification: Provide the method used to calculate the proposed rate amount. If a fringe benefit has been negotiated with, or approved by, a Federal Government agency, provide a copy of the agreement. If no rate agreement exists, provide a breakdown of the amounts and percentages that comprise fringe benefit costs such as health insurance, FICA, retirement insurance, taxes, etc. Identify the base for allocating these fringe benefit expenses.

c. TRAVEL. Description: Travel is limited to employees of the organization and students receiving stipends in support of this project.. Provide the costs of project-related travel. Travel cost shall not include costs of sub-contractor travel.

Justification: For each proposed trip, provide the purpose, number of travelers, travel origin and destination, number of days, and a breakdown of costs for airfare, lodging, meals, car rental, and incidentals. The basis for the airfare, lodging, meals, car rental, and incidentals must be provided, such as past trips, current quotations, Federal Travel Regulations, etc.

- d. EQUIPMENT. Description: "Equipment" means an article of nonexpendable, tangible personal property having a useful life of more than one year and an acquisition cost which equals or exceeds the lesser of (a) the capitalization level established by the organization for the financial statement purposes, or (b) \$5,000. (Note: Acquisition cost means the net invoice unit price of an item of equipment, including the cost of any modifications, attachments, accessories, or auxiliary apparatus necessary to make it usable for the purpose for which it is acquired. Ancillary charges, such as taxes, duty, protective in-transit insurance, freight, and installation shall be included in or excluded from acquisition cost in accordance with the organization's regular written accounting practices.)

Justification: For each type of equipment requested, provide a description of the equipment, the cost per unit, the number of units, the total cost, and a plan for use on the project, as well as use or disposal of the equipment after the project ends. An applicant organization that uses its own definition for equipment should provide a copy of its policy or section of its policy which includes the equipment definition.

- e. SUPPLIES. Description: Costs of all tangible personal property other than that included under the Equipment category.

Justification: Specify general categories of supplies and their costs. Show computations and provide other information which supports the amount requested.

- f. CONTRACTUAL. Description: Costs of all contracts for services and goods except for those that belong under other categories such as equipment, supplies, construction, etc. Include third party evaluation contracts (if applicable) and contracts with secondary recipient organizations.

Justification: Demonstrate that all procurement transactions will be conducted in a manner to provide, to the maximum extent practical, open and free competition. Identify proposed subaward/sub-contractor work and the cost of each subaward/sub-contractor. Provide a detailed budget for each subawardee that is expected to perform work estimated to be \$100,000 or more, or 50% of the total work effort, whichever is less. The subawardee budget should provide the same level of detail as that of the applicant (i.e., by Object Class Category/Cost Classification). In addition, the following information must be provided:

Subcontractors - Identify each planned subcontractor and its total proposed budget. Each subcontractor's budget and supporting detail should be included as part of the applicant's budget narrative. In addition, the applicant shall provide the following information for each planned subcontract: a brief description of the work to be subcontracted; the number of quotes solicited and received; the cost or price analysis

performed by the applicant; names and addresses of the subcontractors tentatively selected and the basis for their selection; i.e. low bidder, delivery schedule, technical competence; type of contract and estimated cost and fee or profit; and, affiliation with the Applicant, if any.

Recipient may be required to make available to DHS, pre-award review and procurement documents, such as request for proposals or invitations for bids, independent cost estimates, etc. This may include procurements expected to exceed the simplified acquisition threshold fixed at 41 USC 403(11) (currently set at \$100,000) and expected to be awarded without competition or only one bid or offer is received in response to a solicitation.

Subgrants – Identify each planned subgrantee and its total proposed budget. Each subgrantee's budget and supporting detail should be included as part of the applicant's budget narrative. In addition, implementation work plans including spend plans for each component will be submitted for approval to NCSD at least sixty (60) days prior to the start of each budget year. The Grantee will also provide NCSD with its proposed list of participants for review and approval.

- g. OTHER DIRECT COSTS. Provide an itemized list with costs for any other item proposed as a direct cost and state the basis for each proposed item.
- h. INDIRECT COSTS. If claiming indirect costs, provide a copy of the latest rate agreement approved by a Federal Government agency. If the applicant organization is in the process of initially developing or renegotiating a rate, upon notification that an award will be made, it should immediately develop a tentative indirect cost rate proposal based on its most recently completed fiscal year, in accordance with the cognizant agency's guidelines for establishing indirect cost rates, and submit it to the cognizant agency. Applicants awaiting approval of their indirect cost proposals may also request indirect costs. When an indirect cost rate is requested, those costs included in the indirect cost pool should not also be charged as direct costs to the grant/cooperative agreement. Also, if the applicant is requesting a rate which is less than what is allowed under the program, the authorized representative of the applicant organization must submit a signed acknowledgement that the applicant is accepting a lower rate than allowed.

Attachment 4 – CERTIFICATIONS/ASSURANCES

Applicants must complete: SF-424B, Assurances – Nonconstruction Programs; and, SF-LLL, Disclosure of Lobbying Activities – as revised in 1996.

By signing and/or submitting this application, the recipient is providing: Certification Regarding Debarment, Suspension, and Other Responsibility Matters—Primary Covered

Transactions (see Attachment A); and, Certification Regarding Drug-Free Workplace Requirements (see Attachment B).

C. **Funding Restrictions.** DHS Grant funds may only be used for the purpose set forth in the Grant, and must be consistent with the statutory authority for the award. Grant funds may not be used for matching funds for other federal grants, lobbying, or intervention in federal regulatory or adjudicatory proceedings. In addition, federal funds may not be used to sue the federal government or any other government entity.

1. **Equipment.**

- a. Prior to the purchase of equipment in the amount of \$5,000 or more per unit cost, the recipient must obtain the written approval from DHS.
- b. For equipment purchased with grant/cooperative agreement funds having a \$5,000 or more per unit cost, the Recipient shall submit an inventory on a quarterly basis which will include a brief description of the item, serial number and amount of purchase.
- c. Maintenance and insurance will be the responsibility of the Recipient.
- d. Title of equipment will remain with the Recipient until closeout when disposition will be provided in writing by the DHS within 120 days of submission of final reports.

2. **Travel.**

- a. Travel required in the performance of the duties approved in the award must comply with the applicable Office of Management & Budget (OMB) Cost Principles Circular.
- b. Foreign travel using funds obtained under this award is not permitted provided that, under special circumstances, DHS may approve the use of funds obtained under this award for foreign travel in which case such foreign travel must be approved by DHS in advance and in writing.

3. **Construction Costs.** Construction costs are not allowable under this funding opportunity.

4. **Pre-award.** Pre-award costs are allowable only with the written consent of DHS and included in the award agreement.

5. **Other.** Federal employees may not receive funds under this award.

6. **Profit/Fee.** Profit or fee is not allowable except when subcontracting for routine goods and services with commercial organizations.

D. **Intergovernmental Review:**

This program is not subject to Executive Order 12372, " Intergovernmental Review of Federal Programs."

V. **APPLICATION REVIEW INFORMATION**

The application will be reviewed and recommended for funding based on the program criteria identified below by the DHS Preparedness Directorate

The Preparedness Directorate's policy is to ensure an impartial, equitable, and comprehensive evaluation of all proposals and to select the source (or combination of sources) whose offer is most advantageous to the government. To provide the desired technical evaluation, government evaluators and employees, including state and local officials, will review and rate each submission. In some specific cases where an area of technical expertise is unavailable within the government, contractors may be engaged to evaluate specific areas of a proposal. Further, contractor personnel will be used to handle the submissions administratively. These personnel will have signed, and will be subject to, the terms and conditions of nondisclosure agreements.

A. **Review Criteria**

1. **Technical Capabilities and Past Performance.**

The proposal must demonstrate prior experience and the technical capability and resources to guide outreach, education, and technical assistance efforts provided by the local and state public safety practitioners and experts. Evaluation criteria for technical capabilities that will considered are:

- Experience in working with public safety practitioners from all jurisdictions and leveraging their knowledge on communications and interoperability issues;
- Ability to direct tasks associated with public safety interoperability and communications; and
- Experience in working with all levels and jurisdictions of the public safety community.

2. **Cost Realism.**

The proposed costs must be both reasonable for the work proposed and cost effective to complete the projects proposed. The proposal should demonstrate that the applicant has fully analyzed budget requirements and addressed potential cost risks. It should also address cost-sharing and leveraging opportunities that may have been explored and/or

identified. The evaluation of cost will consider realistic costs for the work proposed, including travel and incidental expenses.

3. **Subject Matter Expertise related topic areas.**

The applicant must demonstrate expertise in the following subject areas to meet the needs of the public safety community: Public Safety, Technologies, Equipment, Training, Industry, Communications, and other public safety communication areas.

4. **Project Management Plan.**

The proposal should be feasible, achievable, complete, and supported by a team that has the expertise and experience to carryout the project. Task descriptions must be complete and logical with clearly defined products for public dissemination. Evaluation of the management plan will consider:

- Clarity of timelines;
- Defined tasked and responsible parties;
- Clear and useful products for public dissemination;
- Identified risks and risk mitigation; and
- Depth and breadth of staff to handle high priority, immediate turn around tasking.

VI. AWARD ADMINISTRATION INFORMATION

- A. **Notice of Award.** The award will be made under a grant to be executed by a DHS Grants Officer authorized to obligate DHS funding.
- B. **Compliance.** The recipient and subrecipients must, in addition to the assurances made as part of the application, comply and require each of its subcontractors, employed in the completion of the project, to comply with all applicable statutes, regulations, executive orders, OMB circulars, terms and conditions of the award, and the approved application.
- C. **Administrative and National Policy Requirements.** The award is subject to the following administrative and national policy requirements.
1. **Administrative and Cost Principles.** The following Administrative and Cost Principles, as applicable, apply to the award:
 - a. OMB CIRCULAR A-110. "Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, and Other Non-profit Organizations."
 - b. OMB Circular A-21. "Cost Principles for Educational Institutions."

- c. OMB CIRCULAR A-133. "Audits of States, Local Governments, and Non-Profit Organizations."

These publications may be viewed at:

http://www.whitehouse.gov/omb/grants/grants_circulars.html

2. **Nondiscrimination.** The award is subject to the following:
 - a. TITLE VI OF THE CIVIL RIGHTS ACT OF 1964. As amended, provides that no person in the United States shall, *on the grounds of race, color, or national origin*, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance. Title VI also extends protection to persons with limited English proficiency. (42 U.S.C. 2000d et seq.)
 - b. TITLE IX OF THE EDUCATION AMENDMENTS OF 1972. Provides that no person in the United States shall, *on the basis of sex*, be excluded from participation in, be denied benefits of, or be subject to discrimination under any education program or activity receiving federal financial assistance. (20 U.S.C. 1681 et seq.)
 - c. THE AGE DISCRIMINATION ACT OF 1975. Provides that no person in the United States shall, *on the basis of age*, be excluded from participation in, be denied benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance. (42 U.S.C. 6101 et seq.)
 - d. SECTION 504 OF THE REHABILITATION ACT OF 1973. Provides that no otherwise qualified individual with a disability in the United States, shall, *solely by reason of his/her disability*, be excluded from participation in, be denied benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance. (29 U.S.C. 794)
 - e. THE AMERICANS WITH DISABILITIES ACT OF 1990 ("ADA"). Prohibits discrimination *on the basis of disability* in employment (Title I), state and local government services (Title II), places of public accommodation and commercial facilities (Title III). (42 U.S.C. 12101-12213)
3. **Certifications and Assurances.** Certifications and assurances regarding the following apply:
 - a. LOBBYING. Section 319 of Public Law 101-121 prohibits the use of funds in lobbying members and employees of Congress, as well as employees of federal agencies, with respect to the award or amendment of any Federal grant, cooperative agreement, contract, or loan. DHS has codified restrictions upon lobbying at 6 CFR Part 9. (31 U.S.C. 1352)
 - b. DRUG-FREE WORKPLACE ACT. Requires the recipient to publish a statement about its drug-free workplace program and give a copy of the statement to each

employee (including consultants and temporary personnel) who will be involved in award-supported activities at any site where these activities will be carried out. Also, place(s) where work is being performed under the award (i.e., street address, city, state and zip code) must be maintained on file. The recipient must notify the Grants Officer of any employee convicted of a violation of a criminal drug statute that occurs in the workplace. (41 U.S.C. 701 et seq.)

- c. **DEBARMENT AND SUSPENSION.** Executive Orders (E.O.) 12549 and 12689 provide protection from fraud, waste, and abuse by debarring or suspending those persons that deal in an irresponsible manner with the federal government. The recipient must certify that they are not debarred or suspended from receiving federal assistance.
- d. **FEDERAL DEBT STATUS.** The recipient may not be delinquent in the repayment of any federal debt. Examples of relevant debt include delinquent payroll or other taxes, audit disallowances, and benefit overpayments. (OMB Circular A-129)

D. **Publications.** All publications produced as a result of this funding which are submitted for publication in any magazine, journal, or trade paper shall carry the following:

- 1. **Acknowledgement.** “This material is based upon work supported by the U.S. Department of Homeland Security under Grant Award Number [insert DHS Grant/Cooperative Agreement number]. The percentage and dollar amounts of the total program or project costs financed with federal money is [insert percentage and amount] and the percentage and dollar amount of the total costs financed by nongovernmental sources is [insert percentage and amount].”
- 2. **Disclaimer.** “The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Department of Homeland Security.”

E. **Security Requirements.**

- 1. The work performed and information resulting from the work completed under this agreement shall be protected through recipient’s (and sub-recipients of this award) DHS-approved security procedures, unless otherwise specified in writing by DHS.
- 2. The recipient and sub-recipients of the award shall use their own security procedures and protections to protect information developed, generated or received from this award. A copy of the procedures, to include a Non-Disclosure Agreement, shall be submitted DHS for review and approval within 2 weeks of the award.
- 3. The recipient and sub-recipients shall ensure that sensitive information be protected in such a manner that it is safeguarded from public disclosure in accordance with applicable state or Federal laws.

4. DHS provided information designated as Sensitive But Unclassified (SBU) or For Official Use Only (FOUO) transmitted to the Grantee will be safeguarded in accordance with written guidance provided by DHS.
5. Transmission of information developed, generated or received by the award designated as SBU or FOUO shall be transported via secure security methods.

F. Non-Disclosure Agreements. The Grantee shall require all employees and sub-recipients having access to information or materials pertaining to the award to sign a Non-Disclosure Agreement (NDA) to protect against the misuses of information.

In the event that information is divulged in violation of the terms of the NDA, the Grantee will immediately notify DHS of the violation and take appropriate law enforcement and legal action.

G. Payment. The recipient shall be paid in advance by electronic payments through the U.S. Department of Health and Human Services (HHS) Payment Management System (SMARTLINK), provided it maintains or demonstrates the willingness and ability to minimize the time elapsing between the transfer of funds and disbursement of expenditures. When these requirements are not met, the recipient will be required to use the reimbursement method of payment processing.

H. Reporting Requirements.

1. Document Reporting.
 - a. Documents and products prepared under this award shall be reviewed for proprietary and sensitive information by NCSD prior to public dissemination. Thirty (30) days prior to publication, the Grantee must submit a draft to the NCSD Program Manager for review. All documents related to insider threat behavior, network database of insider threat detection, control system security programs, research and demonstration results, and internet security and resilience must be submitted to the NSCD Program Manager thirty (30) days prior to dissemination to the public
2. **Financial Reports.**
 - a) The Grantee shall submit financial reports (SF 269, Financial Status Report) to the Grants Officer no later than the last day of the month following each calendar year quarter.
 - b) The Grantee is required to submit a Cash Transaction Report (SF 272) with a copy of the SF 272 to the Grants Officer.
 - c) The Grantee is required to submit a Final Financial Status Report (SF 269) to the Grants Officer within 90 days after the expiration date of the Performance Period.

3. Performance Reports.

- a) Performance Reports should be submitted to the Grants Officer, listed under Article VII, Department of Homeland Security Contacts.
- b) The recipient shall submit quarterly Performance Reports no later than the last day of the month following each calendar year quarter, ending , March 31, June 30, September 30 and December 31.
- c) Performance Reports shall describe accomplishments in terms of the approved project objectives.
- d) Final Performance Reports shall be submitted 90 days after the expiration date of the Performance Period.

VII. DEPARTMENT OF HOMELAND SECURITY CONTACTS

The DHS POCs are as follows:

- DHS Program Manager – Rick Harris
Department of Homeland Security
Attn: National Cyber Security Division/Preparedness Directorate
Washington, DC 20528

(b)(6)

- DHS Grants Officer – Rosemary Springer
Department of Homeland Security
Attn: Office of the Chief Procurement Officer/Office of Procurement
Operations/Grants and Financial Assistance Division
Washington, DC 20528

(b)(6)

DHS may change the individuals designated above upon notice to the recipient of such change.

VIII. OTHER INFORMATION

Copyright and Data Rights:

- E. Copyright: The Recipient may publish, or otherwise exercise copyright in, any work first produced under this Agreement unless the work includes information that is otherwise

controlled by the Government (e.g. classified information or other information subject to national security or export control laws or regulations). For scientific, technical, or other copyrighted work based on or containing data first produced under this Agreement, including those works published in academic, technical or professional journals, symposia proceedings, or similar works, the Recipient grants the Government a royalty-free, nonexclusive and irrevocable license to reproduce, display, distribute copies, perform, disseminate, or prepare derivative works, and to authorize others to do so, for Government purposes in all such copyrighted works. The Recipient shall affix the applicable copyright notices of 17 U.S.C. 401 or 402, and an acknowledgment of Government sponsorship (including award number) to any work first produced under this Agreement.

F. Data rights:

1. General Requirements. The Grantee grants the Government a royalty-free, nonexclusive and irrevocable license to reproduce, display, distribute copies, perform, disseminate, or prepare derivative works, and to authorize others to do so, for Government purposes in:
 - a. Any data that first produced under this Agreement and provided to the Government;
 - b. Any data owned by third parties that is incorporated in data provided to the Government under this Agreement; or
 - c. Any data requested in paragraph 2 below, if incorporated in the Agreement.

"Data" means recorded information, regardless of form or the media on which it may be recorded.

2. Additional requirement for research awards.
 - a. Requirement. If the Government believe that it needs additional research data that was produced under this Agreement, the Government may request the research data and the Recipient agrees to provide the research data within a reasonable time.
 - b. Applicability. The requirement in paragraph 2.a of this section applies to any research data that are:
 - (1) Produced under this agreement, either as a recipient or subrecipient;
 - (2) Used by the Government in developing an agency action that has the force and effect of law; and
 - (3) Published, which occurs either when:
 - (a) The research data is published in a peer-reviewed scientific or technical journal; or
 - (b) DHS publicly and officially cites the research data in support of an agency action that has the force and effect of law.
 - c. Definition of "research data." For the purposes of this section, "research data":
 - (1) Means the recorded factual material (excluding physical objects, such as laboratory samples) commonly accepted in the scientific community as necessary to validate research findings.

(2) Excludes:

- (a) Preliminary analyses;
 - (b) Drafts of scientific papers;
 - (c) Plans for future research;
 - (d) Peer reviews;
 - (e) Communications with colleagues;
 - (f) Trade secrets;
 - (g) Commercial information;
 - (h) Materials necessary that a researcher must hold confidential until they are published, or similar information which is protected under law; and
 - (i) Personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy, such as information that could be used to identify a particular person in a research study.
3. Requirements for subawards. The Recipient agrees to include in any subaward made under this Agreement the requirements of the *Copyright and Data Rights* paragraphs this of this article and of 37 C.F.R. 401.14, if included in this Agreement by reference.

CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

This certification is required by the regulations implementing Sections 5151-5160 of the Drug-Free Workplace Act of 1988 (P.L. 100-690, Title V, Subtitle D; 41 U.S.C. 701 *et seq.*).

1. **By signing and/or submitting this application or grant agreement, the grantee is providing the certification set out below.**
2. The certification set out below is a material representation of fact upon which reliance is placed when the agency awards the grant. If it is later determined that the grantee knowingly rendered a false certification, or otherwise violates the requirements of the Drug-Free Workplace Act, the agency, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.
3. For grantees other than individuals, Alternate I applies.
4. For grantees who are individuals, Alternate II applies.
5. Workplaces under grants, for grantees other than individuals, need not be identified on the certification. If known, they may be identified in the grant application. If the grantee does not identify the workplaces at the time of application, or upon award, if there is no application, the grantee must keep the identity of the workplace(s) on file in its office and make the information available for Federal inspection. Failure to identify all known workplaces constitutes a violation of the grantee's drug-free workplace requirements.
6. Workplace identifications must include the actual address of buildings (or parts of buildings) or other sites where work under the grant takes place. Categorical descriptions may be used (e.g., all vehicles of a mass transit authority or State highway department while in operation, State employees in each local unemployment office, performers in concert halls or radio studios).
7. If the workplace identified to the agency changes during the performance of the grant, the grantee shall inform the agency of the change(s), if it previously identified the workplaces in question (see paragraph five).
8. Definitions of terms in the Nonprocurement Suspension and Debarment common rule and Drug-Free Workplace common rule apply to this certification. Grantees' attention is called, in particular, to the following definitions from these rules:

Controlled substance means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. 812) and as further defined by regulation (21 CFR 1308.11 through 1308.15);

Conviction means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes;

Criminal drug statute means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) All direct charge employees; (ii) All indirect charge employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) Temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement; consultants or independent contractors not on the grantee's payroll; or employees of subrecipients or subcontractors in covered workplaces).

Certification Regarding Drug-Free Workplace Requirements

Alternate I. (Grantees Other Than Individuals)

A. The grantee certifies that it will or will continue to provide a drug-free workplace by:

- (a.) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;
- (b.) Establishing an ongoing drug-free awareness program to inform employees about --
 - (1) The dangers of drug abuse in the workplace;
 - (2) The grantee's policy of maintaining a drug-free workplace;
 - (3) Any available drug counseling, rehabilitation, and employee assistance programs; and
 - (4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;
- (c.) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);
- (d.) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will --
 - (1) Abide by the terms of the statement; and
 - (2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

- (e.) Notifying the agency in writing, within ten calendar days after receiving notice under paragraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;
- (f.) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (d)(2), with respect to any employee who is so convicted --
 - (1) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
 - (2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;
- (g.) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

(B) The grantee may insert in the space provided below the site(s) for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city, county, state, zip code)

Check if there are workplaces on file that are not identified here.

Alternate II. (Grantees Who Are Individuals)

- (a.) The grantee certifies that, as a condition of the grant, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity with the grant;
- (b.) If convicted of a criminal drug offense resulting from a violation occurring during the conduct of any grant activity, he or she will report the conviction, in writing, within 10 calendar days of the conviction, to every grant officer or other designee, unless the Federal agency designates a central point for the receipt of such notices. When notice is made to such a central point, it shall include the identification number(s) of each affected grant.

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND
OTHER RESPONSIBILITY MATTERS**

This certification is required by the Department of Homeland Security implementing Executive Orders 12549 and 12689, Debarment and Suspension.

Instructions for Certification

- 1. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.**
2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.
3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.
4. The prospective primary participant shall provide immediate written notice to the department or agency to which this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
5. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
6. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

**Certification Regarding Debarment, Suspension, and Other Responsibility Matters--
Primary Covered Transactions**

- (1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;
 - (b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-- Lower Tier Covered Transactions

Instructions for Certification

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or had become erroneous by reason of changed circumstances.

4. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this clause, have the meaning set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, [[Page 33043]] should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from covered transactions, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

**Certification Regarding Debarment, Suspension, Ineligibility an Voluntary Exclusion--
Lower Tier Covered Transactions**

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Grant Number: 2006-CS-001-000001-03			
Grantee: Dartmouth College			
Project Period: September 30, 2006 - March 31, 2009			
Budget Period: April 1, 2008 - March 31, 2009			
	REQUESTED	NEGOTIATED	
Salaries	1,173,870	1,173,870	Fringe rate: see breakout
Fringe	355,387	355,387	by position
Total personnel	1,529,257	1,529,257	
Travel	177,455	177,455	
Equipment	0	0	
Supplies	15,663	15,663	
Contractual	5,097,581	5,097,581	
Consultant	93,588	93,588	
Construction	0	0	
Other			
Participant/Trainee Costs	31,672	31,672	
Registration Fees	6,200	6,200	
Publication Costs	46,768	46,768	
Event & Meeting Costs	170,380	170,380	
Total Other Direct Costs	255,020	255,020	
Total Direct Costs	7,168,564	7,168,564	
Indirect Costs	1,171,436	1,171,436	Rate: 35% - Other Sponsored Programs
			Base: 191,652
			Rate: 59.9% - Research
			Base: 979,784
TOTAL	8,340,000	8,340,000	
SUMMARY of REVIEW and NEGOTIATIONS:			
A-133:	Grantee is in compliance - submitted most recent audit March 2007 There are no reportable conditions, no material weaknesses and no questioned costs.		
DEBARRED LIST:	EPLS system searched - Grantee not listed		
NOTES:	The budget is broken out by initiative. Individual budget worksheets were provided. Analysis was conducted by initiative not by budget category. Dartmouth provided justifications and follow up explanations for budgets. The budget worksheets, questions, and responses are attached.		

Administrative Information Outside of Scope

Close Form

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Check Form for Errors

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About

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 0410278220000

* Budget Type: Project Subaward/Consortium

Enter name of Organization: Trustees of Dartmouth College

* Start Date: 04/01/2008 * End Date: 03/31/2010 Budget Period 1

Administrative Information Outside of Scope

A. Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary (\$)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)
1.				Ph.D.	PD/PI					0.00	0.00	0.00
2.				PhD	Co-PI				1.50	29,750.00	11,602.50	41,352.50
3.				PhD	Senior Faculty/Prof		3.00		1.75	70,150.00	27,358.00	97,508.00
4.			(b)(6)	PhD	Senior Faculty/Prof				2.25	49,014.00	16,382.42	65,396.42
5.				PhD	Senior Faculty/Prof				1.75	54,447.00	21,171.48	75,618.48
6.				PhD	Senior Faculty/Prof				1.75	29,867.00	12,648.13	42,515.13
7.				PhD	Senior Faculty/Prof				1.50	25,258.00	9,850.62	35,108.62
8.												

9. Total Funds requested for all Senior Key Persons in the attached file

258,486 98,013.15
Total Senior/Key Person 356,499.15

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)
8	Post Doctoral Associates	27.50			145,755.00	16,043.50	161,798.50
12	Graduate Students	54.00			133,510.00	1,123.20	134,633.20
6	Undergraduate Students	14.00			17,100.00	0.00	17,100.00
1	Secretarial/Clerical	1.00			667.00	256.80	923.80
1	Faculty	7.00			95,189.00	37,123.71	132,312.71
12	Researchers	85.50			523,163.00	202,827.15	725,990.15
40	Total Number Other Personnel						

Total Other Personnel 915,384 357,314.36
Total Salary, Wages and Fringe Benefits (A+B) 1,529,257.51

RESEARCH & RELATED Budget (A-B) (Funds Requested)

Tracking Number: GRANT10007704

OMB Number: 4040-0001
Expiration Date: 04/30/2008

Funding Opportunity Number: DHS-06-CS-001-001-NC3 Received Date: 2008-01-28T15:33:06-04:00

Administrative Information Outside of Scope

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

ORGANIZATIONAL UONS:

Budget Type: Single Subaward/Consortium

Enter name of Organization:

Delete Entry * Start Date: * End Date: Budget Period 1

C. Equipment Description

List items and dollar amount for each item exceeding \$5,000

	Equipment Item	* Funds Requested (\$)
1.	<input type="text"/>	<input type="text"/>
2.	<input type="text"/>	<input type="text"/>
3.	<input type="text"/>	<input type="text"/>
4.	<input type="text"/>	<input type="text"/>
5.	<input type="text"/>	<input type="text"/>
6.	<input type="text"/>	<input type="text"/>
7.	<input type="text"/>	<input type="text"/>
8.	<input type="text"/>	<input type="text"/>
9.	<input type="text"/>	<input type="text"/>
10.	<input type="text"/>	<input type="text"/>
11.	Total funds requested for all equipment listed in the attached file	<input type="text"/>
	Total Equipment	<input type="text"/>

Additional Equipment:

Add Attachment

Delete Attachment

View Attachment

D. Travel

- 1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)
- 2. Foreign Travel Costs

Funds Requested (\$)

Total Travel Cost

E. Participant/Trainee Support Costs

- 1. Tuition/Fees/Health Insurance
- 2. Stipends
- 3. Travel
- 4. Subsistence
- 5. Other

Funds Requested (\$)

Number of Participants/Trainees

Total Participant/Trainee Support Costs

Administrative Information Outside of Scope

RESEARCH & RELATED Budget {C-E} (Funds Requested)

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RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

ORGANIZATIONAL DUNS:

Budget Type: Grant Subaward Consortium

Enter name of Organization:

Delete Entry Start Date: End Date: Budget Period 1

F. Other Direct Costs

	Funds Requested (\$)
1. Materials and Supplies	15,663.00 ✓
2. Publication Costs	46,768.00 ✓
3. Consultant Services	93,588.00 ✓
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	5,097,581.00 ✓
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. <input type="text" value="Registration Fees"/>	6,200.00 ✓
9. <input type="text" value="Event and Meeting Costs"/>	170,380.00 ✓
10. <input type="text"/>	
Total Other Direct Costs	5,430,180.00

Administrative Information Outside of Scope

G. Direct Costs

Funds Requested (\$)
Total Direct Costs (A thru F)
7,168,564.51

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1. <input type="text" value="MTDC"/>	35.00	547,579.00	191,652.00
2. <input type="text" value="MTDC"/>	59.90	1,635,700.00	979,784.00
3. <input type="text"/>			
4. <input type="text"/>			
Total Indirect Costs			1,171,436.00

Cognizant Federal Agency: (b)(6) 2
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

Funds Requested (\$)
Total Direct and Indirect Institutional Costs (G + H)
8,340,000.51

J. Fee

Funds Requested (\$)

K. * Budget Justification: (Only attach one file.)

Add Attachment

Delete Attachment

View Attachment

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals (\$)
Section A, Senior/Key Person		356,499.15
Section B, Other Personnel		1,172,758.36
Total Number Other Personnel	40	
Total Salary, Wages and Fringe Benefits (A+B)		1,529,257.51
Section C, Equipment		
Section D, Travel		177,455.00
1. Domestic	177,455.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		31,672.00
1. Tuition/Fees/Health Insurance	31,672.00	
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		5,430,180.00
1. Materials and Supplies	15,663.00	
2. Publication Costs	46,768.00	
3. Consultant Services	93,588.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	5,097,581.00	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	6,200.00	
9. Other 2	170,380.00	
10. Other 3		
Section G, Direct Costs (A thru F)		7,168,564.51
Section H, Indirect Costs		1,171,436.00
Section I, Total Direct and Indirect Costs (G + H)		8,340,000.51
Section J, Fee		

Administrative Information Outside of Scope

OMB Number: 4040-0001
Expiration Date: 04/30/2008

BUDGET NARRATIVE

Award Number: 2006-CS-001-000001

Non-Competing renewal proposal: DHS-06-CS-001-001-NC3

Dartmouth College

January 2008

The following 15 projects are presented for Budget Period III – with a total proposed amount of \$8,340,000. Please see the proposal narrative for additional details on the needs and overall project goals. See Appendix A (Detailed Budget Worksheets) for additional information on calculations and breakdowns.

I3P

I3P Management

I3P Research (Initiative 1) – I3P Fellowship & Scholars Program

✓ I3P Research (Initiative 2) – Human Behavior, Insider Threat, and Awareness

I3P Research (Initiative 3) – Cyber Security Workshops

I3P Research (Initiative 4) – Process Control Systems

✓ I3P Research (Initiative 5) – Business Rationale for Cyber Security

I3P Research (Initiative 6) – Assessable Identity and Privacy Protection

ISTS

✓ ISTS Cyber Research (Initiative 7)

- Dartmouth Internet Security Testbed - DIST
- Information Risk in Data-Oriented Enterprises - IRIDOE
- MetroSense – Scalable Secure Sensor Systems - Metro
- Interoperability and Usability for PKI Management - PKI
- Laboratory for Hardware Based Security - HBS
- Digital Video Forensics - DVF
- Foundations for Practical Autonomic Computing - AC

✓ ISTS Cyber Education & Curriculum Development (Initiative 8)

- Secure Information Systems, Mentoring and Training - SISMAT

Summary - breakdown by categories
 January 2008

Object Class Categories:		TOTAL	Budget Period I	Budget Period II - Feb 2007	Supplement Budget Period II - March 2007	Proposed Budget Period III
a.	Personnel	3,372,406	187,367	1,415,283	595,886	1,173,870
b.	Fringe Benefits	1,002,535	53,625	398,449	195,073	355,388
c.	Travel	543,575	49,765	266,205	50,150	177,455
d.	Equipment	418,082	158,992	259,090	-	-
e.	Supplies	227,463	14,000	87,160	26,000	100,303
f.	Contractual	14,139,462	130,640	7,038,024	1,779,630	5,191,168
g.	Construction	-	-	-	-	-
h.	Other	735,787	89,008	401,299	75,100	170,380
i.	Total Direct Charges	20,439,310	683,397	9,865,510	2,721,839	7,168,564
j.	Indirect Charges	3,860,689	246,603	1,864,490	578,161	1,171,436
k.	TOTAL	24,300,000	930,000	11,730,000	3,300,000	8,340,000

Notes

All "Personnel" in the table above represent Dartmouth Employees. Student support salary is in accordance with A-21 and A-110.

Most faculty members have nine-month appointments, and therefore, the percent effort is based on nine months for those individuals. Those with nine-month appointments are noted in the budget detail worksheets.

In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives and the ISTS projects have been made accordingly in the attached budget sheets.

It is anticipated that remaining funds from Budget Period II will be carried-forward for all on-going projects. Workshop funds may be reallocated to the I3P Management budget.

Budget Period III runs for ²⁴ months, from April 1, 2008 to March 31, 2010. While projects have milestones based on an end date of March 31, 2009, the I3P Fellowship and Scholars program will run through March 31, 2010.

The Dartmouth Fiscal Year is as follows:

July 1, 2007 to June 30, 2008 (three months of period III)

July 1, 2008 to June 30, 2009 (nine months of Budget Period III)

Annual salary raises take affect on July 1 of each year.

All I3P initiatives have a management budget that is separate from the research budget. The management budget supports the team-leader for team coordination and liaison with the I3P consortium and staff at Dartmouth.

Travel is reimbursed per the approved Dartmouth Travel Policy.

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Appendix A: Detailed Budget Worksheets

Appendix A: Detailed Budget Worksheets

1. Personnel – Salaries for Director (b)(6) (b)(6) reflected on the R&R 424 budget form are not consistent with the budget worksheets. Please explain your calculations for these salaries as reflected on the R&R budget form.

(b)(6) - ISTS Initiatives 7&8 budget sheet total of \$71,961 (2.75 months) minus 17,514 (.5 months allocated in the BPII supplements) – total of \$54,447. This seems to match. Please call and we can figure out what the problem is.

(b)(6) - ISTS Initiatives 7&8 budget sheet total of \$22,050 (1.0 months) minus 4,667 (.25 months allocated in the BPII supplements)– total of \$17,383
 Business Rationale Project, Initiative 5 - \$23,928
 Human Behavior Project, Initiative 2 - \$7,703
 Total for Johnson – \$49,014
 This seems to match. Please call and we can figure out what the problem is.

2. Travel – I calculate a total of \$207,455 based on the worksheets. The R&R reflects a total \$177,455. Please explain your calculations as reflected on the R&R.

There are 8 budgeted sheets. Below is the travel I show.

I3P Admin - \$8,850
 I3P Fellowship - \$14,700
 I3P Human Behavior – \$12,320
 I3P Workshop - \$92,825
 I3P PCS - \$0
 I3P Business Rationale - \$20,000
 I3P Assessable Identity - \$0
 ISTS Initiative 7&8 - \$28,760
 Total of \$177,455. This seems to match. Please call and we can figure out what the problem is.

3. MTDC at 35% – I calculated a total base amount of \$578,609. The R&R form reflects \$547,579. Please explain your calculations as reflected on the R&R.

There are 3 budget worksheets that take the rate of 35%

I3P Admin - \$143,521
 I3P Fellowship - \$165,400 (6 sub-awards at \$25k each plus 15,400 for the rest of the costs)

I3P Workshop - \$274,656 (1 sub-award at 24,968, other sub-award is a continuation so no indirects are allowed, plus \$249,688 for the rest of the costs). HOWEVER, in the budget period II supplement, workshops were calculated at the 59.9%, instead of 35% - so you will see in the worksheets, the \$12,599 adjustment at 35% - equals \$35,998 in direct costs. ($35,998 \times 35\% = 12,599$).

\$143,521

\$165,400

\$274,656

(\$35,998)

\$547,579, which is the number I used in the 424.

4. MTDC at 59.9% – I calculated a total base amount of \$1,693,203. The R&R form reflects \$1,635,700. Please explain your calculations as reflected on the R&R.

There are 5 budget worksheets that take the rate of 59.9%.

I3P Human Behavior – \$142,627 (no indirects allowed on sub-awards as they are all continuation funding)

I3P PCS - \$0 (no indirects allowed on sub-awards as they are all continuation funding)

I3P Business Rationale - \$257,344 no indirects allowed on sub-awards as they are all continuation funding)

I3P Assessable Identity - \$0 (no indirects allowed on sub-awards as they are all continuation funding)

ISTS Initiative 7&8 - \$1,235,732 (no indirects allowed on sub-awards as they are all continuation funding, no indirects on equipment or tuition)

\$ 142,627

\$ 257,344

\$1,235,732

\$1,635,703 (\$3 off for rounding), which is the number I used in the 424.

Renwick, Tya

From: (b)(6)
Sent: Friday, March 21, 2008 7:22 AM
To: 'Renwick, Tya'
Cc: 'Morgan, Marilyn'; 'Osterhus, Diane'; 'Harris, Richard'; 'Lee, Annabelle'; 'Martha Austin'
Subject: RE: Dartmouth - Non-competing Continuation Application Review
Attachments: responses 424 03-21-08.pdf

Good Morning Tya,
 See attached responses. Please call with questions.

Thanks

(b)(6)

-----Original Message-----

From: Renwick, Tya [mailto:(b)(6)]
Sent: Thursday, March 20, 2008 4:39 PM
To: (b)(6)
Cc: Morgan, Marilyn; Osterhus, Diane; Harris, Richard; Lee, Annabelle; Martha Austin
Subject: Dartmouth - Non-competing Continuation Application Review

(b)(6)

I'm continuing with the review of your application. Please address the following by COB, March 21st:

R&R 424 Budget Form

1. Personnel – Salaries for Dr. (b)(6) reflected on the R&R 424 budget form are not consistent with the budget worksheets. Please explain your calculations for these salaries as reflected on the R&R budget form.
2. Travel – I calculate a total of \$207,455 based on the worksheets. The R&R reflects a total \$177,455. Please explain your calculations as reflected on the R&R.
3. MTDC at 35% – I calculated a total base amount of \$578,609. The R&R form reflects \$547,579. Please explain your calculations as reflected on the R&R.
4. MTDC at 59.9% – I calculated a total base amount of \$1,693,203. The R&R form reflects \$1,635,700. Please explain your calculations as reflected on the R&R.

Thank you.

Tya Penwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

Initiative 6 – Assessable Identity and Privacy Protection:

1. Research Budget SRI (b)(6) – Other Costs: \$13,446 is requested for the computer science laboratory facility. Please provide more details on how these funds will support the CSL.

SCHEDULE C-2: SRI COMPUTER USAGE

CSL

The Computer Science Laboratory (CSL) computer facility provides the infrastructure necessary for the support and integration of project and SRI-owned workstations. Specifically, CSL supports its own research facility and maintains its own computing facilities of workstations, servers, laser printers, and specialized peripherals. All staff members have workstations in their offices providing links to other offices and, by multiple backup links to the Internet. Regular system backups are taken, and electronic media stored both in secure on-site facilities and commercial off-site data storage facilities. CSL servers are protected by Cisco PIX. Network policy is set at default deny so that all unwanted connections to SRI's internal network are blocked.

The cost of the CSL computer facility infrastructure is allocated weekly, to each specific account, based on the labor hours of each individual. The hourly charge for the CSL facility is currently estimated at \$10.53. The calculation for the computer cost is shown in the table below.

COMPUTER CHARGES

Comp. Hrs. Computer Name Rate Total

Year 1 1,324 CSL--SRI-owned machines 10.53 13,940

Year 2 1,277 CSL--SRI-owned machines 10.53 13,446

Total 2,601 \$27,386

1. **Foreign travel** – Dartmouth College will request prior approval for each trip from DHS. No foreign travel will be charged to the award without approval.
2. **GMU \$12,096 in other costs.** As stated in the justification “GRA Tuitions: Institute policy requires research grants to pay tuition for graduate research assistants at the rate of \$504 per month per student.” The total cost of \$12,096 represents 2 grad students. (504 x 12 x 2).

ISTS Initiative 7 & 8 – Security and Privacy

1. **Foreign travel** – Dartmouth College will request prior approval for each trip from DHS. No foreign travel will be charged to the award without approval.
2. **DIST, Metro and AC Thayer school grad rates.** – Thayer school tuition rates for FY08 Spring - \$5,828, FY09 are Summer - \$4,895, Fall - \$6,119, Winter - \$6,119, Spring - \$6,119. The school charges for 4 terms over the academic year. 09/16-12/15, 12/16-3/15, 3/16-6/15, 6/16-9/15. Note that the projects have slightly different projected ends dates. DIST – 3/31/09, AC – 10/31/08, and Metro – 12/31/08. All actual costs charged are in accordance with A-21 guidelines.

3. HBS consultant –

The students (graduate and undergraduate) and staff (professors, researchers) who will be working on hardware-based security issues. (b)(6) has a long history in this field (and was behind the hardware security of the first product to earn a FIPS 140-1 Level 4 validation from NIST).

Renwick, Tya

From: (b)(6)
Sent: Thursday, March 20, 2008 8:27 AM
To: 'Renwick, Tya'
Cc: 'Morgan, Marilyn'; 'Osterhus, Diane'; 'Harris, Richard'; 'Lee, Annabelle'; 'Martha Austin'
Subject: RE: Dartmouth - Non-competing Continuation Application Review
Attachments: NCSA response 3-09-08 | 6,7,8.pdf

Good Morning Tya,
 See attached responses.

Thanks

(b)(6)

-----Original Message-----

From: Renwick, Tya (b)(6)
Sent: Wednesday, March 19, 2008 4:28 PM
To: (b)(6)
Cc: Morgan, Marilyn; Osterhus, Diane; Harris, Richard; Lee, Annabelle; Martha Austin
Subject: Dartmouth - Non-competing Continuation Application Review

Hi (b)(6)

I'm continuing with the review of your application. Please address the following by COB, March 20th:

Initiative 6 – Assessable Identity and Privacy Protection:

1. Research Budget SRI ((b)(6)) – Other Costs: \$13,446 is requested for the computer science laboratory facility. Please provide more details on how these funds will support the CSL.
2. Research Budget Purdue ((b)(6)) – Travel: \$10,001 is budgeted for travel. However, this cost includes 2 foreign trips. As you know, foreign travel is not permitted except under special circumstances. DHS approval is required. A request for foreign travel must be submitted in writing and include a detail justification and explanation of the trip.
3. Research Budget Georgia Tech ((b)(6)) – Other Costs: \$12,096 is requested. However, a justification is not provided. Please explain.

ISTS Initiative 7 & 8 – Security and Privacy

1. DIST – Travel: Foreign travel is included in the budget for DIST. As you

know, foreign travel is not permitted except under special circumstances. DHS approval is required. A request for foreign travel must be submitted in writing and include a detail justification and explanation of the trip.

2. How were the tuitions for DIST, Metro, & AC Thayer school students calculated?
3. HBS – Consultant: \$10,000 (b)(6) training and seminars. Please explain who will benefit from the training and seminars.

Thank you.

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

I3P Administration Budget:

1. **Web Design \$25,000 –RESPONSE:** We have budgeted \$25,000 for the first comprehensive website update since it was designed over three years ago. The I3P website is a major tool that is used by the membership as well providing general information about the I3P activities. The site is complicated, offering researchers collaborative/secure work spaces and compiling all research on-going and completed. Since budgeting was completed in January, the I3P staff has been studying different options for the update, realizing the need to use funds cautiously and prudently. We are actively working to leverage the expertise at Dartmouth College in an effort to minimize cost and maximize the benefit to the I3P and our sponsors. The updated website will continue to meet the mission of I3P, the needs of its members, while communicating our accomplishments. It will provide a source of accurate and up-to-date information for policymakers, industry, researchers, and federal agencies. In addition, the website will clearly state our mission, provide an overview of our research and educational programs, offer a media portal and give information about our members as well as membership opportunities.

Initiative 1 – Fellowship Program:

1. The budget narrative notes that the program will continue through March 31, 2010. At this point we will not be able to address a no-cost extension. **RESPONSE:** Please be aware that the fellowships and the newly created scholar programs run on annual cycles. These are an important part of the outreach and education component of the award to Dartmouth and we understand are of particular importance and value to the agency. We discussed the issue of the end date with our program manager who agreed that a change in end date would be appropriate. We can address the timing of the fellowship awards and contract period during the budget period III performance period.
2. **Subawards/Contractual Costs –** We are anticipating 3 fellowship winners. Sub-awards will be issued through a formal contract, as they were this past year. Contract dates will be addressed during budget period III.

Initiative 2 – Human Behavior, Insider Threat, and Awareness

1. RAND is considered a "commercial" organization as an exemption under OMB A-122. They are allowed to have the fee paid. I am attaching a pdf where this is outlined. Rosemary Springer worked on this issue last year and agreed to the fee. I am attaching the email where that approval is given.
2. RAND, BPIII consultant should also be \$144,345. I inadvertently left out the number – the totals are all correct. Below is the justification which should have been included. Dr. (b)(6) role is outlined in the statement of work.

(b)(6) is a private consultant, affiliated with Carnegie Mellon University. He brings to this project expertise in many vital fields of policy and management, such as information technology (specifically information infrastructure security), the environment, corporate and public finance, heavy industry management, and international relations. He has extensive experience in the public sector and has been a significant presence in Washington, DC, New York, Boston and the Silicon Valley.

3. Research Budget Cornell. Cornell's budget was reduced by \$50,000 per the Year 1 reviewer comments. A recommendation was made and consensus between our research team (b)(6) as PI, and the project managers (b)(6) Rick Harris) was reached. The approved change is summarized below.

Although there were extensive comments and questions about Indiana's work from the reviewers, the responses from the Indiana team clarified their direction and addressed the larger concerns. As a result of this, and in concurrence with DHS, I3P will make an additional \$50,000 available to Indiana University to focus all of its I3P efforts on its modeling work toward developing a potentially high-value predictive capability. Indiana is asked to produce a revised SOWP and budget to reflect the revised approach and funding change.

4. Dartmouth College ISTS – Travel: Some conferences and travel that is anticipated follows:

The Insider workshop at Schloss Dagstuhl.

New Security Paradigms Workshop (NSPW)

The First ACM Workshop on AISec October 27, 2008

Workshop on Usable IT Security Management (At SOUPS.)

SACMAT: Symposium on Access Control Models and Technologies

For site visits, we are exploring the possibility of working with Wells Fargo (although we should keep that generally on the d-i, since they will want us to sign a non-disclosure like the others). This would involve extended visits to their San Francisco and Minneapolis sites to demo our tools, gather data, and conduct interviews. Similarly, we want to follow up with our existing partners in the financial industry at their NYC area sites to demo the simulation tools that we have generated in response to the interviews we conducted earlier. If these visits and demos goes well, we will work with our partners in the financial industry to use the tools to gather further information about the strengths and weaknesses of current access control solutions, and thus get information to help us refine our models and target areas for future technology development; this will involve collaboration remotely as well as more site visits. Finally, we hope to leverage our current healthcare contacts to establish new ones at different institutions (to better understand the impact that size, culture, etc. have on insider concerns in that domain), which will also involve a site visit or two (although probably only a couple of days a pop, since healthcare orgs have much less developed IT suborgs)

5. Dartmouth College ISTS – Undergrad and graduate students are budgeted based on projected Dartmouth rates. Current FY08 grad student rates are \$1,872 monthly plus student health benefits of \$1,435 annually. A 5% increase is expected for FY09. Based on these rates, the project will support one graduate student over the 12 month period. Undergraduates will play an important role in this project. Rates are usually at \$10, but can go as high as \$14 per hour based on expertise. Over the school year students generally work 10-15 hours per week during term and over summer term 40 hours per week. The \$14,000 is based on a combination of summer and on-term work. We estimate 5 students over the 12 month time period.

6. Dartmouth College ISTS – The base salary for FY08:

(b)(6) is \$132,000 (9 month salary)
is \$189,000 (9 month salary)

For staff (b)(6) it is \$138,000 (12 month salary)

Please note, that I3P released funds for this project back in Dec 2006 and research totals within the initiative remained the same. Any small adjustments, since salaries were projected and have inevitably changed, will be reallocated within the project.

Initiative 5 – Research Budget RAND –

1. RAND is considered a "commercial" organization as an exemption under OMB A-122. They are allowed to have the fee paid. I am attaching a pdf where this is outlined. Rosemary Springer worked on this issue last year and agreed to the fee. I am attaching the email where that approval is given.

2. Dartmouth College ISTS – The base salary for FY08:

(b)(6) is \$189,000 (9 month salary).
hl is \$145,000 (12 month salary)
\$96,000 (12 month salary)

Please note, that I3P released funds for this project back in Dec 2006 and research totals within the initiative remained the same. Any small adjustments, since salaries were projected and have inevitably changed, will be reallocated within the project.

The hourly rate is budget at \$26 per hour. This is based on a competitive salary for Tuck Business School students who are the in the top tier of their peers and have several summer intern opportunities presented to them.

The 28% rate was projected for FY09 back in Dec 2006. The actual rate will be 26.5% based on updated and approved rate agreements. Tuck School has made a business decision to not include pension in faculty compensation that is over and above a faculty's base pay. The different of 12.5% represents this pension contribution.

under subchapter I of Chapter 57, Title 5, United States Code ("Travel and Subsistence Expenses; Mileage Allowances"), or by the Administrator of General Services, or by the President (or his or her designee) pursuant to any provisions of such subchapter shall apply to travel under Federal awards (48 CFR 31.205-46(a)).

c. Commercial air travel. (1) Airfare costs in excess of the customary standard commercial airfare (coach or equivalent), Federal Government contract airfare (where authorized and available), or the lowest commercial discount airfare are unallowable except when such accommodations would: require circuitous routing; require travel during unreasonable hours; excessively prolong travel; result in additional costs that would offset the transportation savings; or offer accommodations not reasonably adequate for the traveler's medical needs. The non-profit organization must justify and document these conditions on a case-by-case basis in order for the use of first-class airfare to be allowable in such cases.

(2) Unless a pattern of avoidance is detected, the Federal Government will generally not question a non-profit organization's determinations that customary standard airfare or other discount airfare is unavailable for specific trips if the non-profit organization can demonstrate either of the following: that such airfare was not available in the specific case; or that it is the non-profit organization's overall practice to make routine use of such airfare.

d. Air travel by other than commercial carrier. Costs of travel by non-profit organization-owned, -leased, or -chartered aircraft include the cost of lease, charter, operation (including personnel costs), maintenance, depreciation, insurance, and other related costs. The portion of such costs that exceeds the cost of allowable commercial air travel, as provided for in subparagraph c., is unallowable.

e. Foreign travel. Direct charges for foreign travel costs are allowable only when the travel has received prior approval of the awarding agency. Each separate foreign trip must receive such approval. For purposes of this provision, "foreign travel" includes any travel outside Canada, Mexico, the United States, and any United States territories and possessions. However, the term "foreign travel" for a non-profit organization located in a foreign country means travel outside that country.

52. Trustees. Travel and subsistence costs of trustees (or directors) are allowable. The costs are subject to restrictions regarding lodging, subsistence and air travel costs provided in paragraph 51 of this appendix.

Appendix C to Part 230—Non-Profit Organizations Not Subject to This Part

1. Advance Technology Institute (ATI), Charleston, South Carolina
2. Aerospace Corporation, El Segundo, California
3. American Institutes of Research (AIR), Washington DC
4. Argonne National Laboratory, Chicago, Illinois
5. Atomic Casualty Commission, Washington, DC
6. Battelle Memorial Institute, Headquartered in Columbus, Ohio
7. Brookhaven National Laboratory, Upton, New York
8. Charles Stark Draper Laboratory, Incorporated, Cambridge, Massachusetts
9. CNA Corporation (CNAC), Alexandria, Virginia
10. Environmental Institute of Michigan, Ann Arbor, Michigan
11. Georgia Institute of Technology/Georgia Tech Applied Research Corporation/ Georgia Tech Research Institute, Atlanta, Georgia
12. Hanford Environmental Health Foundation, Richland, Washington
13. IIT Research Institute, Chicago, Illinois
14. Institute of Gas Technology, Chicago, Illinois
15. Institute for Defense Analysis, Alexandria, Virginia
16. LMI, McLean, Virginia
17. Mitre Corporation, Bedford, Massachusetts
18. Mitretek Systems, Inc., Falls Church, Virginia
19. National Radiological Astronomy Observatory, Green Bank, West Virginia
20. National Renewable Energy Laboratory, Golden, Colorado
21. Oak Ridge Associated Universities, Oak Ridge, Tennessee
22. Rand Corporation, Santa Monica, California
23. Research Triangle Institute, Research Triangle Park, North Carolina
24. Riverside Research Institute, New York, New York
25. South Carolina Research Authority (SCRA), Charleston, South Carolina
26. Southern Research Institute, Birmingham, Alabama
27. Southwest Research Institute, San Antonio, Texas
28. SRI International, Menlo Park, California
29. Syracuse Research Corporation, Syracuse, New York
30. Universities Research Association, Incorporated (National Acceleration Lab), Argonne, Illinois
31. Urban Institute, Washington DC
32. Non-profit insurance companies, such as Blue Cross and Blue Shield Organizations
33. Other non-profit organizations as negotiated with awarding agencies

[FR Doc. 05-16650 Filed 8-30-05; 8:45 am]

BILLING CODE 3110-01-P

Renwick, Tya

From: Springer, Rosemary (b)(6)
Sent: Tuesday, April 03, 2007 3:24 PM
To: (b)(6)
Cc: Morgan, Marilyn J
Subject: RE: Your grant

You are correct.

Rosemary Springer
Department of Homeland Security
Office of Procurement Operations
Grants and Financial Assistance Division
Phone (b)(6)
Fax: (202) 447-5600

-----Original Message-----

From: (b)(6)
Sent: Tuesday, April 03, 2007 9:59 AM
To: 'Springer, Rosemary'
Subject: RE: Your grant

Thanks Rosemary, I appreciate all your help in moving this forward. One thing I wanted to make sure of - I had sent you the below response in regards to the RAND fee. Can you confirm that the fee is allowable under the NCS D guidelines?

Thanks

(b)(6)

RAND is not subject to A-122, and considers itself a non-profit commercial organization subject to FAR 31.7. Dartmouth accepts that this fee is okay to request. Per the funding announcement, we feel that the fee is allowable given RAND's commercial status. Please let us know if NCS D has additional policies that would preclude us from using NCS D grant funds to pay the fee.

-----Original Message-----

From: Springer, Rosemary [redacted] (b)(6)

Sent: Monday, April 02, 2007 2:07 PM

To: [redacted] (b)(6)

Cc: Harris, Richard; Morgan, Marilyn J

Subject: Your grant

[redacted] (b)(6)

I got your phone message. You are correct that you gave me everything and I thank you so much for all of your help and your very timely responses. Thank you again.

There is one last approval we are waiting for. You will hear from us by the end of the week.

Thank you,
Rosemary.

Rosemary Springer
Department of Homeland Security
Office of Procurement Operations
Grants and Financial Assistance Division
Phone [redacted] (b)(6)
Fax: (202) 447-5600

Renwick, Tya

From: (b)(6)
Sent: Tuesday, March 18, 2008 12:50 PM
To: 'Renwick, Tya'
Cc: 'Morgan, Marilyn'; 'Lee, Annabelle'; 'Harris, Richard'; 'Martha Austin'
Subject: RE: Dartmouth - Non-competing Continuation Application Review
Attachments: Scan001.pdf; RE: Your grant; NCSD response 3-18-08 I 1 2 5.doc

Tya,
 See attached responses in the word doc and two other pieces of supporting info on the RAND question.

Thanks

(b)(6)

-----Original Message-----

From: Renwick, Tya (b)(6)
Sent: Monday, March 17, 2008 4:45 PM
To: (b)(6)
Cc: Morgan, Marilyn; Lee, Annabelle; Harris, Richard; Martha Austin
Subject: Dartmouth - Non-competing Continuation Application Review

H (b)(6)

I'm continuing with the review of your application. Please address the following by COB, March 18th:

I3P Administration Budget:

1. Web Design \$25,000 – Is this a necessary expense for the success of this project?

Initiative 1 – Fellowship Program:

1. The budget narrative notes that the program will continue through March 31, 2010. At this point we will not be able to address a no-cost extension. If you would like to request a no-cost extension towards the end of BPIII please ensure that your request includes a justification for the request, outline of remaining funds available to support extended period, and a description of performance measures necessary to complete the project.
2. Subawards/Contractual Costs – A memorandum of understanding (MOU) will be issued to 3 institutes to support the fellowship program. Based on our records from BPII the MOU issued was followed up by issuing a formal contract. Will that be the same for BPIII? How many fellows will be selected?

Initiative 2 – Human Behavior, Insider Threat, and Awareness

1. An 8% fixed fee is reflected on RAND management and research budget. Per the funding announcement for this program, Article IV, item C.6. “Profit or fee is not allowable except when subcontracting for routine goods and services with commercial organizations.” How will Dartmouth ensure compliance?
2. Research Budget RAND – It appears that your total calculations for BPIII incorporate \$144,345 for consultant/contracts costs. However, consultant/contracts costs are not budgeted for BPIII. Please explain your calculations. Also there is not a justification to support these costs.
3. Research Budget Cornell – Cornell’s budget was reduced by \$50,000. Where were these funds reallocated?
4. Dartmouth College ISTS – Travel: What are the various conferences that will be supported by these funds?
5. Dartmouth College ISTS – \$14,000 & \$18,459 are budgeted for undergrads and CS grad students respectively. How were these totals calculated (hours, rate, etc.)? How many students will be supported?
6. Dartmouth College ISTS – What are the base salaries for the faculty and staff?

Initiative 5 – Research Budget RAND –

1. An 8% fixed fee is reflected on RAND management and research budget. Per the funding announcement for this program, Article IV, item C.6. “Profit or fee is not allowable except when subcontracting for routine goods and services with commercial organizations.” How will Dartmouth ensure compliance?
2. Dartmouth College ISTS – Personnel: What are the base salaries for the faculty and staff? Per the budget justification a student who will assist with data reduction, modeling and report/presentation writing 480 hours/year. What is the hourly rate for this student? 28% fringe rate is applied to faculty. Do you have a rate agreement reflecting the 28%?

Thank you.

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

Renwick, Tya

From: Renwick, Tya
Sent: Monday, March 24, 2008 10:33 AM
To: (b)(6)
Subject: RE: Dartmouth Continuation Application - Tuition

I will place these costs under the "other" category.

Thanks.

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

From: (b)(6)
Sent: Friday, March 21, 2008 3:22 PM
To: 'Renwick, Tya'
Subject: RE: Dartmouth Continuation Application - Tuition

Well, I guess I don't really have a good answer for that one. It would make more sense under the 'other' category.

Sarah

-----Original Message-----

From: Renwick, Tya (b)(6)
Sent: Friday, March 21, 2008 3:06 PM
To: (b)(6)
Subject: Dartmouth Continuation Application - Tuition

(b)(6)

I have one more question...

Why is the \$31,672 for "Participant/Trainee Support Costs" indicated on the R&R 424 budget form included with the supply costs of \$100,303 reflected on your "Summary – breakdown by categories" worksheet (please see page 2 of the attachment). Normally, I would put this cost under "Other."

Thanks.

Tya Penwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds spend during Dartmouth FY08 and FY09

\$395,979

I3P Human Behavior - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item/Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total	inflation
		Fed	state	university	subtotal	Fed	state	university	subtotal		
Faculty FAC Associate Professor FAC Professor	9 month base salary 9 month base salary	3 months 5 effort	0.00%	\$0	0.00%	\$0		\$42,500	\$42,500	5.0%	
Staff RAC (staff)	12 month base salary	15% effort					\$7,703	\$7,703	\$7,703	5.0%	
Students Undergrads CS grad students	Rate per hour \$10.00								Administrative Information Outside of Scope		
Subtotal, without fringe				\$0				\$102,853	\$102,853		
FAC Fringe on Faculty			38.5%	\$0			39.0%	\$19,579	\$19,579		
AP Fringe on AP I and AP II			38.5%	\$0			39.0%	\$0	\$0		
UG Fringe on full-time undergraduates			9.0%	\$0			9.0%	\$0	\$0		
RAA Fringe on Research Associate A			9.0%	\$0			9.0%	\$0	\$0		
RAB Fringe on Research Associate B			24.5%	\$0			24.5%	\$0	\$0		
RAC Fringe on Research Associate C			38.5%	\$0			39.0%	\$7,874	\$7,874		
Total fringe				\$0				\$27,454	\$27,454		
Subtotal, including fringe				\$0				\$130,307	\$130,307		
Indirects on people	59.90%			\$0				\$78,054	\$78,054		
Direct materials		Computation							Total	notes	
Travel											
Conferences, Meetings and Coord	Airfare \$270							\$4,320	\$4,320		
No. of travelers	4 Hotel \$300 / day							\$4,800	\$4,800		
No. of Trips	4 Meals \$50 / day							\$1,600	\$1,600		
No. of nights	1 Mileage/tax/parking (\$60+\$20+\$20) \$100							\$1,600	\$1,600		
Capital equipment											
Breakdown of Equipment											
Participant Support Costs									\$0		
Other Direct Costs											
Materials and Supplies											
Publication Costs											
Conference Registration Fees											
Event and Meeting Costs											
Consultant Services											
Indirects on travel, supplies, other costs (NOT equipment or tuition)	59.90%			\$0				\$7,380	\$7,380		
Subawards/Contractual Costs		Base price							Total	inflation	
Describe Product or Service										5.0%	
Manu	(b)(6)							\$149,518	\$149,518		
RAN	(b)(6)							\$305,709	\$305,709		
Misc	(b)(6)							\$300,000	\$300,000		
Conu	(b)(6)							\$300,000	\$300,000		
Comp	(b)(6)							\$300,000	\$300,000		
Per R	(b)(6)							\$300,000	\$300,000		
Purch	(b)(6)							\$150,149	\$150,149		
Indial	(b)(6)							\$220,977	\$220,977		
Subtotal								\$1,279,397	\$1,279,397		
Indirect on first \$25k each subcontract	59.90%							\$0	\$0		
Total directs				\$0				\$1,422,024	\$1,422,024		
Total indirects				\$0				\$85,433	\$85,433		
Total				\$0				\$1,507,457	\$1,507,457		

Administrative Information Outside of Scope

Administrative Information Outside of Scope

Administrative Information

Administrative Information Outside of Scope

I3P Initiative 2 – Human Behavior, Insider Threat, and Awareness

Team Leader (b)(6), RAND Corporation

Cost - Budget Period III: \$1,507,457
(Budget Period II supplement: \$396,956)

See Project Narrative for proposal information. This project includes Dartmouth College as well as 6 other institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: RAND (b)(6)

	BPII	BPII	Total
A. Personnel	43,029	43,029	86,058
B. Fringe Benefits	15,749	15,749	31,498
C. Travel	10,346	10,346	20,692
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	11,422	11,422	22,844
Total Direct Costs	80,546	80,546 ✓	161,092
I. Indirect Costs 20% 72%	57,896	57,896	115,792
Fixed Fee 8%	11,076	11,076	22,152
TOTAL PROJECT COST:	149,518	149,518 ✓	299,036

61,381,442 x 8%

Personnel

(b)(6), Senior Information Scientist, will serve as team leader for this initiative. (b)(6) a policy analyst studying at the Pardee RAND Graduate School, will be assisting Dr. (b)(6) tracking the progress of the eight partners performing the Insider Threat research. Both (b)(6) will be assisted by (b)(6) a RAND research assistant with experience in cyber security. (b)(6) will support the effort as administrative assistant.

Fringe

Rates based on approved rate agreement.

Travel

The budgeted travel supports (b)(6) for travel to project-related meetings when the travel is not covered by the Insider Threat proposal. Such meetings may include team meetings, project presentations, and coordination among subsets of team members.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs involve only computing and communications costs to support the researchers in completing the tasks for this project. Charges for desktop PC's at RAND are allocated in proportion to staff time spent on projects. The estimated computing and communications costs for this project include charges for photocopying, printing, telephone and fax, adjusted for inflation.

Indirect Costs and Fee of 8%

Rates based on approved rate agreement.

Research Budget: RAND

(b)(6)

	BPII	BPII	Total
A. Personnel	42,073	42,073	84,146
B. Fringe Benefits	19,354	19,354	38,708
C. Travel	5,189	5,189	10,378
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts	144,345	?	144,345
H. Other Costs	11,597	11,597	23,194
Total Direct Costs	222,559	222,559	445,118
I. Indirect Costs 27%	60,505	60,505	121,010
Fixed Fee 8%	22,645	22,645	45,290
TOTAL PROJECT COST:	305,709	305,709	611,418

Administrative Information Outside

Personnel

(b)(6) Senior Information Scientist, will serve as project manager for the RAND portion of this initiative (b)(6) Associate Engineer, will work with (b)(6) to investigate the ethical and policy issues of insider threat discovery and management, as laid out in the task descriptions. The will be assisted by (b)(6) (b)(6) a RAND research assistant with experience in cyber security. (b)(6) (b)(6) will support the effort as administrative assistant.

Fringe

Rates based on approved rate agreement.

Travel

There are seven other widely-dispersed partners with whom we are likely to meet over the course of the project, but we are unable at this time to know with which partners we are likely to meet over the course of the year. Consequently, we have budgeted for one two-day trip to California, to cover the cost of these meetings.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs involve only computing and communications costs to support the researchers in completing the tasks for this project. Charges for desktop PC's at RAND are allocated in proportion to staff time spent on projects. The estimated computing and communications costs for this project include charges for photocopying, printing, telephone and fax, adjusted for inflation.

Indirect Costs and Fee of 8%

Rates based on approved rate agreement.

Research Budget: Mitre

(b)(6)

	BPII		Total
A. Personnel	129,513	129,375	258,888
B. Fringe Benefits	129,628	129,491	259,119
C. Travel	7,124	7,286	14,410
D. Equipment			-
E. Supplies	5,217	5,342	10,559
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	271,482	271,494	542,976
I. Indirect Costs	28,518	28,506	57,024
TOTAL PROJECT COST:	300,000	300,000	600,000

Personnel

(b)(6) will serve as the project manager for the Mitre portion of this initiative. He will enlist appropriately skilled staff as required. Leveraging of MITRE's Information Security Center will be done through (b)(6) will provide administrative support. (b)(6) will provide financial services.

Fringe

Rates based on approved rate agreement.

Travel

The budgeted travel supports travel for three people to four team meetings. Expected duration of travel is 3 to 5 days per trip. Locations specified are tentative.

Equipment

N/A.

Supplies

The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs

N/A.

Indirect Costs

The G&A and COM fees are 7% and 4% respectively.

Administrative Information Outside of Scope

Research Budget: Columbia

(b)(6)

	BPII		Total
A. Personnel	132,094	137,325	269,419
B. Fringe Benefits	21,756	23,269	45,025
C. Travel	3,068	999	4,067
D. Equipment	10,000	10,000	20,000
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	33,702	28,616	62,318
Total Direct Costs	200,620	200,209	400,829
I. Indirect Costs	99,380	99,791	199,171
TOTAL PROJECT COST:	300,000	300,000	600,000

Budget and Budget Justification: Columbia requests a total of \$600,000 over the two year period of performance. The Columbia budget is primarily focusing on personnel expenses, both at with nominal support for travel and no equipment, plus overhead.

Personnel: In each of the two years, the budget requests 1 summer month for the project manager for the Columbia portion of this initiative (b)(6) and 2 PhD or MS Graduate Research Assistants (GRAs). A full time research scientist position is proposed to be responsible for the implementation and delivery of technologies for test and evaluation by other collaborators on this project; in particular funds are requested for (b)(6) who is the primary designer of the email mining technology that was the core of his PhD thesis research.

Equipment: In each of the two years, the budget requests \$10,000 for the purchase and upgrade of at least 3 servers to be used on this project. One server will be primarily a

development system to construct the host-based sensors for use in masquerade detection test and evaluation. The second server will be used to host the Cornell-supplied Cauyuga system which forms the core of the egress firewall technology to be tested. The third server will function as the primary mailservers to exchange "bogus emails" with other members of the research team. We expect to upgrade these systems in the second year to accommodate higher network speeds and throughputs to be tested in our first year of effort.

GRA support includes 9-month tuition and stipend. In addition, the budget includes a \$2,000/GRA+PI/year charge that covers the cost of the computing services that will be used as part of conducting the research.

Travel: We request approximately \$4,000 to cover the cost of team and PI meetings, and 1-2 conferences each year.

Overhead: Columbia charges an Indirect Cost Rate on all research project items, with the exception of tuition and equipment (which do not incur any overhead). This rate is negotiated by Columbia periodically with the Government, and is currently set at 61%.

Research Budget: Cornell (b)(6)

	BPII (adj)		Total
A. Personnel	136,034	168,177	304,211
B. Fringe Benefits	18,998	16,433	35,431
C. Travel	6,600	8,400	15,000
D. Equipment			-
E. Supplies		521	521
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	9,556	13,313	22,869
Total Direct Costs	171,188	206,844	378,032
I. Indirect Costs	78,812	93,156	171,968
TOTAL PROJECT COST:	250,000	300,000	550,000

Note: After our formal review process in December 2007, it was determined that the BPII amount for Cornell would be reduced to by \$50,000 to a new total of \$250,000. This is reflected in the budget worksheet.

Salaries:

(b)(6) Associate Professor, will serve as project manager for the Cornell portion of this initiative. He will be the institutional contact and will coordinate activities, and collaborate closely with (b)(6) the other member of the team to develop technologies described in the SOWP. This proposal requests salary support for a 0.5 month of summer salary and ten percent of academic year effort each year. (note that the \$50k reduction in BPII is a result for (b)(6) being on sabbatical)

(b)(6) Professor, will collaborate with Associate Professor (b)(6) to develop technologies and will share with Associate Professor (b)(6) funding for graduate students to assist in working on the respective technologies. This proposal requests salary support for a 0.5 month of summer salary and ten percent of academic year effort each year.

Graduate Student: Graduate students will assist Associate Professor (b)(6) and Professor (b)(6) in developing the technologies described in the SOWP. This proposal requests salary support for one hundred percent of academic year effort for two graduate students each year and for one graduate student for one semester each year, and salary support for one hundred percent effort for three graduate students in the summer in year one and two students in the summer in year two. The salary support includes the stipend and salary used toward tuition and health insurance each year.

Annual salaries are budgeted with a five percent increase in July of each year.

Employee Benefits: Employee Benefits have been proposed at a rate of thirty-three percent for all non-student compensation as approved by the Department of Health and Human Services. See http://www.accounting.cornell.edu/Employee_Benefit_Rates.cfm.

Travel: Funds are requested for travel to enable the project participants to attend conferences and meetings with other team members to promote technology transfer and refine technology demonstration plans. Estimates are based on current airfare costs and relevant associated costs based on historical information.

Materials and Supplies: The cost of computer research materials under \$5,000, including computer hardware, computer software, and research books which are primarily related to the research project Computer research material costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other - Publications: The costs associated with publications in related technical journals. Publication costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other - Communications: Communication costs consist of project specific conference calls, faxing, modem, lab phone equipment, etc. Communications costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other - Workstation Support: Workstation support represents hardware and software maintenance, software licensing, networking, printing service, file service, backups and user consulting support for the machines used to conduct research as outlined in this proposal. The costs are calculated based on the effort of the project participants. The following steps are used to bill the costs associated with the Computer Science Department Central Facility:

a) For each user with a computing account in the facility, a user class is assigned to the individual, based on their past or anticipated usage. The user class of an individual may

change during the year in response to changes in their usage of the facility. User class is determined by a set of objective use criteria for each user.

b) A user profile is established for each individual in the department that identifies percentage of time spent on Administration, Instruction, Departmental Research, and Organized Research activities. The profile is updated for summer, fall, and spring billing cycles.

c) The profile and user-class-based charges are used to allocate costs for the individual's activities to Administration, Instruction, Departmental Research, and Organized Research.

Costs associated with Organized Research are billed to sponsored research projects. Costs for Administration, Instruction, and Departmental Research are billed to university funds.

Facilities and Administrative Costs (F&A): F&A costs have been proposed at a rate of fifty eight percent from April 1, 2007 through June 30, 2007 and fifty-nine percent from July 01, 2007 through March 31, 2009 of Modified Total Direct Cost (MTDC) as approved in Cornell's rate agreement with the Department of Health and Human Services. A copy of this agreement may be found at http://www.accounting.cornell.edu/F&A_Cost_Rates.cfm. MTDC exclusions include Capital Equipment, GRA Allowance and Health Insurance, and Subcontract costs in excess of \$25,000 per subcontract.

The five percent annual escalation for the general expenses is proposed in accordance with University policy.

Research Budget: Purdue

(b)(6)

	BPII		Total
A. Personnel	64,688	73,780	138,468
B. Fringe Benefits	18,832	19,141	37,973
C. Travel	8,607		8,607
D. Equipment			-
E. Supplies	2,000	1,140	3,140
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	6,308	6,707	13,015
Total Direct Costs	100,435	100,768	201,203
I. Indirect Costs	49,416	49,381	98,797
TOTAL PROJECT COST:	149,851	150,149	300,000

(b)(6)

will co-lead this Purdue portion of the initiative. They will participate in the research involved in the program, in supervision of the graduate student, in dissemination of the results, and in delivering material via classes. As such, all three are listed for support.

Funds have been included for a graduate student who will do the bulk of the background research and data analysis.

Travel funds have been budgeted for travel to conferences and for travel to a small number of sites where we hope to consult with outside experts. This includes trips to Atlanta to consult with the GBI (Georgia Bureau of Investigation) and Washington to work with selected FBI agents.

A small amount has been budgeted for equipments, supplies and telephone costs.

Indirect rates are in accordance with the negotiated Purdue University Indirect cost rate agreement.

Research Budget: Indiana

(b)(6)

	BPII	(b)(6)	Total
A. Personnel	62,069	100,042	162,111
B. Fringe Benefits	9,587	16,231	25,818
C. Travel	13,449	8,013	21,462
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	19,293	32,683	51,976
Total Direct Costs	104,398	156,969	261,367
I. Indirect Costs	44,859	64,008	108,867
TOTAL PROJECT COST:	149,257	220,977	370,234

Budget Justification Second Year

A. SENIOR PERSONNEL

The PI's salary requested for year 1 is based on present salary. Salary is increased by an estimate of 5% as next year's salary is not determined. Professor (b)(6) (b)(6) is requesting 2 summer months of salary and Professor (b)(6) is requesting one and one half summer month of salary for the second year of the grant. The additional time will be spent concentrating on the optimal follow-up from the April 2008 workshop on Insider Threats.

GRADUATE STUDENTS –Five (5) graduate students will receive support for both years of the grant. Four students will receive full support (10 months each year) during this period and one student will receive support for 1 semester (5 months each year) during the duration of the grant.

B. FRINGE BENEFITS

Fringe benefit rate of 21.06% is used for the faculty summer salary. A flat rate of \$1,613 is included for health insurance for the 2 full time graduate students. The amount of \$1001 is used for the part-time student.

C. TRAVEL

The travel cost will cover travel to two events. For the IEEE Symposium being held at Oakland, CA it will cover 3 persons, the 2 PIs and 1 student. 3 persons written in the grant will attend the I3P Workshop on Insider Threats.

H. OTHER COSTS

Fee Remissions are included for the graduate student research assistants in year 1 at the in-state rate of \$ 7,971.00 for the full time students. The cost for the part time student would be \$3,985.50.

I. INDIRECT RATE

Currently the University indirect rate is 51.5%.

Research Budget: Dartmouth College - IST

(b)(6)

	BPII	(b)(6)	Total
A. Personnel	29,620	102,853 ✓	132,473
B. Fringe Benefits	3,003	27,454 ✓	30,457
C. Travel	9,240	12,320 ✓	21,560
D. Equipment	5,000		5,000
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	46,863	142,627	189,490
I. Indirect Costs	25,076	85,433	110,509
TOTAL PROJECT COST:	71,939	228,060	299,999

Personnel: The research staff consists of project manager Prof. (b)(6) who will drive much of the work in the project and take a research term leave to focus more intensely on it. Prof. (b)(6) of the Tuck School will assist in analyzing the information flow and operations in our business domain partners. Ph.D. student (b)(6) will assist in this work and supervise the two WISP (Women in Science Program) interns. (Analyzing information security requirements in real-world domains and designing usable technological solutions to meet them are central parts of (b)(6) work.) (b)(6) the Senior PKI Architect at Dartmouth, will provide invaluable real-world technology expertise.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budgeted travel supports participation in various conferences (location unknown), and other venues to present project progress and results. In person meetings with various team members will be required throughout the project. Our project explicitly intends to reach outside of academia and to mine real-world domains facing insider attack threats. The travel support is necessary to allow trips to these sites.

Equipment: Two laptops for use by the undergraduate students are budgeted.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

I3P Business Rationale - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total
			# of months	% effort	\$/effort	subtotal	# of months	% effort	\$/effort	subtotal	
Faculty											
FAC-L	(b)(6) (essor)	9 month base salary	1/9 effort		\$10,096				\$13,832	\$23,928	
FAC-L	(b)(6) (ec Dir)	12 month base salary	3 months		\$0				\$37,856	\$37,856	
Administrative Information Outside of Scope											
Staff											
RAC	(b)(6)	12 month base salary	100% effort		\$25,310				\$75,929	\$101,238	
Students											
UG/Tuck Graduat	(b)(6)	Rate per hour			\$2,000	hours	480.00		\$10,480	\$12,480	
Subtotal, without fringe											
					\$37,406				\$138,097	\$175,502	
FAC-L	Fringe on Faculty			38.5%	\$0			39.0%	\$14,764	\$14,764	
UG	Fringe on full-time undergraduates			9.0%	\$180			9.0%	\$943	\$1,123	
RAC	Fringe on full-time undergraduates			38.5%	\$9,744			39.0%	\$29,612	\$39,356	
FAC-L	Fringe on Faculty - lower rate			27.0%	\$2,726			28.0%	\$3,873	\$6,599	
Total fringe											
					\$12,650				\$49,192	\$61,842	
Subtotal, including fringe											
	Indirects on people		59.90%		\$29,983				\$112,186	\$142,169	
Direct materials											
Computation											
Travel											
	Travel to partners	20 trips at \$1,000 per trip per year							\$20,000	\$20,000	
Capital equipment											
Breakdown of Equipment											
Quantity plus unit price											
Quantity plus unit price											
Quantity plus unit price											
Participant Support Costs											
Other Direct Costs											
Materials and Supplies											
Publication Costs											
Conference Registration Fees											
Event and Meeting Costs											
Consultant Services											
	Indirects on travel, supplies, other costs (NOT equipmer		59.90%		\$0				\$11,980	\$11,980	
Subawards/Contractual Costs											
Base price											
Describe Product or Service											
	Management, U of Virgin	(b)(6)							\$125,000	\$125,000	
	U of V	(b)(6)							\$650,000	\$650,000	
	RAND	(b)(6)							\$174,450	\$174,450	
	Univer	(b)(6)							\$143,441	\$143,441	
	Business	(b)(6)							\$126,110	\$126,110	
Subtotal											
					\$0				\$496,317	\$496,317	
	Indirect on first \$25k each subcontract		59.90%						\$0	\$0	
Total directs											
					\$50,056				\$703,606	\$753,661	
Total indirects											
					\$29,983				\$124,166	\$154,149	
Total											
					\$80,039				\$827,771	\$907,810	

Administrative Information Outside of Scope

I3P Initiative 5 – Business Rationale for Cyber Security

Team leader (b)(6) University of Virginia

Cost - Budget Period III: \$907,810
 (Budget Period II supplement: \$596,574)

See Project Narrative for proposal information. This project includes Dartmouth College as well as 4 other institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: U of Virginia (b)(6)

	BPII	BPII	Total
A. Personnel	43,979	45,737	89,716
B. Fringe Benefits	12,447	12,944	25,391
C. Travel	11,000	8,800	19,800
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	15,082	15,027	30,109
Total Direct Costs	82,508	82,508	165,016
I. Indirect Costs	42,492	42,492	84,984
TOTAL PROJECT COST:	125,000	125,000	250,000

Budget Detail

	Year 1 4/1/07- 3/31/08	Year 2 4/1/08- 3/31/09	Total
A. Personnel & Benefits			
1. (b)(6) Principal Investigator			
5% (.60 mos.) effort 12 mos. @ \$228,000 CY	11,400	11,400	22,800
Allowance for salary increase	152	814	766
Fringe Benefits - 28.3%	3,270	3,400	6,670
2. Research Scientist			
40% (4.8 mos.) effort 12 mos. @ \$80,000 CY	32,000	32,000	64,000
Allowance for salary increase	427	1,723	2,150
Fringe Benefits - 28.3%	9,177	9,544	18,721
SUBTOTAL PERSONNEL	\$43,979	\$45,737	\$89,716
SUBTOTAL BENEFITS	\$12,447	\$12,944	\$25,391
B. Travel - Domestic	11,000	8,800	19,800
C. Other Contractual Services			
1. Security Executive Advisory Council	10,000	10,000	20,000
2. Copying, communications	5,082	5,027	10,109
TOTAL DIRECT COSTS	\$92,508	\$92,508	\$185,016
D. F & A (Indirect) Costs - 51.5% Modified Total Direct Costs	42,492	42,492	84,984
TOTAL	\$125,000	\$125,000	\$250,000

Personnel - Faculty appointments are generally effective calendar year (CY/12 mos.) beginning July 1 or Academic Year (AY/9 mos.) beginning September 1 (b)(6) will serve as team leader for this effort. A research scientist will provide support for this effort. Salary and fringe benefits for these individuals will be covered under the budget. Salary Increases - A 4% salary increase is applied to a majority of SEAS proposals, effective 11/25/07, and is accumulated annually from this date. Faculty increases are based on contributions in academic and research areas and are approved by the State of Virginia Budget Office. Staff increases are based on State of Virginia proficiency guidelines. New salaries are given as soon as they are available.

Fringe Benefits - The University of Virginia's proposed fringe benefits rates as they apply to sponsored programs are as follows: 28.30% for faculty and professional staff, 36.8% for classified staff, 14% for part-time faculty and staff and 4.5% for wage employees and summer effort by faculty with AY appointments. Fringe benefits apply to graduate and undergraduate research assistants if not enrolled full time (generally 12 hrs. for undergraduates and 9 hrs. for graduates).

Travel - Trips to related technical conferences, workshops, seminars, etc. The budgeted travel supports the research scientist to travel to team meetings and the workshop and for (b)(6) to travel to Security Executive Advisory Council meetings. Trips to sponsor for technical discussions and presentation of results. Trips for 2 persons to Boston, MA; and Washington, DC for Project Meetings. Trips to IAB Conferences for 2 persons to Boston, MA and Washington, DC.

Other --

- a. Security Executive Advisory Council - \$10,000 per year to support costs for the Security Executive Advisory Council to travel to team meetings, in Boston, MA and Washington, DC, and the workshop in Washington, DC.
- b. Other Costs - Estimated project related costs for photocopying, long distance phone and FAX, etc. are based on prior SEAS research experience. The University of Virginia system, through copy cards, etc., is able to document such costs as related to the project.

Facilities and Administrative (F&A) (Indirect/Overhead) Costs - The University of Virginia's negotiated MTDC F&A rates with DHHS per agreement of 5/23/05 is: 7/1/05 - 6/30/06 - 52.5% "on campus" and 26% "off-campus"; effective 7/1/06 - 51.5% "on Campus" and 26% "off-campus". (Note: The MTDC base consists of total direct costs less individual equipment items in excess of \$5,000, alterations and renovations, patient care costs, stipends, tuition remission and rental costs of off-campus facilities.) Includes F&A on the first \$25,000 of subcontracts.

Research Budget: U of Virginia

(b)(6)

	BPII		Total
A. Personnel	294,836	302,437	597,273
B. Fringe Benefits	45,785	46,429	92,214
C. Travel	19,200	13,300	32,500
D. Equipment			-
E. Supplies	16,000	13,000	29,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	71,079	72,626	143,705
Total Direct Costs	446,900	447,792	894,692
I. Indirect Costs	203,100	202,208	405,308
TOTAL PROJECT COST:	650,000	650,000	1,300,000

Budget Detail

	Year 1 4/1/07- 3/31/08	Year 2 4/1/08- 3/31/09	Total
A. Personnel & Benefits			
1. (b)(6) Principal Investigator 35% (4.2 mos.) effort 12 mos. @ \$228,000 CY Allowance for salary increase Fringe Benefits - 28.3%	79,800 1,064 22,885	79,800 4,299 23,800	159,600 5,363 46,685
2. (b)(6) Co-Principal Investigator 10% (1.2 mos.) effort 12 mos. @ \$228,800 CY Allowance for salary increase Fringe Benefits - 28.3%	22,880 305 6,562	22,880 1,232 6,824	45,760 1,537 13,386
3. (b)(6) Co-Principal Investigator 20% (2.4 mos.) effort 12 mos. @ \$79,500 CY 15% (1.8 mos.) effort 12 mos. @ \$79,500 CY Allowance for salary increase Fringe Benefits - 28.3%	15,900 - 212 4,560	- 11,925 642 3,556	15,900 11,925 854 8,116
4. (b)(6) Co-Principal Investigator 18% (2.16 mos.) effort 12 mos. @ \$78,000 CY Allowance for salary increase Fringe Benefits - 28.3%	14,040 187 4,026	14,040 756 4,187	28,080 943 8,213
5. (b)(6) Co-Principal Investigator 8% (0.96 mos.) effort 12 mos. @ \$106,500 CY Allowance for salary increase Fringe Benefits - 28.3%	8,520 114 2,444	8,520 459 2,541	17,040 573 4,985
6. (b)(6) Co-Principal Investigator 2 mos. (summer) effort 9 mos. @ \$82,500 AY 2 mos. summer effort @ \$82,500 AY Allowance for salary increase Fringe Benefits - 28.3% - AY Fringe Benefits - 4.5% - Summer	5,775 18,333 103 1,663 824	5,775 18,333 1,070 1,730 958	11,550 36,666 1,173 3,393 1,682
7. (b)(6) Center Coordinator 14% (1.68 mos.) effort 12 mos. @ \$41,617 CY Allowance for salary increase Fringe Benefits - 36.8%	5,826 78 2,173	5,826 313 2,259	11,652 391 4,432

Personnel - Faculty appointments are generally effective calendar year (CY/12 mos.) beginning July 1 or Academic Year (AY/9 mos.) beginning September 1. (b)(6) will serve as project manager for this UVa portion of the initiative. (b)(6) will lead the decision support tool task. (b)(6) will lead the phantom systems modeling and interdependencies task. (b)(6) will lead the analyzing the emergent nature of cyber security effort. (b)(6) will provide support for the modeling effort for the interdependency task. Salary and fringe benefits for these individuals will be covered under the budget.

Center Coordinator – (Operations Manager) – (b)(6) will provide data support, data acquisition, and data management support for the interdependency task.

Graduate Research Assistants (GRAs) and Undergraduate Research Assistants (URAs) - Costs are estimated based on the minimum and maximum payments for the academic year established by the University Office of the Vice-President and Provost. All compensation in SEAS proposals are within these guidelines. For the decision support task two graduate students will carry out the proposed research and support the software development effort. For the interdependency task one graduate student will carry out the proposed research. For the emergent nature of cyber security one graduate student will carry out the proposed research. For the decision support task one undergraduate student will support the software implementation configuration control.

Salary Increases - A 4% salary increase is applied to a majority of SEAS proposals, effective 11/25/07, and is accumulated annually from this date. Faculty increases are based on contributions in academic and research areas and are approved by the State of Virginia Budget Office. Staff increases are based on State of Virginia proficiency guidelines. New salaries are given as soon as they are available.

Fringe Benefits - The University of Virginia's proposed fringe benefits rates as they apply to sponsored programs are as follows: 28.30% for faculty and professional staff, 36.8% for classified staff, 14% for part-time faculty and staff and 4.5% for wage employees and summer effort by faculty with AY appointments. Fringe benefits apply to graduate and undergraduate research assistants if not enrolled full time (generally 12 hrs. for undergraduates and 9 hrs. for graduates).

Travel - Trips to related technical conferences, workshops, seminars, advisory board meetings, etc. Trips to sponsor for technical discussions and presentation of results. These trips will include meetings with the Security Executive Advisory Council and participation in the Workshop related to use of the open source Decision Support Tool developed under this activity. The PIs and graduate students will travel to conferences and workshops to present this effort to include the annual meetings of the multidisciplinary Society for Risk Analysis, the annual meetings of the multidisciplinary Systems, Man, and Cybernetics Society of the IEEE. Funding for this conference travel will be partially covered by funds proposed for this I3P effort.

Materials and Supplies - Laboratory supplies for specific use in the research project (The laptop computers are to be used by the students engaged in creating the open source SW for the economic game activity. The game will be built on top of selected off-the-shelf software packages (e.g., Groove) that will require purchases of licenses. There are also specific software programs that must be used in order to perform project related research. Software will be necessary for interdependency modeling and analysis, e.g. Evolver software from Palisade Corporation.). For the decision support tool effort five laptops will be purchased over a 2 year period to permit the software development and experimental conduct of economic exercises, In addition software licenses will need to be acquired to support the software development effort and the final decision support tool. For the interdependency task one laptop per year will be purchased, and software licenses acquired to support the interdependency modeling effort. Does not include office or other general purpose supplies.

Other –

- a. Tuition Remission - Effective September 1, 1990, it is the policy of the University of Virginia to provide tuition for graduate research assistants as partial compensation for services.
- b. Graduate Research Assistant Health Insurance – Effective July 1, 2005, it is the policy of the University of Virginia to provide health insurance for graduate research assistants as partial compensation for services.
- c. Technical Editor – A professional technical editor will assist in the editing of archival papers, conference presentations and the progress reports submitted to the funding agency. These editing services are absolutely indispensable for the quality control of our publications.
- d. Other Costs - Estimated project related costs for photocopying, long distance phone and FAX, etc. are based on prior SEAS research experience. The University of Virginia system, through copy cards, etc., is able to document such costs as related to the project.

Facilities and Administrative (F&A) (Indirect/Overhead) Costs - The University of Virginia's negotiated MTDC F&A rates with DHHS per agreement of 5/23/05 is: 7/1/05 - 6/30/06 – 52.5% "on campus" and 26% "off-campus"; effective 7/1/06 – 51.5% "on Campus" and 26% "off-campus". (Note: The MTDC base consists of total direct costs less individual equipment items in excess of \$5,000, alterations and renovations, patient care costs, stipends, tuition remission and rental costs of off-campus facilities.) Includes F&A on the first \$25,000 of subcontracts.

Research Budget: RAND

(b)(6)

	BPII	BPIII	Total
A. Personnel	49,427	49,427	98,854
B. Fringe Benefits	22,736	22,736	45,472
C. Travel	5,189	5,189	10,378
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	13,097	13,097	26,194
Total Direct Costs	90,449	90,449	180,898
I. Indirect Costs	71,079	71,079	142,158
Fee 8%	12,922	12,922	25,844
TOTAL PROJECT COST:	174,450	174,450	348,900

Personnel

Dr. (b)(6) Senior Information Scientist, will lead the RAND portion of this initiative. Dr. (b)(6) Associate Operations Research Analyst, will take the lead in the task that refines the economic model evaluation framework, extending the work that she is currently performing on the I3P Economics of Cyber Security project. Both (b)(6) will conduct the case study, assisted by (b)(6)

a RAND research assistant with experience in cyber security (b)(6) will support the effort as administrative assistant.

Fringe

Rates based on approved rate agreement.

Travel

One trip to California is budgeted, to be made in support of the case study interviews.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs involve only computing and communications costs to support the researchers in completing the tasks for this project. Charges for desktop PC's at RAND are allocated in proportion to staff time spent on projects. The estimated computing and communications costs for this project include charges for photocopying, printing, telephone and fax, adjusted for inflation.

Indirect Costs and Fee of 8%

Rates based on approved rate agreement.

Research Budget: U of California, Berkeley

(b)(6)

	BPII	BPII	Total
A. Personnel	63,226	63,769	126,995
B. Fringe Benefits	10,063	10,063	20,126
C. Travel	18,670	18,670	37,340
D. Equipment	-	-	-
E. Supplies	6,100	1,000	7,100
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	250	250	500
Total Direct Costs	98,309	93,752	192,061
I. Indirect Costs	52,104	49,689	101,793
TOTAL PROJECT COST:	150,413	143,441	293,854

Personnel (b)(6) Clinical Professor of Law, and Director of the Samuelson Law, Technology & Public Policy Clinic will serve as Principal Investigator for this project (8% effort). (b)(6) TRUST and ACCURATE Fellow at the Samuelson Clinic will serve as Senior Research Fellow (30% effort). One graduate student will assist Professor (b)(6) and Fellow (b)(6) (50% effort). Law students will provide research support (at \$15 per hour) (b)(6) Associate Director of Policy & Outreach

and Senior Attorney at the Samuelson Clinic, will provide advice and consultation to the project, as needed.

Salary and employee benefits (including Graduate student health insurance and fee remissions) are included for (b)(6) and one graduate student for two years. Salaries are based on current levels with no projected annual increases.

Fringe: See above.

Travel: The budgeted travel supports trips to be shared by a combination of the team members (location to be determined).

Travel costs are obtained via estimated costs for round-trip, coach, non-restricted trips to the East Coast (\$600 total), ground transportation (\$100 total), average per diem costs (\$65 for meal and incidentals), and lodging (\$150 per night).

Specific trips are: a) to I3P meetings; b) to CSO Association meetings; and c) to interview several CSOs within the region in one trip.

Supplies: Supplies and Expenses for the direct benefit of this research include long-distance telephone charges, publication costs, and express shipping charges.

A laptop is requested to assist with data collection and note-taking during field interviews with Chief Security Officers.

Recording equipment is requested to assist with capturing CSO interviews.

A speakerphone is requested to conduct follow-up discussions and conference calls.

Transcription services are requested to memorialize CSO interviews.

Other costs:

Modified total direct costs (MTDC) exclude equipment, graduate student health insurance & fee remissions.

Research Budget: Dartmouth College - ISTS (b)(6)

	BPII	BPIII	Total
A. Personnel	167,794	174,506	342,300
B. Fringe Benefits	58,863	62,838	121,701
C. Travel	20,000	20,000	40,000
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	246,657	257,344	504,001
I. Indirect Costs	147,747	154,149	301,896
TOTAL PROJECT COST	394,404	411,493	805,897

Dartmouth College - ISTS (Tuck School of Business)

Personnel and Fringe: Prof [(b)(6)] will be the project manager for this Tuck portion of the initiative, by overseeing the research efforts. [(b)(6)] will be fully involved in the day-to-day planning, organization, coordination, execution, and presentation of the proposed research. [(b)(6)] will also be centrally involved in the research administration and execution. Support for a student is included in the budget; this individual would assist with data reduction, modeling and report/presentation writing. Salary and fringe benefits for these individuals is covered in the budget for this project.

Effort:

(b)(6)	1 month/year
	12 months/year
	3 months/year
Student:	480 hrs/year (equivalent to a summer intern)

Travel: The budgeted travel supports roughly 20 trips per year at \$1000/trip; this should be adequate for travel to interview firms, present at workshops, and travel to I3P inter-group meetings. With respect to interview travel, the goal is for two researchers [(b)(6)] and [(b)(6)] to visit multiple firms on each trip; from a knowledge capture standpoint having two researchers present at each interview is much more effective than a single interviewer. There will be 3 different people making the trips. Generally, based on historical trips from the Hanover area, the Tuck School of Business uses on average \$1,000 per trip. This roughly breaks down to \$450 for airfare, \$175 per night for 2 nights, \$50 per day for food for 2 days, and \$100 for mileage, parking, taxis (or rental car) per trip. These trips are necessary to meet and gather data from various key stakeholders, as well as attend conferences and team meetings in order to successfully complete the project.

Indirect Costs: The budgeted indirect cost rate is used in accordance with the DHS approved rates for the Tuck School of Business at Dartmouth College.

Budget Detailed Worksheets

Institute for Security Technology Studies Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08				Dartmouth FY09				Total	Inflation				
Item	Labor (Dartmouth)	Base salary	# of months	Staff	Rate	Subtotal	# of months			Staff	Rate	Subtotal	
Facility													
FAC	DIST/Metro (b)(6)	9 month base salary	\$165,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$38,500	\$38,500	5.0%
FAC	DIST/Metro (b)(6)	5 month base salary	\$125,696	0.50	100%	10.00%	\$12,570	2.25	100%	45.00%	\$59,391	\$71,961	5.0%
FAC	DVF Metro (b)(6)	9 month base salary	\$143,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$33,367	\$33,367	5.0%
FAC	Metro (b)(6)	9 month base salary	\$141,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$32,900	\$32,900	5.0%
FAC	SISMAT (b)(6)	9 month base salary	\$132,000	0.00	100%	0.00%	\$0	2.25	100%	25.00%	\$34,650	\$34,650	5.0%
FAC	IRIDOE (b)(6)	9 month base salary	\$189,000	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$22,050	\$22,050	5.0%
FAC	DIST TBA (Visiting Professor)	9 month base salary	\$129,000	0.00	100%	0.00%	\$0	4.00	100%	44.44%	\$57,333	\$57,333	0.0%
	DIST (b)(6)	Budget Period II Supplement					-0.50				(\$8,750)	(\$8,750)	
	DVF (b)(6)	Budget Period II Supplement					-0.25				(\$3,500)	(\$3,500)	
	Metro (b)(6)	Budget Period II Supplement					-0.50				(\$17,514)	(\$17,514)	
	Metro (b)(6)	Budget Period II Supplement					-0.50				(\$7,642)	(\$7,642)	
	IRIDOE (b)(6)	Budget Period II Supplement					-0.50				(\$7,000)	(\$7,000)	
	IRIDOE (b)(6)	Budget Period II Supplement					-0.25				(\$4,667)	(\$4,667)	
Staff													
AP	DI (b)(6)	12 month base salary	\$72,119	3.00	100%	25.00%	\$18,030	3.00	100%	25.00%	\$18,751	\$36,781	4.0%
RAB	DI (b)(6)	12 month base salary	\$67,500	3.00	50%	12.50%	\$8,438	6.00	80%	40.00%	\$28,080	\$36,518	4.0%
RAB	DI (b)(6)	12 month base salary	\$67,500	3.00	50%	12.50%	\$8,438	3.00	100%	25.00%	\$17,550	\$25,988	4.0%
RAB	DI (b)(6)	12 month base salary	\$105,160	1.50	100%	12.50%	\$13,145	7.00	100%	58.33%	\$64,411	\$77,556	5.0%
AP	DI (b)(6)	12 month base salary	\$65,700	3.00	100%	25.00%	\$16,275	6.00	100%	50.00%	\$34,178	\$50,353	5.0%
AP	DI (b)(6)	12 month base salary	\$65,000	3.00	100%	25.00%	\$16,250	6.00	100%	50.00%	\$34,125	\$50,375	5.0%
AP	DI (b)(6)	12 month base salary	\$65,100	3.00	25%	6.25%	\$4,069	1.00	25%	2.08%	\$1,411	\$5,479	4.0%
AP	DV (b)(6)	12 month base salary	\$44,124	3.00	100%	25.00%	\$11,031	9.00	100%	75.00%	\$34,417	\$45,448	4.0%
RAB	Me (b)(6)	12 month base salary	\$87,000	3.00	100%	25.00%	\$18,750	2.00	100%	16.67%	\$11,613	\$28,363	4.0%
RAB	Me (b)(6)	12 month base salary	\$70,304	3.00	100%	25.00%	\$17,576	0.00	0%	0.00%	\$0	\$17,576	4.0%
RAB	Me (b)(6)	12 month base salary	\$67,200	3.00	100%	25.00%	\$16,800	4.00	100%	33.33%	\$23,296	\$40,096	4.0%
AP	Me (b)(6)	12 month base salary	\$78,500	3.00	100%	25.00%	\$19,625	1.00	100%	8.33%	\$6,803	\$26,428	4.0%
RAC	Me (b)(6)	12 month base salary	\$67,000	3.00	100%	25.00%	\$16,750	2.00	100%	16.67%	\$11,613	\$28,363	4.0%
RAC	Me (b)(6)	12 month base salary	\$75,000	3.00	100%	25.00%	\$18,750	2.50	100%	20.83%	\$16,250	\$35,000	4.0%
RAC	SIS (b)(6)	12 month base salary	\$138,646	1.00	25%	2.08%	\$2,888	0.00	0%	0.00%	\$0	\$2,888	4.0%
RAB	SIS (b)(6)	12 month base salary	\$67,500	1.00	50%	4.17%	\$2,813	0.00	0%	0.00%	\$0	\$2,813	4.0%
AP	SIS (b)(6)	12 month base salary	\$40,000	1.00	20%	1.67%	\$667	0.00	0%	0.00%	\$0	\$667	4.0%
RAB	SIS (b)(6)	12 month base salary	\$87,300	3.00	50%	13%	\$8,438	0.00	20%	10%	\$7,020	\$15,458	4.0%
RAB	IRI (b)(6)	12 month base salary	\$70,000	3.00	100%	25.00%	\$17,500	6.50	100%	54.17%	\$39,433	\$56,933	4.0%
RAB	IRI (b)(6)	12 month base salary	\$60,000	1.00	100%	8.33%	\$5,000	9.00	100%	75.00%	\$46,800	\$51,800	4.0%
RAB	PKI (b)(6)	12 month base salary	\$67,600	3.00	100%	25.00%	\$16,900	9.00	100%	75.00%	\$52,728	\$69,628	4.0%
RAC	PKI (b)(6)	12 month base salary	\$138,646	2.50	50%	10.42%	\$14,342	9.00	50%	37.50%	\$54,072	\$68,514	4.0%
RAB	HBS (b)(6)	12 month base salary	\$67,500	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	4.0%
	Metro Post-docs Budget Period II Supplement										(\$117,950)	(\$117,950)	
	DIST Post-docs Budget Period II Supplement										(\$50,550)	(\$50,550)	
	DIST Post-docs Budget Period II Supplement										(\$56,448)	(\$56,448)	
Students		Rate per hour		hours/week	#weeks	#students		hours/week	#weeks	#students			
	DIST Undergrads	\$10.00		10.00	10	3.5	\$3,500	10.00	8	2	\$1,600	\$5,100	
		Mo. Salary		#months	#students			#months	#students				
	DIST CS grad students	\$1,992		3	1.0	\$5,976		0	1.0	\$0	\$5,976	5.0%	
	DIST CS grad students	\$1,992		3	1.0	\$5,976		0.5	1.0	\$1,046	\$7,022	5.0%	
	DIST Thayer grad students	\$2,102		3	2.0	\$12,612		6	2.0	\$26,485	\$39,097	5.0%	
	DVF CS grad students	\$1,992		3	1	\$5,976		8	1	\$16,733	\$22,709	5.0%	
	Metro CS grad students	\$1,992		2	1	\$3,984		6	1	\$12,550	\$16,534	5.0%	
	SISMAT CS grad students (summer-school teacher)	\$1,992		1	1	\$1,992		1	1	\$2,092	\$4,084	5.0%	
UG	SISMAT Undergrad (Non profit student stipends)	\$1,992		0	0	\$0		2	3	\$12,550	\$12,550	5.0%	
	IRIDOE CS grad students	\$1,992		3	0.5	\$2,988		9	1.0	\$18,824	\$21,812	5.0%	
	IRIDOE WISP Intern	\$345		3	1	\$1,035		3	2	\$2,070	\$3,105	5.0%	
	AC Thayer grad students	\$2,102		2.5	1	\$5,255		4	1	\$8,828	\$14,083	5.0%	
	HBS EE student, as lab tech			10.00	5	\$500		10.00	5	1	\$500	\$1,000	
	HBS CS grad students	\$1,992		0	1.0	\$0		4	10	\$7,321	\$7,321	5.0%	
	Metro Thayer grad students	\$2,102		3	1	\$6,306		6	1	\$13,243	\$19,549	5.0%	
	Metro Students Budget Period II Supplement										(\$74,289)	(\$74,289)	
Subtotal, without fringe							\$339,243			\$556,272	\$895,515		
	FAC Fringe on Faculty					38.5%	\$4,830			19.0%	\$108,495	\$113,324	
	AP Fringe on AP I and AP II					38.5%	\$33,089			39.0%	\$50,572	\$83,666	
	UG Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$1,129	\$1,129	
	RAA Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	\$0	
	RAB Fringe on Research Associate B					24.5%	\$29,069			24.5%	\$55,499	\$84,567	
	RAC Fringe on Research Associate C					38.5%	\$25,401			39.0%	\$57,075	\$82,476	
	Fringe Budget Period II Supplement										(\$99,080)	(\$99,080)	
Total Fringe							\$92,399			\$173,693	\$266,692		
Subtotal, including fringe							\$431,641			\$729,965	\$1,162,207		
	Indirects on people		59.90%				\$258,553			\$437,349	\$695,803		

TDC Budget

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Direct materials	Computation	Dartmouth FY08	Dartmouth FY09	Total	notes
Travel					
DIST Conferences, Meetings and Coord	Airfare \$500			\$6,000	
No. of travelers	2 Hotel \$175 / day			\$6,300	
No. of Trips	6 Meals \$50 / day			\$1,800	
No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$1,200	
Metro Conferences, Meetings and Coord	(b)(6) Airfare \$500			\$2,000	
No. of travelers	2 Hotel \$175 / day			\$2,100	
No. of Trips	2 Meals \$50 / day			\$600	
No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$400	
Metro Conferences, Meetings and Coord	(b)(6) Airfare \$500			\$1,000	
No. of travelers	1 Hotel \$175 / day			\$1,050	
No. of Trips	2 Meals \$50 / day			\$300	
No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$200	
DVF Conferences, Meetings and Coord	Airfare \$900			\$1,000	
No. of travelers	2 Hotel \$175 / day			\$1,050	
No. of Trips	1 Meals \$50 / day			\$300	
No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$200	
SISMAT Visit regional schools to recruit and promote	Mileage \$150			\$150	
No. of travelers	1 Hotel \$175 / day			\$175	
No. of Trips	1 Meals \$50 / day			\$50	
No. of nights	1 Taxi/parking \$30			\$30	
SISMAT Visit regional schools after program finishes	Mileage \$150			\$150	
No. of travelers	1 Hotel \$175 / day			\$175	
No. of Trips	1 Meals \$50 / day			\$50	
No. of nights	1 Taxi/parking \$30			\$30	
IRIDOE Travel to partners	Airfare \$600			\$5,000	
No. of travelers	2 Hotel \$175 / day			\$3,500	
No. of Trips	5 Meals \$50 / day			\$1,000	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$1,000	
AC Conferences, Meetings and Coord	Airfare \$500			\$1,000	
No. of travelers	1 Hotel \$175 / day			\$1,050	
No. of Trips	2 Meals \$50 / day			\$300	
No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$200	
PKI Travel for outreach trips	No. of travelers	2 Rental Car (\$150/day)		\$300	
No. of Trips	2 Meals \$50 / day			\$200	
No. of nights	1			\$200	
PKI Conferences, Meetings and Coord	Airfare \$500			\$9,000	
No. of travelers	2 Hotel \$175 / day			\$6,300	
No. of Trips	9 Meals \$50 / day			\$1,800	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$3,600	
HBS Conferences, Meetings and Coord	Airfare \$500			\$4,000	
No. of travelers	2 Hotel \$175 / day			\$2,800	
No. of Trips	4 Meals \$50 / day			\$800	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100			\$800	
HBS Travel for outreach trips	No. of travelers	2 Rental Car (\$150/day)		\$450	
No. of Trips	3 Meals \$50 / day			\$300	
No. of nights	1			\$0	
Travel Budget Period III Supplement				\$30,000	
Capital equipment					
Breakdown of Equipment					
Participant Support Costs					
DIST Thayer Tuition		\$11,522		\$12,271	
Metro Thayer Tuition	based on Thayer School rates	\$5,828		\$11,014	
AC Thayer Tuition		\$6,082		\$7,955	
Other Direct Costs				\$14,037	
Materials and Supplies					
Metro Cell plans for mobile phones (12 months each)		0 \$1,890		\$0	
SISMAT Keyboard Video monitor		1 \$750		\$750	
SISMAT Rack with switch		1 \$500		\$500	
SISMAT Summer-school supplies				\$1,778	
AC Internet Line (\$240/mo)				\$720	
HBS ModelSim XE III Verilog			1 \$945	\$945	
HBS Xilinx FPGA tools			1 \$1,589	\$1,589	
DIST Activation and termination fees		13 \$211		\$2,743	
DIST Monthly fees, for 12 months (April 2008 through March 2009)		13 \$720		\$9,360	

Administrative Information Outside of Scope

Administrative Information Outside of Scope

Administrative Information Outside of Scope

Administrative Information Outside of Scope

Administrative Information Outside of Scope

400K 2550 2550 5100

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

	Dartmouth FY08		Dartmouth FY09		Total	Inflation
	QTY	UNIT PRICE	QTY	UNIT PRICE		
Publication Costs						
ALL Conference Registration Fees <small>(1) Fees Budget Period 4 Supplement</small>	5	\$800	4	\$800	\$3,200	\$7,200
Event and Meeting Costs						
SISMAT Summer-school for students	10 students for 2 weeks					
Travel	350	\$350/modest travel allowance	10			\$3,500
Sustenance	510	\$310/week housing and \$200/week food	20			\$10,200
Other	100	Supplies & space cost per student \$100	10			\$1,000
SISMAT Summer-school for professors	10 profs. for 2 weeks					
Travel	500	\$500/modest travel allowance	10			\$2,500
Sustenance	510	\$310/week housing and \$200/week food	20			\$10,200
Other	0	Supplies & space cost per student \$100	0			\$0
Consultant Services						
SISMAT Summer-school Instructor (course development)	1	\$250				\$250
SISMAT Consultant Travel	Airfare \$500					
No. of travelers	1	Hotel \$175 / day				\$500
No. of Trips	1	Meals \$50 / day				\$525
No. of nights	3	Mileage/tax/parking (\$80+\$20+\$20) \$100				\$150
HBS Steve Weingart, training and seminars						\$10,000
HBS Consultant Travel	Airfare \$500					
No. of travelers	1	Hotel \$175 / day				\$500
No. of Trips	1	Meals \$50 / day				\$875
No. of nights	5	Mileage/tax/parking (\$80+\$20+\$20) \$100				\$250
Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%			\$1,239	\$44,401
Subawards/Contractual Costs						
	Base price				Total	Inflation
DIST UMass (4/1/08-8/31/08) RA, 1 Summer mod	(b)(6) Administrative Information Outside of Scope				\$0	\$0
DIST UMass (8/1/08-3/31/09) RA, 1 Summer mod	(b)(6) Administrative Information Outside of Scope				\$44,566	\$44,566
Subtotal					\$29,566	\$29,566
Indirect on first \$25k each subcontract	59.90%				\$0	\$0
Total Directs					\$527,129	\$769,841
Total Indirects					\$301,715	\$438,489
Total					\$828,844	\$1,208,329
						\$2,037,173

Administrative Information Outside of Scope

(b)(6) Administrative Information Outside of Scope

~~\$29,566~~

ISTS Initiative 7 & 8 – Security and Privacy for Real People and Education and Curriculum Development

Project Lead: Co-PI (b)(6)

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the ISTS research projects have been made accordingly. See the following chart for an outline of the total project costs.

ISTS (Initiatives 7 & 8)

	BPI	BPII	BPII supp	PPM	Total
Fel	75,365	-	-	-	75,365
PK	67,555	300,716	-	341,756	710,027
HB	182,189	254,673	-	75,753	512,615
Me		622,625	471,322	143,758	1,237,705
DIS	174,737	1,117,917	274,340	747,603	2,314,598
DV	(b)(6)	88,542	7,779	208,853	305,174
IRII		235,068	25,930	330,442	591,441
AC	100,154	179,780	19,495	101,224	400,654
BE		121,092	-	-	121,092
SIS		79,586	63,966	87,783	231,329
Total ISTS	600,000	3,000,000	862,827	2,037,173	6,500,000

Dartmouth Internet Security Testbed – DIST

Cost - Budget Period III: \$747,603
(Budget Period II supplement: \$274,340)

Personnel (b)(6) will lead this project. As Professor of Computer Science and Director of the Center for Mobile Computing (b)(6) brings extensive experience in wireless networks, pervasive computing, and computer security to the project. He also has experience leading several large research projects. Professor (b)(6) will co-lead, responsible for the NSOC component. A visiting professor is also budgeted in order to help oversee the project with Professor (b)(6) s on sabbatical. The budget includes two **technician/programmers** (at typical Dartmouth rates), to assist with the planning and deployment of the test bed. The budget includes two **postdoctoral research associates**, two **computer-science graduate students**, two **engineering graduate students**, and several **undergraduate students**, to assist with the development of software for the testbed and with the research projects described in the proposal.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budgeted travel supports participation in various conferences (domestic and foreign locations as yet unknown) and other venues to present project progress and results.

Participant Fees: Tuition for Thayer school graduate students is billed at a rate of 50% of full tuition.

Materials & Supplies: All equipment and computer components were budgeted in BP II. The project will incur cell phone service fees during the final year of the project.

Sub-agreements: This project will require 2 sub-agreements to support our collaboration with UMass Lowell (Professor (b)(6) and student) and Aruba Networks (b)(6) (b)(6). These agreements are budgeted in BP II, BP II supplement, and BP III.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Information Risk in Data-Oriented Enterprises – IRIDOE

Cost - Budget Period III: \$330,442
(Budget Period II supplement: \$25,930)

Personnel: Professor (b)(6) and Tuck Faculty (b)(6) will lead the project. Two **post-docs** are also budgeted. Small amounts also have been allocated for undergraduate **WISP intern** and **graduate students** interns.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Funds to conduct follow-on visits to current partner institutions, as well as similar two-week student visits to commercial banks (such as Bank of America) and possibly other financial services providers (such as H&R Block) are requested.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

MetroSense – Scalable Secure Sensor Systems – Metro

Cost - Budget Period III: \$143,758
(Budget Period II supplement: \$471,322)

Personnel:
Professor (b)(6) co-leads) will lead the

project and supervise the students and staff on the research and development. Postdoctoral research fellows will assist with the research and evaluation and assist with supervising research students. Researchers will help with the purchase, configuration, inventory, and deployment of all of the hardware. Graduate and Undergraduate students from both Computer Science and Thayer also will be involved in the project. Costs are budgeted based on current approved rates. Personnel costs were budgeted for this project in the budget period II supplement.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Participant Costs: Tuition for Thayer school graduate students is billed at a rate of 50% of full tuition. Costs were budgeted for this project in the budget period II supplement.

Materials & Supplies: Monthly cell phones plans are needed in order to conduct the research are anticipated.

Indirect Costs: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Interoperability and Usability for PKI Management – PKI

Cost - Budget Period III: \$341,756

(Budget Period II supplement: \$0)

Personnel: Professor (b)(6) will lead this project. An Associate Professor of Computer Science, Dr (b)(6) brings extensive experience in Public-Key Infrastructure (PKI); he was the founding program chair (and continuing program committee member) of NIST's annual *PKI Research Workshop*, and also served on the founding program committee of *EuroPKI*, the European response to NIST's effort. He founded the PKI Lab at Dartmouth, which has been instrumental in developing a production-quality PKI for Dartmouth College. Sun Microsystems, Cisco Systems, and Intel Corporation have recognized his work with gifts and grants to support his PKI research. He also has experience leading several large research projects. Postdoctoral researcher (b)(6) (100% effort) will play a key role in developing and implementing the outreach effort; Pala is the designer of the original OpenCA software and has been project manager of OpenCA since its creation. Researcher (b)(6) 50% effort beginning January 2008) brings critical expertise as the lead organizer of the Higher-Education Bridge Certificate Authority (HEBCA) at Dartmouth College, and in reaching out to other universities and to The America's Grid Policy Management Authority (TAGPMA).

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with key project stakeholders (both domestic and foreign). Collection and dissemination of research information is also expected. A few trips will involve drives to a regional university to give presentations on the PKI research. We foresee HEBCA

evangelism trips, PKI standards and working group trips, as well as the usual conference trips. In particular we envisage collaboration with the IETF for the standardization efforts (PRPQ). Discussions with TERENA working groups also will be considered to promote the project results and increase its impact over the PKI world community.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Laboratory for Hardware Based Security – HBS

Cost - Budget Period III: \$75,753
(Budget Period II supplement: \$0)

Personnel: Professor (b)(6) will lead this project. Professor (b)(6) has extensive experience in trusted computing hardware, having been a key player on the IBM team that developed the 4758; the first product ever to achieve FIPS level-4 certification. **Student** researchers will include an engineering upperclassman, to work part-time to help set up and maintain the lab and graduate students to help do the research. A **postdoctoral researcher** also will be hired, using some available carry-forward funds from budget period II.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops, and to interact with key project stakeholders (such as Intel). Collection and dissemination of research information is expected during such trips.

Materials and Supplies: A ModelSim XE and Xilinx FPGA are budgeted for use in the lab.

Consultants: (b)(6) noted expert in physical security attacks and defenses, will come up and give two week-long seminars, and also provide consulting advice on an as-needed basis.

Sub-agreements: none.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Digital Video Forensics – DVF

Cost - Budget Period III: \$208,853
(Budget Period II supplement: \$7,779)

Personnel: (b)(6) Professor of Computer Science, will lead the project. Professor (b)(6) has extensive experience in digital image analysis and a long track record applying

statistical techniques to detect tampering in digital images and digital audio. He works closely with many parties with a need for these applications, including the FBI, the federal Office of Research Integrity, and the Associated Press. We also budget for 12 months of a Computer Science graduate student and a full-time programmer.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budget includes two trips to present research at national conferences.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Foundations for Practical Autonomic Computing – AC

Cost - Budget Period III: \$101,224

(Budget Period II supplement: \$19,495)

Personnel: Professor (b)(6) will lead this project. As the Dorothy and Walter Gramm Professor of Engineering, Professor (b)(6) brings extensive experience in computer security, mobile computing, wireless networks, agent-based computing, sensor fusion, and parallel computing. He also has experience leading several large research projects. His primary role is in setting the project direction and oversight. Senior Researcher (b)(6) will be the primary technical lead in conducting the research. He too has extensive experience in computer security and sensor fusion. The budget includes twelve months of a Thayer School of Engineering **graduate student**.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with key project stakeholders. Collection and dissemination of research information is expected during these trips. We budget for two trips in this period.

Equipment: none.

Materials & Supplies: An independent Internet connection, with a monthly access fee, is required for the project. It will continue into Budget Period III.

Other Costs: Tuition for Thayer school graduate students is billed at a rate of 50% of full tuition. We budget for conference registration fees at average rates.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

ISTS Initiative 8 – Education and Curriculum Development

Project Lead: Co-P (b)(6)

Secure Information Systems, Mentoring and Training – SISMAT

Cost - Budget Period III: \$87,783

(Budget Period II supplement: \$63,960)

Personnel: Professor (b)(6) will lead this project. Postdoctoral fellow, (b)(6) and research (b)(6) will spend 20-50% of their time devoted to the project to work with industry partners, and to find relevant and interesting internship opportunities for participants. Additional personnel will be brought on for instruction, logistical support and for students to complete internships.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth to visit regional schools is budgeted. This travel will help to market the program to faculty and students at these schools and to coordinate with visiting faculty we intend to draw from one or more schools.

Materials & Supplies: A small amount of equipment and school supplies will be needed in Budget Period III to assist in preparation. Most costs will be covered by carry-forward funds from Budget Period II.

Event and Meeting: Costs to cover students and professors attending the training is budgeted. Students will stay in Dartmouth dorms and eat at the dining hall.

Consultants: A summer-school instructor will be hired to do preliminary work (developing syllabi and course materials) in the planning phase of the project.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Budget Detailed Worksheets
I3P Proposal
 Government FY07 funds - spend during Dartmouth FY07 and FY08
I3P Workshop - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total
			# of months	all	not	subtotal	# of months	all	not	subtotal	
Faculty											
Staff											
Students											
Subtotal, without fringe					\$0				\$0	\$0	\$0
Total fringe					\$0				\$0	\$0	\$0
Subtotal, including fringe					\$0				\$0	\$0	\$0
Indirects on people		35.00%			\$0				\$0	\$0	\$0
Direct materials			Computation								Total
Travel											Total
#10 Critical Infrastructure Protection Conference											
I3P Staff											
		Airfare \$600								\$2,000	\$2,000
	No. of travelers	4 Hotel \$175 / day								\$3,500	\$3,500
	No. of Trips	1 Meals \$50 / day								\$1,000	\$1,000
	No. of nights	5 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$400	\$400
	Registration Fee	3 \$400 per fee								\$1,200	\$1,200
#10 Critical Infrastructure Protection Conferences											
Students											
		Airfare \$500								\$1,500	\$1,500
	No. of travelers	3 Hotel \$175 / day								\$2,100	\$2,100
	No. of Trips	1 Meals \$50 / day								\$600	\$600
	No. of nights	4 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$300	\$300
	Registration Fee	3 \$400 per fee								\$1,200	\$1,200
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP111 (end of project workshop)											
I3P Staff											
		Airfare \$500								\$1,500	\$1,500
	No. of travelers	3 Hotel \$175 / day								\$1,575	\$1,575
	No. of Trips	1 Meals \$50 / day								\$450	\$450
	No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$300	\$300
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP111 (end of project workshop)											
Team Members											
		Airfare \$500								\$4,000	\$4,000
	No. of travelers	8 Hotel \$175 / day								\$4,200	\$4,200
	No. of Trips	1 Meals \$50 / day								\$1,200	\$1,200
	No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$800	\$800
#12 WES11 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008											
I3P Staff											
		Airfare \$500								\$1,000	\$1,000
	No. of travelers	2 Hotel \$175 / day								\$1,050	\$1,050
	No. of Trips	1 Meals \$50 / day								\$300	\$300
	No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$200	\$200
#12 WES11 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008											
Team Members											
		Airfare \$500								\$2,500	\$2,500
	No. of travelers	5 Hotel \$175 / day								\$1,750	\$1,750
	No. of Trips	1 Meals \$50 / day								\$500	\$500
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$500	\$500
#13 Insider Threat - (April 2008 - North Carolina)											
I3P Staff											
		Airfare \$500								\$2,000	\$2,000
	No. of travelers	4 Hotel \$175 / day								\$2,100	\$2,100
	No. of Trips	1 Meals \$50 / day								\$600	\$600
	No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$1,200	\$1,200
#13 Insider Threat - (April 2008 - North Carolina)											
Team Members											
		Airfare \$500								\$4,000	\$4,000
	No. of travelers	8 Hotel \$175 / day								\$2,800	\$2,800
	No. of Trips	1 Meals \$50 / day								\$800	\$800
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$1,600	\$1,600
#13 Insider Threat - (April 2008 - North Carolina)											
Students											
		Airfare \$500								\$1,500	\$1,500
	No. of travelers	3 Hotel \$175 / day								\$1,050	\$1,050
	No. of Trips	1 Meals \$50 / day								\$300	\$300
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$300	\$300
#14 Insider Threat - BP111 (end of Project) - Spring 2009 - DC area											
I3P Staff											
		Airfare \$500								\$2,000	\$2,000
	No. of travelers	4 Hotel \$175 / day								\$2,100	\$2,100
	No. of Trips	1 Meals \$50 / day								\$600	\$600
	No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$1,200	\$1,200
#14 Insider Threat - BP111 (end of Project) - Spring 2009 - DC area											
Team Members											
		Airfare \$500								\$4,000	\$4,000
	No. of travelers	8 Hotel \$175 / day								\$2,800	\$2,800
	No. of Trips	1 Meals \$50 / day								\$800	\$800
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$1,600	\$1,600
#14 Insider Threat - BP111 (end of Project) - Spring 2009 - DC area											
Students											
		Airfare \$500								\$1,500	\$1,500
	No. of travelers	3 Hotel \$175 / day								\$1,050	\$1,050
	No. of Trips	1 Meals \$50 / day								\$300	\$300

Administrative Information Outside of Scope

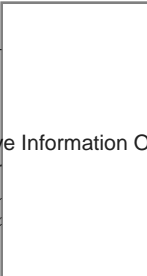
I3P Workshop - Budget Period III

Dates: April 1, 2008 to March 31, 2009

			Dartmouth FY08	Dartmouth FY09	
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$300
#13 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days					
Students		Airfare	\$500		\$1,500
No. of travelers	3	Hotel \$175 / day			\$1,575
No. of Trips	1	Meals \$50 / day			\$450
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$300
Registration Fee	3	\$250 per fee			\$750
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (track oversight)					
I3P Staff		Airfare	\$500		\$2,000
No. of travelers	4	Hotel \$175 / day			\$2,100
No. of Trips	1	Meals \$50 / day			\$600
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$400
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (track oversight)					
Team members		Airfare	\$500		\$1,500
No. of travelers	3	Hotel \$175 / day			\$1,050
No. of Trips	1	Meals \$50 / day			\$300
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$300
#17 Business Rationale - (end of Project) - Spring 2009 - TBA					
I3P Staff		Airfare	\$500		\$1,500
No. of travelers	3	Hotel \$175 / day			\$1,575
No. of Trips	1	Meals \$50 / day			\$450
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$900
#17 Business Rationale - (end of Project) - Spring 2009 - TBA					
Team Members		Airfare	\$500		\$1,500
No. of travelers	3	Hotel \$175 / day			\$1,050
No. of Trips	1	Meals \$50 / day			\$300
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$600
Capital equipment					
Breakdown of Equipment					
Participant Support Costs					
Other Direct Costs					
Materials and Supplies					
Supplies for Workshop #10	60	\$10/person			\$600
Supplies for Workshop #11	60	\$10/person			\$600
Supplies for Workshop #12	50	\$10/person			\$500
Supplies for Workshop #13	40	\$10/person			\$400
Supplies for Workshop #14	40	\$10/person			\$400
Supplies for Workshop #15	100	\$10/person			\$1,000
Supplies for Workshop #16	40	\$10/person			\$400
Supplies for Workshop #17	40	\$10/person			\$400
Workshop registration software	3	\$250			\$750
Conference calls for planning					\$508
Publication Costs					
Conference Registration Fees					
Event and Meeting Costs					
#10 Critical Infrastructure Protection Conference (2.5 days, 60 people, 3 classes, 1 room) - Dartmouth Spring 2009					
Food for event	60	Meals (\$70/ day)			\$4,200
Dinners	60	\$70/day - 3 days			\$12,600
Set-up room fee for event		\$2,000 per meeting (baseball, markers, tele conf, etc.)			\$2,000
Room rental fee for event		\$3,000 per meeting			\$3,000
AV equipment for event		\$4,000 per meeting			\$4,000
Printing		Session information and documents to distribute			\$1,000
Promotional Materials		Invitations, posters, brochures, advertising			\$1,000
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP/III (end of project workshop) - 1 day, 60 people					\$500
Food for PCS Workshop	60	Meals (\$60/ day)			\$3,600
Set-up room fee for event		\$2,000 per meeting (baseball, markers, tele conf, etc.)			\$2,000
Room rental for workshop		\$3,000 per meeting			\$3,000
AV equipment for workshop		\$5,000 per meeting			\$5,000
Postage		\$150 for materials to and from venue			\$150
Printing		Print session information 120 at \$2 per copy			\$240
Promotional Materials		Printing/burning of CD's with label - 120 at \$3 each			\$360
Invitations, posters, brochures, advertising					\$1,500
#12 WESU 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008					
Food for event	50	Meals (\$90/ day)			\$4,500
Set-up room fee for event		\$2,000 per meeting (baseball, markers, tele conf, etc.)			\$2,000
Room rental fee for event		\$3,000 per meeting			\$3,000
AV equipment for event		\$5,000 per meeting			\$5,000
Postage		\$150 for materials to and from venue			\$150
Printing		Print session information 120 at \$2 per copy			\$240
Promotional Materials		Printing/burning of CD's with label - 120 at \$3 each			\$360
Invitations, posters, brochures, advertising					\$1,500

Administrative Information Outside of Scope

Administrative Information Outside of Scope



ISP Workshop - Budget Period III

Dates:

April 1, 2008 to March 31, 2009

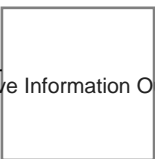
Dartmouth FY08

Dartmouth FY09

Item Description	Quantity	Unit Price	Dartmouth FY08	Dartmouth FY09
#13 Insider Threat - (April 2008 - North Carolina) - 1 day, 40 people, 1 dinner, 1 room				
Food for PCS Workshop	40 Meals	(\$90/ day)		
Dinner	40	\$70/day - 1 day	\$3,200	\$3,200
Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)	\$2,800	\$2,800
Room rental for workshop		\$3,000 per meeting	\$2,000	\$2,000
AV equipment for workshop		\$5,000 per meeting	\$3,000	\$3,000
Postage		\$150 for materials to and from venue	\$500	\$500
Printing		Print session information 120 at \$2 per copy	\$240	\$240
		Printing/burning of CD's with label - 120 at \$3 each	\$360	\$360
Promotional Materials		Invitations, posters, brochures, advertising	\$1,500	\$1,500
#14 Insider Threat - BP III (end of Project) - Spring 2009 - DC area- 1 day, 40 people, 1 room				
Food for PCS Workshop	40 Meals	(\$90/ day)		
Dinner	40	\$90/day - 1 day	\$3,600	\$3,600
Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)	\$2,000	\$2,000
Room rental for workshop		\$4,000 per meeting	\$4,000	\$4,000
AV equipment for workshop		\$5,000 per meeting	\$5,000	\$5,000
Postage		\$150 for materials to and from venue	\$300	\$300
Printing		Print session information 120 at \$2 per copy	\$240	\$240
		Printing/burning of CD's with label - 120 at \$3 each	\$360	\$360
Promotional Materials		Invitations, posters, brochures, advertising	\$1,500	\$1,500
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days, 100 people				
Food for PCS Workshop	100 Meals	(\$90/ day)		
Dinner	100	\$90/day - 2.5 days	\$20,000	\$20,000
Set-up room fee for event		\$2,000 per meeting	\$4,000	\$4,000
Room rental for workshop		\$4,000 per meeting	\$8,000	\$8,000
AV equipment for workshop		\$5,000 per meeting	\$3,000	\$3,000
Postage		\$150 for materials to and from venue	\$240	\$240
Printing		Print session information 120 at \$2 per copy	\$1,500	\$1,500
Promotional Materials		Invitations, posters, brochures, advertising		
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (truck overnight) - 1 day, 40 people, 1 room				
Food for event	40 Meals	(\$90/ day)		
Dinner	40	\$70/day - 1 day	\$3,200	\$3,200
Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)	\$2,800	\$2,800
Room rental for event		\$4,000 per meeting	\$2,000	\$2,000
AV equipment for event		\$4,000 per meeting	\$4,000	\$4,000
Postage		\$150 for materials to and from venue	\$300	\$300
Promotional Materials		Invitations, posters, brochures, advertising	\$1,500	\$1,500
#17 Business Rationale - (end of Project) - Spring 2009 - TBA - 1.5 days, 40 people, 1 dinner, 1 room				
Food for PCS Workshop	40 Meals	(\$90/ day)		
Dinner	40	\$70/day - 1 day	\$5,400	\$5,400
Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)	\$2,800	\$2,800
Room rental for workshop		\$4,000 per meeting	\$2,000	\$2,000
AV equipment for workshop		\$5,000 per meeting	\$4,000	\$4,000
Postage		\$150 for materials to and from venue	\$500	\$500
Printing		Print session information 120 at \$2 per copy	\$240	\$240
Promotional Materials		Invitations, posters, brochures, advertising	\$1,500	\$1,500
Consultant Services				
#18 Critical Infrastructure Protection Conference				
Speakers		Airfare \$500		
No. of travelers	3	Hotel \$175 / day	\$1,500	\$1,500
No. of Trips	1	Meals \$50 / day	\$1,575	\$1,575
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$450	\$450
			\$300	\$300
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP III (end of project workshop)				
Speakers		Airfare \$500		
No. of travelers	2	Hotel \$175 / day	\$1,000	\$1,000
No. of Trips	1	Meals \$50 / day	\$700	\$700
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$200	\$200
			\$200	\$200
#12 WEST 1 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008				
Speakers		Airfare \$500		
No. of travelers	2	Hotel \$175 / day	\$1,000	\$1,000
No. of Trips	1	Meals \$50 / day	\$700	\$700
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$200	\$200
			\$200	\$200
#13 Insider Threat - (April 2008 - North Carolina)				
Speakers		Airfare \$500		
No. of travelers	2	Hotel \$175 / day	\$1,000	\$1,000
No. of Trips	1	Meals \$50 / day	\$700	\$700
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$200	\$200
			\$200	\$200
#14 Insider Threat - BP III (end of Project) - Spring 2009 - DC area				
Speakers		Airfare \$500		
No. of travelers	2	Hotel \$175 / day	\$1,000	\$1,000
No. of Trips	1	Meals \$50 / day	\$700	\$700
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$200	\$200
			\$200	\$200
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days				
Speakers		Airfare \$500		
No. of travelers	2	Hotel \$175 / day	\$1,000	\$1,000
No. of Trips	1	Meals \$50 / day	\$700	\$700
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$200	\$200
			\$200	\$200
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (truck overnight)				
Speakers		Airfare \$500		
No. of travelers	2	Hotel \$175 / day	\$1,000	\$1,000
No. of Trips	1	Meals \$50 / day	\$700	\$700
			\$200	\$200

Administrative Information Outside of Scope

Administrative Information Outside of Scope



13P Workshop - Budget Period III

Dates:	April 1, 2008 to	March 31, 2009	Dartmouth FY08		Dartmouth FY09	
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$200	\$200
Administrative Information Outside of Scope						
#17 Business Rationale - (end of Project) - Spring 2009 - TBA						
Speakers	Airfare \$500				\$1,000	\$1,000
No. of travelers	2	Hotel \$175 / day			\$700	\$700
No. of Trips	1	Meals \$60 / day			\$200	\$200
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20)	\$100		\$200	\$200
Indirects on travel, supplies, other costs (NOT equipment or tuition)	15.00%				\$85,641	\$85,641
Subawards/Contractual Costs			Base prices		Total	
Describe Product or Service			\$0		\$0	\$0
Industry Sessions, 3 in BP III						
Sando National Labs 2 for staff time, travel and shipping					\$60,000	\$60,000
SRI International 1 for staff time, travel and shipping					\$24,968	\$24,968
Sponsoring workshops and conferences (1 at \$5,000 each)					\$5,000	\$5,000
Subtotal					\$89,968	\$89,968
Indirect on first \$25k each subcontract			15.00%	\$0	\$10,489	\$10,489
Total directs			\$0		\$334,656	\$334,656
Indirects on direct support activities					\$96,130	\$96,130
Total indirects			\$0		\$96,130	\$96,130
Total			\$0		\$418,187	\$418,187

Administrative Information C

I3P Initiative 3 – Cyber Security Workshops

Team leader (b)(6) I3P, Dartmouth College

Cost - Budget Period III: \$418,187
(Budget Period II supplement: \$80,909)

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

This budget represents costs for eight workshops, three industry sessions, and three small I3P sponsorships, to be held between April 1, 2008, and March 31, 2009. Costs include travel for key participants, students and organizers, food, room rental, audio visual costs, along with printing, postage, marketing and supply expenses. In addition, consultants and sub-agreements are budgeted for help with key aspects of the workshops. All details are outlined in the workshop proposal.

Workshop # 10 (2.5 days, 60 people, 3 dinners, 1 room)

Title: Critical Infrastructure Protection Conference

Date: March 2009

Location: Hanover, NH

Workshop # 11 (1 day, 80 people, 1 room)

Title: Process Control Systems Security Workshop

Date: February 2009

Location: To be determined

Workshop # 12 (1 day, 50 people, 1 room)

Title: The Second Workshop on the Economics of Securing the Information Infrastructure (WESII 2)

Date: September 2008

Location: Arlington, VA

Workshop # 13 (1 day, 40 people, 1 dinner, 1 room)

Title: Workshop on Insider Threats in the Networked World

Date: April 2008

Location: Durham, NC

Workshop # 14 (1 day, 40 people, 1 room)

Title: Insider Threat Workshop

Date: March 2009

Location: To be determined

Workshop # 15 (2.5 days, 100 people, 1 room)

Title: Hosting and Supporting the Workshop on the Economics of Information Security (WEIS 2008)

Date: June 2008

Location: Hanover, NH

Workshop # 16 (1 day, 40 people, 1 room)

Title: Economics Executive Workshop for CISOs

Date: March 2009

Location: To be determined

Workshop #17 (1.5 days, 40 people, 1 dinner, 1 room)

Title: Business Rationale for Cyber Security Workshop - Making Good Cyber Security Investment Decisions

Date: November 2008

Location: Charlottesville, VA

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of members from outside the Dartmouth area.

Airfare \$500

Hotel \$175 / day

Meals \$50 / day

Mileage/taxi/parking (\$60+\$20+\$20) \$100

In some cases student support is budgeted. Registration fees are also anticipated for 3 of the workshops, to offset the overall cost.

Equipment: none.

Materials and Supplies: Budgeted expenditures are for the supplies for the events. Costs are calculated based on an average from historical data based on actual workshops hosted by the I3P. Name tags, folders, labels, pens, pads, tent cards, and lanyards are supplied to participants. When applicable, CDs with presentations are included in the supply costs. A registration vendor is budgeted. Also, conference calls related to conference planning are anticipated.

Publications Costs: None.

Event and Meeting Costs: Costs associated with the workshops include renting space and facilities for the workshops, food (including tax and gratuities), audio/video set up with technical support, postage for materials to and from the venue, and printing costs for proceedings. Printing charges for materials (such as workshop agenda and speaker biographies) and handouts to be distributed before and during the event as well as invitations are budgeted. Printing and design of posters or promotional material is also anticipated. Costs are calculated based on historical data, location, workshop needs, and the number of expected participants. The I3P has hosted several and been involved with many successful workshops. It is the standard industry practice to provide lunch and refreshments for participants. I3P feels it is important to keep people on site and engaged with workshop participants. The meals are incidental to the workshop. Some workshops include a dinner program, with at least one dinner speaker on such evenings. The dinner

program will tie closely to the workshop program (and dinners will be a compulsory part of the program agenda), offering attendees further perspectives and insights into workshop related content.

Consultant Services: Speakers and panelist payments are included for participation in several of the workshops. These experts will help create an interactive environment and will bring the necessary subject matter expertise for successful events.

Sub-agreements: Sub-agreements for work to complete the proposed work are detailed below.

Sponsoring workshops and conferences (1 at \$5,000 each)

Sandia National Labs - \$60,000

SRI International - \$24,968

1. Sandia National Laboratories Statement of Work for I3P Workshops and Outreach

The new I3P project in PCS security, *Survivability and Recovery of Process Control Systems*, builds upon the previous I3P PCS security project managed by Sandia. In support of this new project and the I3P's broader research agenda, Sandia will leverage its understanding of the problem domain and stakeholder community developed through its involvement in both I3P PCS projects and utilize the specialized PCS security curriculum that it developed as a deliverable for the first I3P PCS project.

Task 1. Organize, prepare for, and participate in two outreach events to help communicate the objective of the I3P's new initiative in PCS security, identify industry needs, and increase industry awareness of cyber security risks and mitigation options. Sandia will identify relevant outreach opportunities, and in consultation with the I3P, it will select two events to support. One of these events will likely be the API's 3rd Annual IT Security Conference, which will be held in Houston, Texas in November 2008.

An objective of this outreach task will be to provide asset owners with foundational technical knowledge and first-hand practical experience that will allow them to better understand the vulnerabilities of their control systems to cyber disruptions as well as the steps that they can take to mitigate this risk. Sandia will provide briefings and hands-on demonstrations of security issues and solutions at the outreach events, drawing upon the following collection of materials that it has developed previously for the I3P:

- A basic overview of control system cyber security issues and mitigation strategies
- Industry-specific insights gathered from the oil and gas industry through site visits, workshops, and other interactions
- Tutorial on wireless security featuring an overview of current and emerging wireless technologies and their security features

- Hands-on security awareness and training exercise that highlights security issues and shows how to simply configure and test a hardened security architecture using a DMZ, strict firewall rules, and open-source IDS.

Sandia Budget

Labor - \$48,000

Travel - \$12,000 (travel to two outreach events for four staff, including all travel costs and registration fees)

Total - **\$60,000**

Note: all above numbers are fully loaded based on approved Sandia pricing

2. SRI will support the I3P in preparing and executing the participation in a session at one selected industry event on Process Control System (PCS) security, expected to take place in the United States between April 1, 2008, and March 31, 2009. SRI will assist in the planning of the session, including supporting the preparation of presentations and demonstrations. Two SRI staff members will participate in the event and the execution of the session. This work is limited to the presentation and demonstration of material developed in the I3P PCS Security Research Projects or related efforts – no new research or development will be performed by SRI under this statement of work.

SRI Budget

Personnel - \$18,853

Travel - 2 staff, 3 days, 1 trip. \$3,580

Shipping and printing - \$1,477

Computer usage - \$1,058

Total - **\$24,968**

Note: all above numbers are fully loaded based on approved SRI pricing

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Budget Detailed Worksheets

ISP Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISP Administration - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item/Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total	Inflation
		Fed	State	Local	Other	Fed	State	Local	Other		
Faculty											
Staff											
AP		3.00	0%	0.00%	\$0	0.00	5%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	90%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	50%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	50%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	50%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
AP		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
Subtotal, without fringe					\$0				\$0	\$0	
FAC Fringe on Faculty					38.5%	\$0			39.0%	\$0	
AP Fringe on AP I and AP II					38.5%	\$0			39.0%	\$0	
UG Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$0	
RAA Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	
RAB Fringe on Research Associate B					24.5%	\$0			24.5%	\$0	
RAC Fringe on Research Associate C					38.5%	\$0			39.0%	\$0	
Total fringe					\$0				\$0	\$0	
Subtotal, including fringe					\$0				\$0	\$0	
Indirects on people	35.00%				\$0				\$0	\$0	
Direct materials	Computation								Total	notes	
Travel											
Airfare	3	\$500						\$3,000	\$3,000		
Hotel	3	\$175 / day						\$3,150	\$3,150		
Meals	2	\$50 / day						\$900	\$900		
Mileage/taxi/parking	5	(\$60+\$20+\$20) \$100						\$1,800	\$1,800		
Capital equipment											
Breakdown of Equipment											
Participant Support Costs									\$0		
Other Direct Costs											
Materials and Supplies											
Replacement laptops					2	\$2,200		\$4,400	\$4,400		
Cables / batteries / replacement parts					10	\$500		\$5,000	\$5,000		
Postage to meetings					1	\$150		\$150	\$150		
Conference Calls					6	\$40		\$240	\$240		
Software for computers					3	\$300		\$900	\$900		
Publication Costs											
Communication costs (brochures, posters, photography, printing, letterhead, and mailing)					1	\$30,000		\$30,000	\$30,000		
Printing of documents					1	\$16,268		\$16,268	\$16,268		
Conference Registration Fees											
Conference registration fees					2	\$750		\$1,500	\$1,500		
Event and Meeting Costs											
Food, A/V, set up for consortium meeting (1)					0	\$7,000		\$0	\$0		
Supplies for Consortium meeting (1)					0	\$500		\$0	\$0		
Food, A/V, set up for advisory board meetings (9)					9	\$1,600		\$14,400	\$14,400		
Consultant Services											
Advisory Board Meetings											
Airfare	5	\$500						\$17,500	\$17,500		
Hotel	5	\$175 / day						\$6,125	\$6,125		
Meals	2	\$50 / day						\$1,750	\$1,750		
Mileage/taxi/parking	5	(\$60+\$20+\$20) \$100						\$3,500	\$3,500		
rough contract with IBM								\$0	\$0		
Executive Committee payments					1	\$7,938		\$7,938	\$7,938		
Web Design					1	\$25,000		\$25,000	\$25,000		
Indirects on travel, supplies, other costs (NOT equipme	35.00%					\$8,750		\$41,482	\$50,232		
Subawards/Contractual Costs	Base price								Total		
Name & Service Provided	computation										
Indirect on consultants	35.00%					\$0		\$0	\$0		
Total directs						\$25,000		\$118,521	\$143,521		
Total indirects						\$8,750		\$41,482	\$50,232		
Total						\$33,750		\$160,003	\$193,753		

(b)(6)

Administrative Information Outside of Scope

Administrative Information Outside of Scope

Administrative Information Outside of Scope

Administrative Information Outside of Scope

(b)(6)

I3P (Initiatives 1-6 and Management)

	BPI	BPII	BPII supp		Total
I1: I3P Fellowship		480,271	50,000	743,290 ✓	1,273,561
I2: Human Behavior		1,831,099	396,956	1,507,457	3,735,512
I3: Workshop	330,000	439,104	80,909	418,187	1,268,200
I4: PCS		2,263,249	351,907	1,669,330	4,284,486
I5: Business Rationale		1,670,240	596,574	907,810	3,174,625
I6: Assessable Identity		1,603,399	641,354	863,003	3,107,755
I3P Management / <i>Administration</i>		442,638	319,470	193,753 ✓	955,861
Total I3P	330,000	8,730,000	2,437,170	6,302,830	18,000,000

I3P Management

Project Lead: PI (b)(6)

Cost - Budget Period III: \$193,753
(Budget Period II supplement: \$319,470)

I3P management costs will begin in 2008, when the current management funding is exhausted. See the detailed budget worksheets for additional information on the costs outlined below.

Personnel: All personnel are Dartmouth employees. Personnel costs budgeted in BPII and the BPII supplement will cover personnel costs in BPIII.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of members from outside the Dartmouth area.

External conferences, coordination, training, and reporting: Trips are required to participate in meetings, conferences, and seminars in the process of developing research and overall I3P development requirements, collaborating technical solutions, leveraging capabilities and opportunities, and promoting outreach and technical support. The I3P will send people to receive training in the fields of information technology, software applications, and business development, operations and processing.

Materials and Supplies: Budgeted expenditures are for the purchase of minor expendable equipment, including software and computer related components, postage, books, and conference calls.

Publications Costs: Communication and outreach costs (brochures, posters, photography, printing, and mailing) are anticipated. Publication costs for all research papers and proceedings, including fact sheets and I3P updates are budgeted. These costs are part of a larger I3P communication strategy under the direction of the Assistant Director for Communication and Outreach.

Conference Registration Fees: Registration fees to relevant I3P conferences are anticipated for I3P staff members, most notable, the Associate Director for Research.

Event and Meeting Costs: In addition to quarterly consortium meetings, the I3P has Advisory boards organized for the research initiatives. These boards will meet 3 times per year. Room, food and A/V equipment will be supplied.

Consultant Services: Travel costs associated with the travel of Advisory Board members to attend the advisory board meetings.

Costs include Executive Committee payments made according to the I3P bylaws: Members of the Executive Committee may be compensated for their service to the I3P.

The Vice Chair will be compensated for 5 weeks, or 25 full days, of service annually, for total compensation of \$11,250 based on the \$450 rate limit. Other members of the Executive Committee, excluding the Chair, will be compensated for 3 weeks, or 15 days, of service annually, for total compensation of \$6,750 based on the \$450 rate limit. The Chair will not receive any compensation for serving as a member of the Executive Committee.

Payment will be made to representatives' home institutions according to the terms of a Memorandum of Understanding between Dartmouth College and individual Consortium member institutions. Note, that most costs for the year will be paid from other funds.

A web design consultant is also budgeted. Given the growing prominence of the I3P, the time has come to upgrade the website and to give it a more professional look. The redesigned website will meet the following well-defined needs: it will underscore the overall credibility of the I3P, position the organization as a national resource in cyber security, and provide a source of accurate and up-to-date information for policymakers, industry, researchers and the media. In addition, the website will clearly state our mission, provide an overview of our research and educational programs, offer a media portal and give information about our members as well as membership opportunities.

Sub-agreements: none.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Renwick, Tya

From: (b)(6)
Sent: Wednesday, March 12, 2008 5:48 PM
To: 'Renwick, Tya'
Cc: 'Morgan, Marilyn'; 'Lee, Annabelle'; 'Harris, Richard'; 'Martha Austin'
Subject: RE: Dartmouth - Non-competing Continuation Application Review
Attachments: NCSA response 3-12-08 admin.doc

Thanks Tya,

I attach a word doc with my responses. Please let me know if you need additional explanations. I have tried my best to budget based on our needs.

(b)(6)

-----Original Message-----

From: Renwick, Tya [(b)(6)]
Sent: Wednesday, March 12, 2008 4:49 PM
To: (b)(6)
Cc: Morgan, Marilyn; Lee, Annabelle; Harris, Richard
Subject: Dartmouth - Non-competing Continuation Application Review

Hi

(b)(6)

As you know we are reviewing your non-competing continuation application. The following are questions from the review of the I3P Administration budget. Please respond to these questions as soon as possible but no later than COB, March 13th.

1. Travel – 3 travelers are reflected on the budget worksheet. The calculations for airfare, hotel, and mileage/taxi/parking do not represent costs for 3 travelers. Travel costs for 3 travelers would total \$4425. Please explain the calculations provided in the worksheet.
2. Travel – Do you have any locations and dates for the conferences and meetings?
3. Materials and Supplies - \$4400 is budgeted for 2 laptops. I noticed that this was also included in your budget from last year. Please explain the need for more laptops.
4. Materials and Supplies - \$5,000 is budgeted for cables/batteries/replacement parts. Please explain how these items will be used and the need for replacement parts.

5. Publication Costs - \$30,000 (communication costs) is budgeted for brochures, posters, photography, printing, letterhead, and mailing. This amounts to a \$10,000 increase from last year. Please explain. Also, \$16,268 is requested for "printing of documents." How is this different from the printing costs included in the \$30,000 previously mentioned?
6. Event & Meeting Set-up Costs – \$14,400 (9 x \$1600) Please clarify what 9 represents in your calculations. Your justification notes that there will be 3 board meetings.
7. Consultant Services (board meeting travel costs) - How does the 7 trips correlate to the 3 board meetings reflected in your justification and where are these meetings held? Also, \$7,938 is budgeted for the Executive Committees. This total differs from the justification. Please explain.

Thank you.

Tya Penwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

1. Travel:

The travel is based on 3 travelers, making 2 trips at 3 nights each. (18 total nights)

Airfare \$500

Hotel \$175 / day

Meals \$50 / day

Mileage/taxi/parking (\$60+\$20+\$20) \$100

$\$500 \times 3 \times 2 = \$3,000$

$\$175 \times 18 = \$3,150$

$\$50 \times 18 = \900

$\$100 \times 18 = \$1,800$

2. Meeting and conferences locations and dates are not known at this time.
3. We project for replacement computers for employees, usually every 3 years. There have been, on average 9 employees working from I3P. So we schedule for 2 replacement computers each year.
4. Throughout the year we need to replace laptop batteries, hard drives, or potentially other computer or electronic parts, like monitors or cables for the I3P administrative staff. These can be simple upgrades to a failing piece of hardware.
5. Dartmouth , the I3P and consortium members have been working on an strong outreach initiative to communicate the research of the I3P to relevant channels. We are constantly updating documents and displays with information about the I3P and distributing. This distribution has increased over the years and as we gain momentum with the 4 projects and workshops, and have increased visibility, we will need additional resources dedicated to making and printing these types of documents (brochures, posters, photography, letterhead). The Printing of Documents relates to printing research reports and publications of the research. Given the 4 initiatives, many publications and I3P dedicated research reports have been and will continue to be released and distributed.
6. As noted in the budget narrative, we expect the 3 advisory boards to meet 3 times per year. Hence the total of 9 meetings in my calculations.
7. Travel for the advisory board to travel to meetings are budgeted. However, historically it has been shown that not all members submit travel claims. We have therefore adjusted the amount of budgeted trips to reflect our anticipated number travel claims. Advisory board meetings are usually held in conjunction with a workshop or other team meetings so as to alleviate unnecessary travel burden to the group. There is no set place for each meeting. Total executive committee costs for one year is \$31,500. The executive committee payments budgeted in BPII have been paid by another source. So using those available funds and the additional \$7,938 budgeted will pay for 6 months of the executive committee. Probably 10/1/08-3/31/09.

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

I3P Fellowship Program - Budget Period III

Dates: April 1, 2008 to March 31, 2010

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total
			# of months	Salary	Benefit	Subtotal	# of months	Salary	Benefit	Subtotal	
Faculty											
Staff											
Students											
Subtotal, without fringe								\$0	\$0	\$0	
Total fringe								\$0	\$0	\$0	
Subtotal, including fringe								\$0	\$0	\$0	
	Indirects on people	35.00%						\$0	\$0	\$0	
Direct materials											
Travel											Total
	Travel for fellows to consortium meeting	Airfare \$500	Administrative Information Outside of Scope						\$2,000		\$2,000
	No. of travelers	2 Hotel \$175 / day							\$1,400		\$1,400
	No. of Trips	2 Meals \$50 / day							\$400		\$400
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100							\$400		\$400
	Travel for scholars to consortium meeting	Airfare \$500							\$1,500		\$1,500
	No. of travelers	3 Hotel \$175 / day							\$1,050		\$1,050
	No. of Trips	1 Meals \$50 / day							\$300		\$300
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100							\$300		\$300
	Travel for scholars to initial event	Airfare \$500							\$1,500		\$1,500
	No. of travelers	3 Hotel \$175 / day							\$1,050		\$1,050
	No. of Trips	1 Meals \$50 / day							\$300		\$300
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100							\$300		\$300
	Travel for fellows to consortium meeting	Airfare \$500							\$2,000		\$2,000
	No. of travelers	2 Hotel \$175 / day							\$1,400		\$1,400
	No. of Trips	2 Meals \$50 / day							\$400		\$400
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100							\$400		\$400
Capital equipment											
Breakdown of Equipment											
Participant Support Costs											
Other Direct Costs											
Materials and Supplies											
	Review costs (fac-ex, conf calls)								\$200		\$200
Publication Costs											
	Printing/advertising/ mailing costs								\$500		\$500
Conference Registration Fees											
Event and Meeting Costs											
Consultant Services											
	Indirects on travel, supplies, other costs (NOT equipment or	35.00%						\$1,470		\$3,920	\$5,390
Subawards/Contractual Costs											Total
Describe Product or Service											
A memorandum of understanding will be issued to 3 institutes per year to support the I3P fellowship program. These fellowships will be hosted at various consortium members' institutes. Fellows will be selected based on a scientific review process, for details about the process please see attached.									\$450,000		\$450,000
Costs will include:											
	Salary/Benefits	Will not exceed \$150,000 per awarded fellowship									
	Travel allowance/Equipment										
	Indirect costs										
	Scholar program (average of \$90k per subaward)	\$30-40k annual salary, plus 3k in travel, fringe and institutional costs							\$270,000		\$270,000
Subtotal									\$670,000		\$670,000
	Indirect on first \$25k each sub-contract	35.00%							\$22,500		\$52,500
Total direct									\$4,200		\$685,400
Total indirect									\$1,470		\$57,890
Total									\$5,670		\$743,290

Administrative Information Outside of Scope

I3P Initiative 1 – I3P Fellowship Program

Team leader: (b)(6) I3P, Dartmouth College

Cost - Budget Period III: \$743,290
(Budget Period II supplement: \$50,000)

See Project Narrative for proposal information. This program includes fellowships to be awarded annually based on the I3P fellowship guidelines. Additional funds are allocated for a the I3P Scholar Program. Both programs will continue to March 31, 2010. → ?

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH area and travel required of members from outside the Dartmouth area.

The awarded fellowships require each fellow to travel to Consortium Meetings to present their findings. The budget is based on 3 fellowships awarded in Budget Period III.

Additional trips are budgeted for the I3P Scholars to attend an initial event, and at least one Consortium meeting.

Equipment: none.

Materials and Supplies: Review costs associated with selecting the fellowship and scholar winners (conference calls, mailing, etc.) are budgeted.

Publications Costs: Printing and advertising costs related to announcing the call for proposals are budgeted.

Conference Registration Fees: none.

Event and Meeting Costs: none.

Sub-agreements: In Budget Period III, 3 fellowships have been budgeted at a maximum rate of \$150,000 per fellowship. Historically the breakdown is roughly \$80,000 for salary and fringe. \$8,000 for travel. \$5,000 for supplies and \$57,000 for indirects. Since all I3P member institutions have varying fringe and indirect rates, these are just estimates. Scholars, at an estimated rate of \$90k each, are budgeted. All sub-awards will be made to consortium member institutions.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds spend during Dartmouth FY08 and FY09

I3P Process Control Systems - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08			Dartmouth FY09			Total
			# of months	Cost/yr	Net Cost/yr subtotal	# of months	Cost/yr	Net Cost/yr subtotal	
Faculty									
Staff									
Students									
Subtotal, without fringe					\$0		\$0	\$0	
Total fringe					\$0		\$0	\$0	
Subtotal, including fringe					\$0		\$0	\$0	
	Indirects on people	59.90%			\$0		\$0	\$0	
Direct materials			Computation			Total			
Travel									
Capital equipment									
Breakdown of Equipment									
Participant Support Costs								\$0	
Other Direct Costs									
Materials and Supplies									
Publication Costs									
Conference Registration Fees									
Event and Meeting Costs									
Consultant Services									
Indirects on travel, supplies, other costs (NOT equipment or tu					59.90%		\$0	\$0	
Subawards/Contractual Costs			Base price			Total			
Describe Product or Service					\$0		\$0	\$0	
Management: MIT-LL (Rob Cunningham)							\$77,044	\$77,044	
MIT-LL (Rob Cunningham)							\$356,275	\$356,275	
Mitre (Jim Waters)							\$150,000	\$150,000	
PNNL (Ron Pawlowski)							\$239,500	\$239,500	
Sandia (Anne McInrye)							\$448,600	\$448,600	
SRI (Ulf Lindqvist)							\$199,818	\$199,818	
Tulsa (Sujeet Shenoi)							\$200,000	\$200,000	
UIUC (David Nicol)							\$250,000	\$250,000	
USMA (John James)							\$100,000	\$100,000	
Subtotal					\$0		\$2,021,237	\$2,021,237	
Indirect on first \$25k each subcontract					59.90%		\$0	\$0	
Total directs					\$0		\$1,669,330	\$1,669,330	
Total indirects					\$0		\$0	\$0	
Total					\$0		\$1,669,330	\$1,669,330	

Administrative Information Outside of Scope

Administrative Information Outside of Scope

I3P Initiative 4 – Survivability and Recovery of Process Control Systems

Team leader (b)(6) MIT Lincoln Laboratory

Cost - Budget Period III: \$1,669,330
(Budget Period II supplement: \$351,907)

See Project Narrative for proposal information. This project includes 9 institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: MIT-LL (b)(6)

	BPII	[REDACTED]	Total
A. Personnel	71,274	72,550	143,824
B. Fringe Benefits			-
C. Travel	1,682	4,494	6,176
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	72,956	77,044	150,000
I. Indirect Costs			-
TOTAL PROJECT COST:	72,956	77,044	150,000

Research Budget: MIT-LL (b)(6)

	BPII	[REDACTED]	Total
A. Personnel	416,078	332,795	748,873
B. Fringe Benefits			-
C. Travel	22,514	19,995	42,509
D. Equipment	2,022	379	2,401
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	3,111	3,106	6,217
Total Direct Costs	443,725	356,275	800,000
I. Indirect Costs			-
TOTAL PROJECT COST:	443,725	356,275	800,000

MIT Lincoln Laboratory has two roles on this project: the first is as team lead and overall coordinator. The team lead is (b)(6). The second is MIT's portion of this initiative, as the sole developer of the testing framework for PCS software. In addition to these tasks, Lincoln will use this funding to support several I3P and academic workshops and conferences (b)(6) will call upon other staff at MIT Lincoln Laboratory to assist with this effort as needed.

Labor rates provided include salary, benefits, and support. The rates used by Lincoln Laboratory are DoD approved and in accordance with DCAA standards. Audit records can be made available to government agencies on request.

Fringe: See above.

Travel: Four trips for two people were assumed to be necessary to attend quarterly team meetings. One workshop for two people per year is assumed as well as two trips to meet with academia, industry and/or vendors. This budget also includes event registrations. Adjustments will be made to meet with industry and/or DHS as project needs arise.

Equipment: A new computer and associated hardware will be purchased for this program.

Supplies: No costs are expected to be incurred.

Consultants: No costs are expected to be incurred.

Other: No costs are expected to be incurred.

Indirect: No costs are expected to be incurred.

Research Budget: Mitre (b)(6)

	BPII	(b)(6)	Total
A. Personnel	62,646	62,646	125,292
B. Fringe Benefits	63,090	63,090	126,180
C. Travel	10,484	10,484	20,968
D. Equipment			-
E. Supplies	1,151	1,151	2,302
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	137,371	137,371	274,742
I. Indirect Costs	12,629	12,629	25,258
TOTAL PROJECT COSTS	150,000	150,000	300,000

Personnel

(b)(6) will serve as the PI for this project. He will enlist appropriately skilled staff as required. Leveraging of MITRE's Information Security Center will be done through (b)(6) (b)(6) will provide administrative support. Bev Nunan will provide financial services.

Fringe

See above.

Travel

The budgeted travel is based on two site meetings for each template development effort. Each site meeting will involve 2-3 team members. Additional travel is budgeted for quarterly Project Team meetings and for one or two outreach events as directed by the Project. Locations are tentative, so a mixture of West-US, Mid-US and East-US trips are postulated.

Equipment

N/A.

Supplies

The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs

N/A.

Indirect Costs

The G&A and COM fees are 7% and 4% respectively

Administrative Information Outside of Scope

Research Budget: PNNL

(b)(6)

	BPII		Total
A. Personnel	72,309	76,893	149,201
B. Fringe Benefits	25,783	26,823	52,606
C. Travel	11,057	11,290	22,347
D. Equipment			-
E. Supplies	34,735	3,116	37,852
F. Construction			-
G. Consultants/Contracts	4,885	3,992	8,877
H. Other Costs			-
Total Direct Costs	148,769	122,114	270,883
I. Indirect Costs	111,731	117,386	229,117
TOTAL PROJECT COST:	260,500	239,500	500,000

Table A: Personnel

(b)(6) is an expert on Process Control and SCADA systems, and will be the project manager for the PNNL portion of this initiative. (b)(6)

(b)(6) are experts on cyber-security, and will be responsible for porting the

existing SHARP software to a ruggedized, industrial-quality appliance. (b)(6) manages the SCADA cyber-security program at PNNL, and will assist with industry outreach. Other PNNL staff who will contribute to this project have yet to be named, but will include the following: a Computer Engineer and an additional PCS Engineer to assist with the design and implementation of the SHARP appliance, and an Administrative Professional to assist with project management duties as well as the maintenance of the Fact Sheets for all teams on the I3P PCS project. All of the individuals listed above will charge directly to this project for only that time that is spent on project work.

Direct labor costs are based on average charge-out rates for specific job categories. Average charge-out rates are calculated each fiscal year (FY is October 1 through September 30) as follows:

$$\frac{\text{Average Salary} \times (1 + \text{Fringe Benefit Rate})}{\text{Productive Hours}}$$

Average charge-out rates for FY2007 through FY2009 (FY is October 1 through September 30) were calculated using the following factors:

FY	Salary Increase (compounding annually)	Fringe Benefit Rate	Productive Hours
2007	0.00%	35.7%	1820
2008	4.14%	35.6%	1828
2009	4.10%	34.4%	1820

Salary increases are based on Consumer Price Index forecasts, staff growth, and salary history. The fringe benefit rate for limited term and hourly employees is 15.1%. Productive hours in a year exclude holidays, vacation, and other absences.

Table B: Fringe Benefits

Fringe benefit rates are described above in the section entitled "Table A: Personnel."

Table C: Travel

The budgeted travel supports travel for (b)(6) or his delegate, for the following purposes:

- Travel to attend four (4) project review meetings. The duration of these trips is estimated to be five (5) days for each trip. Washington, DC was chosen as a representative destination for cost estimation purposes.
- Travel to attend two (2) workshops for the purpose industry outreach. The duration of these trips is estimated to be five (5) days for each trip. Houston, TX was chosen as a representative destination for cost estimation purposes.
- Travel for the purpose of testing the SHARP appliance on the Sandia test bed. The duration of this trip is estimated to be five (5) days. Albuquerque, NM was chosen as a representative destination for cost estimation purposes.
- Travel for the purpose of testing the SHARP appliance on an industry test bed. The duration of this trip is estimated to be five (5) days. Houston, TX was chosen as a representative destination for cost estimation purposes.

The travel costs cover airfare, hotel, rental car, meals and incidental expenses. Staff salary and fringe benefit costs have been included in Tables A and B, and are not included here. Airfare rates have been estimated utilizing non-refundable quotes from Travel Management Partners (TMP). Subsistence costs (meals and lodging) have been estimated using per diem rates published in the Federal Travel Regulations. Travel rates have been escalated at the annual rates listed below:

2007	2.6%
2008	2.4%
2009	2.4%

Table D: Equipment

No special equipment will be purchased on this project.

Table E: Supplies

Budgeted expenditures that are listed for the item “Circuit Boards and Components” are to cover materials for the fabrication of the SHARP appliance. Details on the specific materials to be used will be determined during the initial stages of the project. It is expected that the SHARP appliance will use Commercial, Off-the-Shelf components to the largest extent possible, and thereby limiting the need for costly custom components.

Budgeted expenditures that are listed for the item “Workshop and Presentation Materials” are for handouts, poster boards, and other presentation materials at the two Industry Outreach Workshops discussed under the Travel section.

Table F: Not found

Table G: Consultants/Contracts

No outside consultants will be used on this project.

Within the Contracts table, the charge for the “Office of Fellowship Programs” results from our desire to use undergraduate and post-graduate students on this project. This

charge helps to set up and maintain the program by which students can be used to help staff the project. The benefits to the effort include the following: (1) Fellows provide low cost yet skilled technical help on the project thus reducing project labor costs without sacrificing quality, (2) The industry and society benefit since the pool of skilled professionals that are knowledgeable in security and process control systems grows as more young people are involved in this effort.

Table H: Other Costs

No other costs are expected on this project.

Table I: Indirect Costs

Battelle Memorial Institute, Pacific Northwest Division (Battelle) operates PNNL for the United States Department of Energy. Battelle is obligated to follow Cost Accounting Standards (CAS) 48CFR9904. Battelle has established a direct and indirect cost policy in accordance with 48CFR9904.418 to facilitate the full recovery of all costs. Annually, Battelle submits a proposal for an "Indirect Rate Agreement" to the Department of Energy. Battelle's indirect rates are audited by the Defense Contract Audit Agency (DCAA) and approved by DOE. **A copy of Battelle's Indirect Rate Agreement is available to the Government upon request.**

The following paragraphs describe the elements included under Indirect Costs:

Organizational Overhead

Organizational Overhead for technical organizations represents costs for management, supervision, and administration of technical departments. Organizational Overhead also includes costs for building and utilities and for research equipment such as small tools, lab supplies, laundry, decontamination/waste disposal, maintenance, and expenses associated with equipment with an initial cost of less than \$50,000. The Organizational Overhead rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval.

Program Development and Management

Program development and program management (PDM) costs include costs for business development, planning, and monitoring for a group of projects. Costs are pooled and then applied at the rate of -6.0% of value added (excluding PDM costs), plus materials and subcontracts (excluding OFP, ICP and ILA costs). The PDM rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval.

Technical Management Cost

Technical Management Cost (TMC) includes costs for supervision and administration of a technical organization as well as the organization's technical facility and operations cost. The TMC rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval. The rate per hour for each fiscal year is listed below:

2007	0.15
2008	0.15
2009	0.15

Laboratory Directed Research and Development

LDRD is research and development work of a creative and innovative nature for the purpose of maintaining the scientific and technological vitality of the Laboratory and/or responding to new scientific or technological opportunities. Costs are pooled and then applied at the rate of 8.50% to the value added base. The LDRD rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval.

General and Administrative Expense

G&A includes general functions such as Accounting, Legal, and Personnel department costs, contract administration, replacement cost of laboratory support equipment, etc. G&A is allocated to final objectives by applying the appropriate rate to the value-added base. The G&A rates have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval. The G&A rate(s) per FY are as follows:

2007	28.50
2008	29.00
2009	29.00

Service Assessment

Service Assessment includes costs paid to DOE for plant-wide support services such as fire, library, mail, and roads. Service Assessment costs are allocated at applicable rate of total estimated costs. The Service Assessment rate(s) per FY are as follows:

2007	2.40
2008	2.40
2009	2.50

Research Budget: Sandia

(b)(6)

	BPII	BPII	Total
A. Personnel	415,400	418,600	834,000
B. Fringe Benefits			-
C. Travel	28,000	28,000	56,000
D. Equipment	8,000	2,000	10,000
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	451,400	448,600	900,000
I. Indirect Costs			-
TOTAL PROJECT COST:	451,400	448,600	900,000

Personnel: An average technical staff salary cost was used to calculate the personnel costs. This was based on an average 1.3 FTEs per year. (b)(6) will act as the project manager for this Sandia portion of the initiative. (b)(6) and Other Tech Resources are budgeted.

Fringe: This cost is included in the burdened costs shown in the personnel budget.

Travel: Four trips were assumed to be necessary to attend quarterly team meetings. One workshop per year is assumed as well as two trips to meet with industry and/or vendors. This budget also included event registrations.

Equipment: Extending and expanding the use of the SCADA TestBed at Sandia and this was shown as equipment costs. This would vendor hardware and software for testing scenarios in recovery and response.

Supplies: No costs are expected to be incurred.

Consultants: No costs are expected to be incurred.

Other: No costs are expected to be incurred.

Indirect: No costs are expected to be incurred.

Research Budget: SRI (b)(6)

	BPII	BPII	Total
A. Personnel	172,846	173,034	345,880
B. Fringe Benefits			-
C. Travel	18,434	18,434	36,868
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	8,613	8,350	16,963
Total Direct Costs	199,893	199,818	399,711
I. Indirect Costs			-
TOTAL PROJECT COST:	199,893	199,818	399,711

Personnel

(b)(6) will serve as the project manager for this portion of the initiative. He will manage SRI's efforts and lead the coordination with other institutions. Mr. (b)(6) (b)(6) Senior Computer Scientist, will provide technical expertise to SRI's effort and support the technology evaluations. Mr. (b)(6) Director of Client Services, will lead the industry outreach activities and support all the technology transition activities. Mr. (b)(6) Deputy Director, will provide technical expertise to SRI's effort and support the industry outreach activities. Ms. (b)(6) Administrative Analyst, will provide administrative services to SRI's effort.

Fringe

Proprietary

Travel

The budgeted travel supports anticipated team meetings.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs include the Computer Science Laboratory (CSL) computer facility.

SRI Proprietary Cost Data

SRI business systems, including our accounting system, undergo continuing review by our cognizant U.S. Government contract administration organization (DCMA) and our cognizant U.S. Government audit agency (DCAA). It is SRI's policy to treat our labor and indirect rates as sensitive, proprietary information that is disclosed only to authorized representatives of the U.S. Government. As a result, SRI is not disclosing those specific rates to Dartmouth. However, SRI will fully cooperate with any assist audit conducted by

DCAA or will provide full costing detail in a sealed envelope addressed directly to the Government contracting agency, at the option of Dartmouth.

Research Budget: Tulsa

(b)(6)

	BPII	BPII	Total
A. Personnel	94,587	99,316	193,903
B. Fringe Benefits	20,505	21,531	42,036
C. Travel	16,000	12,000	28,000
D. Equipment	14,000	10,000	24,000
E. Supplies	2,318	1,933	4,251
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	147,410	144,780	292,190
I. Indirect Costs	52,590	55,220	107,810
TOTAL PROJECT COST:	200,000	200,000	400,000

The University of Tulsa is responsible for developing situational awareness and attack mitigation tools for a Modbus environment for use in the oil and gas industry. The requested funds will cover two months of salary per year for Dr. (b)(6) project manager for this Tulsa portion of the initiative.), Dr. (b)(6) Co-lead) and Dr. (b)(6) (Collaborator). Funds will also be used to support two graduate students throughout the 24 month period covered by the budget. Budget items for equipment and supplies will be used to support tool development and a demonstration scenario. It is estimated that requested travel funds will cover 12-16 person trips to professional meetings and industry facilities. Fringe benefits at the University of Tulsa are computed as 35% of faculty salaries. Indirect costs are estimated by the University of Tulsa at the current rate of 55.6% of salaries and wages.

Research Budget: UIUC

(b)(6)

	BPII	BPII	Total
A. Personnel	108,969	113,328	222,297
B. Fringe Benefits	20,819	21,652	42,471
C. Travel	10,000	8,000	18,000
D. Equipment	4,500		4,500
E. Supplies	1,004	686	1,690
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	27,173	27,541	54,714
Total Direct Costs	172,465	171,207	343,672
I. Indirect Costs	77,535	78,793	156,328
TOTAL PROJECT COST:	250,000	250,000	500,000

SENIOR PERSONNEL
\$89,034

The project manager (b)(6) and Co-lead (b)(6) will be responsible for all project activities for this UIUC portion of the initiative (b)(6) requests 1 ½ month support per year for a total of 3 months support. The proposal also includes 1 month support for (b)(6) per year for a total of 2 months support.

OTHER PERSONNEL

\$133,263

3 – Graduate Research Assistant

The graduate students will assist the Senior Personnel in conducting the research described in the proposal.

1 – Staff (Academic Professional)

The staff personnel will assist the Senior Personnel by administering the day-to-day operations necessary for the project.

Senior Personnel (Faculty), Academic Professionals, and Graduate Research Assistants at the University of Illinois are paid on a person-month basis, no timesheets are maintained for these groups of employees. An estimate for faculty and academic professionals is 160 hours/1 FTE and 173 hours for 1 FTE for Graduate Research Assistants.

Fringe Benefits

\$42,471

Retirement –	10.82%
Health, Life and Dental Insurance -	21.18%
Termination Benefits –	1.62%
Workmen’s Compensation	0.13%
Medicare -	<u>1.45%</u>
Total Benefits	35.20%

35.2% computed on all salaries **except** Graduate Students

Graduate Student salaries -- Graduate Student Health, Life and Dental Insurance, 5.13% and Workmen’s Comp, 0.13% are calculated at 5.26%

Travel – Domestic

\$18,000

9 trips per year for the PI and Co-PI (2-days) per trip at approximately \$1,000 for meetings, project reviews and/or attendance at technical conferences related to this work effort.

Materials, Supplies and Expensed Equipment

\$6,190

The budget includes \$1,690 for materials and supplies including reference books, hanging files, transparencies, engineering notebooks, storage media, electronic components, repair parts and in-house poster preparation; \$4,500 for expensed equipment. Equipment will be PCs and other devices needed to facilitate the project

Computer Services
\$9,000

The budget includes in-house dedicated computer entities and networking support utilized by research groups housed in the Coordinated Science Laboratory. Logon fee of \$125 per month (CRHC Group) per logon supports salaries, supplies, repairs, maintenance, and equipment upgrades or replacements of the entity.

General Services
\$1,501

Also included in the budget are costs for services related to communications, duplication costs, long-distance tolls, teleconferencing, and maintenance.

Tuition Remission
\$44,213

37% of Graduate Research Assistant salaries

MTDC BASE – Indirect Costs
\$156,328

53% of Total Direct Costs, excluding tuition remission, expensed equipment, and subcontracts over \$25,000 each.

MTDC BASE = \$343,672 less \$44,213 (tuition remission) less \$4,500 (expensed equipment) = \$294,959
\$294,959 x 53% = \$156,328 (rounded) in total indirect costs *

Research Budget: USMA (b)(6)

	BPII	BPI	Total
A. Personnel	65,200	65,200	130,400
B. Fringe Benefits	15,700	15,700	31,400
C. Travel	9,000	9,000	18,000
D. Equipment			-
E. Supplies	1,000	1,000	2,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	90,900	90,900	181,800
I. Indirect Costs	9,100	9,100	18,200
TOTAL PROJECT COST:	100,000	100,000	200,000

Personnel costs are for approximately 5 and ½ months of salary and benefits each year of the project. Project manager of this USAM portion of the initiative is (b)(6) Other USMA personnel involved in the effort will have their salaries and benefits provided by USMA.

Travel costs are to attend various technical conferences, estimated at 12 conference attendees at \$1,500 apiece over the 2 yr period.

Materials and Supplies include costs for production of the reports and presentations.

Institutional Facilities and Administration costs for sponsored research are computed as 10% of the Modified Total Direct Costs.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

I3P Assessable Identity - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08			Dartmouth FY09			Total
			# of months	% effort	net effort subtotal	# of months	% effort	net effort subtotal	
Faculty									
Staff									
Students									
Subtotal, without fringe					\$0		\$0	\$0	
Total fringe					\$0		\$0	\$0	
Subtotal, including fringe					\$0		\$0	\$0	
	Indirects on people	59.90%			\$0		\$0	\$0	
Direct materials			Computation						
	Travel								
	Capital equipment								
	Breakdowns of Equipment								
	Participant Support Costs								
	Other Direct Costs								
	Materials and Supplies								
	Publication Costs								
	Conference Registration Fees								
	Event and Meeting Costs								
	Consultant Services								
	Indirects on travel, supplies, other costs (N							\$0	
	Administrative Information Outside of Scope								
	Subawards/Contractual Costs							\$0	
	Describe Product or Service								
	(b)(6)								
	Subtotal				\$0		\$863,003	\$863,003	
	Indirect on first \$25k each subcontract	59.90%			\$0		\$0	\$0	
Total directs					\$0		\$863,003	\$863,003	
Total indirects					\$0		\$0	\$0	
Total					\$0		\$863,003	\$863,003	

Administrative Information Outside of Scope

(b)(6)

Administrative Information Outside of Scope

I3P Initiative 6 – Assessable Identity and Privacy Protection

Team leader (b)(6) MITRE Corporation

Cost - Budget Period III: \$863,003

See Project Narrative for proposal information. This project includes 7 institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: Mitre (b)(6)

	BPII	BPIII	Total
A. Personnel	43,138	43,075	86,213
B. Fringe Benefits	43,444	43,381	86,825
C. Travel	3,045	3,121	6,166
D. Equipment			-
E. Supplies	1,904	1,955	3,859
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	91,531	91,532	183,063
I. Indirect Costs	8,469	8,468	16,937
TOTAL PROJECT COST:	100,000	100,000	200,000

Personnel (b)(6) will serve as the team leader for this initiative. Leveraging of MITRE's Information Security Center will be done through (b)(6). (b)(6) will provide administrative support. (b)(6) will provide financial services.

Fringe: The budgeted fringe rates are used in accordance with approved rates.

Travel: The budgeted travel supports (b)(6)' travel to four team meetings. Expected duration of travel is 2 or 3 days per trip. Locations specified are tentative.

Equipment: N/A

Supplies: The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs: N/A

Indirect Costs: The G&A and COM fees are 7% and 4% respectively.

Administrative Information Outside of Scope

Research Budget: Mitre (b)(6)

	BPII	BPIII	Total
A. Personnel	132,135	132,098	264,233
B. Fringe Benefits	133,074	133,036	266,110
C. Travel	7,536	7,724	15,260
D. Equipment			-
E. Supplies	1,746	1,633	3,379
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	274,491	274,491	548,982
I. Indirect Costs	25,509	25,509	51,018
TOTAL PROJECT COST:	300,000	300,000	600,000

Personnel: (b)(6) will be managed by the project manager for this Mitre portion of the initiative. He will enlist appropriately skilled staff as required. Leveraging of MITRE's Information Security Center will be done through (b)(6). (b)(6) will provide administrative support. (b)(6) will provide financial services.

Fringe: The budgeted fringe rates are used in accordance with approved rates.

Travel: The budgeted travel supports travel for two people to four team meetings. Expected duration of travel is 2 or 3 days per trip. Locations specified are tentative.

Equipment: N/A

Supplies: The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs: N/A

Indirect Costs: The G&A and COM fees are 7% and 4% respectively.

Research Budget: UIUC (b)(6)

Administrative Information Outside of Scope

	BPII	BPIII	Total
A. Personnel	131,885	137,161	269,046
B. Fringe Benefits	28,886	30,042	58,928
C. Travel	10,000	8,000	18,000
D. Equipment	3,000	2,515	5,515
E. Supplies	3,000		3,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	27,854	27,040	54,894
Total Direct Costs	204,625	204,758	409,383
I. Indirect Costs	95,375	95,242	190,617
TOTAL PROJECT COST:	300,000	300,000	600,000

SENIOR PERSONNEL

\$106,713

The project manager (b)(6) and Co-lead (b)(6) will be responsible for all project activities for this UIUC portion of the initiative. (b)(6) requests 1 month support per year for a total of 2 months support. The proposal also includes a 1 month support for each (b)(6) per year for a total of 4 months support.

OTHER PERSONNEL

\$162,333

3 – Graduate Research Assistant

The graduate students will assist the Senior Personnel in conducting the research described in the proposal.

1 – Staff (Academic Professional)

The staff personnel will assist the Senior Personnel by administering the day-to-day operations necessary for the project.

Senior Personnel (Faculty), Academic Professionals (Programmer) and Graduate Research Assistants at the University of Illinois are paid on a person-month basis, no timesheets are maintained for these groups of employees. An estimate for faculty and academic professionals is 160 hours/1 FTE and 173 hours for 1 FTE for Graduate Research Assistants.

Fringe Benefits

\$58,928

Retirement –	10.82%
Health, Life and Dental Insurance -	21.18%
Termination Benefits –	1.62%
Workmen’s Compensation	0.13%
Medicare -	<u>1.45%</u>
Total Benefits	35.20%

35.2% computed on all salaries **except** Graduate Students

Graduate Student salaries -- Graduate Student Health, Life and Dental Insurance, 5.13% and Workmen's Comp, 0.13% are calculated at 5.26%

Travel – Domestic

\$18,000

9 trips per year for the PI and Co-PIs (2-days) per trip at approximately \$1,000 for meetings, project reviews and/or attendance at technical conferences related to this work effort.

Materials, Supplies and Expensed Equipment

\$8,515

The budget includes \$3,000 for materials and supplies including reference books, hanging files, transparencies, engineering notebooks, storage media, electronic components, repair parts and in-house poster preparation; \$5,515 for expensed equipment. Equipment will be PCs and other devices needed to facilitate the project

Computer Services

\$9,000

The budget includes in-house dedicated computer entities and networking support utilized by research groups housed in the Coordinated Science Laboratory. Logon fee of \$125 per month (CRHC Group) per logon supports salaries, supplies, repairs, maintenance, and equipment upgrades or replacements of the entity.

General Services

\$1,681

Also included in the budget are costs for services related to communications, duplication costs, long-distance tolls, teleconferencing, and maintenance.

Tuition Remission

\$44,213

37% of Graduate Research Assistant salaries

MTDC BASE – Indirect Costs

\$190,617

53% of Total Direct Costs, excluding tuition remission, equipment and expensed equipment, and subcontracts over \$25,000 each.

MTDC BASE = \$409,383 less \$44,213 (tuition remission) less

\$5,515 (expensed equipment) = \$359,655

\$359,655 x 53% = \$190,617 (rounded) in total indirect costs

Research Budget: SRI

(b)(6)

	BPII	BPIII	Total
A. Personnel	278,942	279,241	558,183
B. Fringe Benefits			-
C. Travel	7,085	7,085	14,170
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	13,940	13,446	27,386
Total Direct Costs	299,967	299,772	599,739
I. Indirect Costs			-
TOTAL PROJECT COST:	299,967	299,772	599,739

Personnel

(b)(6) will serve as project manager for this SRI portion of the initiative, and will coordinate overall architecture issues to ensure SRI's work integrates with the overall project.

(b)(6) will be involved with credentials, cryptography, and protocols.

(b)(6) will be responsible for the demo facility and will contribute to demo development.

Fringe

Proprietary

Travel

The budgeted travel supports anticipated team meetings.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs include the Computer Science Laboratory (CSL) computer facility.

The indirect rates included in this proposal are based on SRI's Forward Pricing Indirect Rate Proposal dated 28 August 2006. Rates may be verified by calling SRI's cognizant ACO, Mr (b)(6)

Research Budget: Cornell (Rafael Pass)

	BPII	BPII	Total
A. Personnel	99,434	104,497	203,931
B. Fringe Benefits	6,920	7,267	14,187
C. Travel	15,000	15,751	30,751
D. Equipment			-
E. Supplies	6,912	819	7,731
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	11,415	11,984	23,399
Total Direct Costs	139,681	140,318	279,999
I. Indirect Costs	60,319	59,682	120,001
TOTAL PROJECT COST:	200,000	200,000	400,000

Salaries:

Project manager (b)(6) Assistant Professor, will be the institutional contact and lead for the Cornell portion of this initiative. He will coordinate activities, and collaborate closely with (b)(6) and other members of the team to develop technologies described in the SOWP. This proposal requests salary support for a 0.5 month of summer salary each year.

Co-Lead: (b)(6) Professor, and (b)(6) Assistant Professor, will collaborate with Assistant Professor (b)(6) to develop technologies and will share with Assistant Professor (b)(6) funding for graduate students to assist in working on the respective technologies. This proposal request salary support for 0.5 month of summer salary each year.

Graduate Student: Graduate students will assist Assistant Professor (b)(6) Professor (b)(6) and Assistant Professor (b)(6) in developing the technologies described in the SOWP. This proposal requests salary support for one hundred percent of academic year effort for two graduate students each year. The salary support includes the stipend and salary used toward tuition and health insurance each year.

Annual salaries are budgeted with a five percent increase in July of each year.

Employee Benefits: Employee Benefits have been proposed at a rate of thirty-three percent for all non-student compensation as approved by the Department of Health and Human Services. See http://www.accounting.cornell.edu/employee_Benefit_Rates.cfm.

Travel: Funds are requested for travel to enable the project participants to attend conferences and meetings with other team members to promote technology transfer and refine technology demonstration plans. Estimates are based on current airfare costs and relevant associated costs based on historical information.

Material and Supplies: The cost of computer research materials under \$5,000, including computer hardware, computer software, and research books which are primarily related

to the research project. Computer research material costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other – Publications: The costs associated with publications in related technical journals. Publication costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other – Communications: Communication costs consist of project specific conference calls, faxing, modem, lab phone equipment, etc. Communications costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other – Workstation Support: Workstation support represents hardware and software maintenance, software licensing, networking, printing service, file service, backups and user consulting support for the machines used to conduct research as outlined in this proposal. The costs are calculated based on the effort of the project participants. The following steps are used to bill the costs associated with the Computer Science Department Central Facility:

a) For each user with a computing account in the facility, a user class is assigned to the individual, based on their past or anticipated usage. The user class of an individual may change during the year in response to changes in their usage of the facility. User class is determined by a set of objective use criteria for each user.

b) A user profile is established for each individual in the department that identifies percentage of time spent on Administration, Instruction, Departmental Research, and Organized Research activities. The profile is updated for summer, fall, and spring billing cycles.

c) The profile and user-class-based charges are used to allocate costs for the individual's activities to Administration, Instruction, Departmental Research, and Organized Research.

Costs associated with Organized Research are billed to sponsored research projects. Costs for Administration, Instruction, Departmental Research are billed to university funds.

Facilities and Administrative Costs (F&A): F&A costs have been proposed at a rate of fifty-eight percent from April 1, 2007 through June 30, 2007 and fifty-nine percent from July 01, 2007 through March 31, 2009 of Modified Total Direct Cost (MTDC) as approved in Cornell's rate agreement with the Department of Health and Human Services. A copy of this agreement may be found at http://www.accounting.cornell.edu/F&A/F&A_Cost_Rates.cfm. MTDC exclusions include Capital Equipment, GRA Allowance and Health Insurance, and Subcontract costs in excess of \$25,000 per subcontract.

The five percent annual escalation for the general expenses is proposed in accordance with University policy.

Research Budget: Purdue (b)(6)

	BPII	BPII	Total
A. Personnel	66,949	66,646	133,595
B. Fringe Benefits	15,134	15,460	30,594
C. Travel	10,000	10,001	20,001
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	9,574	9,537	19,111
Total Direct Costs	101,657	101,644	203,301
I. Indirect Costs	48,343	48,356	96,699
TOTAL PROJECT COST:	150,000	150,000	300,000

Personnel:

(b)(6) Professor at Purdue University, will serve as the Purdue project manager for portion of the initiative (b)(6) will oversee the project for the entire duration; however only 50% of one month of her summer salary will be allocated to the project. The rest of her summer salary will be covered by NSF funding. The research carried with the NSF funding is related to digital identity management and thus synergic with the work to be carried out in the I3P project.

(b)(6) Professor at Purdue University, will oversee the interactions with the stakeholders and conduct research on the credentialing framework. 25% of one month summer salary will be allocated to the project. The rest of his summer salary will be covered by other sources.

A postdoc will be hired to carry on research on the trust negotiation and on implementation of the demo. 50% of the salary of the postdoc will be charged to the project.

A graduate research assistant will be involved in the project. The RA will be supported at 50% during the academic year and 100% during summer months. Tuition fees are also budgeted.

Fringe: Fringe benefits are computer at the negotiated university rate.

Travel: 5 domestic trips have been budgeted for each year of the project. 4 of such trips will be for attending the project meetings; 1 will be for attending a conference in the USA. 2 foreign trips have been budgeted for each year of the project to allow the Purdue team members to attend and collaborate on related initiatives abroad.

Equipment: N/A

Supplies: N/A

Indirect Costs: Indirect costs are charged at the Purdue rate of 52.5%. Indirect costs are not charged on fee remission.

Research Budget: Georgia Tech (Douglas Blough)

	BPII	BPII	Total
A. Personnel	77,191	80,811	158,001
B. Fringe Benefits	7,135	7,492	14,628
C. Travel	6,000	6,000	12,000
D. Equipment			-
E. Supplies	500	500	1,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	12,096	12,096	24,192
Total Direct Costs	102,922	106,899	209,821
I. Indirect Costs	45,685	47,686	93,371
TOTAL PROJECT COST:	148,607	154,585	303,192

Salaries:

PIs' salaries and the ECE Graduate Research Assistant's (GRA-1) stipend are based on current rates and projected increases of 5% per year. CoC GRA stipends are set to increase on 8/1/2007 and, therefore, the exact current and increased rates are used for GRA-2. Fringe benefits are charged at the rate of 24.1% on the faculty salaries. GRAs do not receive benefits.

The yearly budget for this proposal contains one month of summer salary for the project manager, (b)(6) and co-lead, (b)(6) per year. It also includes support for 2 graduate research assistants for 12 months each year at 50% time, which is full time employment for graduate students.

Travel:

Travel funds will be used for the lead and co-lead to attend semi-annual team meetings at various locations in the U.S. Each person trip is budgeted at \$1500, with estimated breakdown as follows:

- Air fare: \$1000
- Hotel (2 nights) \$300
- Rental car \$100
- Meals/misc \$100

Equipment:

No equipment is requested.

Materials and Supplies:

Funds in this category will be used primarily for purchases of inexpensive software, small hardware, and other miscellany (photocopies, postage etc) needed to support project operation.

GRA Tuitions:

Institute policy requires research grants to pay tuition for graduate research assistants at the rate of \$504 per month per student.

Indirect Costs:

Indirect costs are charged at the negotiated rate of 50.3%. Indirect costs are applied to all direct costs except GRA tuitions.

Indirect Costs:

The budgeted indirect cost rate is used in accordance with the DHS approved rates for Dartmouth College.

Budget Detailed Worksheets

ISP Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISP Administration - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total	Inflation
			# of months	% effort	net effort	subtotal	# of months	% effort	net effort	subtotal		
Faculty												
Staff												
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	5%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	90%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	50%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	50%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	50%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	50%	0.00%	\$0	\$0	5.0%
A	(b)(6)		3.00	0%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
Subtotal, without fringe						\$0			\$0	\$0		
FAC Fringe on Faculty					38.5%	\$0			39.0%	\$0	\$0	
AP Fringe on AP I and AP II					38.5%	\$0			39.0%	\$0	\$0	
UG Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$0	\$0	
RAA Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	\$0	
RAB Fringe on Research Associate B					24.5%	\$0			24.5%	\$0	\$0	
RAC Fringe on Research Associate C					38.5%	\$0			39.0%	\$0	\$0	
Total fringe						\$0			\$0	\$0		
Subtotal, including fringe						\$0			\$0	\$0		
Indirects on people		35.00%			\$0				\$0	\$0		
Direct materials											Total	notes
Travel												
Conferences, Meetings and C/Airfare \$500											\$3,000	\$3,000
No. of travelers 3 Hotel \$175 / day											\$3,150	\$3,150
No. of Trips 2 Meals \$50 / day											\$900	\$900
No. of nights 3 Mileage/tax/parking (\$60+\$20+\$20) \$100											\$1,800	\$1,800
Capital equipment												
Breakdowns of Equipment												\$0
Participant Support Costs												
Other Direct Costs												
Materials and Supplies												
Replacement laptops											2 \$2,200	\$4,400
Cables / batteries / replacement parts											10 \$500	\$5,000
Postage to meetings											1 \$150	\$150
Conference Calls											6 \$40	\$240
Software for computers											3 \$300	\$900
Publication Costs												
Communication costs (brochures, posters, photography, printing, letterhead, and mailing)											1 \$30,000	\$30,000
Printing of documents											1 \$16,268	\$16,268
Conference Registration Fees												
Conference registration fees											2 \$750	\$1,500
Event and Meeting Costs												
Food, A/V, set up for consortium meeting (1)											0 \$7,000	\$0
Supplies for Consortium meeting (1)											0 \$500	\$0
Food, A/V, set up for advisory board meetings (9)											9 \$1,600	\$14,400
Consultant Services												
Advisory Board Meetings												
Airfare \$500											\$17,500	\$17,500
No. of travelers 3 Hotel \$175 / day											\$6,125	\$6,125
No. of Trips 7 Meals \$50 / day											\$1,750	\$1,750
No. of nights 1 Mileage/tax/parking (\$60+\$20+\$20) \$100											\$3,500	\$3,500
(b)(6) through contract with IBM											\$0	\$0
Executive Committee payments											1 \$7,938	\$7,938
Web Design											1 \$25,000	\$25,000
Indirects on travel, supplies, other costs (NOF equipme		35.00%			\$8,750				\$41,482	\$50,232		
Subawards/Contractual Costs												
Name & Service Provided computation												
Indirect on consultants		35.00%			\$0				\$0	\$0		
Total directs						\$25,000			\$118,521	\$143,521		
Total indirects						\$8,750			\$41,482	\$50,232		
Total						\$33,750			\$160,003	\$193,753		

Budget Detailed Worksheets

13P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

13P Fellowship Program - Budget Period III

Dates: April 1, 2008 to March 31, 2010

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08			Dartmouth FY09			Total
			# of months	effort	subtotal	# of months	effort	subtotal	
Faculty									
Staff									
Students									
Subtotal, without fringe					\$0		\$0	\$0	
Total fringe					\$0		\$0	\$0	
Subtotal, including fringe					\$0		\$0	\$0	
	Indirects on people	35.00%			\$0		\$0	\$0	
Direct materials		Computation						Total	
Travel									
Travel for fellows to consortium meeting		Airfare \$500			\$2,000			\$2,000	
No. of travelers		2 Hotel \$175 / day			\$1,400			\$1,400	
No. of Trips		2 Meals \$50 / day			\$400			\$400	
No. of nights		2 Mileage/taxi/parking (\$60+\$20+\$20) \$100			\$400			\$400	
Travel for scholars to consortium meeting		Airfare \$500				\$1,500		\$1,500	
No. of travelers		3 Hotel \$175 / day				\$1,050		\$1,050	
No. of Trips		1 Meals \$50 / day				\$300		\$300	
No. of nights		2 Mileage/taxi/parking (\$60+\$20+\$20) \$100				\$300		\$300	
Travel for scholars to initial event		Airfare \$500				\$1,500		\$1,500	
No. of travelers		3 Hotel \$175 / day				\$1,050		\$1,050	
No. of Trips		1 Meals \$50 / day				\$300		\$300	
No. of nights		2 Mileage/taxi/parking (\$60+\$20+\$20) \$100				\$300		\$300	
Travel for fellows to consortium meeting		Airfare \$500				\$2,000		\$2,000	
No. of travelers		2 Hotel \$175 / day				\$1,400		\$1,400	
No. of Trips		2 Meals \$50 / day				\$400		\$400	
No. of nights		2 Mileage/taxi/parking (\$60+\$20+\$20) \$100				\$400		\$400	
Capital equipment									
Breakdown of Equipment			Quantity	price each	subtotal	Quantity	price each	subtotal	
								\$0	
								\$0	
Participant Support Costs									
Other Direct Costs									
Materials and Supplies									
Review costs (fed-ex, conf calls)						\$200		\$200	
Publication Costs									
Printing/advertising/ mailing costs						\$500		\$500	
Conference Registration Fees									
Event and Meeting Costs									
Consultant Services									
Indirects on travel, supplies, other costs (NOT equipment or		35.00%			\$1,470			\$3,920	
								\$5,390	
Subawards/Contractual Costs		Base price						Total	
Describe Product or Service									
A memorandum of understanding will be issued to 3 institutes per year to support the 13P fellowship program. These fellowships will be hosted at various consortium members' institutes. Fellows will be selected based on a scientific review process, for details about the process please see attached narrative proposal							\$450,000	\$450,000	
Costs will include:									
Salary/Benefits		Will not exceed \$100,000 per awarded fellowship							
Travel allowance/Equipment									
Indirect costs									
Budget Period 4 Supply/Services							\$550,000	\$550,000	
Scholar program (average of \$90k per subaward)							\$270,000	\$270,000	
#30-40k annual salary, plus 3k in travel, fringe and institutional costs									
Subtotal					\$0		\$670,000	\$670,000	
Indirect on first \$25k each subcontract		35.00%			\$0		\$52,500	\$52,500	
Total direct					\$4,200		\$681,200	\$685,400	
Total indirect					\$1,470		\$54,420	\$57,890	
Total					\$5,670		\$737,620	\$743,290	

Budget Detailed Worksheets

13P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

\$386,979

13P Human Behavior - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08			Dartmouth FY09			Total	inflation
			# of months	% effort	net subtotal	# of months	% effort	net subtotal		
Faculty	Associate Professor	9 month base salary	3 months		0.00%	\$0		\$42,500	\$42,500	5.0%
Faculty	Professor	9 month base salary	.5 effort		0.00%	\$0		\$7,703	\$7,703	5.0%
Staff	(b)(6)									
Staff	Staff	12 month base salary	15% effort					\$20,191	\$20,191	4.0%
Students	Undergrads	Rate per hour \$10.00						\$14,000	\$14,000	
Students	CS grad students							\$18,459	\$18,459	3.5%
Subtotal, without fringe								\$102,853	\$102,853	
FAC	Fringe on Faculty				38.5%	\$0		\$19,579	\$19,579	
AP	Fringe on AP I and AP II				38.5%	\$0		\$0	\$0	
UG	Fringe on full-time undergraduates				9.0%	\$0		\$0	\$0	
RAA	Fringe on Research Associate A				9.0%	\$0		\$0	\$0	
RAB	Fringe on Research Associate B				24.5%	\$0		\$0	\$0	
RAC	Fringe on Research Associate C				38.5%	\$0		\$7,874	\$7,874	
Total fringe								\$27,454	\$27,454	
Subtotal, including fringe								\$130,307	\$130,307	
	Indirects on people	59.90%						\$78,054	\$78,054	
Direct materials										
Travel										
Conferences, Meetings and Coord								\$4,320	\$4,320	
No. of travelers								\$4,800	\$4,800	
No. of Trips								\$1,600	\$1,600	
No. of nights								\$1,600	\$1,600	
Airfare \$270										
4 Hotel \$300 / day										
4 Meals \$50 / day										
1 Mileage/tax/parking (\$60+\$20+\$20) \$100										
Capital equipment										
Breakdown of Equipment			Quantity	price each	subtotal	Quantity	price each	subtotal		
Participant Support Costs									\$0	
Other Direct Costs										
Materials and Supplies										
Publication Costs										
Conference Registration Fees										
Event and Meeting Costs										
Consultant Services										
Indirects on travel, supplies, other costs (NOT equipment or built)			59.90%		\$0			\$7,380	\$7,380	
Subawards/Contractual Costs										
Describe Product or Service										
Manag	(k)(2)							\$149,518	\$149,518	5.0%
RAND								\$305,709	\$305,709	
Mitre								\$300,000	\$300,000	
Colum								\$300,000	\$300,000	
Cornel								\$300,000	\$300,000	
Per Re								\$50,000	\$50,000	
Purdue								\$150,149	\$150,149	
Indian								\$220,977	\$220,977	
Brigham								\$326,256	\$326,256	
Subtotal								\$1,279,397	\$1,279,397	
Indirect on first \$25k each subcontract			59.90%		\$0			\$0	\$0	
Total directs								\$1,422,024	\$1,422,024	
Total indirects								\$85,433	\$85,433	
Total								\$1,507,457	\$1,507,457	

Budget Detailed Worksheets

I3P Proposal

Government FY07 funds - spend during Dartmouth FY07 and FY08

I3P Workshop - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08			Dartmouth FY09			Total
			# of months	Staff	Subtotal	# of months	Staff	Subtotal	
Faculty									
Staff									
Students									
Subtotal, without fringe					\$0		\$0	\$0	
Total fringe					\$0		\$0	\$0	
Subtotal, including fringe					\$0		\$0	\$0	
	Indirects on people	35.00%			\$0		\$0	\$0	
Direct materials		Computation						Total	
Travel									
#10 Critical Infrastructure Protection Conference									
	I3P Staff	Airfare \$500					\$2,000	\$2,000	
	No. of travelers	4 Hotel \$175 / day					\$3,500	\$3,500	
	No. of Trips	1 Meals \$50 / day					\$1,000	\$1,000	
	No. of nights	5 Message/tax/parking (\$60+\$20+\$20) \$100					\$400	\$400	
	Registration Fee	3 \$400 per fee					\$1,200	\$1,200	
#10 Critical Infrastructure Protection Conference									
	Students	Airfare \$500					\$1,500	\$1,500	
	No. of travelers	3 Hotel \$175 / day					\$2,100	\$2,100	
	No. of Trips	1 Meals \$50 / day					\$600	\$600	
	No. of nights	4 Message/tax/parking (\$60+\$20+\$20) \$100					\$300	\$300	
	Registration Fee	3 \$400 per fee					\$1,200	\$1,200	
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP11 (end of project workshop)									
	I3P Staff	Airfare \$800					\$1,500	\$1,500	
	No. of travelers	3 Hotel \$175 / day					\$1,575	\$1,575	
	No. of Trips	1 Meals \$60 / day					\$450	\$450	
	No. of nights	3 Message/tax/parking (\$60+\$20+\$20) \$100					\$300	\$300	
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP11 (end of project workshop)									
	Team Members	Airfare \$500					\$4,000	\$4,000	
	No. of travelers	8 Hotel \$175 / day					\$4,200	\$4,200	
	No. of Trips	1 Meals \$50 / day					\$1,200	\$1,200	
	No. of nights	3 Message/tax/parking (\$60+\$20+\$20) \$100					\$800	\$800	
#12 WESU 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008									
	I3P Staff	Airfare \$500					\$1,000	\$1,000	
	No. of travelers	2 Hotel \$175 / day					\$1,050	\$1,050	
	No. of Trips	1 Meals \$50 / day					\$300	\$300	
	No. of nights	3 Message/tax/parking (\$60+\$20+\$20) \$100					\$200	\$200	
#12 WESU 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008									
	Team Members	Airfare \$500					\$2,500	\$2,500	
	No. of travelers	5 Hotel \$175 / day					\$1,750	\$1,750	
	No. of Trips	1 Meals \$50 / day					\$500	\$500	
	No. of nights	2 Message/tax/parking (\$60+\$20+\$20) \$100					\$500	\$500	
#13 Insider Threat - (April 2008 - North Carolina)									
	I3P Staff	Airfare \$900					\$2,000	\$2,000	
	No. of travelers	4 Hotel \$175 / day					\$2,100	\$2,100	
	No. of Trips	1 Meals \$50 / day					\$600	\$600	
	No. of nights	3 Message/tax/parking (\$60+\$20+\$20) \$100					\$1,200	\$1,200	
#13 Insider Threat - (April 2008 - North Carolina)									
	Team Members	Airfare \$500					\$4,000	\$4,000	
	No. of travelers	8 Hotel \$175 / day					\$2,800	\$2,800	
	No. of Trips	1 Meals \$50 / day					\$800	\$800	
	No. of nights	2 Message/tax/parking (\$60+\$20+\$20) \$100					\$1,600	\$1,600	
#13 Insider Threat - (April 2008 - North Carolina)									
	Students	Airfare \$500					\$1,500	\$1,500	
	No. of travelers	3 Hotel \$175 / day					\$1,050	\$1,050	
	No. of Trips	1 Meals \$50 / day					\$300	\$300	
	No. of nights	2 Message/tax/parking (\$60+\$20+\$20) \$100					\$300	\$300	
#14 Insider Threat - BP11 (end of Project) - Spring 2009 - DC area									
	I3P Staff	Airfare \$500					\$2,000	\$2,000	
	No. of travelers	4 Hotel \$175 / day					\$2,100	\$2,100	
	No. of Trips	1 Meals \$50 / day					\$600	\$600	
	No. of nights	3 Message/tax/parking (\$60+\$20+\$20) \$100					\$1,200	\$1,200	
#14 Insider Threat - BP11 (end of Project) - Spring 2009 - DC area									
	Team Members	Airfare \$500					\$4,000	\$4,000	
	No. of travelers	8 Hotel \$175 / day					\$2,800	\$2,800	
	No. of Trips	1 Meals \$50 / day					\$800	\$800	
	No. of nights	2 Message/tax/parking (\$60+\$20+\$20) \$100					\$1,600	\$1,600	
#14 Insider Threat - BP11 (end of Project) - Spring 2009 - DC area									
	Students	Airfare \$500					\$1,500	\$1,500	
	No. of travelers	3 Hotel \$175 / day					\$1,050	\$1,050	
	No. of Trips	1 Meals \$50 / day					\$300	\$300	

I3P Workshop - Budget Period III

Dates:

April 1, 2008 to March 31, 2009

Dartmouth FY08

Dartmouth FY09

		Quantity	Price each	subtotal	Quantity	Price each	subtotal
No. of nights		2	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$300
							\$300
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days							
Students			Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day		\$1,575			\$1,575
No. of Trips	1	Meals \$50 / day		\$450			\$450
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100		\$300			\$300
Registration Fee	3	\$250 per fee		\$750			\$750
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (week overnight)							
I3P Staff			Airfare \$500				\$2,000
No. of travelers	4	Hotel \$175 / day		\$2,100			\$2,100
No. of Trips	1	Meals \$50 / day		\$600			\$600
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100		\$400			\$400
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (week overnight)							
Team members			Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day		\$1,050			\$1,050
No. of Trips	1	Meals \$50 / day		\$300			\$300
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100		\$300			\$300
#17 Business Rationale - (end of Project) - Spring 2009 - TBA							
I3P Staff			Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day		\$1,575			\$1,575
No. of Trips	1	Meals \$50 / day		\$450			\$450
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100		\$900			\$900
#17 Business Rationale - (end of Project) - Spring 2009 - TBA							
Team Members			Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day		\$1,050			\$1,050
No. of Trips	1	Meals \$50 / day		\$300			\$300
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100		\$600			\$600
Capital equipment							
Breakdown of Equipment							
Participation Support Costs							
Other Direct Costs							
Materials and Supplies							
Supplies for Workshop #10	60	\$10/person		\$600			\$600
Supplies for Workshop #11	60	\$10/person		\$800			\$800
Supplies for Workshop #12	50	\$10/person		\$500			\$500
Supplies for Workshop #13	40	\$10/person		\$400			\$400
Supplies for Workshop #14	40	\$10/person		\$400			\$400
Supplies for Workshop #15	100	\$10/person		\$1,000			\$1,000
Supplies for Workshop #16	40	\$10/person		\$400			\$400
Supplies for Workshop #17	40	\$10/person		\$400			\$400
Budget Period III Supplies							
Workshop registration software	3	\$250		\$750			\$750
Conference calls for planning				\$508			\$508
Publication Costs							
Conference Registration Fees							
Event and Meeting Costs							
#10 Critical Infrastructure Protection Conference (2.5 days, 60 people, 3 dinners, 1 room) - Dartmouth Spring 2009							
Food for event	60	Meals (\$70/ day)		\$10,500			\$10,500
Dinners	60	\$70/day - 3 days		\$12,600			\$12,600
Set-up room fee for event		\$2,000 per meeting (essels, markers, tele conf, etc.)		\$2,000			\$2,000
Room rental fee for event		\$3,000 per meeting		\$3,000			\$3,000
A/V equipment for event		\$4,000 per meeting		\$4,000			\$4,000
Printing		Session information and documents to distribute		\$1,000			\$1,000
Promotional Materials		Invitations, posters, brochures, advertising		\$1,500			\$1,500
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP III (end of project workshop) - 1 day, 60 people, 1 room							
Food for PCS Workshop	60	Meals (\$60/ day)		\$6,400			\$6,400
Set-up room fee for event		\$2,000 per meeting (essels, markers, tele conf, etc.)		\$2,000			\$2,000
Room rental for workshop		\$3,000 per meeting		\$3,000			\$3,000
A/V equipment for workshop		\$5,000 per meeting		\$5,000			\$5,000
Postage		\$150 for materials to and from venue		\$300			\$300
Printing		Print session information 120 at \$2 per copy		\$240			\$240
		Printing/burning of CD's with label - 120 at \$3 each		\$360			\$360
Promotional Materials		Invitations, posters, brochures, advertising		\$1,500			\$1,500
#12 WESH 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008							
Food for event	50	Meals (\$90/ day)		\$4,500			\$4,500
Set-up room fee for event		\$2,000 per meeting (essels, markers, tele conf, etc.)		\$2,000			\$2,000
Room rental fee for event		\$3,000 per meeting		\$3,000			\$3,000
A/V equipment for event		\$5,000 per meeting		\$5,000			\$5,000
Postage		\$150 for materials to and from venue		\$300			\$300
Promotional Materials		Invitations, posters, brochures, advertising		\$1,500			\$1,500

IJP Workshop - Budget Period III
 Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08

Dartmouth FY09

#13 Insider Threat - (April 2008 - North Carolina) - 1 day, 40 people, 1 dinner, 1 room									
Food for PCS Workshop	40 Meals (\$80/day)						\$3,200	\$3,200	
Dinner	40 \$70/day - 1 day						\$2,800	\$2,800	
Set-up room fee for event	\$2,000 per meeting (essels, markers, tele conf, etc.)						\$2,000	\$2,000	
Room rental for workshop	\$3,000 per meeting						\$3,000	\$3,000	
AV equipment for workshop	\$5,000 per meeting						\$5,000	\$5,000	
Postage	\$150 for materials to and from venue						\$300	\$300	
Printing	Print session information 120 at \$2 per copy						\$240	\$240	
	Printing/burning of CD's with label - 120 at \$3 each						\$360	\$360	
Promotional Materials	Invitations, posters, brochures, advertising						\$1,500	\$1,500	
#14 Insider Threat - BPIII (end of Project) - Spring 2009 - DC area- 1 day, 40 people, 1 room									
Food for PCS Workshop	40 Meals (\$90/day)						\$3,600	\$3,600	
Set-up room fee for event	\$2,000 per meeting (essels, markers, tele conf, etc.)						\$2,000	\$2,000	
Room rental for workshop	\$4,000 per meeting						\$4,000	\$4,000	
AV equipment for workshop	\$5,000 per meeting						\$5,000	\$5,000	
Postage	\$150 for materials to and from venue						\$300	\$300	
Printing	Print session information 120 at \$2 per copy						\$240	\$240	
	Printing/burning of CD's with label - 120 at \$3 each						\$360	\$360	
Promotional Materials	Invitations, posters, brochures, advertising						\$1,500	\$1,500	
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days, 100 people									
Food for PCS Workshop	100 Meals (\$80/day)						\$20,000	\$20,000	
Set-up room fee for event	\$2,000 per meeting						\$4,000	\$4,000	
AV equipment for workshop	\$4,000 per meeting						\$8,000	\$8,000	
Postage	\$150 for materials to and from venue						\$300	\$300	
Printing	Print session information 120 at \$2 per copy						\$240	\$240	
Promotional Materials	Invitations, posters, brochures, advertising						\$1,500	\$1,500	
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (tuck overnight) - 1 day, 40 people, 1 room									
Food for event	40 Meals (\$80/day)						\$3,200	\$3,200	
Dinner	40 \$70/day - 1 day						\$2,800	\$2,800	
Set-up room fee for event	\$2,000 per meeting (essels, markers, tele conf, etc.)						\$2,000	\$2,000	
Room rental for event	\$4,000 per meeting						\$4,000	\$4,000	
AV equipment for event	\$4,000 per meeting						\$4,000	\$4,000	
Postage	\$150 for materials to and from venue						\$300	\$300	
Promotional Materials	Invitations, posters, brochures, advertising						\$1,500	\$1,500	
#17 Business Roundtable - (end of Project) - Spring 2009 - TBA - 1.5 days, 40 people, 1 dinner, 1 room									
Food for PCS Workshop	40 Meals (\$90/day)						\$5,400	\$5,400	
Dinner	40 \$70/day - 1 day						\$2,800	\$2,800	
Set-up room fee for event	\$2,000 per meeting (essels, markers, tele conf, etc.)						\$2,000	\$2,000	
Room rental for workshop	\$4,000 per meeting						\$4,000	\$4,000	
AV equipment for workshop	\$5,000 per meeting						\$5,000	\$5,000	
Postage	\$150 for materials to and from venue						\$300	\$300	
Printing	Print session information 120 at \$2 per copy						\$240	\$240	
Promotional Materials	Invitations, posters, brochures, advertising						\$1,500	\$1,500	
Budget Period I Supplement 1							(\$19,500)	(\$19,500)	
Consultant Services									
#10 Critical Infrastructure Protection Conference									
Speakers	Airfare \$500						\$1,500	\$1,500	
No. of travelers	3 Hotel \$175 / day						\$1,575	\$1,575	
No. of Trips	1 Meals \$50 / day						\$450	\$450	
No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100						\$300	\$300	
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BPIII (end of project workshop)									
Speakers	Airfare \$500						\$1,000	\$1,000	
No. of travelers	2 Hotel \$175 / day						\$700	\$700	
No. of Trips	1 Meals \$50 / day						\$200	\$200	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100						\$200	\$200	
#12 WESII 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008									
Speakers	Airfare \$500						\$1,000	\$1,000	
No. of travelers	2 Hotel \$175 / day						\$700	\$700	
No. of Trips	1 Meals \$50 / day						\$200	\$200	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100						\$200	\$200	
#13 Insider Threat - (April 2008 - North Carolina)									
Speakers	Airfare \$500						\$1,000	\$1,000	
No. of travelers	2 Hotel \$175 / day						\$700	\$700	
No. of Trips	1 Meals \$50 / day						\$200	\$200	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100						\$200	\$200	
#14 Insider Threat - BPIII (end of Project) - Spring 2009 - DC area									
Speakers	Airfare \$500						\$1,000	\$1,000	
No. of travelers	2 Hotel \$175 / day						\$700	\$700	
No. of Trips	1 Meals \$50 / day						\$200	\$200	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100						\$200	\$200	
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days									
Speakers	Airfare \$500						\$1,000	\$1,000	
No. of travelers	2 Hotel \$175 / day						\$700	\$700	
No. of Trips	1 Meals \$50 / day						\$200	\$200	
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100						\$200	\$200	
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (tuck overnight)									
Speakers	Airfare \$500						\$1,000	\$1,000	
No. of travelers	2 Hotel \$175 / day						\$700	\$700	
No. of Trips	1 Meals \$50 / day						\$200	\$200	

I3P Workshop - Budget Period III

Dates:

April 1, 2008 to March 31, 2009

Dartmouth FY08

Dartmouth FY09

		Dartmouth FY08	Dartmouth FY09			
	No. of nights 2	Mileage/tax/parking (\$60+\$20+\$20) \$100			\$200	\$200
#17 Business Rationale - (end of Project) - Spring 2009 - TBA						
Speakers		Airfare \$500			\$1,000	\$1,000
	No. of travelers 2	Hotel \$175 / day			\$700	\$700
	No. of Trips 1	Meals \$50 / day			\$200	\$200
	No. of nights 2	Mileage/tax/parking (\$60+\$20+\$20) \$100			\$200	\$200
Indirects on travel, supplies, other costs (NOT equipment or tuition)		35.00%	\$0		\$85,641	\$85,641
Subawards/Contractual Costs		Base price				Total
Describe Product or Service			\$0		\$0	\$0
Industry Sessions, 3 in BP III						
	Sandia National Labs	2 for staff time, travel and shipping			\$60,000	\$60,000
	SRI International	1 for staff time, travel and shipping			\$24,968	\$24,968
Sponsoring workshops and conferences (1 at \$5,000 each)					\$5,000	\$5,000
Subtotal					\$89,968	\$89,968
Indirect on first \$25k each subcontract		35.00%	\$0		\$10,489	\$10,489
Total directs			\$0		\$334,656	\$334,656
Budget Period 1 Supplemental amounts					(512,599)	(512,599)
Total indirects			\$0		\$96,130	\$96,130
Total			\$0		\$418,187	\$418,187

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

I3P Process Control Systems - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08			Dartmouth FY09			Total
			# of months	ad % effort	net % effort subtotal	# of months	ad % effort	net % effort subtotal	
Faculty									
Staff									
Students									
Subtotal, without fringe					\$0		\$0	\$0	
Total fringe					\$0		\$0	\$0	
Subtotal, including fringe					\$0		\$0	\$0	
Indirects on people		59.90%			\$0		\$0	\$0	
Direct materials	Computation							Total	
Travel									
Capital equipment									
Breakdown of Equipment			Quantity	rice each	subtotal	Quantity	rice each	subtotal	
Participant Support Costs								\$0	
Other Direct Costs									
Materials and Supplies									
Publication Costs									
Conference Registration Fees									
Event and Meeting Costs									
Consultant Services									
Indirects on travel, supplies, other costs (NOT equipment or tu		59.90%			\$0		\$0	\$0	
Subawards/Contractual Costs	Base price							Total	
Describe Product or Service:					\$0		\$0	\$0	
(b)(6)							\$77,044	\$77,044	
							\$356,275	\$356,275	
							\$150,000	\$150,000	
							\$239,500	\$239,500	
							\$448,600	\$448,600	
							\$199,818	\$199,818	
							\$200,000	\$200,000	
							\$250,000	\$250,000	
							\$100,000	\$100,000	
							\$2,021,237	\$2,021,237	
Subtotal					\$0		\$2,021,237	\$2,021,237	
Indirect on first \$25k each subcontract		59.90%			\$0		\$0	\$0	
Total directs					\$0		\$1,669,330	\$1,669,330	
Total indirects					\$0		\$0	\$0	
Total					\$0		\$1,669,330	\$1,669,330	

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

I3P Business Rationale - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total
			# of months	% effort	net effort	subtotal	# of months	% effort	net effort	subtotal	
Faculty											
FAC-FA	(b)(6)	9 month base salary	1/9 effort		\$10,096				\$13,832	\$23,928	
FAC-FA		12 month base salary	3 months		\$0				\$37,856	\$37,856	
Staff RA	(b)(6)	12 month base salary	100% effort		\$25,310				\$75,929	\$101,238	
Students		Rate per hour				hours					
UG/Tuck Graduate Student		\$26.00			\$2,000	480.00			\$10,480	\$12,480	
Subtotal, without fringe					\$37,406			\$138,097	\$175,502		
FAC	Fringe on Faculty			38.5%	\$0		39.0%	\$14,764	\$14,764		
UG	Fringe on full-time undergraduates			9.0%	\$180		9.0%	\$943	\$943	\$1,123	
RAC	Fringe on full-time undergraduates			38.5%	\$9,744		39.0%	\$29,612	\$39,356	\$39,356	
FAC-L	Fringe on Faculty - lower rate			27.0%	\$2,726		28.0%	\$3,873	\$6,599	\$6,599	
Total fringe					\$12,650			\$49,192	\$61,842		
Subtotal, including fringe					\$50,056			\$187,289	\$237,344		
	Indirects on people	59.90%			\$29,983			\$112,186	\$142,169	\$142,169	
Direct materials											
Computation											
Travel											
	Travel to partners	20 trips at \$1,000 per trip per year						\$20,000	\$20,000	\$30,000	
Capital equipment											
	Breakdowns of Equipment		Quantity rice each		subtotal	Quantity rice each		subtotal		\$0	
Participant Support Costs											
Other Direct Costs											
Materials and Supplies											
Publication Costs											
Conference Registration Fees											
Event and Meeting Costs											
Consultant Services											
	Indirects on travel, supplies, other costs (NOT equipmer)	59.90%			\$0			\$11,980	\$11,980	\$11,980	
Subawards/Contractual Costs											
Base price											
	Manag U of V RAND Univer	(b)(6)						\$125,000	\$125,000	\$125,000	
	Univer							\$650,000	\$650,000	\$650,000	
	Evans							\$174,450	\$174,450	\$174,450	
								\$143,441	\$143,441	\$143,441	
								\$496,317	\$496,317	\$496,317	
Subtotal					\$0			\$496,317	\$496,317	\$496,317	
	Indirect on first \$25k each subcontract	59.90%						\$0	\$0	\$0	
Total directs					\$50,056			\$703,606	\$753,661	\$753,661	
Total indirects					\$29,983			\$124,166	\$154,149	\$154,149	
Total					\$80,039			\$827,771	\$907,810	\$907,810	

Budget Detailed Worksheets

I3P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

I3P Assessable Identity - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08			Dartmouth FY09			Total
			# of months	at % effort	net % effort subtotal	# of months	at % effort	net % effort subtotal	
Faculty									
Staff									
Students									
Subtotal, without fringe					\$0			\$0	
Total fringe					\$0			\$0	
Subtotal, including fringe					\$0			\$0	
	Indirects on people	59.90%			\$0			\$0	
Direct materials			Computation			Total			
	Travel								
	Capital equipment								
	Breakdown of Equipment		Quantity	price each	subtotal	Quantity	price each	subtotal	
	Participant Support Costs								
Other Direct Costs									
	Materials and Supplies								
	Publication Costs								
	Conference Registration Fees								
	Event and Meeting Costs								
	Consultant Services								
	Indirects on travel, supplies, other costs (NOT equipment)	59.90%			\$0			\$0	
Subawards/Contractual Costs			Base price			Total			
	Describe Product or Service				\$0			\$0	
	(b)(6)							\$100,000	
								\$300,000	
								\$300,000	
								\$299,772	
								\$200,000	
								\$150,000	
								\$154,585	
								\$5641,354	
Subtotal					\$0			\$863,003	
	Indirect on first \$25k each subcontract	59.90%			\$0			\$0	
Total directs					\$0			\$863,003	
Total indirects					\$0			\$0	
Total					\$0			\$863,003	

Budget Detailed Worksheets

Institute for Security Technology Studies Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total	Inflation	
			# of months	rate	# of staff	total	# of months	rate	# of staff	total			
Faculty													
FAC	DIS	9 month base salary	\$165,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$38,500	\$38,500	5.0%
FAC	DIS	5 month base salary	\$125,696	0.50	100%	10.00%	\$12,570	2.25	100%	45.00%	\$59,391	\$71,961	5.0%
FAC	DF	9 month base salary	\$143,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$33,367	\$33,367	5.0%
FAC	Me	9 month base salary	\$141,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$32,900	\$32,900	5.0%
FAC	SIS	9 month base salary	\$132,000	0.00	100%	0.00%	\$0	2.25	100%	25.00%	\$34,650	\$34,650	5.0%
FAC	IRI	9 month base salary	\$189,000	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$22,050	\$22,050	5.0%
FAC	DIS	9 month base salary	\$129,000	0.00	100%	0.00%	\$0	4.00	100%	44.44%	\$57,333	\$57,333	0.0%
	DIS							-0.50			(\$8,750)	(\$8,750)	
	DVF							-0.25			(\$3,500)	(\$3,500)	
	Me							-0.50			(\$17,514)	(\$17,514)	
	Me							-0.50			(\$7,642)	(\$7,642)	
	IRI							-0.50			(\$7,000)	(\$7,000)	
	IRI							-0.25			(\$4,667)	(\$4,667)	
Staff													
AP	DIS	12 month base salary	\$72,119	3.00	100%	25.00%	\$18,030	3.00	100%	25.00%	\$18,751	\$36,781	4.0%
RAB	DIS	12 month base salary	\$67,500	3.00	50%	12.50%	\$8,438	6.00	80%	40.00%	\$28,080	\$36,518	4.0%
RAB	DIS	12 month base salary	\$67,500	3.00	50%	12.50%	\$8,438	3.00	100%	25.00%	\$17,550	\$25,988	4.0%
RAC	DIS	12 month base salary	\$105,160	1.50	100%	12.50%	\$13,145	7.00	100%	58.33%	\$64,411	\$77,556	5.0%
AP	DIS	12 month base salary	\$65,100	3.00	100%	25.00%	\$16,275	6.00	100%	50.00%	\$34,178	\$50,275	5.0%
AP	DIS	12 month base salary	\$65,000	3.00	100%	25.00%	\$16,250	6.00	100%	50.00%	\$34,125	\$50,250	5.0%
AP	DIS	12 month base salary	\$65,100	3.00	25%	6.25%	\$4,069	1.00	25%	2.08%	\$1,411	\$5,479	4.0%
AP	DV	12 month base salary	\$44,124	3.00	100%	25.00%	\$11,031	9.00	100%	75.00%	\$34,417	\$45,448	4.0%
RAB	Me	12 month base salary	\$67,000	3.00	100%	25.00%	\$16,750	2.00	100%	16.67%	\$11,613	\$28,363	4.0%
RAB	Me	12 month base salary	\$70,304	3.00	100%	25.00%	\$17,576	0.00	0%	0.00%	\$0	\$17,576	4.0%
RAB	Me	12 month base salary	\$67,200	3.00	100%	25.00%	\$16,800	4.00	100%	33.33%	\$23,296	\$40,096	4.0%
AP	Me	12 month base salary	\$78,500	3.00	100%	25.00%	\$19,625	1.00	100%	8.33%	\$6,803	\$26,428	4.0%
RAC	Me	12 month base salary	\$67,000	3.00	100%	25.00%	\$16,750	2.00	100%	16.67%	\$11,613	\$28,363	4.0%
RAC	Me	12 month base salary	\$75,000	3.00	100%	25.00%	\$18,750	2.50	100%	20.83%	\$16,250	\$35,000	4.0%
RAC	SIS	12 month base salary	\$138,646	1.00	25%	2.08%	\$2,888	0.00	0%	0.00%	\$0	\$2,888	4.0%
RAB	SIS	12 month base salary	\$67,500	1.00	50%	4.17%	\$2,813	0.00	0%	0.00%	\$0	\$2,813	4.0%
AP	SIS	12 month base salary	\$40,000	1.00	20%	1.67%	\$667	0.00	0%	0.00%	\$0	\$667	4.0%
RAB	SIS	12 month base salary	\$67,500	3.00	50%	13%	\$8,438	8.00	20%	10%	\$7,020	\$15,458	4.0%
RAB	IRI	12 month base salary	\$70,000	3.00	100%	25.00%	\$17,500	6.50	100%	54.17%	\$39,433	\$56,933	4.0%
RAB	IRI	12 month base salary	\$60,000	1.00	100%	8.33%	\$5,000	9.00	100%	75.00%	\$46,800	\$51,800	4.0%
RAB	PK	12 month base salary	\$67,600	3.00	100%	25.00%	\$16,900	9.00	100%	75.00%	\$52,728	\$69,628	4.0%
RAC	PK	12 month base salary	\$138,646	2.50	50%	10.42%	\$14,442	9.00	50%	37.50%	\$54,072	\$68,514	4.0%
RAB	HBS TBD (postdoc)	12 month base salary	\$67,500	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	4.0%
	Metro Post-docs Budget Period II Supplement										(\$117,950)	(\$117,950)	
	DIST Post-docs Budget Period II Supplement										(\$50,550)	(\$50,550)	
	DIST Post-docs Budget Period II Supplement										(\$56,448)	(\$56,448)	
Students													
	DIST Undergrads	Rate per hour \$10.00		10.00	10	#students 3.5	\$3,500	10.00	8	#students 2	\$1,600	\$5,100	
		Mo. Salary			#months	#students			#months	#students			
	DIST CS grad students	\$1,992			3	1.0	\$5,976		0	1.0	\$0	\$5,976	5.0%
	DIST CS grad students	\$1,992			3	1.0	\$5,976		0.5	1.0	\$1,046	\$7,022	5.0%
	DIST Thayer grad students	\$2,102			3	2.0	\$12,612		6	2.0	\$26,485	\$39,097	5.0%
	DVF CS grad students	\$1,992			3	1	\$5,976		8	1	\$16,733	\$22,709	5.0%
	Metro CS grad students	\$1,992			2	1	\$3,984		6	1	\$12,550	\$16,534	5.0%
	SISMAT CS grad students (summer-school to	\$1,992			1	1	\$1,992		1	1	\$2,092	\$4,084	5.0%
	UG SISMAT Undergrad (Non profit student stipen	\$1,992			0	0	\$0		2	3	\$12,550	\$12,550	5.0%
	IRIDOE CS grad students	\$1,992			3	0.5	\$2,988		9	1.0	\$18,824	\$21,812	5.0%
	IRIDOE WISP Interns	\$345			3	1	\$1,035		3	2	\$2,070	\$3,105	
	AC Thayer grad students	\$2,102			2.5	1	\$5,255		4	1	\$8,828	\$14,083	5.0%
	HBS EE student, as lab tech		0.00		10.00	5	\$500	10.00	5	1	\$500	\$1,000	
	HBS CS grad students	\$1,992			0	1.0	\$0		4	1.0	\$7,321	\$7,321	5.0%
	Metro Thayer grad students	\$2,102			3	1	\$6,306		6	1	\$13,243	\$19,549	5.0%
	Metro Students Budget Period II Supplement										(\$74,289)	(\$74,289)	
Subtotal, without fringe							\$339,243			\$556,272	\$895,515		
FAC	Fringe on Faculty					38.5%	\$4,839			39.0%	\$108,495	\$113,334	
AP	Fringe on AP I and AP II					38.5%	\$33,089			39.0%	\$50,577	\$83,666	
UG	Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$1,129	\$1,129	
RAA	Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	\$0	
RAB	Fringe on Research Associate B					24.5%	\$29,069			24.5%	\$55,498	\$84,567	
RAC	Fringe on Research Associate C					38.5%	\$25,401			39.0%	\$57,075	\$82,476	
	Fringe Budget Period II Supplement										(\$99,080)	(\$99,080)	
Total fringe							\$92,399			\$173,693	\$266,892		
Subtotal, including fringe							\$431,641			\$729,966	\$1,161,607		
	Indirects on people		59.90%				\$258,553				\$437,249	\$695,803	

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

		Dartmouth FY08		Dartmouth FY09					
Publication Costs									
<u>ALL Conference Registration Fees</u>		5	\$800	\$4,000	4	\$800	\$3,200	\$7,200	
<i>(Cost Fees Budget Period II Supplement)</i>							(42,500)	(42,500)	
Event and Meeting Costs									
SISMAT Summer-school for students		10 students for 2 weeks							
	Travel	350	\$350 modest travel allowance	10		10		\$3,500	
	Sustenance	510	\$310/week housing and \$200/week food	20		20		\$10,200	
	Other	100	Supplies & space cost per student \$100	10		10		\$1,000	
SISMAT Summer-school for professors		10 profs. for 2 weeks							
	Travel	500	\$500 modest travel allowance	5		10		\$2,500	
	Sustenance	510	\$310/week housing and \$200/week food	20		20		\$10,200	
	Other	0	Supplies & space cost per student \$100	0		0		\$0	
Consultant Services									
SISMAT Summer-school instructor (course development)		1	\$250	\$250				\$250	
SISMAT Consultant Travel			Airfare \$500	\$500				\$500	
	No. of travelers	1	Hotel \$175 / day	\$525				\$525	
	No. of Trips	1	Meals \$50 / day	\$150				\$150	
	No. of nights	3	Mileage/taxi/parking (\$80+\$20+\$20) \$100	\$100				\$100	
HB	(b)(6) training and seminars						\$10,000	\$10,000	
HBS Consultant Travel			Airfare \$500	\$500				\$500	
	No. of travelers	1	Hotel \$175 / day	\$875				\$875	
	No. of Trips	1	Meals \$50 / day	\$250				\$250	
	No. of nights	5	Mileage/taxi/parking (\$80+\$20+\$20) \$100	\$100				\$100	
Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%		\$43,162			\$1,239	\$44,401	
Subawards/Contractual Costs		Base price						Total	Inflation
DIST UMass (4/1/08-8/31/08 1 RA. (b)(6))				\$0			\$44,566	\$44,566	
<i>(DIST U Mass Budget Period II Supplement)</i>							(15,799)	(15,799)	
Subtotal				\$0			\$29,566	\$29,566	
Indirect on first \$25k each subcontract		59.90%					\$0	\$0	
Total directs				\$527,129			\$769,841	\$1,296,970	
Total indirects				\$301,715			\$438,489	\$748,203	
Total				\$828,844			\$1,208,329	\$2,037,173	

**Comments on the I3P/ISTS Budget Period III Project
Cyber Security Collaboration and Information Sharing Project**

March 21, 2008 responses

(b)(6) **ISTS overview**

1. Pg. 4, Paragraph 2. RABS were comprised to review initiatives 2, 4, 5, and 6. Why weren't they comprised to review initiatives 7 and 8? I would like more extensive program reviews for the ISTS projects.

RESPONSE: The ISTS projects were externally reviewed in Dec 2006 through a rigorous review process. This process was outlined in the Jan 2007 BPII proposal. In December 2007, a formal 1-year review was performed by (b)(6) along with the NCS D program manager Rick Harris and DHS representative, Brenda Oldfield. Given the size of the ISTS projects, it did not seem that a full external review panel was necessary.

2. Pg. 5, Paragraph 2. Why will the Exec Dir for ISTS not be appointed until June 2008?

RESPONSE (b)(6) appointment as Executive Director ended December 31, 2007. The Provost Office is working on the best way to govern ISTS. (b)(6) is acting to oversee ISTS in his role a Vice-Provost of Research, until a permanent solution is found. Until that time (b)(6) remains Co-PI on this grant and co-manages the ISTS projects

(b)(6) **Fellowship**

3. Pg. 7, paragraph 4. Have the fellows visited DHS and the national laboratories? Have the mid-term and final reports for the fellows been submitted to DHS?

RESPONSE: It is not a requirement of the program that the fellows visit DHS and the National Labs. They are certainly encouraged to do so. The fellows who are currently funded through NCS D have not submitted their mid term reports yet (they started in Summer and Fall 2007), we expect them soon. We can certainly share with you the reports of fellows funded under the previous grant if you wish.

4. Pg. 8, paragraph 2. Have the scholars been selected for BP II?

RESPONSE: The scholar program is a new addition to our educational initiative for BPIII. A call for scholar applications has gone out. Applications are due to the I3P in late April with review and selections made by the education committee in early May.

5. Pg., 9, Schedule: Is the schedule on target? For example, has the I3P Fellowship Subcommittee been appointed and have applications been received?

RESPONSE: There is a standing education subcommittee to review fellowship applications. 18 applications were received in February. A review of the applications is taking place as part of the March 20/21 consortium meeting at NIST. The schedule is on target.

6. Pg. 10, Evaluation. Has a program evaluation of the Fellowship Program been initiated? (The proposal states the evaluation will be initiated at the end of BP II.)

RESPONSE: The program evaluation will take place at the end of BPII. It is anticipated that the evaluation will begin in late April of 2008.

7. Pg. 11, Program Schedule. Is the schedule accurate?

RESPONSE: The schedule is accurate and was accepted by DHS in our original proposal. We realize we will have to address the end date of this part of the program during the beginning of BP III.

8. Pg. 11, Evaluation. Has DHS been consulted in the evaluation process?

RESPONSE: Brenda Oldfield of DHS has been included as part of the I3P's education subcommittee. She was invited to participate in the review of the current round of fellowship applications.

(b)(6)

Human Behavior, Insider Threat and Awareness

9. Pg. 12, first paragraph. It is not clear how the two characterizations assist managers in responding appropriately to prevent untoward activities or mitigation of their effects.

RESPONSE: The paragraph reads as follows: "A major thrust of BP II of the Human Behavior, Awareness, and Insider Threat project was development of a detailed understanding of the nature of the insider threat. Project researchers built a taxonomy of insider activity, based on characteristics such as intent, motivation, and whether de facto and de jure policy were broken or implemented improperly. Accompanying the actions taxonomy is a characterization of possible responses. In concert, the two characterizations assist managers in responding appropriately to prevent untoward activities or mitigation of their effects. In BP III, each project partner will use the characterizations to define not only what aspects of the insider problem are being addressed, but also what is left to future research."

It is tempting to suggest a one-size-fits-all approach to insider threat, and to insist on complete prevention. The reality suggests otherwise. Some insider problems are significant: serious in intention, serious in impact. Others are relatively benign: insiders circumvent security in order to get their jobs done. Indeed, sometimes there is good reason to subvert the security, as when an unauthorized insider acts like an authorized one in order to access medical records and save a life. So the taxonomy links the over thirty different characterizations of insiders to appropriate responses, allowing managers to focus their limited resources on the more serious threats.

10. Pg. 12, second paragraph. It is not clear how the various data collection methods will provide a lightweight, robust, and scalable event processing infrastructure that can be deployed in a range of at-risk enterprises. How are the data collection methods applicable to real world environments?

RESPONSE: "Two primary areas of inquiry will focus and integrate the proposed activities of each project partner: technology exploration and environmental constraints. The first area addresses the need for base technologies to monitor insider behavior, coupled with behavioral descriptions of suspicious, inappropriate or illegitimate events or activities. Because data are usually not available to assist researchers in understanding common insider actions (or sequences of actions), project partners are generating data in several ways: by examining trends in the federal government's Suspicious Activity Reports about misuse of position, by monitoring student behavior at a large university, by planting "honeypots" such as credit card numbers on the Web and watching how and where they travel, and by running "capture the flag" exercises with volunteers who try to steal the information. In combination, the technology and monitoring will provide a lightweight, robust,

and scalable event processing infrastructure that can be deployed in a range of at-risk enterprises (e.g. the U.S. military, banks, chemical plants and refineries, and border and port security systems)."

Using the taxonomy, which separates various kinds of insiders into over 30 different characterizations, the proposed data collection methods will help us to understand how many of the different characterizations tend to act. For instance, insider types that are not malicious but are subverting security to get their jobs done may act differently from malicious people who are trying to hide their activities. The taxonomy plus insight from the described behavioral analysis will lead to guidelines for responses to each of the 30+ types, some of which have to do with mitigation and prevention, and others of which may suggest that, because the effects of the insider activities are relatively benign, only mild punishment is necessary. That is, the characterization plus behavioral analysis will enable institutions to perform trade-off analysis between the cost of (before the fact) prevention vs. the cost of (after the fact) mitigation or punishment.

With respect to data collection reflecting real-world environments: Given that organizations have been unwilling to be direct and forthcoming with us, we are proposing our approach as a less-than-optimal but still effective alternative. One of the foci of our two remaining workshops is to present our findings and hypotheses to industry participants and get feedback from them on how realistic they are.

11. Pg. 14, paragraphs two and three. What components of Cayuga, QuickSilver and NightWatch will be available to the Federal government? Cayuga and QuickSilver are not defenses as stated in the third paragraph. What is the rationale for using an epidemiology-based technique for generating probability distributions?

RESPONSE: All the systems cited here were funded under government research programs, hence the US government has worldwide non-exclusive, no-fee licenses on these systems. These can't be transferred, but they guarantee that the government can use these technologies in their current form without concerns. However, no support is provided by Cornell for these systems. Were a system like Quicksilver to be placed into a production setting, some kind of support arrangement would have to be negotiated. In practice we have a number of users today for Cayuga and Quicksilver and in fact we do support them, but the level of support is not up to what one might call a professional product standard. Our users are mostly engaged in research and the systems being constructed are mostly pre-production prototypes and proof-of-concept applications.

It is important to note that all these systems are components of a larger defense system: Cayuga can be configured to look for certain patterns of behavior; while Quicksilver can disseminate notifications of detections available to subscribers. NightWatch can detect compromise in these (and other) services. It does so by generating probability distributions of normal behavior and detecting anomalies. The underlying protocol used by NightWatch is epidemic--- it is by far the most robust approach to build robust decentralized services. The intuition is that some of the protocols in question are based on pseudo-random peer-to-peer communication patterns, in which nodes pick partners at random and exchange data with them. This pattern is very difficult for an attacker to defeat and will tend to overcome even severe communication outages. The associated mathematics turns out to be closely related to the mathematical theories used to predict the spread of infections in biological populations, and we've drawn heavily on that prior work -- a fascinating example of results

that can be used in a very different domain than the one for which they were originally conceived!

As a simple example, suppose that my machine "knows" about event E. When it interacts with your machine (via "gossip"), your machine will become infected: now two machines know about E. Then four, then eight, etc. We see that a simple exponential arises and, modulo re-infection, the information spreads in time $\log(N)$ if our system has N nodes. We're finding that we can "shape" such distributions (a bit like what might happen in populations where some subgroups have genetic resistance to a pathogen), that we can use randomness to achieve remarkable levels of robustness (the exponential still holds even if high rates of message loss are occurring), and that we can use these mechanisms to build robust higher-level functionality. For example, much of our work is concerned with using aggregation techniques to obtain robust probabilistic estimates of population statistics with bounded delay. Interestingly, the load imposed on participating nodes is usually a constant, and the local loads imposed on regions of the network are typically bounded and very low.

In massive networks, these kinds of probabilistic techniques seem to hold tremendous promise for progress, offering us a way to monitor hundreds of thousands or even millions of participants, to share data rapidly and robustly, to dynamically sense conditions and automatically repair damage, etc. The potential is simply enormous -- a very exciting and rapidly advancing area of study. It is entirely possible that the next generation of the Internet will gain robustness against problems like DDoS attacks by exploiting these sorts of tools.

12. Pg. 15, paragraph 1. How does Nysiad address exfiltration of data and zero-day attacks?
RESPONSE: Nysiad does not address exfiltration of data; Nysiad does address availability and integrity of services in the face of zero-day attacks assuming sufficient diversity exists among the guards that Nysiad deploys. There does not currently exist an approach that can counter zero-day attacks without such diversity, and it is difficult to envision one. The most likely source of diversity in the face of intruder attacks is administrative diversity. In other words, the defense system cannot be under the control of a single administrator.

13. Pg. 15, BPII Q4 deliverable. What are diversity considerations? Will the production version of NightWatch be made available to the government?
RESPONSE: We are considering peering approaches so that significant diversity comes at little cost to stakeholders. Multiple stakeholders can participate in a defense system in which none trusts any of the others, but each trusts that the majority is doing the right thing. It is probably essential for this that the confidentiality problems that come with replication be addressed. Is it possible to run guards at remote systems that do not have a readable copy of state? More on this below.

An implementation of NightWatch is under development and will be made available when completed. We currently estimate that such an implementation will be finished by May 2008. A simulator of NightWatch, if interest exists, can be made available today.

14. Pg. 15, BPIII Q4. What are the privacy-protection features? How is privacy-protection defined?
RESPONSE: There is a well-known trade-off between the issues of confidentiality and availability. In order to get more availability, one needs to replicate, and replication

increases the threat to confidentiality. A standard solution is secret-sharing, but it is not clear that these techniques can be applied here, as all participants need to be able to monitor the data in order to check for intrusions. Secure multiparty computations have severe limitations. We are currently investigating something we call "part-time replication" where a minimal amount of data is made available temporarily in order to implement accountability without providing full access to all data all the time. We have made significant contributions to solutions to this problem (in particular, our COCA "Cornell Online Certification Authority") service) and believe we can add more. However, this is possibly the most ambitious aspect of our efforts.

15. Pg. 16, item 2. Some insiders are not motivated by incentives. How does this address the political/criminal insider?

RESPONSE: This can be addressed by considering the worst-case scenario using zero-sum game. In a zero-sum game, one player's gain is the other party's loss and therefore the interests of the two parties are completely diametric. This can be used to describe insiders with extremely malicious intents. A solution of the game, called the minimax equilibrium, informs the defender of the best move regardless of the malicious insider's move.

For extremely malicious insiders, the mechanism we design will model their interactions with the defender as a zero-sum game. This helps the defender to identify the measures at her disposals to counter such insiders and the worst-case interest she can expect. The worst case scenario can be used to choose the right strategy to manage the risk.

16. Pg. 16, item 4. How does this analysis of insiders address terrorists/political individuals/criminals? The profile of malicious insiders as often isolated and discordant may not be accurate.

RESPONSE: We agree that the CERT profile of insiders as discordant or isolated is early research that needs to be more completely examined. That is one goal of this experiment. For example, it may be that only those insiders who are discordant are typically apprehended thus biasing the CERT results. It may be that there is great discordance, so that the measure is not particularly useful.

Thus our proposed work both tests and builds upon the referenced CERT work which finds insiders to be discordant. One element of this research is to look at various populations to examine levels of discordance. The second element is to use these characterizations in real world environments. To that end, we are seeking corporate partners for more realistic testing in the long term. Clearly, before the tools to exploit any discordance can be tested in a corporate or real world environment, they must be constructed and tested in laboratory conditions. This experiment will significantly inform their construction.

17. Pg. 17, paragraph 2. How does the study of the browsing habits of undergraduates apply to criminal/terrorist/political insiders? I don't believe that the model will apply.

RESPONSE: The purpose of the browsing habit study is to understand inadvertent insiders. This research is important because a large amount of intrusions and system breaches (up to 70% according to statistics) are caused by legitimate users' mistakes, for example, misconfiguration. Actually, the major channel for malicious attackers to attack a system is to exploit the mistakes made by inadvertent insiders. Irresponsible browsing habits can easily get one's system infected by the malware devised by a malicious party, who as a result becomes the dangerous insider in a sense that it can freely access the internal system.

Therefore, it is extremely important to study the behaviors of inadvertent insiders and mitigate the potential damage they may cause.

This data will also be used in the examination of the CERT finding of those who present insider threats as discordant and isolated by evaluating homophily where the only threat is inadvertent insiders.

18. Pg. 17, paragraphs 3 and 4. Provide additional information on “privacy-enhanced social browsing” and “privacy-enhanced monitoring.”

RESPONSE: Social browsing and monitoring tend to be instrumented a very simple manner, by sharing all the browsing information, which can be indirect opposition to the privacy interests of the subjects. Privacy implementations enable aligning the incentives of the monitored entity with that of the monitoring entity. As an implementation example, storing browsing data in a hashed form enables identification of insiders in a manner that does not create the perverse incentives of constant monitoring, as discussed in the surveillance literature. (If individuals who are insider threats can be identified as discordant, as indicated by the referenced research.)

In terms of privacy-enhanced social browsing, data are shared to decrease the risk of masquerade attacks by leveraging the inherent temporal characteristics of masquerade sites. We enable sharing in a social network controlled by the user. That user-selected data sharing will have perfect forward secrecy should one participant be ejected from an individual's social network. Human subject experiments using social browsing to identify masquerade site has shown a significant change in risky browsing behaviors.

19. Pg. 18, paragraphs 2 and 3. How does the risk communication specified in paragraphs 2 and 3 advance the state of the art?

RESPONSE: The state of the art in computer security ignores well-known findings in risk communication. Risk communication in computer security is characterized by providing information bereft of narrative, ignoring the mental models of the technically naive user, providing detailed technical information with no context, and high level of jargon use. All of these approaches are proven failures in risk communication. We cannot answer the question of how far will this innovative research will advance the state of the art but clearly the potential is great.

20. Pg. 19. Mental models are not described in the project plan. How does a “dorm occupants” model apply to criminals/terrorists/political insiders?

RESPONSE: Mental models are a widely-applied and well-known approach to risk communication. Mental models experiments on student populations, particularly in terms of risk perception of rare events, have been shown over the past twenty year to be widely applicable with the exception that these populations tend to be slightly more risk-seeking than the norm. Consistent heuristics and biases with respect to risk perception have been shown across domains, populations and decades of research. The question our research hopes to answer is how these well-documented and Noble prize-winning heuristics apply in an electronic domain. Delineating the subtle differences in the nature of anchoring, framing, inadequate adjustment, and other heuristics in different population is a long term, experimentally intensive goal that is beyond the scope of the possible research.

(b)(6) **Workshops**

21. Pg. 20. Has feedback from previous workshops altered the proposed workshops?

RESPONSE: Yes, I3P workshops have changed significantly over the years based on feedback from participants. At all I3P workshops we solicit input and comments from participants – sometimes in the form of written surveys; other times verbally – in order to provide more useful events and content. For example, early I3P workshops focused on process control systems (PCS) security had multiple parallel tracks. Workshop participants said that they would rather have a single track so that they would not have to choose which I3P tools and technologies they could hear about. Based on this feedback, the most recent PCS workshop, held on March 6, 2008 in Houston, had a single track with technology demonstrations in the afternoon so that participants could see all the I3P technologies and choose for themselves how much time to spend on each one. In addition, our PCS stakeholders in the oil and gas sector let us know that it would be most convenient for them if we held our PCS workshops in the Houston area. In response to this feedback, we have held three of our four PCS workshops in or around Houston. Furthermore, participants at our PCS workshops have encouraged us to hold our workshops in conjunction with other PCS events to limit the number of times that they have to travel to the various events. In response, we have held our PCS workshops in conjunction with a Process Control Systems Forum (PCSF) annual meeting (June 2006) and a National Petrochemical Refiners Association (NPRA) security conference (March 2008). In another example, participants at the first IFIP/I3P critical infrastructure protection (CIP) conference told us that we had packed the agenda too full of presentations and talks and had not left enough time for networking and more informal interactions. As a direct response to that feedback, the second CIP conference, held March 16-19, 2008 in Arlington, Virginia, provided attendees with longer breaks and more time for informal conversations over lunch and dinner. We also did not schedule speakers for every meal for the same reason.

22. Pgs. 21 and 22. Are the CIP and PCS workshops being coordinated with the CIP and Controls Systems Programs at DHS?

RESPONSE: Yes, I3P workshops are closely coordinated with the appropriate groups at DHS. DHS program managers are regularly updated on I3P workshop plans and preparations. In addition, there is extensive coordination and cooperation between the I3P and different parts of DHS in the context of specific I3P events. Over the past several years, I3P researchers and leadership have been in regular contact with representatives from the Control Systems Security Program (CSSP), including (b)(6) and, more recently, (b)(6) on the subject of workshops. CSSP representatives are always invited to attend I3P PCS workshops and actively participate in the program. Moreover, in a meeting with the CSSP leadership in 2006, the I3P PCS team was encouraged to hold its workshops in conjunction with PCSF, which had been given an overall coordination function for PCS outreach. Based on this input, the I3P held one of its workshops in conjunction with a PCSF annual meeting and tried to do so again for its most recent PCS workshop. However, because PCSF could not decide on a date and location in a timely manner, the I3P was forced to partner with NPRA this time. We remain open to coordination with PCSF in the future. It should also be noted that the agenda and content of I3P PCS workshops is closely aligned with CSSP objectives and priorities. There has been significant coordination with DHS for other I3P workshops. For instance, the I3P worked closely with DHS Assistant Secretary for Cyber Security and Telecommunications (b)(6) in planning an event in October 2007 at the Tuck School of Business at Dartmouth College for corporate chief information security officers (CISOs) focused on incorporating security into corporate risk management. Secretary (b)(6) spoke at the workshop. This collaboration has since been further expanded leading to the creation of a new I3P research project on accurately pricing cyber risk. Likewise, there has been regular interaction with

DHS on the I3P supported CIP conferences, and representatives from DHS have attended (and spoken at) both of these events held so far. We look forward to continued close collaboration with various DHS stakeholders as we continue to offer highly relevant workshops and conferences that are valuable to industry and research experts, as well as being closely aligned with DHS priorities.

(b)(6) PCS

23. Pg. 29. DHS received a soft copy of the RiskMAP deliverable. The product consists of several excel spreadsheets that contain no data. The user must enter all the requirements, weights, objectives, etc. The recommendation to expand RiskMAP was based on the assumption that the product contained information relevant to the oil and gas sector. If the model templates are to be expanded to other critical infrastructure sectors, the models need to contain data specific to that sector, not just a blank template.

RESPONSE: The soft copy of the tool that DHS has received is the "clean" version that demonstrates the RiskMAP methodology in general. We can provide DHS a copy of the tool that is populated with the oil refinery template. Please note that the template is generic, rather than to contain any proprietary data from a specific oil refinery. While the template provides a good starting point for modeling a refinery, the data regarding network nodes and risks is hypothetical.

24. Pg. 31. Will APT be made available to the government?

RESPONSE: Yes, APT will be made available to the government. The University of Illinois at Urbana-Champaign will license APT to the government free of charge. However, UIUC will retain ownership and intellectual property rights for APT.

25. Pg. 32. The document states that the RiskMAP data including a list of PCS network nodes will be made available to Sandia? Will this data be delivered to the government?

Will the mitigation actions be delivered to the government?

RESPONSE: There are two parts to this question.

a. The data referred to in this question is for a specific refinery and is being shared between MITRE, Sandia, and the owner under the provisions of a Non-Disclosure Agreement (NDA) prepared by the owner. Any further sharing of this proprietary data will be subject to the owner's approval. The NDA does not allow us to share it further.

b. The mitigation actions developed by Sandia will be generic, meant to be used as guidance by anyone in the sector. I believe those actions will appear in a project deliverable from Sandia.

26. Pg. 33. The deliverable states that a template will be developed for a second energy sector. Will this be delivered to the government?

RESPONSE: The template to be developed during the coming year will be provided as a project deliverable. We anticipate that it will be based on a pipeline operation and, as with the oil refinery template, it will be generic rather than to contain data pertaining to one specific pipeline operation.

27. Pg. 34, tasks. What products/tools will be delivered to the government? (Do not include documents.)

RESPONSE: All the products under the I3P PCS security program will be made available to the government. However, the institutions developing the products will retain intellectual property rights for their products/tools.

(b)(6)

Business Rationale

28. Pg. 37, paragraph 5. Excellent discuss of supply chain. This is a state-of-the-art concern?

RESPONSE: We agree this is an important and timely concern.

29. Pg. 39, subtask 1.4.5. Has this task been coordinated with NIST and DHS?

RESPONSE: DHS has already been informally made aware of the intended next steps on Subtask 4.5 in the Business Rationale SOW. After the contract award we will coordinate the details for proceeding with both DHS and NIST.

(b)(6)

Assessable Identity

30. Pg. 43, 2.4.1.1. What is the basis for the statement, "Much of the trust that is built is necessary only because poorly designed technology requires it?"

RESPONSE: Business trust is trust between organizations, as established and maintained by organizational agreements. (See response to 4, below.) These include agreements on business processes and procedures, in particular redress procedures: How will organization A raise concerns about the actions taken by organization B (e.g., unapproved sharing by B with C of identity information provided by A to B)?

Poorly designed technology causes more information to be shared than is operationally necessary. For example, A might provide B with many more fields in a credential than B needs to identify & authenticate an individual, and make decisions about the individual's rights to use B's resources. B might only need to know whether the individual is over 21, not the individual's date of birth. But if the only way A's technology can provide B with the individual's credential is to reveal the date of birth, B will have to handle date-of-birth. Since date-of-birth is more sensitive than "over 21", the procedures B must agree to will include more stringent procedures for protecting information from A than B uses to protect information that B itself collects from individuals; those procedures will also include redress processes that would be unnecessary if A's technology enabled A to share only what B needs.

31. Pg. 44, paragraphs 1 and 2. The paragraphs describe a significant amount of technical capabilities. I am not sure this is realistic to accomplish in one year. Why are "sharing personal information" and "sharing digital credentials" combined into one framework? The concepts and requirements are very different. Why are "privacy protection" and "credential information quality assurance" included together?

RESPONSE:

Pg. 44, paragraphs 1 and 2. The paragraphs describe a significant amount of technical capabilities. I am not sure this is realistic to accomplish in one year.

RESPONSE: The paragraphs do not describe technical capabilities to be developed under this project; they describe the characteristics and dimensions of Sharing Protected Identity & Credential Information (SPICI) framework.

Why are "sharing personal information" and "sharing digital credentials" combined into one framework?

RESPONSE: The framework addresses "sharing personal information across organizations ****in the form of**** digital credentials." Personal information that can be presented in digital credentials is a subset of personal information. We could have better phrased this relationship as: "sharing personal information across organizations enabled by [strike – "in the form of"] digital credentials."

The concepts and requirements are very different. Why are "privacy protection" and "credential information quality assurance" included together?

RESPONSE: Privacy protection is achieved by compliance with Fair Information Practices. One of the Fair Information Practice Principles is Accuracy, since inaccurate information about an individual can lead to social, physical, or financial harms to the individual. This is particularly true of identifying and authorization-related information. For example, if a credential falsely (inaccurately) states that a physician is not authorized to prescribe narcotics, and the physician uses the credential in a prescription, the physician will be subject to legal investigation (and possibly false arrest).

In particular, the research team is looking at the enablement of attributes as part of the identity management credential regime. Given this stronger coupling, the former distinctions between privacy protection and credential quality assurance begin to blur.

32. Pg. 44, paragraph 3. There are many identity management programs that are operational. What is included in this program that is state-of-the-art?

RESPONSE: As we met with stakeholders, we identified capabilities that are not provided by state-of-the-practice systems. Our work focuses on the capability gaps that stakeholders identified (in particular, for finer-grained, more continuous, rule-based authorization for services).

33. Pg. 44, bottom of the page. Where is "business trust" defined?

RESPONSE: The term "business trust" is widely used, so we did not define it. Here's an excerpt from "Business Trust and the Formation of Virtual Organizations" by Christopher P. Holland & A. Geoff Lockett, Proceedings of the Thirty-First Hawaii International Conference on System Sciences, Volume 6, 1998:

In the context of business relationships, Ring and Van de Ven (1994) define trust as "the confidence that another organization will behave according to its expectations and that it will exhibit goodwill". Hart and Saunders (1997) expand on this definition to state that: "Trust is based on 'fair dealing' and a sense of reciprocity, but does not imply that outcomes be divided equally between parties."

34. Pg. 45, paragraph 3. What is a "set of design patterns?"

RESPONSE: A design pattern is a generalization of a commonly used solution to a design problem (e.g., how to use a directory server to provide identity attributes).

35. Pg. 45, paragraph 5. What is state-of-the-art in the credential management system?

RESPONSE: See answer to 32, above.

36. Pg. 46, paragraph 1. How will you determine if a solution does not expand the state-of-the-art? When will you cease the effort if the solution is not beyond current capabilities?

RESPONSE: Our general approach is to work towards side-by-side comparisons of capabilities, performance, scalability characteristics, security properties, or other attributes of the solutions at hand. Ideally, one can reduce comparisons such as these to mathematics, in the style of a complexity analysis. If one system is insecure in a dimension for which the other is provably secure, one can typically prove this.

If our work doesn't yield advances in at least some significant dimensions, we would certainly shift attention to other questions. But obviously, we do believe that there is a high likelihood of success; if not, we wouldn't be tackling this approach.

37. Pg. 46, paragraphs 4, 5, 6. Is CorSSO available to the government? If multiple authentication servers are used, how is a DOS attack prevented that could compromise the system? What is a "message bus layer over the lower-level group multicast infrastructure?" Cryptographic protocols must be approved by NIST/NSA for use by the government. How will the crypto protocol that is proposed be useful to the government? What is the overhead?

Pg. 46, paragraphs 4, 5, 6. Is CorSSO available to the government?

RESPONSE: The CorSSO system will be released publicly under the GPL and will be available to the government. We'll also be happy to collaborate with early adopters as we have an alpha release ready right now.

If multiple authentication servers are used, how is a DOS attack prevented that could compromise the system?

RESPONSE: Traditional single sign-on systems, such as Kerberos or Passport, rely on centralization of authorization functionality in servers. Such servers are then inherently vulnerable to DoS attacks, as the centralized server presents a single point of failure. There have been prior attempts to address this fundamental problem by replicating the servers, but naive replication compounds the problem by replicating the secrets used for authentication, and hence increasing the system's attack profile.

In contrast, CorSSO's main feature is to distribute the authorization functionality across any number of servers, without replicating the secrets used for authorization. CorSSO enables applications to delegate authentication to a threshold group ('t' out of 'n' servers). The system will simply route around a DoS attack against a server in that group by directing clients to any of the other authentication servers. Only a DoS attack that compromises 'n-t' servers can prohibit client authentication; here, the value 'n-t' is under application control and can be made arbitrarily large without a corresponding increase in client authentication latency, as the client latency scales with 'O(t)'. The only cost of increasing 'n' would be during the key refresh phase, which is a background, non-performance critical operation.

What is a "message bus layer over the lower-level group multicast infrastructure?"

RESPONSE: This is a reference to our new live objects technology, which uses a popular model called "publish subscribe" and commonly characterized as a form of "message bus" as the internal API (for use by developers). The technology in question is closely aligned with the web services platform solutions that the government has adopted for uses such as

the military GIG/NCES platform.

We've recorded two short "flash" demos that will give the interested reader a real feeling for the power of these solutions. They can be seen by clicking to <http://liveobjects.cs.cornell.edu> and then clicking in the large black video player windows. A voice-over explains the idea. We believe that live objects may be directly adaptable for use in a great variety of military and government scenarios, and in fact see potential identity management roles for them as well: they make it easy to construct high-performance, highly flexible distributed applications that pull data from web services compatible sources, such as databases and similar platforms, and then combine that data into high-value end-user deliverables.

Cryptographic protocols must be approved by NIST/NSA for use by the government.

RESPONSE: Our current implementation is layered on top of SSL, so CorSSO clients are exposed only to the government-approved SSL protocol. Authorization servers implement additional protocols for key refresh, which are based on an RSA variant that *may* need government approval, or it may have been government-approved already as it was invented about a decade ago by Boneh et al. and is not specific to CorSSO. We would appreciate input from an expert in government-approved crypto protocols to find out which protocols have been approved.

How will the crypto protocol that is proposed be useful to the government?

RESPONSE: The CorSSO system enables multiple application servers (e.g. web services and the like) to share a common, distributed authentication platform. Factoring out authentication from application servers reduces their attack profile, delegating authentication to threshold groups of well-administered servers. Failures and compromises of authentication servers that do not exceed application-determined threshold levels do NOT lead to a security breach.

What is the overhead?

RESPONSE: Our initial results indicate that client latency for authentication is under 1 ms, which is well-below the perception threshold and well within the 20-30ms average latency experienced for contacting a remote web server. We are in the process of characterizing the performance of our initial prototype.

38. Pg. 47, paragraph 1. The model defined in paragraph 1 is not necessarily the one used throughout the government.

RESPONSE: The model outlined in this paragraph matches the prevailing industry standards for medical health record management in federated settings. We believe this is a large and important problem area. While recognizing that the government uses all sorts of methods and standards, if our goal is to impact this particular stakeholder community -- the medical records federation community -- we need to compare our approach with their presumed standards. This said, we think that new options created by our work could be valuable to the government in many settings that require cooperation or federation between parties but in which the parties place limited trust in one-another and in their clients, and where we wish to minimize information leakage while supporting queries. For example, our approach might be of interest in military settings where coalition partners are in a position to query multiple, independently managed US databases. Thus, advances in our work could be of use to the government even if the medical community ultimately sticks with the currently proposed standards.

39. Pg. 47, paragraph 2. How is the integrity of the data maintained if it is stored in multiple locations? What are "cryptographic mix technologies" that are used to security handle joint operations? Scalability is definitely issue. How will it be addressed?

RESPONSE: Our idea is that only a single authoritative version of any given record would be maintained. Your concern is more relevant with respect to the proposed standards for federating systems managing health care records -- those standards make it easy to create copies of records and to move them around, and one then has to worry that if an inconsistency is introduced by accident, it might propagate widely. Our solution would eliminate that risk because it makes no replicas of the data.

Cryptographic Mix technologies are a widely known technique developed by David Chaum, now at NIST, for moving data in a "pipeline" so that the receiver can't tell who the sender was. You may know this by the name "onion skin routing", which is also common. The idea is actually pretty simple: the sender encrypts the data with the public key of node X, then puts a header saying "node X" on the front. Then the sender encrypts again with the key for Y, etc. Finally it sends the repeatedly encrypted object to Z. Z decrypts (removes a "layer of the onion") and then forwards to Y, which in turn forwards to X, etc. The idea is that although Z knows the sender, by the time the message passes through the pipeline, the sender information has been stripped and the traffic "mixed" with other traffic from other sources. The receiver can't tell who sent the message.

One can then reverse the process, so the receiver can still take some action and "reply". The message climbs back up the chain, from X to Y to Z to the sender, who knows the original route and hence can apply the correct decrypt functions in the right order, and hence can then extract the reply.

We're using this technique to combine partial results of queries: the node that combines the data can't tell where it came from.

40. Pg. 47, paragraph 4. What is the source of the statement, "However, it has been shown that cryptographic protocols that are secure in isolation often *do not remain secure* when executed concurrently (with other protocols)?" I checked with some crypto experts at NIST and they did not understand this statement.

RESPONSE: One of the easiest attacks (c.f. "Non-malleable Cryptography" by Dolev, Dwork and Naor from 1991) involves a "man-in-the-middle attacker" that participates in 2 concurrent executions, but is able to "correlate" the first execution with the second and eventually violate security of the protocols.

To give an example, consider for instance a client A proving its identity to a server using a cryptographic protocol. Even if the protocol is secure when executed in isolation (in fact, even if it is "zero-knowledge") it might be the case that the server, acting as a man-in-the-middle attacker, can claim to someone else that it is A (even if this is *not* possible if the server attempts to do so after the first interaction has taken place). A major research question in recent years has been to construct protocols that withstand this--and often more elaborate---types of concurrent attacks. Our focus is on constructing protocols for which we can provide principled "proofs of security" (rather than unreliable heuristics). Some of this work is listed below.

* Precise Concurrent Zero Knowledge. (EuroCrypt'08), O. Pandey, R. Pass, A. Sahai,

W. Tseng and M. Venkatasubramanian.

- * Concurrent Non-malleable Commitments from One-way Functions. (TCC'08), H. Lin, R. Pass and M. Venkatasubramanian.
- * On Constant-Round Concurrent Zero Knowledge. (TCC'08), R. Pass and M. Venkatasubramanian.
- * Cryptography from Sunspots: How to Use an Imperfect Reference String. (FOCS'07), R. Canetti, R. Pass and A. Shelat.
- * An Efficient Parallel Repetition Theorem for Arthur-Merlin Games. (STOC'07), R. Pass and M. Venkatasubramanian. pdf
- * Universally Composable Protocols with Global Set-up. (TCC'07), R. Canetti, Y. Dodis, R. Pass and S. Walfish. pdf
- * Input-Indistinguishable Computation. (FOCS'06), S. Micali, R. Pass, A. Rosen. pdf
- * Concurrent Non-Malleable Commitments. (FOCS'05), R. Pass and A. Rosen. ps , pdf
- * New and Improved Constructions of Non-Malleable Cryptographic Protocols. (STOC'05), R. Pass and A. Rosen. ps , pdf
- * Universally Composable Protocols with Relaxed Set-up Assumptions. (FOCS'04), B. Barak, R. Canetti, J. Nielsen and R. Pass. ps , pdf
- * Bounded-Concurrent Secure Multi-Party Computation with a Dishonest Majority. (STOC'04), R. Pass. ps , pdf
- * Bounded-Concurrent Secure Two-Party Computation in a Constant Number of Rounds. (FOCS'03), R. Pass and A. Rosen. ps
<<http://www.nada.kth.se/~rafael/papers/bound2party.ps>> , pdf
<<http://www.nada.kth.se/~rafael/papers/bound2party.pdf>>
- * Simulation in Quasi-Polynomial Time and Its Application to Protocol Composition. (EUROCRYPT'03), R. Pass.

41. Pg. 48, second bullet. See above comment.

RESPONSE: Discussed in the same papers.

42. Pg. 48, paragraph 3. What is the overhead for the zero-knowledge protocols?

RESPONSE: Within the I3P, Cornell is just one of three groups interested in this topic, and each of us is exploring classes of protocols that behave slightly differently, have different costs and different benefits.

With respect to the specific question you pose, we are not yet able to answer. As you know, our work has two aspects. One involves gaining a deeper understanding of the nature of the knowledge leaks that can arise when concurrent attacks are launched on a service; the work on this side is primarily theoretical. On the more practical side, though, we are developing new protocols that can be proved to achieve zero-knowledge. Doing this involves a number of overheads; the best possible (minimal cost) solutions are not yet clear.

Indeed, one of the important research directions we are pursuing is to address this very problem, with the goal of ultimately constructing practical zero-knowledge protocols that withstand concurrent attacks and only induce small overhead. The best known solutions, today, would be fairly costly, but might still be practical in settings where authentication is not required frequently.

43. Pg. 51, paragraph 1. With the transmission of the health data, how will the integrity be maintained if the data is modified?

RESPONSE: The ONCHIT/AHIC use case on "Consumer Access to Clinical Information" details requirements for a Personal Health Record (PHR) service. It specifies that patients are allowed to selectively disclose information from their PHR and to annotate it but they are *not* allowed to modify the PHR data. Our approach uses a cryptographic technique referred to as a redactable signature. (Please see our Technical Report at: <http://www.cercs.gatech.edu/tech-reports/tr2007/abstracts/10.html> for details on our redactable signature mechanism.)

Redactable signatures allow information to be omitted (but *not* modified) from a larger set of information, while still allowing the signature to verify the integrity of the remaining data. This allows the patient to selectively disclose information from their PHR to third parties while still permitting verifiability of the disclosed information based on the signature from its original provider. Annotations are provided as a separate data object either unsigned or signed with the patient's private key, instead of with the private key of the original provider.

(b)(6) - **ISTS Initiative 7**

44. Pg. 53, AC. What is state-of-the-art (b)(6) AC]

RESPONSE: There are currently no commercial, operational autonomic computing systems that are capable of general self-awareness and self-healing. So the commercial state-of-the-art is primitive notwithstanding marketing claims.

An overview of the research state-of-the-art can be found in the proceedings of the recent IEEE Conferences on Autonomic Computing, in which we have participated. IBM has a site at

<http://www.research.ibm.com/autonomic/> which provides an overview of their vision, but no products, yet.

45. Pg. 53, DIST. What will be delivered to the government? Have you investigated the DETER testbed (b)(6) DIST]

RESPONSE: We will develop, document and distribute as appropriate new techniques, algorithms and software systems for monitoring and analyzing nontrivial, operational networks. The deliverables will be technical reports and software as appropriate. No *operational* data or government access to operational networks has been promised or will be provided. No data from the Dartmouth network will be provided, given privacy issues.

This definition of the DETER testbed is taken from the DETER website (<http://www.deterlab.net/>):

"<<http://www.isi.edu/deter/docs/200708-usecdw-deter-design-deploy.pdf>>The DETER testbed is a public facility for medium-scale repeatable experiments in computer security. Built using <<http://www.emulab.net>>Utah's Emulab software, the DETER testbed has been configured and extended to provide effective containment of a <<http://www.isi.deterlab.net/projectlist.php3>>variety of computer security experiments, including defense against attacks such as DDoS, worms, viruses, and other malware, as well as attacks on the routing infrastructure."

DETER is a testbed that simulates network traffic. It is not an operational network.

46. Pg. 53, DVF. Have you consulted with NSF on their work (b)(6) [DVF]

RESPONSE: Our recent NSF Infrastructure grant is supporting some of my work in digital forensics. So, yes, we are aware and are receiving some funding from NSF, as well as US Air Force, Adobe, and Microsoft. The work that NSF is funding is primarily for the art forensics and for extending our Computer Graphics v. Photo work. This grant is also for infrastructure only (major equipment purchases). This NSF grant is related to our general forensics work, but does not overlap with the specific work in DVF which is focused on video forensics.

47. Pg. 53, HBS. What will be delivered to the government? (b)(6) [HBS]

RESPONSE: We offer our results and code to the world at large, including the government, as "research reports" and also through the venue of competitive, refereed publications. We also offer our students. (E.g., we are exploring using a FIPS validation lab as a partner for SISMAT interns)

48. Pg. 53, MetroSense. What is state-of-the-art? (b)(6) [Metro]

RESPONSE: When we started the project there was little in the way of related work on secure urban sensor networks. Proposals in the areas of tiered sensor networks, delay-tolerant sensor networks, and sensor network and ubiquitous computing middleware architectures represent the most closely related work; all of which are discussed in [1].

Recently, there have been new initiatives in academia and industry looking at implementing large scale and/or people-centric sensor networks. The TENET project at UCLA's Center on Embedded Networked Sensors (CENS) proposed an architecture for tiered sensor networks focused on leveraging device heterogeneity to promote scalability and simplicity of design and deployment. The Urban Sensing project at CENS seeks to develop cultural and technological approaches for using embedded and mobile sensing to invigorate public space and enhance civic life. The NSF CitySense project, between Harvard and BBN, is studying static sensors in the city of Cambridge, MA.

Industry is also engaging in this problem. SensorPlanet is a Nokia-initiated cooperative project focused on building an open global mobile device centric research platform for large-scale wireless sensor network research. Similarly, Microsoft Research, Motorola and Intel Research are studying the application of sensor networks at scale in urban environments.

The MetroSense project stands apart from these initiatives in that we were the first group to publish in this new area and are thus a lead project. We are also more focused on a holistic view of urban sensing, where communications, security, and fusion are all considered in the problem space.

[1] "People-Centric Urban Sensing"

(b)(6)

(b)(6)

In Proceedings of the Second ACM/IEEE Annual International Wireless Internet Conference (WICON 2006), Boston, Massachusetts, USA, August 2-5, 2006.

49. Pg. 54, PKI. There is significant work on PKI – why is this necessary? What is unique/original [(b)(6) PKI]

RESPONSE: As an initial answer, we observe that the necessity and uniqueness of research is discussed in detail in (original proposal, section 4.). We, as scientists, strive for originality of proposed ideas. As common practice in academia, we constantly submit our work to the judgment of the scientific community by publishing it in peer-reviewed conferences and journals.

In particular, we have published the main research idea at *EuroPKI* (2007), as shown in our progress reports. This publication has been selected as one of the best and invited for extended publication on the *Journal of Computer Security* (IOS Press). In addition to this, we have recently published a paper at *STPG: Security, Trust and Privacy in Grid Environments* (2008) and submitted another paper to *EuroPKI* (2008).

The extensive review of the scientific community over our work and the positive feedback provided by the successful publication of our research work provides strong and stimulating evidence about the novelty and uniqueness of our approach. We refer the reviewers to our original proposal, the feedback we received from its reviewers, and our publications for an extended and more insightful description.

In addition to the original proposal, the related publications and the project reports, in order to provide an introduction to the background of our work, we quickly review the motivation of our work. Today, X.509 PKIs provide the main tools that ease trust management for secure communication. Many technologies rely on PKIs and Public Key Certificates to guarantee privacy, integrity and secrecy (original proposal, section 3.) of data stored or transmitted over networks (e.g., E-Mail, Secure Web, SAML, etc.). Regrettably the barriers faced when adopting this technology are still very high, and this project is aimed at reducing those hurdles, and putting the power of the technology into a broader base of users and relying parties. What is particularly alarming is that PKIs are considered complex systems and difficult to implement when utilized to address security and integrity concerns within a given enterprise, but these obstacles are even more exacerbated when *multiple enterprises* attempt to rely upon PKI credentials issued outside their enterprise boundary in any sort of federated trust arrangement (original proposal, section 1.)

A contemporary OASIS survey - "*Obstacles to PKI Deployment and Usage*" (original proposal, section 2.) shows that the three most urgent obstacles are: the high cost of PKI setup and management, usability issues (both at user and management levels), and the lack of support for PKI technology built into applications.

To address this, our project is aimed at making PKI technology easier to deploy and more user-friendly. In particular we address these problems by focusing on three sub-projects: (a) the development of a new PKI Resource Discovery Protocol (and its deployment in a Peer-to-peer context) that will allow for better interoperability and usability of PKIs (particularly in federated environments) (original proposal, section 4.2); (b) the development of an easy-to-use PKI library that will help developers to integrate the usage of Public Key Cryptography and digital certificates into new and existing applications (original proposal, section 4.1); (c) outreach that spreads the results of our current research and deployment work where the need for security is tangible (e.g., Computing Grids, Universities, etc.) (original proposal, section 4.3).

This three-headed approach (research, development and outreach) gives the project *UNIQUE ADVANTAGES*, in particular this project will: provide a strong path for real-world impact via (a) and (b); leverage feedback coming from reached communities (grid, universities, etc.) and professionals via (c). The uniqueness of the project resides in addressing PKI Interoperability and Usability with a 360 degree angle: for developers, for users, for PKI adopters, and relying parties.

We also are quite aware there is "significant work in PKI"---we play a major role in it! One of the investigators that work on the project is the leader of **OpenCA** (so we are able to leverage the OpenCA community of users to maximize the impact of our work in the real world---see the original proposal, section 2.1.1). Another investigator plays a key role in **HEBCA**, is advisor to HHS for Federal PKI, is the member of the **Federal PKI Certificate Policy Working Group**, and the higher education representative on **International Collaboration on Identity Management** (a consortium of the four principal bridges, including the **Federal bridge**). Our lab is the operator of the **NIH PKI Interoperability Pilot Project**. (We've also deployed 10,000 certificates to the campus population, and modified Dartmouth's Web-based information services to use client-side SSL for authentication; we also use client-side PKI via EAP-TLS for access to our secure WLAN.)

50. Pg. 54, paragraph 3. There is significant work defined in this paragraph addressing self-healing and self-configuring systems. I don't believe it is realistic to complete all this work in one year. Also, have you consulted with NSF on their work? [(b)(6) - AC]

RESPONSE: The paragraph cited is: "Given these realities, we are exploring the basic science and technology for building self-aware, self-healing and self-configuring systems within the context and constraints of real-world information technology as it presently exists and will likely continue to evolve. Such systems would ultimately require user interaction only when key decisions need to be made, operating the majority of the time autonomously as individual devices and services as well as collectively as teams of machines and services. Such systems are called autonomic or self-*."

As stated, we are addressing several basic science and technology issues, including instrumentation of hosts and machines, and distributed self-awareness. We have completed the work as described and believe we can complete the documented tasks as described in Budget Period III Update. We are not proposing to build a complete, commercial-class autonomic system although that is the ultimate goal of the community of researchers and companies working in this general area.

We are aware of NSF, DARPA and more recently AFRL work in this area. There are ongoing commercial efforts as well, but in some notable cases, such as IBM, they have stalled for technical reasons. We have close relationships with the Air Force's autonomic systems group.

51. Pg. 55, item 2. Please provide more explanation of, "self-calibration of models for estimation and detection of those states, and learning of appropriate actuations." [(b)(6) - AC]

RESPONSE: Our approach involves having a state-machine or Markov-like (eg, HMM) model of "normal" system operation. Normal system operation cannot be defined by a vendor for all users and all manifestations of their machines. Models must be instantiated for each machine-user combination. So a model must be learned for each machine as it is

used and the evidence that supports that behavioral model must be calibrated to minimize false positives and negatives. Once a behavior outside of what is deemed normal has been detected, some action is required. We are proposing to learn the appropriate actions based on user behaviors and feedback as opposed to hard-wired vendor logic.

52. Pg. 55, last paragraph. Regression techniques are not predictive models. (b)(6) AC] RESPONSE: We are using the independent variables in a linear model together with the empirically estimated (via regression analysis eg) linear coefficients to estimate the dependent variable. If one has not observed the dependent variable then this is a prediction of the dependent variable. This is how regression is used in areas such as autoregressive modeling of time series analysis and Kalman filtering for example.

There might be a terminology mismatch between us and the reviewer. In our community, regression models are commonly used as predictive models with great success. For example, I did a Google using search terms "regression prediction" and visited the first returned site (there were over 700,000 websites found by Google). Here are the first few lines from the article:

Osborne, Jason W. (2000). *Prediction in multiple regression*. Practical Assessment, Research & Evaluation, 7(2). Retrieved March 20, 2008 from <http://PAREonline.net/getvn.asp?v=7&n=2>. This paper has been viewed 44,115 times since 3/10/2000.

There are two general applications for multiple regression (MR): prediction and explanation. These roughly correspond to two differing goals in research: being able to make valid projections concerning an outcome for a particular individual (prediction), or attempting to understand a phenomenon by examining a variable's correlates on a group level (explanation).

The very first assertion made in this scholarly article is "There are two general applications for multiple regression (MR): prediction and explanation." I believe that we have a terminology mismatch about what regression and prediction means. Our use of these terms is consistent with the article above and the computing and engineering communities to which we belong.

53. Pg. 56, paragraph 3, pg. 57. Have you looked at existing testbeds such as DETER? What will be made available to the government after the contract is completed? (b)(6) DIST] RESPONSE: DETER and other testbeds are all laboratory facilities that allow controlled testing of security-related software systems. The DIST infrastructure is designed to allow us to capture and analyze *live* network traffic on a production network, a unique capability.

The primary deliverables, in addition to academic papers, are the MAP software - for capturing and analyzing Wi-Fi network traces - and new tools and algorithms for scalable analysis of wired-network traffic.

54. Pg. 57, paragraph 1. What are the legal issues and what is the resolution? (b)(6) DIST] RESPONSE: The College's lead Counsel has reviewed the legal issues involving DIST capture of wireless-network traces and consulted with outside legal experts on the topic. Dartmouth decided to proceed, given careful constraints on the research, and an alignment of the project's research with some operational needs of the College's network-management

team. At the time of this writing, we await the outcome of a detailed external audit of the DIST infrastructure in terms of its ability to manage the risk to privacy. The audit was carried out about two weeks ago and we expect the report within the next week. The report will be sent to the Provost who will review it and make a final determination on the project.

55. Pg. 58, item 2. Have you consulted with the major ISPs and companies such as

Symantec? What is unique in this proposal? (b)(6) [ST]

RESPONSE: We have consulted with several groups within Symantec and CA (formerly Computer Associates) about this work. We have not consulted with ISP's except for Dartmouth Computing Services (which acts as an ISP) and Dartmouth-Hitchcock Medical Center (DHMC). We have also consulted with several industry end users who have expressed interest in such a capability within their own large, sensitive operational networks.

The overarching uniqueness of the proposed techniques in the wired network monitoring is the statefulness and flexibility of the modeling and analysis. There are many stateless network monitoring systems that essentially keep track of how much traffic of what type has been flowing in and out of an enterprise network. Maintaining some nontrivial state of the network traffic for real-time analysis would be a unique capability that this project is investigating.

56. Pg. 60, item 5. There is significant research on intrusion detection. What is unique/state-of-the-art in this proposal? (b)(6) [ST]

RESPONSE: The vast majority of intrusion-detection research is focused on the IP layer and above; the "MAP" research funded under DIST is focused exclusively on the Wi-Fi MAC layer. The work differs from most commercial solutions in focusing on the analysis of frames captured by passive sniffers rather than in the Access Point or Wi-Fi switch -- which makes our approach independent of the Wi-Fi infrastructure and thus compatible with any installation. Also, we are developing several novel measurement techniques, involving channel sampling and refocusing, to maximize the effectiveness of the passive sniffers. Finally, we are developing novel Rogue AP detectors and VoIP analysis methods; the Rogue AP detectors handle Layer-3 APs that are encrypted (unlike all previous work) and the VoIP analysis is designed to run inside the AP and provide a broad range of diagnostic capabilities. Finally, with DIST we will be able to evaluate our methods at scale.

Additionally, commercial IDS systems have been stateless in the sense of inspecting packets one at a time, looking for signatures of known exploits. We are investigating stateful IDS-type techniques.

57. Pg. 61, item 6. PorKI is not described. (b)(6) [DIST]

RESPONSE: Please see Attachment 7, section 2.5.3 (page DIST-14 and following), of the Budget Period II proposal. Intel Labs is funding the PorKI students; DIST funding allows a larger "testbed" of mobile wireless devices - smart phones. The smart-phone infrastructure will also support the Metrosense project.

58. Pg. 63, HBS. Why is a new laboratory needed? (b)(6) [HBS]

RESPONSE: One needs the tools to do the work. Without having the basic tools to experiment with the new industrial architectures and with developing our own designs, there's little chance to make a real contribution. No such tools or lab exists at Dartmouth.

59. Pg. 64, TPM. Why is this being performed? Is this being proposed in collaboration with the individuals who developed TPM? (b)(6) [HBS]

RESPONSE: We are performing this type of work to look for the gap between what exists and what is needed. The current TCG architecture falls short—it takes measurements at load time, not run time, and only of static things, not dynamic behavior. Our scientific paper presenting these results was not only accepted for publication at TRUST2008 - a venue with heavy participation from the industry players involved in bringing TCG to the real world - it was named "Best Paper".

Yes. We are closely collaborating with Sun on TPM/OS interaction, and (as a result) are contributor-level members of the TCG—so we already have “a seat at the table.” To this, we add:

- our Sun research collaborator (b)(6) is now the chairman of the board of the TCG
- Project Lead (Professor (b)(6)) has 12+ year professional relationship with IBM's representative on the TCG board
- (b)(6) also developed the foundational research at IBM that contributed greatly to the industrial emergence of the TPM.

60. Pg. 66, MetroSense. DHS is performing significant R&D work on sensors. Have you contacted DHS (b)(6) [Metro]

RESPONSE: We are not developing sensors, in this project – we are developing sensor-networking and sensor-fusion technology, using off-the-shelf sensor technology. We would be happy to meet with DHS sensor experts.

61. Pg. 71, PKI. There is significant work on PKI. What is state-of-the-art in this proposal? (b)(6) [PKI]

RESPONSE: For the research portion of the project, our solution currently represents the state-of-the-art in the PKI world for the problem we are addressing. (Again, documenting novelty of new approaches and relation to prior work is standard practice in research.) In the original project proposal we provide a thorough analysis of the current solutions that are today adopted for PKI resource discovery (original proposal BP-II, section 2.2.1). Many different problems impact the adoption of current solutions: the lack of standardization (Web Services for PKIs), the lack of flexibility (extensions embedded into certificates, DNS records) and complexity (SLP, Jini, etc.). These technical issues represent the main causes for lack of interoperability among PKIs.

Our research activities on PRQP and its Peer-to-peer (P2P) extension provide a completely new approach to the resource discovery in PKIs and differ from any other previous work in the field. The uniqueness of our work resides in the effort of bridging together P2P technologies and PKIs. We envisage that our work represents the best and more easily deployable solution capable to improve interoperability and usability of PKIs. The referees who accepted this work for publication at EuroPKI 2007 and elsewhere have agreed.

For the development part of the project, our approach is novel in that it is specifically aimed to *ease developers to adopt PKI technology* into applications. As detailed in the original BP-II proposal (section 2.1.2), current cryptographic libraries, because of the complexity of PKIs, confuse developers with many implementation details and options (OpenSSL, Cryptlib, NSS, etc.). LibPKI, on the other end, leverages the capabilities of existing cryptographic libraries (BP-II proposal, section 2.1.4) and provides the developer with a clean and easy-to-

use API. Since the beginning of the project, positive feedback has been received from PKI experts, PKI adopters and companies.

We also note that the investigators are well-positioned to know the “state of the art.” (b)(6) is the project manager of the world’s leading open source Certification Authority project (original proposal, section 4.1.) (b)(6) was the founding program chair of NIST’s research workshop on PKI and has served on the program committee ever since (b)(6) has been a regular member of the committee. (b)(6) was also a founding PC member of *EuroPKI*, Europe’s answer to NIST’s workshop (and also has repeatedly served on the PCs of all of the major security research conferences, as well as on NSF panels). Indeed, it’s a fair statement that the U.S. government and the international research community look to us to judge the state of the art.

62. Pg. 72, Research. Why is DHS funding the submission of a standard to IETF? There are significant international meetings and workshops that are listed. [Sean – PKI]

RESPONSE: The IETF activities, as proposed at the beginning of the project, have three different purposes: (a) to promote the research outcome of the project, (b) to receive feedback on our work by one of the most technically accredited standardization body, and (c) to promote the discussion about Interoperability and Usability of PKIs within the working groups where standards are promoted.

In particular, the importance of promoting the research portion within IETF is evident when considering the scope of our project. To achieve interoperability, the world needs interoperable standards. By actively participating in activities within the IETF, we make sure that the outcomes of our research will have a wide impact in the real world. Moreover, the feedback we will receive within the IETF PKIX working group will enable us with valuable suggestions and contribution on how to improve our research. Indeed within IETF is where collaboration with important industries and professionals take place. Thanks to our presence at IETF meetings we have achieved an important result by having the PRQP as a PKIX working item on the Experimental track.

(b)(6) - **ISTS Initiative 8**

63. Pg. 74, 75. There are many information-security education and training programs. What is unique/state-of-the-art in the proposal? (b)(6) [SMAT]

RESPONSE: We explicitly target regional colleges whose curricula will have prepared upper level undergraduates for this hands-on work but cannot offer it themselves; we target cybersecurity focus areas in which we have leadership and expertise; and we target external partners that have communicated need for training in these areas.

We’re targeting regional colleges that don’t offer hands-on systems training; we’re going deep (in a few selected areas in which we are widely recognized as leaders) rather than broad; and we’re sending students on to our external research, non-profit, and industry partners, many of whom have explicitly asked for students who have this selected expertise. Finally, we’re partnering with the students institutions to enhance the security curricula throughout the area. We’re not just training students; we’re enabling their mentors to teach

security better. Our full proposal (BP-II) outlined these ideas. Additional information is available in that document.

Renwick, Tya

From: Renwick, Tya
Sent: Friday, March 21, 2008 2:32 PM
To: Lee, Annabelle
Cc: 'Morgan, Marilyn'; Osterhus, Diane; Harris, Richard
Subject: FW: Dartmouth - Non-competing Continuation Application Review - Technical Review Questions
Attachments: NCSD Tech Responses 03-21-08.pdf

Hi Annabelle.

Dartmouth met our deadline for response to your technical questions. Please review and let me know if you their responses are satisfactory.

Thanks!

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

From: (b)(6)
Sent: Friday, March 21, 2008 2:28 PM
To: 'Renwick, Tya'
Cc: 'Morgan, Marilyn'; 'Osterhus, Diane'; 'Harris, Richard'; 'Lee, Annabelle'; 'Martha Austin' (b)(6)
Subject: RE: Dartmouth - Non-competing Continuation Application Review - Technical Review Questions

Hi Tya,
Attached are the answers to the technical questions.

(b)(6)

-----Original Message-----

From: Renwick, Tya (b)(6)
Sent: ~~Wednesday~~ March 19, 2008 10:08 AM
To: (b)(6)
Cc: Morgan, Marilyn; Osterhus, Diane; Harris, Richard; Lee, Annabelle; Martha Austin
Subject: Dartmouth - Non-competing Continuation Application Review - Technical Review Questions

(b)(6)

Attached are questions that resulted from the technical/programmatic review of Dartmouth's application. Please provide your responses to me by COB, Friday, March 21st.

Thank you.

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

Renwick, Tya

From: Renwick, Tya
Sent: Wednesday, March 19, 2008 10:08 AM
To: (b)(6)
Cc: Morgan, Marilyn; Osterhus, Diane; Harris, Richard; Lee, Annabelle; Martha Austin
Subject: Dartmouth - Non-competing Continuation Application Review - Technical Review Questions
Attachments: Comments on the I3P 03-18-08.doc

(b)(6)

Attached are questions that resulted from the technical/programmatic review of Dartmouth's application. Please provide your responses to me by COB, Friday, March 21st.

Thank you.

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

Renwick, Tya

From: Lee, Annabelle
Sent: Tuesday, March 18, 2008 4:03 PM
To: Renwick, Tya
Cc: Harris, Richard; Lee, Annabelle; Morgan, Marilyn; Menna, Jenny
Subject: I3P Comments
Importance: High
Attachments: Comments on the I3P 03-18-08.doc

To all –

Attached are my questions for the I3P budget period III proposal. (Tya – I was close I have over 60 questions – some of the questions have multiple parts.) I am out the rest of the week – but will have my blackberry if you have questions.

THANKS...

Annabelle

Annabelle Lee
Director, Security Standards, Best Practices, and R&D Requirements
National Cyber Security Division
Department of Homeland Security

(b)(6)

fax: 703.235.5962

Pages 140 through 144 redacted for the following reasons:

(b)(6), (b)(5)

**Data Collection Form for Reporting on
AUDITS OF STATES, LOCAL GOVERNMENTS, AND NON-PROFIT ORGANIZATIONS**

RETURN TO: Federal Audit Clearinghouse, 1201 E. 10th Street, Jeffersonville, IN 47132

Form SF-SAC(1-15-2004)

OMB #0348-0057

EIN : 020222111

Part I: GENERAL INFORMATION	
1. Fiscal year ending date for this submission (mm/dd/yyyy) 6/30/2006	2. Type of Circular A-133 audit <input checked="" type="radio"/> Single audit
3. Audit period covered <input checked="" type="radio"/> Annual	FEDERAL GOVERNMENT USE ONLY 4. Date received by clearinghouse
5. Auditee Identification Numbers a. Primary Employer Identification Number (EIN) 020222111	b. Are multiple EINS covered in this report? <input checked="" type="radio"/> No c. If Part I, Item 5b = "Yes," complete Part I, Item 5c on the continuation sheet on Page4.
d. Data Universal Numbering System (DUNS) Number 041027822	b. Are multiple DUNS covered in this report? <input checked="" type="radio"/> No c. If Part I, Item 5e = "Yes," complete Part I, Item 5f on the continuation sheet on Page4.
6. AUDITEE INFORMATION	
a. Auditee name TRUSTEES OF DARTMOUTH COLLEGE	a. Auditor name KPMG LLP
b. Auditee address (Number and street) 37 DEWEY FIELD ROAD	b. Auditor address (Number and street) 265 CLINTON SQUARE
City HANOVER	City ROCHESTER
State Zip Code NH 03755 -	State Zip Code NY 14604 - 1795
c. Auditee contact Name (b)(6)	c. Auditor contact Name (b)(6)
Title CONTROLLER	Title PARTNER
d. Auditee contact telephone (b)(6)	d. Auditor contact telephone (b)(6)
e. Auditee contact FAX (Optional) () -	e. Auditor contact FAX (Optional) (585) 454 - 1469
f. Auditee contact E-mail (Optional) (b)(6)	f. Auditor contact E-mail (Optional)
g. AUDITEE CERTIFICATION STATEMENT - This is to certify that, to the best of my knowledge and belief, the auditee has: (1) engaged an auditor to perform an audit in accordance with the provisions of OMB Circular A-133 for the period described in Part I, Items 1 and 3; (2) the auditor has completed such audit and presented a signed audit report which states that the audit was conducted in accordance with the provisions of the Circular; and, (3) the information included in Parts I, II, and III of this data collection form is accurate and complete. I declare that the foregoing is true and correct. Signature of certifying official Name/Title of certifying official (b)(6) DIRECTOR, OFFICE OF SPONSORED PROJECTS	g. AUDITOR STATEMENT - The data elements and information included in this form are limited to those prescribed by OMB Circular A-133. The information included in Parts II and III of the form, except for Part III, Items 7, 8, and 9a-9f, was transferred from the auditor's report (s) for the period described in Part I, Items 1 and 3, and is not a substitute for such reports. The auditor has not performed any auditing procedures since the date of the auditor's report (s). A copy of the reporting package required by OMB Circular A-133, which includes the complete auditor's report (s), is available in its entirety from the auditee at the address provided in Part I of this form. As required by OMB Circular A-133, the information in Parts II and III of this form was entered in this form by the auditor based on information included in the reporting package. The auditor has not performed any additional auditing procedures in connection with the completion of this form. Signature of auditor Date 3/7/2007
Date 3/27/2007	

FAC DETERMINED TYPE OF ENTITY: Non-Profit Institution for Higher Education

[Page 2](#)

[Page 3](#)

[Page 4 - EIN continuation](#)

[Page 4 - DUNS continuation](#)

[Perform a New Query](#)

Form SF-SAC(1-15-2004) OMB #0348-0057

EIN : 020222111

Part II: FINANCIAL STATEMENTS (To be completed by auditor)	
1. Type of audit report Mark either: any combination of:	Unqualified opinion OR 2 <input checked="" type="checkbox"/> Qualified opinion Adverse opinion Disclaimer of opinion
2. Is a "going concern" explanatory paragraph included in the audit report? Yes	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
3. Is a reportable condition disclosed? Yes	<input checked="" type="checkbox"/> No - SKIP to Item 5
4. Is any reportable condition reported as a material weakness? Yes	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
5. Is a material noncompliance disclosed? Yes	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Part III: FEDERAL PROGRAMS (To be completed by auditor)	
1. Does the auditor's report include a statement that the auditee's financial statements include departments, agencies, or other organizational units expending \$500,000 or more in Federal awards that have separate A-133 audits which are not included in this audit? (AICPA Audit Guide, Chapter 12) Yes	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
2. What is the dollar threshold to distinguish Type A and Type B programs? (OMB Circular A-133 § .520(b)) \$3000000.00	
3. Did the auditee qualify as a low-risk auditee? (§ .530) Yes	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4. Is a reportable condition disclosed for any major program? (§ .510(a)(1)) Yes	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No - SKIP to Item 7	
5. Is any reportable condition reported as a material weakness? (§ .510(a)(1)) Yes	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6. Are any known questioned costs reported? (§ .510(a)(3) or (4)) Yes	
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7. Were Prior Audit Findings related to direct funding shown in the Summary Schedule of Prior Audit Findings? (§ .315(b)) <input checked="" type="checkbox"/> Yes No	
8. Indicate which Federal agency(ies) have current year audit findings related to direct funding or prior audit findings shown in the Summary Schedule of Prior Audit Findings related to direct funding. (Mark (x) all that apply or None.) Each agency identified is required to receive a copy of the reporting package.	
10	<input checked="" type="checkbox"/> Department of Agriculture
11	<input checked="" type="checkbox"/> Department of Commerce
12	<input checked="" type="checkbox"/> Department of Defense
93	<input checked="" type="checkbox"/> Department of Health and Human Services
In addition, one copy each of the reporting package is required for:	
1the Federal Audit Clearinghouse archives
0and, if not marked above, the cognizant agency
5Total number of reporting packages to be submitted

FAC DETERMINED CURRENT YEAR DIRECT FINDINGS: NO
 FAC DETERMINED COGNIZANT(C) OR OVERSIGHT(O) AGENCY*: C
 (*Please refer to the FAQ's for definitions)
 FAC DETERMINED COGNIZANT OR OVERSIGHT AGENCY FEDERAL AGENCY PREFIX: 93
 (Federal Agency Prefix List for definitions)
 FAC DETERMINED TYPE OF AUDIT REPORT ON MAJOR PROGRAM COMPLIANCE
 BASED ON 1997-2003 SF-SAC FORM INSTRUCTIONS:

Form SF-SAC(1-15-2004) OMB #0348-0057

EIN : 020222111

Part III: FEDERAL PROGRAMS Continued										
9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR									10. AUDIT FINDINGS	
Row	CFDA Number		Research and development (c)	Name of Federal program (d)	Amount expended (e)	Direct award (f)	Major program		Type(s) of compliance requirement (s) (a)	Audit finding reference number (s) (b)
	Federal Agency Prefix (a)	Extension (b)					Major program (g)	If yes, type of audit report (h)		
1	93	.XXX	<input checked="" type="checkbox"/> Y	NATIONAL INSTITUTE OF HEALTH	\$ 95,261,200	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
2	93	.XXX	<input checked="" type="checkbox"/> Y	NATIONAL INSTITUTE OF HEALTH RESEARCH TRAINING	\$ 3,441,559	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
3	93	.XXX	<input checked="" type="checkbox"/> Y	PUBLIC HEALTH SERVICES CENTER	\$ 970,646	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
4	93	.283	<input checked="" type="checkbox"/> Y	ASSOCIATION OF AMERICAN MEDICAL COLLEGES	\$ 14,220	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
5	93	.395	<input checked="" type="checkbox"/> Y	AMERICAN COLLEGE OF RADIOLOGY	\$ 51,314	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
6	93	.393	<input checked="" type="checkbox"/> Y	ALBERT EINSTEIN COLLEGE OF MEDICINE	\$ -320	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
7	93	.393	<input checked="" type="checkbox"/> Y	ALBERT EINSTEIN COLLEGE OF MEDICINE	\$ 42,576	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
8	93	.000	<input checked="" type="checkbox"/> Y	BETH ISRAEL DEACONESS MEDICAL CENTER	\$ 13,790	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
9	93	.000	<input checked="" type="checkbox"/> Y	BETH ISRAEL DEACONESS MEDICAL CENTER	\$ 102,607	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
10	93	.242	<input checked="" type="checkbox"/> Y	BOSTON UNIVERSITY	\$ 60,793	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
11	93	.242	<input checked="" type="checkbox"/> Y	BOSTON UNIVERSITY	\$ 267,919	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
12	93	.000	<input checked="" type="checkbox"/> Y	BRANDEIS UNIVERSITY	\$ 121	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
13	93	.399	<input checked="" type="checkbox"/> Y	BROWN UNIVERSITY	\$ 107,864	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
14	93	.846	<input checked="" type="checkbox"/> Y	BRIGHAM AND WOMEN S HOSPITAL	\$ 55,448	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
15	93	.397	<input checked="" type="checkbox"/> Y	BRIGHAM AND WOMEN S HOSPITAL	\$ 4,024	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
				BRIGHAM AND						

16	93	.397	<input checked="" type="checkbox"/> Y	WOMEN S HOSPITAL	\$ 1,072	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
17	93	.393	<input checked="" type="checkbox"/> Y	BRIGHAM AND WOMEN S HOSPITAL	\$ 4,313	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
18	93	.393	<input checked="" type="checkbox"/> Y	BRIGHAM AND WOMEN S HOSPITAL	\$ 13,434	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
19	93	.393	<input checked="" type="checkbox"/> Y	BRIGHAM AND WOMEN S HOSPITAL	\$ 119,771	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
20	93	.286	<input checked="" type="checkbox"/> Y	BRIGHAM AND WOMEN S HOSPITAL	\$ 54,816	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
21	93	.286	<input checked="" type="checkbox"/> Y	BRIGHAM AND WOMEN S HOSPITAL	\$ 254,393	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
22	93	.000	<input checked="" type="checkbox"/> Y	CELLDEX THERAPEUTICS, INC	\$ 12,102	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
23	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 7,574	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
24	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 18,341	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
25	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 37,216	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
26	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 48,564	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
27	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 63,958	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
28	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 64,935	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
29	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 155,288	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
30	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 169,945	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
31	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 196,796	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
32	93	.865	<input checked="" type="checkbox"/> Y	CHILDREN S HOSPITAL BOSTON	\$ 221,032	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
33	93	.136	<input checked="" type="checkbox"/> Y	CHILDREN S NATIONAL MEDICAL CENTER	\$ 6,795	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
34	93	.393	<input checked="" type="checkbox"/> Y	COLUMBIA UNIVERSITY	\$ 25,819	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
35	93	.243	<input checked="" type="checkbox"/> Y	COMMUNITY CONNECTIONS	\$ 46,158	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
36	93	.000	<input checked="" type="checkbox"/> Y	COMMUNITY CONNECTIONS	\$ 6,305	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
37	93	.865	<input checked="" type="checkbox"/> Y	CREARE, INC.	\$ 18,221	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A

38	93	.000	<input checked="" type="checkbox"/> Y	DUKE UNIVERSITY	\$ 50,477	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
39	93	.837	<input checked="" type="checkbox"/> Y	ENSION, INC.	\$ 6,678	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
40	93	.000	<input checked="" type="checkbox"/> Y	EMORY UNIVERSITY SCHOOL OF MEDICINE	\$ 42,011	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
41	93	.395	<input checked="" type="checkbox"/> Y	FOXCHASE CANCER CENTER	\$ 21,000	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
42	93	.856	<input checked="" type="checkbox"/> Y	HARVARD UNIVERSITY	\$ -19,902	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
43	93	.856	<input checked="" type="checkbox"/> Y	HARVARD UNIVERSITY	\$ 139,093	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
44	93	.399	<input checked="" type="checkbox"/> Y	HARVARD UNIVERSITY	\$ 242,778	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
45	93	.399	<input checked="" type="checkbox"/> Y	HARVARD UNIVERSITY	\$ 303,780	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
46	93	.393	<input checked="" type="checkbox"/> Y	HARVARD UNIVERSITY	\$ 145,213	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
47	93	.143	<input checked="" type="checkbox"/> Y	HARVARD UNIVERSITY	\$ 8,423	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
48	93	.143	<input checked="" type="checkbox"/> Y	HARVARD UNIVERSITY	\$ 71,621	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
49	93	.242	<input checked="" type="checkbox"/> Y	HOWARD UNIVERSITY	\$ 122,558	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
50	93	.242	<input checked="" type="checkbox"/> Y	UNIVERSITY OF IOWA	\$ 46,330	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
51	93	.859	<input checked="" type="checkbox"/> Y	JOHNS HOPKINS UNIVERSITY	\$ 53,712	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
52	93	.399	<input checked="" type="checkbox"/> Y	JOHNS HOPKINS UNIVERSITY	\$ 137,890	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
53	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF TEXAS, M D ANDERSON CANCER CENTER	\$ 1,160	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
54	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF TEXAS, M D ANDERSON CANCER CENTER	\$ 51,969	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
55	93	.395	<input checked="" type="checkbox"/> Y	MASSACHUSETTS GENERAL HOSPITAL	\$ 194,869	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
56	93	.866	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MICHIGAN	\$ 139,814	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
57	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MICHIGAN	\$ 6,216	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
58	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MICHIGAN	\$ 62,301	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
59	93	.837	<input checked="" type="checkbox"/> Y	MAINE MEDICAL CENTER	\$ 25,918	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A

60	93	.395	<input checked="" type="checkbox"/> Y	NATIONAL CHILDHOOD CANCER FOUNDATION	\$ 7,057	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
61	93	.395	<input checked="" type="checkbox"/> Y	NATIONAL CHILDHOOD CANCER FOUNDATION	\$ 53,875	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
62	93	.000	<input checked="" type="checkbox"/> Y	NMT MEDICAL, INC.	\$ 24,435	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
63	93	.853	<input checked="" type="checkbox"/> Y	NORTHWESTERN UNIVERSITY	\$ 193,157	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
64	93	.396	<input checked="" type="checkbox"/> Y	OHIO STATE UNIVERSITY	\$ 26	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
65	93	.000	<input checked="" type="checkbox"/> Y	OLMSTED MEDICAL CENTER	\$ 29,297	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
66	93	.859	<input checked="" type="checkbox"/> Y	PROMILIAD BIOPHARMA	\$ 15,992	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
67	93	.000	<input checked="" type="checkbox"/> Y	PSYCHOLOGICAL APPLICATIONS	\$ -23,202	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
68	93	.000	<input checked="" type="checkbox"/> Y	PSYCHOLOGICAL APPLICATIONS	\$ 12,277	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
69	93	.000	<input checked="" type="checkbox"/> Y	PSYCHOLOGICAL APPLICATIONS	\$ 87,475	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
70	93	.000	<input checked="" type="checkbox"/> Y	QUALITY METRICS	\$ 511	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
71	93	.000	<input checked="" type="checkbox"/> Y	RADIATION MONITORING DEVICES, INC.	\$ 17,691	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
72	93	.855	<input checked="" type="checkbox"/> Y	UNIVERSITY OF ROCHESTER	\$ 392,291	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
73	93	.853	<input checked="" type="checkbox"/> Y	SPAULDING REHABILITATION HOSPITAL	\$ -30	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
74	93	.000	<input checked="" type="checkbox"/> Y	SOCIAL & SCIENTIFIC SYSTEMS INC	\$ 16,282	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
75	93	.283	<input checked="" type="checkbox"/> Y	STATE OF NEW HAMPSHIRE	\$ 126,166	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
76	93	.242	<input checked="" type="checkbox"/> Y	STATE OF NEW HAMPSHIRE	\$ 16,968	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
77	93	.867	<input checked="" type="checkbox"/> Y	THOMAS JEFFERSON UNIVERSITY	\$ 24,750	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
78	93	.242	<input checked="" type="checkbox"/> Y	THOMAS JEFFERSON UNIVERSITY	\$ 11,748	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
79	93	.393	<input checked="" type="checkbox"/> Y	UNIVERSITY OF ARIZONA	\$ 43,145	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
80	93	.853	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA IRVINE	\$ 3,654	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A

81	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA IRVINE	\$ 65,551	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
82	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA IRVINE	\$ 89,940	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
83	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA IRVINE	\$ 126,490	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
84	93	.200	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA, LOS ANGELES	\$ 11,764	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
85	93	.859	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CONNECTICUT	\$ 47,513	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
86	93	.867	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA, SAN FRANCISCO	\$ 58,832	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
87	93	.855	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA, SAN FRANCISCO	\$ 21,287	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
88	93	.837	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA, SAN FRANCISCO	\$ 226,964	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
89	93	.393	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CALIFORNIA, SAN FRANCISCO	\$ 15,024	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
90	93	.242	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL	\$ 9,000	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
91	93	.394	<input checked="" type="checkbox"/> Y	UNIVERSITY OF TEXAS	\$ -2,971	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
92	93	.393	<input checked="" type="checkbox"/> Y	UNIVERSITY OF SOUTHERN CALIFORNIA	\$ 2,220	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
93	93	.393	<input checked="" type="checkbox"/> Y	UNIVERSITY OF SOUTHERN CALIFORNIA	\$ 535,897	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
94	93	.396	<input checked="" type="checkbox"/> Y	UNIVERSITY OF VIRGINIA	\$ 78,656	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
95	93	.393	<input checked="" type="checkbox"/> Y	UNIVERSITY OF WASHINGTON	\$ -24,811	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
96	93	.393	<input checked="" type="checkbox"/> Y	UNIVERSITY OF WASHINGTON	\$ 108,563	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
97	93	.286	<input checked="" type="checkbox"/> Y	UNIVERSITY OF WISCONSIN	\$ 14,304	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
98	93	.242	<input checked="" type="checkbox"/> Y	UNIVERSITY OF WISCONSIN	\$ 25,830	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
99	93	.393	<input checked="" type="checkbox"/> Y	WESTAT	\$ 17,647	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
100	93	.393	<input checked="" type="checkbox"/> Y	WESTAT	\$ 398,318	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
101	93	.000	<input checked="" type="checkbox"/> Y	WESTAT	\$ -123,917	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A

102	93	.000	<input checked="" type="checkbox"/> Y	WESTAT	\$ 2,399	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
103	47	.XXX	<input checked="" type="checkbox"/> Y	NATIONAL SCIENCE FOUNDATION	\$ 10,477,337	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
104	47	.050	<input checked="" type="checkbox"/> Y	BOSTON UNIVERSITY	\$ 550,750	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
105	47	.041	<input checked="" type="checkbox"/> Y	IOWA STATE UNIVERSITY	\$ 120,722	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
106	47	.076	<input checked="" type="checkbox"/> Y	MONTSHIRE MUSEUM OF SCIENCE	\$ 98,857	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
107	47	.078	<input checked="" type="checkbox"/> Y	OHIO STATE UNIVERSITY	\$ 2,328	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
108	47	.078	<input checked="" type="checkbox"/> Y	OHIO STATE UNIVERSITY	\$ 41,712	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
109	47	.078	<input checked="" type="checkbox"/> Y	OHIO STATE UNIVERSITY	\$ 64,526	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
110	47	.051	<input checked="" type="checkbox"/> Y	OHIO STATE UNIVERSITY	\$ 98	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
111	47	.051	<input checked="" type="checkbox"/> Y	OHIO STATE UNIVERSITY	\$ 6,214	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
112	47	.051	<input checked="" type="checkbox"/> Y	OHIO STATE UNIVERSITY	\$ 17,294	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
113	47	.000	<input checked="" type="checkbox"/> Y	SOUND INNOVATIONS INC.	\$ 38,244	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
114	47	.074	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CONNECTICUT	\$ 45,190	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
115	47	.070	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CONNECTICUT	\$ 77,747	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
116	47	.041	<input checked="" type="checkbox"/> Y	UNIVERSITY OF GEORGIA	\$ 103,613	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
117	47	.070	<input checked="" type="checkbox"/> Y	UNIVERSITY OF ILLINOIS	\$ 32,317	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
118	47	.070	<input checked="" type="checkbox"/> Y	UNIVERSITY OF ILLINOIS	\$ 103,815	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
119	47	.074	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MASSACHUSETTS	\$ 26,642	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
120	47	.074	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL	\$ 64,058	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
121	47	.078	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NEW HAMPSHIRE	\$ 95,538	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
122	12	.XXX	<input checked="" type="checkbox"/> Y	DEPARTMENT OF DEFENSE	\$ 2,468,175	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
123	12	.000	<input checked="" type="checkbox"/> Y	BATTELLE MEMORIAL INSTITUTE		<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A

					\$ 3,173					
124	12	.630	<input checked="" type="checkbox"/> Y	CENTRAL INTELLIGENCE AGENCY	\$ 95,939	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
125	12	.800	<input checked="" type="checkbox"/> Y	CREARE INC.	\$ 1,288	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
126	12	.910	<input checked="" type="checkbox"/> Y	U.S. DEPARTMENT OF HOMELAND SECURITY	\$ 519,918	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
127	12	.000	<input checked="" type="checkbox"/> Y	GENERAL ELECTRIC	\$ 191,401	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
128	12	.000	<input checked="" type="checkbox"/> Y	HENRY JACKSON FOUNDATION	\$ 43,502	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
129	12	.000	<input checked="" type="checkbox"/> Y	HENRY JACKSON FOUNDATION	\$ 72,036	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
130	12	.000	<input checked="" type="checkbox"/> Y	PEGASUS CORPORATION	\$ 25,429	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
131	12	.300	<input checked="" type="checkbox"/> Y	PRECISION MAGNETIC BEARING SYSTEMS, INC.	\$ 26,816	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
132	12	.000	<input checked="" type="checkbox"/> Y	RESONANCE RESEARCH INC.	\$ 32,329	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
133	12	.800	<input checked="" type="checkbox"/> Y	SECURBORATION INC.	\$ 26,397	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
134	12	.000	<input checked="" type="checkbox"/> Y	SECURBORATION INC.	\$ 164,754	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
135	12	.000	<input checked="" type="checkbox"/> Y	SOUND INNOVATIONS INC.	\$ 17,258	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
136	12	.000	<input checked="" type="checkbox"/> Y	SOUND INNOVATIONS INC.	\$ 29,595	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
137	12	.630	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CONNECTICUT	\$ 39,068	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
138	12	.000	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NORTH CAROLINA	\$ 48,816	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
139	12	.431	<input checked="" type="checkbox"/> Y	UNIVERSITY OF WISCONSIN	\$ 146,234	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
140	43	.XXX	<input checked="" type="checkbox"/> Y	U.S. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	\$ 1,900,441	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
141	43	.000	<input checked="" type="checkbox"/> Y	CREARE INC.	\$ 35,941	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
142	43	.001	<input checked="" type="checkbox"/> Y	JOHN HOPKINS UNIVERSITY	\$ 14,748	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
143	43	.001	<input checked="" type="checkbox"/> Y	JET PROPULSION LABORATORY	\$ 9,639	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
				JET PROPULSION						

144	43	.001	<input checked="" type="checkbox"/> Y	LABORATORY	\$ 237,670	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
145	43	.001	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NEW HAMPSHIRE	\$ 18,501	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
146	43	.001	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NEW HAMPSHIRE	\$ 27,716	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
147	10	.XXX	<input checked="" type="checkbox"/> Y	U.S. DEPARTMENT OF AGRICULTURE:	\$ 568,301	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
148	10	.000	<input checked="" type="checkbox"/> Y	PAUL SMITHS COLLEGE	\$ 7,833	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
149	11	.XXX	<input checked="" type="checkbox"/> Y	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION:	\$ 136,513	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
150	11	.432	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MICHIGAN	\$ 375	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
151	11	.460	<input checked="" type="checkbox"/> Y	SAINT LAWRENCE UNIVERSITY	\$ 18,195	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
152	11	.419	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NEW HAMPSHIRE	\$ 50,467	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
153	11	.6XX	<input checked="" type="checkbox"/> Y	U.S. DEPARTMENT OF COMMERCE	\$ 5,339,663	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
154	15	.FFB	<input checked="" type="checkbox"/> Y	NATIONAL FISH AND WILDLIFE FOUNDATION	\$ 30,522	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
155	15	.224	<input checked="" type="checkbox"/> Y	MONTANA STATE UNIVERSITY	\$ 4,197	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
156	16	.XXX	<input checked="" type="checkbox"/> Y	U.S. DEPARTMENT OF JUSTICE:	\$ 14,633,192	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
157	64	.XXX	<input checked="" type="checkbox"/> Y	VETERAN S ADMINISTRATION	\$ 77,756	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
158	27	.XXX	<input checked="" type="checkbox"/> Y	VETERAN S ADMINISTRATION	\$ 231,304	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
159	81	.XXX	<input checked="" type="checkbox"/> Y	DEPARTMENT OF ENERGY:	\$ 1,167,153	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
160	81	.057	<input checked="" type="checkbox"/> Y	UNIVERSITY OF CONNECTICUT	\$ 44,913	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
161	81	.000	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MARYLAND	\$ 47,480	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
162	81	.049	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NEW HAMPSHIRE	\$ 9,435	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
163	81	.049	<input checked="" type="checkbox"/> Y	UNIVERSITY OF NEW HAMPSHIRE	\$ 14,999	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
164	81	.000	<input checked="" type="checkbox"/> Y	UNIVERSITY OF TENNESSEE-BATTELLE	\$ 43,081	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
165	97	.000	<input checked="" type="checkbox"/> Y	BOOZ ALLEN HAMILTON	\$ 26,283	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A

166	96	.007	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MICHIGAN	\$ 55,030	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
167	92	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MICHIGAN	\$ 11,842	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
168	93	.399	<input checked="" type="checkbox"/> Y	UNIVERSITY OF MICHIGAN	\$ 95,261	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
169	97	.061	<input checked="" type="checkbox"/> Y	UNIVERSITY OF COLORADO	\$ 32,095	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
170	97	.061	<input checked="" type="checkbox"/> Y	UNIVERSITY OF COLORADO	\$ 47,059	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
171	96	.000	<input checked="" type="checkbox"/> Y	WESTAT	\$ 222,426	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	U	O	N/A
172	85	.133	<input checked="" type="checkbox"/> Y	NATIONAL INSTITUTE ON DISABILITY AND REHABILITATION RESEARCH	\$ 21,635	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
173	84	.133	<input checked="" type="checkbox"/> Y	NATIONAL INSTITUTE ON DISABILITY AND REHABILITATION RESEARCH	\$ 47,558	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
174	84	.007	<input checked="" type="checkbox"/> N	FEDERAL SUPPLEMENTAL EDUCATIONAL OPPORTUNITY	\$ 800,000	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
175	84	.033	<input checked="" type="checkbox"/> N	FEDERAL WORK STUDY PROGRAM	\$ 1,302,770	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
176	84	.063	<input checked="" type="checkbox"/> N	FEDERAL PELL GRANT PROGRAM	\$ 1,413,965	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
177	93	.000	<input checked="" type="checkbox"/> N	AMBULATORY PEDIATRIC ASSOCIATION	\$ 39,083	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
178	93	.000	<input checked="" type="checkbox"/> N	CENTERS FOR DISEASE CONTROL	\$ 17,941	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
179	93	.283	<input checked="" type="checkbox"/> N	CENTERS FOR DISEASE CONTROL	\$ -255	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
180	93	.283	<input checked="" type="checkbox"/> N	CENTERS FOR DISEASE CONTROL	\$ 201,755	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
181	93	.283	<input checked="" type="checkbox"/> N	CENTERS FOR DISEASE CONTROL	\$ 39,177	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
182	93	.359	<input checked="" type="checkbox"/> N	HEALTH RESOURCES AND SERVICES ADMINISTRATION	\$ 197,445	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
183	93	.110	<input checked="" type="checkbox"/> N	MATERNAL AND CHILD HEALTH FEDERAL CONSOLIDATED PROGRAMS	\$ 1,250	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
184	93	.127	<input checked="" type="checkbox"/> N	HEALTH RESOURCES AND SERVICES ADMINISTRATION	\$ 33,986	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
				GRANTS PROVIDE						

185	93	.918	<input checked="" type="checkbox"/> N	OUTPATIENT EARLY INTERVENTION WITH RESPECT TO HIV	\$ 22,966	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
186	93	.153	<input checked="" type="checkbox"/> N	CORRDINATED SVS AND ACCESS TO RESEARCH FOR WOMEN, INFANTS, CHILDREN AND YO	\$ 315,595	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
187	93	.110	<input checked="" type="checkbox"/> N	MATERNAL AND CHILD HEALTH FEDERAL CONSOLIDATED PROGRAMS	\$ 62,593	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
188	93	.895	<input checked="" type="checkbox"/> N	GRANTS FOR FACULTY DEVELOPMENT IN FAMILY MEDICINE	\$ 101,481	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
189	93	.884	<input checked="" type="checkbox"/> N	GRANTS FOR TRAINNG IN PRIMARY CARE MEDICINE AND DENTISTRY	\$ 251,817	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
190	93	.884	<input checked="" type="checkbox"/> N	GRANTS FOR TRAINNG IN PRIMARY CARE MEDICINE AND DENTISTRY	\$ 121,270	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
191	93	.884	<input checked="" type="checkbox"/> N	GRANTS FOR TRAINNG IN PRIMARY CARE MEDICINE AND DENTISTRY	\$ 157,336	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
192	93	.884	<input checked="" type="checkbox"/> N	GRANTS FOR TRAINNG IN PRIMARY CARE MEDICINE AND DENTISTRY	\$ 119,181	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
193	93	.153	<input checked="" type="checkbox"/> N	CORRDINATED SVS AND ACCESS TO RESEARCH FOR WOMEN, INFANTS, CHILDREN AND YO	\$ -46	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
194	93	.153	<input checked="" type="checkbox"/> N	CORRDINATED SVS AND ACCESS TO RESEARCH FOR WOMEN, INFANTS, CHILDREN AND YO	\$ 42,599	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
195	93	.918	<input checked="" type="checkbox"/> N	GRANTS /PROVIDE OUT PATIENT EARLY INTERVENTION SERVICES WITH RESPECT TO HI	\$ 295,373	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
196	93	.918	<input checked="" type="checkbox"/> N	GRANTS /PROVIDE OUT PATIENT EARLY INTERVENTION SERVICES WITH RESPECT TO HI	\$ 84,422	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
197	93	.110	<input checked="" type="checkbox"/> N	MATERNAL AND CHILD HEALTH FEDERAL CONSOLIDATED PROGRAMS	\$ 205,421	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
198	93	.107	<input checked="" type="checkbox"/> N	MODEL STATE-SUPPORTED AREA HEALTH EDUCATION CENTER	\$ 186,558	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
				MATERNAL AND CHILD						

199	93	.110	<input checked="" type="checkbox"/> N	HEALTH FEDERAL CONSOLIDATED PROGRAMS	\$ 126,906	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
200	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 3,483	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
201	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 38,023	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
202	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ -677	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
203	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 46,308	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
204	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 4,167	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
205	93	.393	<input checked="" type="checkbox"/> N	NATIONAL INSTITUTES OF HEALTH	\$ 12,000	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
206	93	.395	<input checked="" type="checkbox"/> N	CANCER TREATMENT RESEARCH	\$ -12,106	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
207	93	.989	<input checked="" type="checkbox"/> N	NATIONAL CENTER FOR RESEARCH RESOURCES	\$ 458,912	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
208	93	.989	<input checked="" type="checkbox"/> N	NATIONAL CENTER FOR RESEARCH RESOURCES	\$ 66,105	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
209	93	.278	<input checked="" type="checkbox"/> N	DRUG ABUSE NATIONAL RESEARCH SERVICE AWARDS FOR RESEARCH TRAINING	\$ 6,834	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
210	93	.279	<input checked="" type="checkbox"/> N	NATIONAL INSTITUTES OF HEALTH	\$ 39,431	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
211	93	.867	<input checked="" type="checkbox"/> N	VISION RESEARCH	\$ 21,957	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
212	93	.821	<input checked="" type="checkbox"/> N	CELL BIOLOGY AND BIOPHYSICS RESEARCH	\$ -291	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
213	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 45,964	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
214	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 39,550	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
215	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 7,234	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
216	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 29,918	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
217	93	.859	<input checked="" type="checkbox"/> N	BIOMEDICAL RESEARCH AND RESEARCH TRAINING	\$ 7,076	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
218	93	.879	<input checked="" type="checkbox"/> N	MEDICAL LIBRARY ASSISTANCE		<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A

					\$ 167,924					
219	93	.279	<input checked="" type="checkbox"/> N	NATIONAL INSTITUTES OF HEALTH	\$ 109,399	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
220	93	.243	<input checked="" type="checkbox"/> N	SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES	\$ 235,694	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
221	93	.243	<input checked="" type="checkbox"/> N	SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES	\$ 550,009	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
222	93	.395	<input checked="" type="checkbox"/> N	AMERICAN COLLEGE OF RADIOLOGY	\$ 111,403	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
223	93	.399	<input checked="" type="checkbox"/> N	ALLEGHENY-SINGER RESEARCH INSTITUTE	\$ 16	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
224	93	.399	<input checked="" type="checkbox"/> N	ALLEGHENY-SINGER RESEARCH INSTITUTE	\$ 191	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
225	93	.000	<input checked="" type="checkbox"/> N	BETH ISRAEL DEACONESS MEDICAL CENTER	\$ 180	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
226	93	.000	<input checked="" type="checkbox"/> N	BATTELLE MEMORIAL INSTITUTE	\$ 729	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
227	93	.398	<input checked="" type="checkbox"/> N	BOSTON UNIVERSITY	\$ 8,751	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
228	93	.000	<input checked="" type="checkbox"/> N	DANA FARBER CANCER INSTITUTE	\$ 136,730	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
229	93	.000	<input checked="" type="checkbox"/> N	DUKE UNIVERSITY	\$ 4,327	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
230	93	.000	<input checked="" type="checkbox"/> N	MOUNT SINAI SCHOOL OF MEDICINE	\$ 1,500	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
231	93	.000	<input checked="" type="checkbox"/> N	NEW ENGLAND INSTITUTE FOR ADDICTION STUDIES	\$ 15,122	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
232	93	.000	<input checked="" type="checkbox"/> N	NEW ENGLAND INSTITUTE FOR ADDICTION STUDIES	\$ 42,824	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
233	93	.399	<input checked="" type="checkbox"/> N	NATIONAL SURGICAL ADJUVANT BREAST AND BOWEL PROJECT	\$ -560	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
234	93	.399	<input checked="" type="checkbox"/> N	NATIONAL SURGICAL ADJUVANT BREAST AND BOWEL PROJECT	\$ 8,557	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
235	93	.399	<input checked="" type="checkbox"/> N	NATIONAL SURGICAL ADJUVANT BREAST AND BOWEL PROJECT	\$ 9,405	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
236	93	.399	<input checked="" type="checkbox"/> N	NATIONAL SURGICAL ADJUVANT BREAST AND BOWEL PROJECT	\$ 702	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
237	93	.000	<input checked="" type="checkbox"/> N	NATIONAL SPACE BIOMEDICAL RESEARCH INSTITUTE	\$ 69,375	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
238	93	.958	<input checked="" type="checkbox"/> N	STATE OF MINNESOTA	\$ 10,718	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A

239	93	.003	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 66,686	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
240	93	.283	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 170,466	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
241	93	.003	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 21,636	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
242	93	.991	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 90,921	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
243	93	.667	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 3,210	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
244	93	.667	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 518,477	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
245	93	.913	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 59,205	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
246	93	.003	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 154,213	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
247	93	.283	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 17,257	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
248	93	.283	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 14,052	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
249	93	.283	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 273,600	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
250	93	.991	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ -2,568	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
251	93	.913	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 2,038	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
252	93	.667	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 152,562	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
253	93	.959	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 4,199	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
254	93	.283	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 79,278	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
255	93	.994	<input checked="" type="checkbox"/> N	STATE OF VERMONT	\$ 12,483	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
256	93	.003	<input checked="" type="checkbox"/> N	STATE OF VERMONT	\$ 119,642	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
257	93	.994	<input checked="" type="checkbox"/> N	STATE OF VERMONT	\$ 11,960	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
258	93	.283	<input checked="" type="checkbox"/> N	STATE OF VERMONT	\$ 29,402	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
259	93	.399	<input checked="" type="checkbox"/> N	SOUTHWEST ONCOLOGY GROUP	\$ -111	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
260	93	.399	<input checked="" type="checkbox"/> N	SOUTHWEST ONCOLOGY GROUP	\$ -21,855	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A

261	93	.866	<input checked="" type="checkbox"/> N	UNIVERSITY OF CALIFORNIA	\$ 31,147	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
262	93	.000	<input checked="" type="checkbox"/> N	UNIVERSITY OF CHICAGO	\$ 25,397	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
263	93	.000	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS	\$ 5,831	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
264	93	.283	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS	\$ 18,566	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
265	93	.110	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS	\$ -6,713	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
266	93	.145	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS	\$ 1,668	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
267	93	.110	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS	\$ 17,659	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
268	93	.283	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS	\$ 19,058	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
269	93	.000	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS	\$ 14,257	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
270	93	.853	<input checked="" type="checkbox"/> N	UNIVERSITY OF MARYLAND	\$ 19,493	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
271	93	.145	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER	\$ 94,748	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
272	93	.145	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER	\$ 1,725	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
273	93	.145	<input checked="" type="checkbox"/> N	UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER	\$ 1,368	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
274	93	.632	<input checked="" type="checkbox"/> N	UNIVERSITY OF NEW HAMPSHIRE	\$ 27,519	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
275	93	.632	<input checked="" type="checkbox"/> N	UNIVERSITY OF NEW HAMPSHIRE	\$ 2,216	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
276	93	.853	<input checked="" type="checkbox"/> N	UNIVERSITY OF VERMONT	\$ 71,660	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
277	93	.846	<input checked="" type="checkbox"/> N	UNIVERSITY OF WASHINGTON	\$ 6,070	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
278	93	.853	<input checked="" type="checkbox"/> N	YALE UNIVERSITY	\$ 1,650	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
279	47	.000	<input checked="" type="checkbox"/> N	FELLOWSHIP	\$ 1,500	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
280	47	.049	<input checked="" type="checkbox"/> N	MATHEMATICAL AND PHYSICAL SCIENCE	\$ 759	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
281	47	.049	<input checked="" type="checkbox"/> N	MATHEMATICAL AND PHYSICAL SCIENCE	\$ 8,675	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
				MATHEMATICAL AND						

282	47	.049	<input checked="" type="checkbox"/> N	PHYSICAL SCIENCE	\$ 22,721	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
283	47	.050	<input checked="" type="checkbox"/> N	GEOSCIENCES	\$ 130,846	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
284	47	.076	<input checked="" type="checkbox"/> N	EDUCATION AND HUMAN RESOURCES	\$ 23,173	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
285	47	.076	<input checked="" type="checkbox"/> N	EDUCATION AND HUMAN RESOURCES	\$ 339,401	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
286	43	.000	<input checked="" type="checkbox"/> N	INTEGRATED SYSTEMS SOLUTION, DISASTER & WATER MANAGEMENT	\$ 148,962	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
287	43	.001	<input checked="" type="checkbox"/> N	AEROSPACE EDUCATION SERVICES PROGRAM	\$ 11,263	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
288	43	.002	<input checked="" type="checkbox"/> N	TECHNOLOGY TRANSFER	\$ -149	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
289	43	.002	<input checked="" type="checkbox"/> N	TECHNOLOGY TRANSFER	\$ 3,389	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
290	43	.002	<input checked="" type="checkbox"/> N	TECHNOLOGY TRANSFER	\$ 20,429	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
291	43	.002	<input checked="" type="checkbox"/> N	TECHNOLOGY TRANSFER	\$ 39,235	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
292	43	.002	<input checked="" type="checkbox"/> N	TECHNOLOGY TRANSFER	\$ 40,010	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
293	64	.000	<input checked="" type="checkbox"/> N	VETERAN S AFFAIRS ADMINISTRATION	\$ 34,580	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
294	64	.000	<input checked="" type="checkbox"/> N	VETERAN S AFFAIRS ADMINISTRATION	\$ 35,995	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
295	64	.000	<input checked="" type="checkbox"/> N	VETERAN S AFFAIRS ADMINISTRATION	\$ 63,129	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
296	64	.000	<input checked="" type="checkbox"/> N	VETERAN S AFFAIRS ADMINISTRATION	\$ 95,508	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
297	27	.011	<input checked="" type="checkbox"/> N	INTERGOVERNMENTAL PERSONNEL ACT (IPA) MOBILITY PROGRAM	\$ 11,263	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
298	27	.011	<input checked="" type="checkbox"/> N	INTERGOVERNMENTAL PERSONNEL ACT (IPA) MOBILITY PROGRAM	\$ 13,494	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
299	27	.011	<input checked="" type="checkbox"/> N	INTERGOVERNMENTAL PERSONNEL ACT (IPA) MOBILITY PROGRAM	\$ 31,872	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
300	27	.011	<input checked="" type="checkbox"/> N	INTERGOVERNMENTAL PERSONNEL ACT (IPA) MOBILITY PROGRAM	\$ 32,849	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
301	27	.011	<input checked="" type="checkbox"/> N	INTERGOVERNMENTAL PERSONNEL ACT (IPA) MOBILITY PROGRAM	\$ 188,831	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
302	27	.011	<input checked="" type="checkbox"/> N	INTERGOVERNMENTAL PERSONNEL ACT (IPA) MOBILITY PROGRAM	\$ 8,784	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A

303	12	.630	<input checked="" type="checkbox"/> N	BASIC, APPLIED, AND ADVANCED RESEARCH IN SCIENCE AND ENGINEERING	\$ -218	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
304	12	.630	<input checked="" type="checkbox"/> N	BASIC, APPLIED, AND ADVANCED RESEARCH IN SCIENCE AND ENGINEERING	\$ 6,627	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
305	12	.420	<input checked="" type="checkbox"/> N	MILITARY MEDICAL RESEARCH AND DEVELOPMENT	\$ 11,334	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
306	12	.420	<input checked="" type="checkbox"/> N	MILITARY MEDICAL RESEARCH AND DEVELOPMENT	\$ 16,898	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
307	12	.420	<input checked="" type="checkbox"/> N	MILITARY MEDICAL RESEARCH AND DEVELOPMENT	\$ 102,554	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
308	12	.300	<input checked="" type="checkbox"/> N	BASIC AND APPLIED SCIENCE RESEARCH	\$ -479	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
309	12	.910	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 68,725	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
310	16	.560	<input checked="" type="checkbox"/> N	NIJ RESEARCH, EVALUATION, AND DEVELOPMENT PROJECT GRANTS	\$ 722,995	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
311	84	.200	<input checked="" type="checkbox"/> N	GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED	\$ 200,345	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
312	84	.200	<input checked="" type="checkbox"/> N	GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED	\$ 216,190	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
313	84	.200	<input checked="" type="checkbox"/> N	GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED	\$ 235,770	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
314	84	.133	<input checked="" type="checkbox"/> N	WRIGHT STATE UNIVERSITY	\$ 9,890	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N		O	N/A
315	98	.001	<input checked="" type="checkbox"/> N	U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT	\$ 96,604	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
316	97	.071	<input checked="" type="checkbox"/> N	METROPOLITAN MEDICAL RESPONSE SYSTEM	\$ 195,431	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
317	97	.000	<input checked="" type="checkbox"/> N	DEPARTMENT OF HOMELAND SECURITY	\$ 143,005	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
318	90	.300	<input checked="" type="checkbox"/> N	JAPAN-US FRIENDSHIP COMMISSION GRANTS	\$ -5,826	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
319	90	.300	<input checked="" type="checkbox"/> N	JAPAN-US FRIENDSHIP COMMISSION GRANTS	\$ 48,257	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
320	81	.000	<input checked="" type="checkbox"/> N	DEPARTMENT OF EDUCATION - OTHER FEDERAL	\$ 14,639	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
321	66	.514	<input checked="" type="checkbox"/> N	SCIENCE TO ACHIEVE RESULTS (STAR) FELLOWSHIP PROGRAM	\$ 31,152	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A

322	59	.007	<input checked="" type="checkbox"/> N	TECHNICAL ASSISTANCE	\$ 458,907	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
323	59	.000	<input checked="" type="checkbox"/> N	TECHNICAL ASSISTANCE	\$ 119,338	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
324	59	.000	<input checked="" type="checkbox"/> N	TECHNICAL ASSISTANCE	\$ 532,864	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
325	45	.024	<input checked="" type="checkbox"/> N	PROMOTION OF THE ARTS GRANTS TO ORGANIZATIONS AND INDIVIDUALS	\$ 5,000	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
326	45	.024	<input checked="" type="checkbox"/> N	PROMOTION OF THE ARTS GRANTS TO ORGANIZATIONS AND INDIVIDUALS	\$ 20,000	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
327	45	.024	<input checked="" type="checkbox"/> N	PROMOTION OF THE ARTS GRANTS TO ORGANIZATIONS AND INDIVIDUALS	\$ 43,500	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
328	20	.600	<input checked="" type="checkbox"/> N	STATE OF NEW HAMPSHIRE	\$ 82,048	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
329	16	.000	<input checked="" type="checkbox"/> N	STATE OF CONNECTICUT	\$ 2,397	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N		O	N/A
330	84	.033	<input checked="" type="checkbox"/> N	U.S. DEPT OF EDUCATION- PERKINS LOANS O/S 6/30/06	\$ 21,316,930	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
331	84	.032	<input checked="" type="checkbox"/> N	U.S. DEPT OF EDUCATION- FFEL LOANS ISSUED 6/30/06	\$ 22,716,138	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
332	93	.342	<input checked="" type="checkbox"/> N	HEALTH PROFESSIONAL STUDENT LOANS O/S AT 6/30/06	\$ 1,997,650	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
333	93	.108	<input checked="" type="checkbox"/> N	HEALTH EDUCATION ASSISTANT LOANS O/S AT 6/30/06	\$ 104,006	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> Y	U	O	N/A
Computer Generated Total Federal Awards Expended:					\$ 209087672					
TOTAL FEDERAL AWARDS EXPENDED					\$209087672					

*Footnotes for Part 3 - Item 10 and Item 11

1. See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.
2. Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)
3. If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.
4. Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510 (a)) reported for each Federal program.

- | | | | |
|------------------------------------|---|--|---------------------------------|
| A. Activities allowed or unallowed | E. Eligibility | I. Procurement and suspension and debarment | L. Reporting |
| B. Allowable costs/cost principles | F. Equipment and real property management | J. Program income | M. Subrecipient monitoring |
| C. Cash management | G. Matching, level of effort, earmarking | K. Real property acquisition and relocation assistance | N. Special tests and provisions |
| D. Davis-Bacon Act | H. Period of availability of funds | | O. None |
| | | | P. Other |

4. N/A for None.

Page 1

Page 2

Page 4 - EIN continuation

Page 4 - DUNS continuation

Perform a New Query

ORIGINAL

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN #: 1020222111A3

DATE: March 14, 2007

INSTITUTION:
 Dartmouth College
 Office of Sponsored Projects
 11 Rope Ferry Road #6210
 Hanover

NH 03755-1404

FILING REF.: The preceding Agreement was dated May 18, 2006

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: FACILITIES AND ADMINISTRATIVE COST RATES*

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

TYPE	EFFECTIVE PERIOD		RATE (%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
PRED.	07/01/05	06/30/08	59.9	On-Campus	Research
PRED.	07/01/05	06/30/08	35.0	On-Campus	Other Spon. Prog.
PRED.	07/01/05	06/30/08	68.0	On-Campus	Instr. & Training
PRED.	07/01/05	06/30/08	26.0	Off-Campus	All Programs
PROV.	07/01/08	UNTIL AMENDED	Use same rates and conditions as those cited for fiscal year ending June 30, 2008.		

*BASE:

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first \$25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, student tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of \$25,000.

INSTITUTION:
 Dartmouth College
 Office of Sponsored Projects

AGREEMENT DATE: March 14, 2007

SECTION I: FRINGE BENEFITS RATES**

RATE TYPES: FIXED		FINAL	PROV. (PROVISIONAL)	PRED. (PREDETERMINED)	
TYPE	EFFECTIVE PERIOD		RATE (%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
FIXED	07/01/06	06/30/07	38.0	All	Fac&Off & Staff&Ser
FIXED	07/01/06	06/30/07	24.5	All	Research Associate B
FIXED	07/01/06	06/30/07	9.0	All	Temporary
FIXED	07/01/07	06/30/08	38.5	All	Fac&Off & Staff&Ser
FIXED	07/01/07	06/30/08	24.5	All	Research Associate B
FIXED	07/01/07	06/30/08	9.0	All	Temporary
PROV.	07/01/08	UNTIL AMENDED	39.0	All	Fac&Off & Staff&Ser
PROV.	07/01/08	UNTIL AMENDED	24.5	All	Research Associate B
PROV.	07/01/08	UNTIL AMENDED	9.0	All	Temporary

**DESCRIPTION OF FRINGE BENEFITS RATE BASE:
 Salaries and wages.

INSTITUTION:
Dartmouth College
Office of Sponsored Projects

AGREEMENT DATE: March 14, 2007

SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:

The fringe benefits are charged using the rate(s) listed in the Fringe Benefits Section of this Agreement. The fringe benefits included in the rate(s) are listed below.

TREATMENT OF PAID ABSENCES:

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made.

(1) Off-Campus Definition: With the exception of the VA Hospital in White River Junction, Vermont, the off-site rate will apply to all activities performed in facilities not owned by the College and to which rent is directly allocated. Actual costs will be apportioned between on-site and off-site components. Each portion will bear the appropriate rate.

(2) Special Off-Campus Rate: The following rates will apply to activities performed at the VA Hospital in white River Junction, Vermont:

TYPE	FROM	TO	RATE	BASE
Final	7/1/03	6/30/05	29.8%	See Section I
Prov.	7/1/05	Until	29.8%	See Section I
		Amended		

(3) The fringe benefits rate consists of pension, FICA, health insurance, life insurance, worker's compensation, unemployment compensation insurance, disability insurance, employee tuition assistance, employee advising program, severance pay-out plans and TIAA/CREF.

(4) Equipment means an article of nonexpendable, tangible personal property having a useful life of more than one year, and an acquisition cost of \$2,500 or more per unit.

This Rate Agreement updates Fringe Benefit Rates only.

INSTITUTION:
Dartmouth College
Office of Sponsored Projects

AGREEMENT DATE: March 14, 2007

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted; such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21 Circular, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:

Dartmouth College
Office of Sponsored Projects

(NAME)

(SIGNATURE)

(b)(6)

(TITLE) Director, Office of Sponsored Projects

(DATE)

March 14, 2007

(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(NAME)

(b)(6)

DIRECTOR, DIVISION OF COST ALLOCATION

(TITLE)

March 14, 2007

(DATE) 0477

HHS REPRESENTATIVE

Telephone:

(b)(6)

Renwick, Tya

From: (b)(6)
Sent: Friday, March 21, 2008 3:05 PM
To: 'Renwick, Tya'
Subject: RE: Dartmouth - Non-competing Continuation Application Review
Attachments: FAagreement031407.pdf

See attached rate agreement. On Page 2 - you will see the fringe benefits rates. The Tuck Non-Pension Faculty is the same as Research Associate B, as RA-B are non-pension positions. I was wrong in my answer - the rate fro FY09 is 24.5%, not 26.5%!

It has been a long week and I will be leaving shortly - so no more emails until Monday!

Have a nice weekend.

Thanks

(b)(6)

-----Original Message-----

From: Renwick, Tya (b)(6)
Sent: Friday, March 21, 2008 2:22 PM
To: (b)(6)
Subject: RE: Dartmouth - Non-competing Continuation Application Review

(b)(6)

Please send me copy of the approved rate agreement noted in your response to question 2 under Initiative 5.

Thanks.

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

From: (b)(6)
Sent: Tuesday, March 18, 2008 12:50 PM
To: 'Renwick, Tya'
Cc: 'Morgan, Marilyn'; 'Lee, Annabelle'; 'Harris, Richard'; 'Martha Austin'
Subject: RE: Dartmouth - Non-competing Continuation Application Review

Tya,
See attached responses in the word doc and two other pieces of supporting info on the RAND question.

Thanks

(b)(6)

-----Original Message-----

From: Renwick, Ty (b)(6)
Sent: Monday, March 17, 2008 4:45 PM
To: (b)(6)
Cc: Morgan, Marlyn; Lee, Annabelle; Harris, Richard; Martha Austin
Subject: Dartmouth - Non-competing Continuation Application Review

Hi (b)(6)

I'm continuing with the review of your application. Please address the following by COB, March 18th:

I3P Administration Budget:

1. Web Design \$25,000 – Is this a necessary expense for the success of this project?

Initiative 1 – Fellowship Program:

1. The budget narrative notes that the program will continue through March 31, 2010. At this point we will not be able to address a no-cost extension. If you would like to request a no-cost extension towards the end of BPIII please ensure that your request includes a justification for the request, outline of remaining funds available to support extended period, and a description of performance measures necessary to complete the project.
2. Subawards/Contractual Costs – A memorandum of understanding (MOU) will be issued to 3 institutes to support the fellowship program. Based on our records from BPII the MOU issued was followed up by issuing a formal contract. Will that be the same for BPIII? How many fellows will be selected?

Initiative 2 – Human Behavior, Insider Threat, and Awareness

1. An 8% fixed fee is reflected on RAND management and research budget. Per the funding announcement for this program, Article IV, item C.6. "Profit or fee is not allowable except when subcontracting for routine goods and services with commercial organizations." How will Dartmouth ensure compliance?

2. Research Budget RAND – It appears that your total calculations for BPIII incorporate \$144,345 for consultant/contracts costs. However, consultant/contracts costs are not budgeted for BPIII. Please explain your calculations. Also there is not a justification to support these costs.
3. Research Budget Cornell – Cornell’s budget was reduced by \$50,000. Where were these funds reallocated?
4. Dartmouth College ISTS – Travel: What are the various conferences that will be supported by these funds?
5. Dartmouth College ISTS – \$14,000 & \$18,459 are budgeted for undergrads and CS grad students respectively. How were these totals calculated (hours, rate, etc.)? How many students will be supported?
6. Dartmouth College ISTS – What are the base salaries for the faculty and staff?

Initiative 5 – Research Budget RAND –

1. An 8% fixed fee is reflected on RAND management and research budget. Per the funding announcement for this program, Article IV, item C.6. “Profit or fee is not allowable except when subcontracting for routine goods and services with commercial organizations.” How will Dartmouth ensure compliance?
2. Dartmouth College ISTS – Personnel: What are the base salaries for the faculty and staff? Per the budget justification a student who will assist with data reduction, modeling and report/presentation writing 480 hours/year. What is the hourly rate for this student? 28% fringe rate is applied to faculty. Do you have a rate agreement reflecting the 28%?

Thank you.

Tya Renwick

Grants Specialist
Grants and Financial Assistance Division
Office of Procurement Operations
Department of Homeland Security

(b)(6)

Fax: 202-447-5600

ORIGINAL**COLLEGES AND UNIVERSITIES RATE AGREEMENT**

BIN #: 1020222111A3

DATE: May 18, 2006

INSTITUTION:
 Dartmouth College
 Office of Sponsored Projects
 11 Rope Ferry Road #6210
 Hanover

NH 03755-1404

FILING REF.: The preceding
 Agreement was dated
 January 27, 2005

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: FACILITIES AND ADMINISTRATIVE COST RATES*

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

TYPE	EFFECTIVE PERIOD		RATE (%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
PRED.	07/01/05	06/30/08	59.9	On-Campus	Research
PRED.	07/01/05	06/30/08	35.0	On-Campus	Other Spon. Prog.
PRED.	07/01/05	06/30/08	68.0	On-Campus	Instr. & Training
PRED.	07/01/05	06/30/08	26.0	Off-Campus	All Programs
PROV.	07/01/08	UNTIL AMENDED	Use same rates and conditions as those cited for fiscal year ending June 30, 2008.		

***BASE:**

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first \$25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of \$25,000.

INSTITUTION:
 Dartmouth College
 Office of Sponsored Projects

AGREEMENT DATE: May 18, 2006

SECTION I: FRINGE BENEFITS RATES**

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)					
TYPE	EFFECTIVE PERIOD		RATE (%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
FIXED	07/01/05	06/30/06	37.0	All	Fac&Off & Staff&Ser
FIXED	07/01/05	06/30/06	24.5	All	Research Associate B
FIXED	07/01/05	06/30/06	9.0	All	Temporary
FIXED	07/01/06	06/30/07	38.0	All	Fac&Off & Staff&Ser
FIXED	07/01/06	06/30/07	24.5	All	Research Associate B
FIXED	07/01/06	06/30/07	9.0	All	Temporary
PROV.	07/01/07	UNTIL AMENDED	39.0	All	Fac&Off & Staff&Ser
PROV.	07/01/07	UNTIL AMENDED	25.5	All	Research Associate B
PROV.	07/01/07	UNTIL AMENDED	9.0	All	Temporary

**DESCRIPTION OF FRINGE BENEFITS RATE BASE:
 Salaries and wages.

INSTITUTION:
Dartmouth College
Office of Sponsored Projects

AGREEMENT DATE: May 18, 2006

SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:

The fringe benefits are charged using the rate(s) listed in the Fringe Benefits Section of this Agreement. The fringe benefits included in the rate(s) are listed below.

TREATMENT OF PAID ABSENCES:

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made.

- (1) **Off-Campus Definition:** With the exception of the VA Hospital in White River Junction, Vermont, the off-site rate will apply to all activities performed in facilities not owned by the College and to which rent is directly allocated. Actual costs will be apportioned between on-site and off-site components. Each portion will bear the appropriate rate.
- (2) **Special Off-Campus Rate:** The following rates will apply to activities performed at the VA Hospital in White River Junction, Vermont:

TYPE	FROM	TO	RATE	BASE
Final	7/1/03	6/30/05	29.8%	See Section I
Prov.	7/1/05	Until	29.8%	See Section I
		Amended		

(3) The fringe benefits rate consists of pension, FICA, health insurance, life insurance, worker's compensation, unemployment compensation insurance, disability insurance, employee tuition assistance, employee advising program, severance pay-out plans and TIAA/CREF.

(4) Equipment means an article of nonexpendable, tangible personal property having a useful life of more than one year, and an acquisition cost of \$2,500 or more per unit.

This Rate Agreement updates Fringe Benefit Rates only.

INSTITUTION:
Dartmouth College
Office of Sponsored Projects

AGREEMENT DATE: May 18, 2006

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted; such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) the same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21 Circular, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to those programs.

BY THE INSTITUTION:

Dartmouth College

Office of Sponsored Projects

(INSTITUTION)

(b)(6)

Director, Office of Sponsored Projects

(NAME)

(TITLE)

May 30, 2006

(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(b)(6)

DIRECTOR, DIVISION OF COST ALLOCATION

(TITLE)

May 18, 2006

(DATE) 0477

HHS REPRESENTATIVE

Telephone:

(b)(6)

**APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)**

1. * TYPE OF SUBMISSION <input type="checkbox"/> Pre-application <input checked="" type="checkbox"/> Application <input type="checkbox"/> Changed/Corrected Application		2. DATE SUBMITTED 01/28/2008	Applicant Identifier
		3. DATE RECEIVED BY STATE 	State Application Identifier
		4. Federal Identifier 2006-CS-001-000001	
5. APPLICANT INFORMATION			
* Legal Name: Trustees of Dartmouth College		* Organizational DUNS: 041027822	
Department: Office of Sponsored Projects Division:			
* Street1: 11 Rope Ferry Road, #6210 Street2:			
* City: Hanover County: Grafton * State: NH: New			
Province:		* Country: USA: UN * ZIP / Postal Code: 03755-1404	
Person to be contacted on matters involving this application			
Prefix: * First Name: Middle Name: * Last Name: Suffix:			
		(b)(6)	
* Phone Number: (b)(6) Fax Number: 603-646-3670 Email: egrants.gov@dartmouth.edu			
6. * EMPLOYER IDENTIFICATION (EIN) or (TIN): 020222111		7. * TYPE OF APPLICANT: <input type="checkbox"/> Private Institution of Higher Education Other (Specify): Small Business Organization Type <input type="checkbox"/> Women Owned <input type="checkbox"/> Socially and Economically Disadvantaged	
8. * TYPE OF APPLICATION: <input type="checkbox"/> New <input type="checkbox"/> Resubmission <input checked="" type="checkbox"/> Renewal <input type="checkbox"/> Continuation <input type="checkbox"/> Revision If Revision, mark appropriate box(es). <input type="checkbox"/> A. Increase Award <input type="checkbox"/> B. Decrease Award <input type="checkbox"/> C. Increase Duration <input type="checkbox"/> D. Decrease Duration <input type="checkbox"/> E. Other (specify):		9. * NAME OF FEDERAL AGENCY: Office of Procurement Oper	
* Is this application being submitted to other agencies? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> What other Agencies?		10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 97.001 TITLE: Pilot Demonstration or Earmarked Projects	
11. * DESCRIPTIVE TITLE OF APPLICANT'S PROJECT: Cyber Security Collaboration and Information Sharing Project			
12. * AREAS AFFECTED BY PROJECT (cities, counties, states, etc.) N/A			
13. PROPOSED PROJECT: * Start Date * Ending Date 04/01/2008 03/31/2010		14. CONGRESSIONAL DISTRICTS OF: a. * Applicant b. * Project NH-002 NH-002	
15. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION			
Prefix: * First Name: Middle Name: * Last Name: Suffix:			
		(b)(6) Ph.D.	
Position/Title: vice Provost for Research * Organization Name: Trustees of Dartmouth College			
Department: Provost - Dartmouth College Division:			
* Street1: Parkhurst - HB 6004 Street2:			
* City: Hanover County: Grafton * State: NH: New			
Province:		* Country: USA: UN * ZIP / Postal Code: 03755-1404	
* Phone Number: (b)(6) Fax Number:		* Email: (b)(6)	

16. ESTIMATED PROJECT FUNDING	17. * IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?
a. * Total Estimated Project Funding <input type="text" value="8,340,000.00"/> b. * Total Federal & Non-Federal Funds <input type="text" value="0.00"/> c. * Estimated Program Income <input type="text" value="0.00"/>	a. YES <input type="checkbox"/> THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE: <input type="text"/> b. NO <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E.O. 12372; OR <input type="checkbox"/> PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

18. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

* I agree

* The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

19. Authorized Representative

Prefix	* First Name:	Middle Name:	* Last Name:	Suffix:	
	(b)(6)				
* Position/Title:	Assistant Director		* Organization:	Trustees of Dartmouth College	
Department:	Office of Sponsored Projects		Division:		
* Street1:	11 Rope Ferry Road, #6210		Street2:		
* City:	Hanover	County:	Grafton	* State:	NH: New
Province:		* Country:	USA: UN	* ZIP / Postal Code:	03755-1404
* Phone Number:	(b)(6)	Fax Number:	603-646-3670	* Email:	egrants.gov@Dartmouth.edu
* Signature of Authorized Representative			* Date Signed		
(b)(6)			01/28/2008		

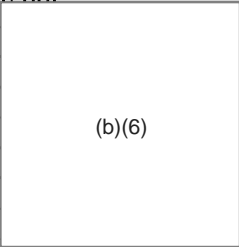
20. Pre-application

21. Attach an additional list of Project Congressional Districts if needed.

G:\OPO Shared Files\GFAD\1 A Programs\Applications\Dartmouth\FY 2008\GRANT10007704_Dartmouth_FY 2008.zip

Name

- Form RR_Budget-V1.1.pdf
 - Form RR_KeyPerson-V1.1.pdf
 - Form RR_OtherProjectInfo-V1.1.pdf
 - Form RR_PerformanceSite-V1.1.pdf
 - Form RR_SF424-V1.1.pdf
 - Form RRSF424_SF424B-V1.1.pdf
 - GrantApplication.xml
 - manifest.txt
 - RR_Budget-BudgetYear1-1247-Budget Narrative BPIII_Final.pdf
 - RR_KeyPerson-AdditionalProfilesAttached-1243-additionalprofiles.pdf
 - RR_KeyPerson-BioSketchsAttached-1244-additionalbios.pdf
 - RR_KeyPerson-KeyPerson-Profile-BioSketchsAttached
 - RR_KeyPerson-KeyPerson-Profile-BioSketchsAttached
 - RR_KeyPerson-KeyPerson-Profile-BioSketchsAttached
 - RR_KeyPerson-KeyPerson-Profile-BioSketchsAttached
 - RR_KeyPerson-KeyPerson-Profile-BioSketchsAttached
 - RR_KeyPerson-KeyPerson-Profile-BioSketchsAttached
 - RR_KeyPerson-KeyPerson-Profile-BioSketchsAttached
 - RR_KeyPerson-PDPI-Profile-BioSketchsAttached-1235
 - RR_OtherProjectInfo-AbstractAttachments-1245-NCSD BP III Project Summary_Final 012808.pdf
 - RR_OtherProjectInfo-ProjectNarrativeAttachments-1246-NCSD BPIII Project Narrative_Final 012808 ...
 - RR_PerformanceSite-1234-additionalsites.pdf
- 22 file(s)**



RESEARCH & RELATED Project/Performance Site Location(s)

Project/Performance Site Primary Location

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Project/Performance Site Location 1

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Next Site

Project/Performance Site Location 2

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Delete Entry

Previous Site

Next Site

Project/Performance Site Location 3

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Delete Entry

Previous Site

Next Site

Project/Performance Site Location 4

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Delete Entry

Previous Site

Next Site

Project/Performance Site Location 5

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Delete Entry

Previous Site

Next Site

Project/Performance Site Location 6

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Delete Entry

Previous Site

Next Site

Close Form

RESEARCH & RELATED Project/Performance Site Location(s)

Project/Performance Site Location 7

Organization Name:

* Street1: Street2:

* City: County: * State:

Province: * Country: * ZIP / Postal Code:

Delete Entry

Previous Site

Additional Location(s)

OMB Number: 4040-0001
Expiration Date: 04/30/2008

Close Form

RESEARCH & RELATED Senior/Key Person Profile

PROFILE - Project Director/Principal Investigator							
Prefix	* First Name	Middle Name	* Last Name	Suffix			
	(b)(6)			Ph.D.			
Position/Title:	Vice Provost for Research		Department:	Provost - Dartmouth College			
Organization Name:	Trustees of Dartmouth College		Division:				
* Street1:	Parkhurst - HB 6004		Street2:				
* City:	Hanover	County:	Grafton	* State:	NH: New	Province:	
* Country:	USA: UN	* Zip / Postal Code:	03755-1404				
* Phone Number	Fax Number		* E-Mail				
(b)(6)							
Credential, e.g., agency login:							
* Project Role:	PD/PI		Other Project Role Category:				
* Attach Biographical Sketch	1235	(b)(6)	pdf	Delete Attachment			
Attach Current & Pending Support			Add Attachment	Delete Attachment			

PROFILE - Senior/Key Person 1							
Prefix	* First Name	Middle Name	* Last Name	Suffix			
	(b)(6)						
Position/Title:			Department:				
Organization Name:			Division:				
* Street1:	Sudikoff Lab, Room 256		Street2:				
* City:	Hanover	County:		* State:	NH: New	Province:	
* Country:	USA: UN	* Zip / Postal Code:	03755				
(b)(6)							
Credential, e.g., agency login:							
* Project Role:	Co-PD/PI		Other Project Role Category:				
* Attach Biographical Sketch	1236	(b)(6)	pdf	Add Attachment	Delete Attachment		
Attach Current & Pending Support			Add Attachment	Delete Attachment			
				Next			

RESEARCH & RELATED Senior/Key Person Profile

PROFILE - Senior/Key Person 2

Prefix	* First Name	Middle Name	* Last Name	Suffix
	(b)(6)			
Position/Title:			Department:	
Organization Name:			Division:	
* Street1: 45 Lyme RD			Street2:	
* City: Hanover	County:	* State: NH: New	Province:	
* Country: USA: UN	* Zip / Postal Code: 03755			
* Phone Number	Fax Number	* E-Mail		
(b)(6)				
Credential, e.g., agency login:				
* Project Role:	Other Professional	Other Project Role Category: Chair		
* Attach Biographical Sketch	123 (b)(6) pdf	Add Attachment	View Attachment	
Attach Current & Pending Support		Add Attachment	View Attachment	

PROFILE - Senior/Key Person 3

Prefix	* First Name	Middle Name	* Last Name	Suffix
	(b)(6)			
Position/Title:			Department:	
Organization Name:			Division:	
* Street1: 1200 South Hayes St			Street2:	
* City: Arlington	County:	* State: VA: vi	Province:	
* Country: USA: UN	* Zip / Postal Code: 99352			
* Phone Number	Fax Number	* E-Mail		
(b)(6)				
Credential, e.g., agency login:				
* Project Role:	Other Professional	Other Project Role Category: Team Leader		
* Attach Biographical Sketch	1238 (b)(6) pdf	Delete Attachment	View	
Attach Current & Pending Support		Delete Attachment		

Next

RESEARCH & RELATED Senior/Key Person Profile

PROFILE - Senior/Key Person 4				
Prefix	* First Name	Middle Name	* Last Name	Suffix
	(b)(6)			
Position/Title:			Department:	
Organization Name:	MIT Lincoln Laboratory		Division:	
* Street1:	18 Webster RD		Street2:	
* City:	Lexington	County:	* State:	MA: Mas Province:
* Country:	USA: UN	* Zip / Postal Code:	02420	
(b)(6)				
Credential, e.g., agency login:				
* Project Role:	Other Professional		Other Project Role Category:	Team Leader
* Attach Biographical Sketch	1239-	(b)(6)	pdf	<input type="button" value="Add Attachment"/> <input type="button" value="View Attachment"/>
Attach Current & Pending Support			<input type="button" value="Add Attachment"/>	<input type="button" value="View Attachment"/>

PROFILE - Senior/Key Person 5				
Prefix	* First Name	Middle Name	* Last Name	Suffix
	(b)(6)			
Position/Title:			Department:	
Organization Name:	University of Virginia		Division:	
* Street1:	PO Box 400747 151 Engineer's Way		Street2:	
* City:	Charlottesville	County:	* State:	VA: Vi Province:
* Country:	USA: UN	* Zip / Postal Code:	22904	
* Phone Number			Fax Number	* E-Mail
(b)(6)				
Credential, e.g., agency login:				
* Project Role:	Other Professional		Other Project Role Category:	Team Leader
* Attach Biographical Sketch	124-	(b)(6)	pdf	<input type="button" value="Delete Attachment"/>
Attach Current & Pending Support			<input type="button" value="Add Attachment"/>	<input type="button" value="Delete Attachment"/>
<input type="button" value="Delete Entry"/>				<input type="button" value="Next Person"/>

Close Form

RESEARCH & RELATED Senior/Key Person Profile

PROFILE - Senior/Key Person 6

Prefix: * First Name: Middle Name: * Last Name: Suffix:

Position/Title: Department:

Organization Name: Mitre Division:

* Street1: 202 Burlington Rd Street2:

* City: Bedford County: * State: MA: Ma Province:

* Country: USA: UN * Zip / Postal Code: 01730

* Phone Number: Fax Number: * E-Mail:

Credential, e.g., agency login:

* Project Role: Other Professional Other Project Role Category: Team Leader

* Attach Biographical Sketch 124 (b)(6) pdf

Attach Current & Pending Support

PROFILE - Senior/Key Person 7

Prefix: * First Name: Middle Name: * Last Name: Suffix:

Position/Title: Department:

Organization Name: Mitre Division:

* Street1: 202 Burlington Rd Street2:

* City: Bedford County: * State: MA: Ma Province:

* Country: USA: UN * Zip / Postal Code: 01730

* Phone Number: Fax Number: * E-Mail:

Credential, e.g., agency login:

* Project Role: Other Professional Other Project Role Category: Project Lead

* Attach Biographical Sketch 1242-Watters.pdf

Attach Current & Pending Support

ADDITIONAL SENIOR/KEY PERSON PROFILE(S) 1243-additionalprofiles

Additional Biographical Sketch(es) (Senior/Key Person) 1244-additionalbios.pdf

Additional Current and Pending Support(s)

OMB Number: 4040-0001
Expiration Date: 04/30/2008

PROFILE – Senior/Key Person

Prefix	*First Name	Middle Name	*Last Name	Suffix
	(b)(6)			
Position/Title:			Department:	
Organization Name:	Sandia National Lab			
Division:				
*Street1:	PO Box 5800 MS 0672	Street2:		
*City:	Albuquerque	County:		
*State:	NM	Province:		
*Country:	USA	*Zip/Postal Code:	87185-0672	
*Phone Nu	(b)(6)			Fax Number:
*E-Mail:	(b)(6)			
Credential, e.g., agency login:				
*Project Role:	Other	Other Project Role Category:	Project Lead	

PROFILE – Senior/Key Person

Prefix	*First Name	Middle Name	*Last Name	Suffix
	(b)(6)			PhD
Position/Title:	Faculty	Department:		
Organization Name:	University of Illinois Champaign-Urbana			
Division:				
*Street1:	Coordinated Science Laboratory	Street2:	1308 West Main St.	
*City:	Urbana	County:		
*State:	IL	Province:		
*Country:	USA	*Zip/Postal Code:	61801	
*Phone Nu	(b)(6)			Fax Number:
*E-Mail:	(b)(6)			
Credential, e.g., agency login:				
*Project Role:	Faculty	Other Project Role Category:		

PROFILE – Senior/Key Person

Prefix ***First Name** **Middle Name** ***Last Name** Suffix
 (b)(6)

Position/Title: Department:
 Organization Name: SRI International
 Division:
 *Street1: SRI International EL-243 Street2: 333 Ravenswood Ave
 *City: Menlo Park County:
 *State: CA Province:
 *Country: USA *Zip/Postal Code: 94025-3493
 *Phone Number (b)(6) Fax Number:
 *E-Mail: (b)(6)
 Credential, e.g., agency login:
 *Project Role: Other Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix ***First Name** **Middle Name** ***Last Name** Suffix
 (b)(6) PhD

Position/Title: Faculty Department: Computer Science
 Organization Name: Dartmouth College
 Division:
 *Street1: 6211 Sudikoff Lab Street2:
 *City: Hanover County:
 *State: NH Province:
 *Country: USA *Zip/Postal Code: 03755
 *Phone Number (b)(6) Fax Number:
 *E-Mail: (b)(6)
 Credential, e.g., agency login:
 *Project Role: Faculty Other Project Role Category:

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name

(b)(6)

Suffix
PhD

Position/Title: Faculty Department: Computer Science

Organization Name: Columbia University

Division:

*Street1: 606 CEPSR

Street2:

*City: New York

County:

*State: NY

Province:

*Country: USA

*Zip/Postal Code: 10027-7003

*Phone Num

(b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role: Other

Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name

(b)(6)

Suffix
PhD

Position/Title: Department:

Organization Name: SRI International

Division:

*Street1: 333 Ravenswood Avenue

Street2:

*City: Menlo Park

County:

*State: CA

Province:

*Country: USA

*Zip/Postal Code:

*Phone Num

(b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role: Other

Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name
(b)(6)

Suffix
PhD

Position/Title: Faculty

Department:

Organization Name: Dartmouth College

Division:

*Street1: Thayer School of Engineering

Street2:

*City: Hanover

County:

*State: NH

Province:

*Country: USA

*Zip/Postal Code: 03755

*Phone Nu (b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role: Faculty

Other Project Role Category:

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name
(b)(6)

Suffix
PhD

Position/Title:

Department:

Organization Name: Georgia Institute of Technology

Division:

*Street1: Department of Electrical and Computer Engineering

Street2:

*City: Atlanta

County:

*State: GA

Province:

*Country: USA

*Zip/Postal Code: 30332

*Phone Nu (b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role: Other

Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name Suffix

(b)(6)

Position/Title: Department:

Organization Name: USMA

Division:

*Street1: Building 601, Room 1107 Street2:

*City: West Point County:

*State: NY Province:

*Country: USA *Zip/Postal Code: 10996

*Phone Number: Fax Number:

*E-Mail: (b)(6)

Credential, e.g., agency login:

*Project Role: Other Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name Suffix

(b)(6) PhD

Position/Title: Faculty Department:

Organization Name: CMU

Division:

*Street1: 5000 Forbes Avenue Street2:

*City: Pittsburgh County:

*State: PA Province:

*Country: USA *Zip/Postal Code:

*Phone Number: Fax Number:

*E-Mail: (b)(6)

Credential, e.g., agency login:

*Project Role: Other Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix	*First Name	Middle Name	*Last Name	Suffix
	(b)(6)			
Position/Title:			Department:	
Organization Name:	Mitre			
Division:				
*Street1:	202 Burlington Rd.		Street2:	
*City:	Bedford		County:	
*State:	MA		Province:	
*Country:	USA		*Zip/Postal Code:	01730-1420
*Phone N	(b)(6)		Fax Number:	
*E-Mail:				
Credential, e.g., agency login:				
*Project Role:	Other	Other Project Role Category:	Project Lead	

PROFILE – Senior/Key Person

Prefix	*First Name	Middle Name	*Last Name	Suffix
	(b)(6)			PhD
Position/Title:	Faculty		Department:	Tuck School of Business
Organization Name:	Dartmouth College			
Division:	Center for Digital Strategies			
*Street1:	100 Tuck Hall		Street2:	
*City:	Hanover		County:	
*State:	NH		Province:	
*Country:	USA		*Zip/Postal Code:	03755-9000
*Phone Nur	(b)(6)		Fax Number:	
*E-Mail:				
Credential, e.g., agency login:				
*Project Role:	Other	Other Project Role Category:	Project Lead	

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name
(b)(6)

Suffix

Position/Title: Department:

Organization Name: Pacific Northwest National Laboratory

Division:

*Street1: P.O. Box 999, MSIN K8-34

Street2:

*City: Richland

County:

*State: WA

Province:

*Country: USA

*Zip/Postal Code: 99352-0999

*Phone Number (b)(6)
*E-Mail: (b)(6)

Fax Number:

Credential, e.g., agency login:

*Project Role: Other Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name
(b)(6)

Suffix

PhD

Position/Title: Faculty Department: Computer Science

Organization Name: Dartmouth College

Division:

*Street1: 6211 Sudikoff

Street2:

*City: Hanover

County:

*State: NH

Province:

*Country: USA

*Zip/Postal Code: 03755

*Phone Number (b)(6)
*E-Mail: (b)(6)

Fax Number:

Credential, e.g., agency login:

*Project Role: Faculty Other Project Role Category:

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name
(b)(6)

Suffix
PhD

Position/Title: Faculty Department:

Organization Name: Indiana University

Division:

*Street1: 901 E. 10th Street

Street2:

*City: Bloomingdale

County:

*State: IN

Province:

*Country: USA

*Zip/Postal Code: 47408

*Phone Number (b)(6)
*E-Mail: (b)(6)

Fax Number:

Credential, e.g., agency login:

*Project Role: Other Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name
(b)(6)

Suffix
PhD

Position/Title: Faculty Department:

Organization Name: Purdue University

Division:

*Street1: Krannert Center, Room 123

Street2:

*City: West Lafayette

County:

*State: IN

Province:

*Country: USA

*Zip/Postal Code: 47907-2066

*Phone Number (b)(6)
*E-Mail: (b)(6)

Fax Number:

Credential, e.g., agency login:

*Project Role: Other Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name

(b)(6)

Suffix
PhD

Position/Title: Faculty Department: Computer Science

Organization Name: Purdue University

Division:

*Street1: 305 N. University Street

Street2:

*City: West Lafayette

County:

*State: IN

Province:

*Country: USA

*Zip/Postal Code: 47907-2066

*Phone Num

(b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role: Other

Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name

(b)(6)

Suffix

Position/Title: Department:

Organization Name: Mitre

Division:

*Street1: 202 Burlington Rd.

Street2:

*City: Bedford

County:

*State: MA

Province:

*Country: USA

*Zip/Postal Code: 01730

*Phone Nu

(b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role: Other

Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix	*First Name	Middle Name	*Last Name	Suffix
	(b)(6)			PhD
Position/Title:	Faculty		Department:	
Organization Name:	MIT – Lincoln Labs			
Division:				
*Street1:	244 Wood St.		Street2:	
*City:	Lexington		County:	
*State:	MA		Province:	
*Country:	USA		*Zip/Postal Code:	02420
*Phone Number:	(b)(6)			Fax Number:
*E-Mail:				
Credential, e.g., agency login:				
*Project Role:	Other		Other Project Role Category:	Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name Suffix

(b)(6)

Position/Title: Clinical Professor and Director Department: Samuelson Law

Organization Name: University of California at Berkeley

Division:

*Street1: 346 Boalt (N Addn)

Street2: Samuelson Law Technology & Public
Policy Clinic

*City: Berkeley

County:

*State: CA

Province:

*Country: USA

*Zip/Postal Code: 94720-7200

*Phone Nu

(b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role:

Other Project Role Category: Project Lead

PROFILE – Senior/Key Person

Prefix *First Name Middle Name *Last Name Suffix

(b)(6)

Position/Title: Assistant Professor Department: Computer Science

Organization Name: Cornell University

Division:

*Street1: Computer Science Department

Street2: 4119A Upson Hall

*City: Ithaca

County:

*State: NY

Province:

*Country: USA

*Zip/Postal Code: 14853

*Phone

(b)(6)

Fax Number:

*E-Mail:

Credential, e.g., agency login:

*Project Role:

Other Project Role Category: Project Lead

Close Form

Next

Check Form for Errors

Save

Print Page

About

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 0410278220000

* Budget Type: Project Subaward/Consortium

Enter name of Organization: Trustees of Dartmouth College

Delete Entry * Start Date: 04/01/2008 * End Date: 03/31/2010 Budget Period 1

A. Senior/Key Person

Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary (\$)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)
1.				Ph.D.	PD/PI					0.00	0.00	0.00
2.				PhD	Co-PI				1.50	29,750.00	11,602.50	41,352.50
3.				PhD	Senior Faculty/Prof		3.00		1.75	70,150.00	27,358.00	97,508.00
4.			(b)(6)	PhD	Senior Faculty/Prof				2.25	49,014.00	16,382.42	65,396.42
5.				PhD	Senior Faculty/Prof				1.75	54,447.00	21,171.48	75,618.48
6.				PhD	Senior Faculty/Prof				1.75	29,867.00	11,648.13	41,515.13
7.				PhD	Senior Faculty/Prof				1.50	25,258.00	9,850.62	35,108.62
8.												

9. Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 356,499.15

Additional Senior Key Persons: Add Attachment Delete Attachment View Attachment

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)
8	Post Doctoral Associates	27.50			145,755.00	16,043.50	161,798.50
12	Graduate Students	54.00			133,510.00	1,123.20	134,633.20
6	Undergraduate Students	14.00			17,100.00	0.00	17,100.00
1	Secretarial/Clerical	1.00			667.00	256.80	923.80
1	Faculty	7.00			95,189.00	37,123.71	132,312.71
12	Researchers	85.50			523,163.00	202,827.15	725,990.15
40	Total Number Other Personnel						

Total Other Personnel 1,172,758.36

Total Salary, Wages and Fringe Benefits (A+B) 1,529,257.51

RESEARCH & RELATED Budget (A-B) (Funds Requested)

OMB Number: 4040-0001
Expiration Date: 04/30/2008

Tracking Number: GRANT10007704

Funding Opportunity Number: DHS-06-CS-001-001-NC3 Received Date: 2008-01-28T15:33:06-04:00

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

ORGANIZATIONAL DUNS:

Budget Type: Primary Subaward/Consortium

Enter name of Organization:

Delete Entry | * Start Date: * End Date: Budget Period: 1

C. Equipment Description

List items and dollar amount for each item exceeding \$5,000

	Equipment item	* Funds Requested (\$)
1.	<input type="text"/>	<input type="text"/>
2.	<input type="text"/>	<input type="text"/>
3.	<input type="text"/>	<input type="text"/>
4.	<input type="text"/>	<input type="text"/>
5.	<input type="text"/>	<input type="text"/>
6.	<input type="text"/>	<input type="text"/>
7.	<input type="text"/>	<input type="text"/>
8.	<input type="text"/>	<input type="text"/>
9.	<input type="text"/>	<input type="text"/>
10.	<input type="text"/>	<input type="text"/>
11.	Total funds requested for all equipment listed in the attached file	<input type="text"/>
	Total Equipment	<input type="text"/>

Additional Equipment:

[View Attachment](#)

D. Travel

	Funds Requested (\$)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	177,455.00
2. Foreign Travel Costs	<input type="text"/>
Total Travel Cost	177,455.00

E. Participant/Trainee Support Costs

	Funds Requested (\$)
1. Tuition/Fees/Health Insurance	31,672.00
2. Stipends	<input type="text"/>
3. Travel	<input type="text"/>
4. Subsistence	<input type="text"/>
5. Other <input type="text"/>	<input type="text"/>
<input type="text"/> Number of Participants/Trainees	
Total Participant/Trainee Support Costs	31,672.00

RESEARCH & RELATED Budget (C-E) (Funds Requested)

OMB Number: 4040-0001
Expiration Date: 04/30/2008

Previous

RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

Next Period

ORGANIZATIONAL DUNS: []

Budget Type: Direct Subaward Contract

Enter name of Organization: []

Delete Entry Start Date: [] End Date: [] Budget Period 1

F. Other Direct Costs	Funds Requested (\$)
1. Materials and Supplies	15,663.00
2. Publication Costs	46,768.00
3. Consultant Services	93,588.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	5,097,581.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Registration Fees	6,200.00
9. Event and Meeting Costs	170,380.00
10. []	
Total Other Direct Costs	5,430,180.00

G. Direct Costs	Funds Requested (\$)
Total Direct Costs (A thru F)	7,168,564.51

H. Indirect Costs	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1. MTDC	35.00	547,579.00	191,652.00
2. MTDC	59.90	1,635,700.00	979,784.00
3. []			
4. []			
Total Indirect Costs			1,171,436.00

Cognizant Federal Agency: Department of Health and Human Services (b)(6)

I. Total Direct and Indirect Costs	Funds Requested (\$)
Total Direct and Indirect Institutional Costs (G + H)	8,340,000.51

J. Fee	Funds Requested (\$)

K. * Budget Justification: 1247-Budget Narrative BPIII Final.pdf (Only attach one file.) View Attachment

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals (\$)
Section A, Senior/Key Person		356,499.15
Section B, Other Personnel		1,172,758.36
Total Number Other Personnel	40	
Total Salary, Wages and Fringe Benefits (A+B)		1,529,257.51
Section C, Equipment		
Section D, Travel		177,455.00
1. Domestic	177,455.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		31,672.00
1. Tuition/Fees/Health Insurance	31,672.00	
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		5,430,180.00
1. Materials and Supplies	15,663.00	
2. Publication Costs	46,768.00	
3. Consultant Services	93,588.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	5,097,581.00	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	6,200.00	
9. Other 2	170,380.00	
10. Other 3		
Section G, Direct Costs (A thru F)		7,168,564.51
Section H, Indirect Costs		1,171,436.00
Section I, Total Direct and Indirect Costs (G + H)		8,340,000.51
Section J, Fee		

OMB Number: 4040-0001
Expiration Date: 04/30/2008

BUDGET NARRATIVE

Award Number: 2006-CS-001-000001

Non-Competing renewal proposal: DHS-06-CS-001-001-NC3

Dartmouth College

January 2008

The following 15 projects are presented for Budget Period III – with a total proposed amount of \$8,340,000. Please see the proposal narrative for additional details on the needs and overall project goals. See Appendix A (Detailed Budget Worksheets) for additional information on calculations and breakdowns.

I3P

I3P Management

I3P Research (Initiative 1) – I3P Fellowship & Scholars Program

✓ I3P Research (Initiative 2) – Human Behavior, Insider Threat, and Awareness

I3P Research (Initiative 3) – Cyber Security Workshops

I3P Research (Initiative 4) – Process Control Systems

✓ I3P Research (Initiative 5) – Business Rationale for Cyber Security

I3P Research (Initiative 6) – Assessable Identity and Privacy Protection

ISTS

– ISTS Cyber Research (Initiative 7)

- Dartmouth Internet Security Testbed - DIST
- Information Risk in Data-Oriented Enterprises - IRIDOE
- MetroSense – Scalable Secure Sensor Systems - Metro
- Interoperability and Usability for PKI Management - PKI
- Laboratory for Hardware Based Security - HBS
- Digital Video Forensics - DVF
- Foundations for Practical Autonomic Computing - AC

– ISTS Cyber Education & Curriculum Development (Initiative 8)

- Secure Information Systems, Mentoring and Training - SISMAT

Summary - breakdown by categories
 January 2008

Object Class Categories:		TOTAL	Budget Period I	Budget Period II - Feb 2007	Supplement Budget Period II - March 2007	Proposed Budget Period III
a.	Personnel	3,372,406	187,367	1,415,283	595,886	1,173,870
b.	Fringe Benefits	1,002,535	53,625	398,449	195,073	355,388
c.	Travel	543,575	49,765	266,205	50,150	177,455
d.	Equipment	418,082	158,992	259,090	-	-
e.	Supplies	227,463	14,000	87,160	26,000	100,303
f.	Contractual	14,139,462	130,640	7,038,024	1,779,630	5,191,168
g.	Construction	-	-	-	-	-
h.	Other	735,787	89,008	401,299	75,100	170,380
i.	Total Direct Charges	20,439,310	683,397	9,865,510	2,721,839	7,168,564
j.	Indirect Charges	3,860,689	246,603	1,864,490	578,161	1,171,436
k.	TOTAL	24,300,000	930,000	11,730,000	3,300,000	8,340,000

Notes

All "Personnel" in the table above represent Dartmouth Employees. Student support salary is in accordance with A-21 and A-110.

Most faculty members have nine-month appointments, and therefore, the percent effort is based on nine months for those individuals. Those with nine-month appointments are noted in the budget detail worksheets.

In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives and the ISTS projects have been made accordingly in the attached budget sheets.

It is anticipated that remaining funds from Budget Period II will be carried-forward for all on-going projects. Workshop funds may be reallocated to the I3P Management budget.

Budget Period III runs for ⁷¹²24 months, from April 1, 2008 to March 31, 2010. While ⁷²⁰⁹projects have milestones based on an end date of March 31, 2009, the I3P Fellowship and Scholars program will run through March 31, 2010.

The Dartmouth Fiscal Year is as follows:

July 1, 2007 to June 30, 2008 (three months of period III)

July 1, 2008 to June 30, 2009 (nine months of Budget Period III)

Annual salary raises take affect on July 1 of each year.

All I3P initiatives have a management budget that is separate from the research budget. The management budget supports the team-leader for team coordination and liaison with the I3P consortium and staff at Dartmouth.

Travel is reimbursed per the approved Dartmouth Travel Policy.

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Appendix A: Detailed Budget Worksheets

I3P (Initiatives 1-6 and Management)

	BPI	BPII	BPII supp	BPIII	Total
I1: I3P Fellowship		480,271	50,000	743,290	1,273,561
I2: Human Behavior		1,831,099	396,956	1,507,457	3,735,512
I3: Workshop	330,000	439,104	80,909	418,187	1,268,200
I4: PCS		2,263,249	351,907	1,669,330	4,284,486
I5: Business Rationale		1,670,240	596,574	907,810	3,174,625
I6: Assessable Identity		1,603,399	641,354	863,003	3,107,755
I3P Management		442,638	319,470	193,753	955,861
Total I3P	330,000	8,730,000	2,437,170	6,302,830	18,000,000

I3P Management

Project Lead: P [redacted] (b)(6)

Cost - Budget Period III: \$193,753
(Budget Period II supplement: \$319,470)

I3P management costs will begin in 2008, when the current management funding is exhausted. See the detailed budget worksheets for additional information on the costs outlined below.

Personnel: All personnel are Dartmouth employees. Personnel costs budgeted in BPII and the BPII supplement will cover personnel costs in BPIII.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of members from outside the Dartmouth area.

External conferences, coordination, training, and reporting: Trips are required to participate in meetings, conferences, and seminars in the process of developing research and overall I3P development requirements, collaborating technical solutions, leveraging capabilities and opportunities, and promoting outreach and technical support. The I3P will send people to receive training in the fields of information technology, software applications, and business development, operations and processing.

Materials and Supplies: Budgeted expenditures are for the purchase of minor expendable equipment, including software and computer related components, postage, books, and conference calls.

Publications Costs: Communication and outreach costs (brochures, posters, photography, printing, and mailing) are anticipated. Publication costs for all research papers and proceedings, including fact sheets and I3P updates are budgeted. These costs are part of a larger I3P communication strategy under the direction of the Assistant Director for Communication and Outreach.

Conference Registration Fees: Registration fees to relevant I3P conferences are anticipated for I3P staff members, most notable, the Associate Director for Research.

Event and Meeting Costs: In addition to quarterly consortium meetings, the I3P has Advisory boards organized for the research initiatives. These boards will meet 3 times per year. Room, food and A/V equipment will be supplied.

Consultant Services: Travel costs associated with the travel of Advisory Board members to attend the advisory board meetings.

Costs include Executive Committee payments made according to the I3P bylaws: Members of the Executive Committee may be compensated for their service to the I3P.

The Vice Chair will be compensated for 5 weeks, or 25 full days, of service annually, for total compensation of \$11,250 based on the \$450 rate limit. Other members of the Executive Committee, excluding the Chair, will be compensated for 3 weeks, or 15 days, of service annually, for total compensation of \$6,750 based on the \$450 rate limit. The Chair will not receive any compensation for serving as a member of the Executive Committee.

Payment will be made to representatives' home institutions according to the terms of a Memorandum of Understanding between Dartmouth College and individual Consortium member institutions. Note, that most costs for the year will be paid from other funds.

A web design consultant is also budgeted. Given the growing prominence of the I3P, the time has come to upgrade the website and to give it a more professional look. The redesigned website will meet the following well-defined needs: it will underscore the overall credibility of the I3P, position the organization as a national resource in cyber security, and provide a source of accurate and up-to-date information for policymakers, industry, researchers and the media. In addition, the website will clearly state our mission, provide an overview of our research and educational programs, offer a media portal and give information about our members as well as membership opportunities.

Sub-agreements: none.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

I3P Initiative 1 – I3P Fellowship Program

Team leader (b)(6) I3P, Dartmouth College

Cost - Budget Period III: \$743,290
(Budget Period II supplement: \$50,000)

See Project Narrative for proposal information. This program includes fellowships to be awarded annually based on the I3P fellowship guidelines. Additional funds are allocated for a the I3P Scholar Program. Both programs will continue to March 31, 2010. → ?

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH area and travel required of members from outside the Dartmouth area.

The awarded fellowships require each fellow to travel to Consortium Meetings to present their findings. The budget is based on 3 fellowships awarded in Budget Period III.

Additional trips are budgeted for the I3P Scholars to attend an initial event, and at least one Consortium meeting.

Equipment: none.

Materials and Supplies: Review costs associated with selecting the fellowship and scholar winners (conference calls, mailing, etc.) are budgeted.

Publications Costs: Printing and advertising costs related to announcing the call for proposals are budgeted.

Conference Registration Fees: none.

Event and Meeting Costs: none.

Sub-agreements: In Budget Period III, 3 fellowships have been budgeted at a maximum rate of \$150,000 per fellowship. Historically the breakdown is roughly \$80,000 for salary and fringe. \$8,000 for travel. \$5,000 for supplies and \$57,000 for indirects. Since all I3P member institutions have varying fringe and indirect rates, these are just estimates. Scholars, at an estimated rate of \$90k each, are budgeted. All sub-awards will be made to consortium member institutions.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

I3P Initiative 2 – Human Behavior, Insider Threat, and Awareness

Team Leader: (b)(6) RAND Corporation

Cost - Budget Period III: \$1,507,457
(Budget Period II supplement: \$396,956)

See Project Narrative for proposal information. This project includes Dartmouth College as well as 6 other institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: RAND (b)(6)

	BPII	BPIII	Total
A. Personnel	43,029	43,029	86,058
B. Fringe Benefits	15,749	15,749	31,498
C. Travel	10,346	10,346	20,692
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	11,422	11,422	22,844
Total Direct Costs	80,546	80,546	161,092
I. Indirect Costs	57,896	57,896	115,792
Fixed Fee 8%	11,076	11,076	22,152
TOTAL PROJECT COST:	149,518	149,518	299,036

Personnel

Dr. (b)(6) Senior Information Scientist, will serve as team leader for this initiative. (b)(6) a policy analyst studying at the Pardee RAND Graduate School, will be assisting Dr. (b)(6) in tracking the progress of the eight partners performing the Insider Threat research. Both (b)(6) will be assisted by (b)(6) RAND research assistant with experience in cyber security. (b)(6) will support the effort as administrative assistant.

Fringe

Rates based on approved rate agreement.

Travel

The budgeted travel supports (b)(6) for travel to project-related meetings when the travel is not covered by the Insider Threat proposal. Such meetings may include team meetings, project presentations, and coordination among subsets of team members.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs involve only computing and communications costs to support the researchers in completing the tasks for this project. Charges for desktop PC's at RAND are allocated in proportion to staff time spent on projects. The estimated computing and communications costs for this project include charges for photocopying, printing, telephone and fax, adjusted for inflation.

Indirect Costs and Fee of 8%

Rates based on approved rate agreement.

Research Budget: RAND

(b)(6)

All budget items
 must be approved by
 the RAND Director
 and the Office of
 Management & Finance
 before being included
 in the budget.

	BPII	BPIII	Total
A. Personnel	42,073	42,073	84,146
B. Fringe Benefits	19,354	19,354	38,708
C. Travel	5,189	5,189	10,378
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts	144,345	144,345	144,345
H. Other Costs	11,597	11,597	23,194
Total Direct Costs	222,559	222,559	445,118
I. Indirect Costs	60,505	60,505	121,010
Fixed Fee 8%	22,645	22,645	45,290
TOTAL PROJECT COST:	305,709	305,709	611,418

Personnel

Dr. (b)(6) Senior Information Scientist, will serve as project manager for the RAND portion of this initiative. Dr. (b)(6) Associate Engineer, will work with (b)(6) to investigate the ethical and policy issues of insider threat discovery and management, as laid out in the task descriptions. The will be assisted by (b)(6) (b)(6) RAND research assistant with experience in cyber security. (b)(6) (b)(6) will support the effort as administrative assistant.

Fringe

Rates based on approved rate agreement.

Travel

There are seven other widely-dispersed partners with whom we are likely to meet over the course of the project, but we are unable at this time to know with which partners we are likely to meet over the course of the year. Consequently, we have budgeted for one two-day trip to California, to cover the cost of these meetings.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs involve only computing and communications costs to support the researchers in completing the tasks for this project. Charges for desktop PC's at RAND are allocated in proportion to staff time spent on projects. The estimated computing and communications costs for this project include charges for photocopying, printing, telephone and fax, adjusted for inflation.

Indirect Costs and Fee of 8%

Rates based on approved rate agreement.

Research Budget: Mitre (b)(6)

	BPII	BPII	Total
A. Personnel	129,513	129,375	258,888
B. Fringe Benefits	129,628	129,491	259,119
C. Travel	7,124	7,286	14,410
D. Equipment			-
E. Supplies	5,217	5,342	10,559
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	271,482	271,494	542,976
I. Indirect Costs	28,518	28,506	57,024
TOTAL PROJECT COST:	300,000	300,000	600,000

Personnel

(b)(6) will serve as the project manager for the Mitre portion of this initiative. He will enlist appropriately skilled staff as required. Leveraging of MITRE's Information Security Center will be done through (b)(6) will provide administrative support. (b)(6) will provide financial services.

Fringe

Rates based on approved rate agreement.

Travel

The budgeted travel supports travel for three people to four team meetings. Expected duration of travel is 3 to 5 days per trip. Locations specified are tentative.

Equipment

N/A.

Supplies

The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs

N/A.

Indirect Costs

The G&A and COM fees are 7% and 4% respectively.

Research Budget: Columbia (b)(6)

	BPII	BPIII	Total
A. Personnel	132,094	137,325	269,419
B. Fringe Benefits	21,756	23,269	45,025
C. Travel	3,068	999	4,067
D. Equipment	10,000	10,000	20,000
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	33,702	28,616	62,318
Total Direct Costs	200,620	200,209	400,829
I. Indirect Costs	99,380	99,791	199,171
TOTAL PROJECT COST:	300,000	300,000	600,000

Budget and Budget Justification: Columbia requests a total of \$600,000 over the two year period of performance. The Columbia budget is primarily focusing on personnel expenses, both at with nominal support for travel and no equipment, plus overhead.

Personnel: In each of the two years, the budget requests 1 summer month for the project manager for the Columbia portion of this initiative (Stolfo), and 2 PhD or MS Graduate Research Assistants (GRAs). A full time research scientist position is proposed to be responsible for the implementation and delivery of technologies for test and evaluation by other collaborators on this project; in particular funds are requested for (b)(6) who is the primary designer of the email mining technology that was the core of his PhD thesis research.

Equipment: In each of the two years, the budget requests \$10,000 for the purchase and upgrade of at least 3 servers to be used on this project. One server will be primarily a

development system to construct the host-based sensors for use in masquerade detection test and evaluation. The second server will be used to host the Cornell-supplied Cauyuga system which forms the core of the egress firewall technology to be tested. The third server will function as the primary mailserver to exchange "bogus emails" with other members of the research team. We expect to upgrade these systems in the second year to accommodate higher network speeds and throughputs to be tested in our first year of effort.

GRA support includes 9-month tuition and stipend. In addition, the budget includes a \$2,000/GRA+PI/year charge that covers the cost of the computing services that will be used as part of conducting the research.

Travel: We request approximately \$4,000 to cover the cost of team and PI meetings, and 1-2 conferences each year.

Overhead: Columbia charges an Indirect Cost Rate on all research project items, with the exception of tuition and equipment (which do not incur any overhead). This rate is negotiated by Columbia periodically with the Government, and is currently set at 61%.

Research Budget: Cornell

(b)(6)

	BPII (adj)	BPII	Total
A. Personnel	136,034	168,177	304,211
B. Fringe Benefits	18,998	16,433	35,431
C. Travel	6,600	8,400	15,000
D. Equipment			-
E. Supplies		521	521
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	9,556	13,313	22,869
Total Direct Costs	171,188	206,844	378,032
I. Indirect Costs	78,812	93,156	171,968
TOTAL PROJECT COST:	250,000	300,000	550,000

Note: After our formal review process in December 2007, it was determined that the BPII amount for Cornell would be reduced to by \$50,000 to a new total of \$250,000. This is reflected in the budget worksheet.

Salaries:

(b)(6)

Associate Professor, will serve as project manager for the Cornell portion of this initiative. He will be the institutional contact and will coordinate activities, and collaborate closely with (b)(6) the other member of the team to develop technologies described in the SOWP. This proposal requests salary support for a 0.5 month of summer salary and ten percent of academic year effort each year. (note that the \$50k reduction in BPII is a result for (b)(6) being on sabbatical)

(b)(6) Professor, will collaborate with Associate Professor (b)(6) to develop technologies and will share with Associate Professor (b)(6) funding for graduate students to assist in working on the respective technologies. This proposal requests salary support for a 0.5 month of summer salary and ten percent of academic year effort each year.

Graduate Student: Graduate students will assist Associate Professor (b)(6) and Professor (b)(6) in developing the technologies described in the SOWP. This proposal requests salary support for one hundred percent of academic year effort for two graduate students each year and for one graduate student for one semester each year, and salary support for one hundred percent effort for three graduate students in the summer in year one and two students in the summer in year two. The salary support includes the stipend and salary used toward tuition and health insurance each year.

Annual salaries are budgeted with a five percent increase in July of each year.

Employee Benefits: Employee Benefits have been proposed at a rate of thirty-three percent for all non-student compensation as approved by the Department of Health and Human Services. See http://www.accounting.cornell.edu/Employee_Benefit_Rates.cfm.

Travel: Funds are requested for travel to enable the project participants to attend conferences and meetings with other team members to promote technology transfer and refine technology demonstration plans. Estimates are based on current airfare costs and relevant associated costs based on historical information.

Materials and Supplies: The cost of computer research materials under \$5,000, including computer hardware, computer software, and research books which are primarily related to the research project Computer research material costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other - Publications: The costs associated with publications in related technical journals. Publication costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other - Communications: Communication costs consist of project specific conference calls, faxing, modem, lab phone equipment, etc. Communications costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other - Workstation Support: Workstation support represents hardware and software maintenance, software licensing, networking, printing service, file service, backups and user consulting support for the machines used to conduct research as outlined in this proposal. The costs are calculated based on the effort of the project participants. The following steps are used to bill the costs associated with the Computer Science Department Central Facility:

a) For each user with a computing account in the facility, a user class is assigned to the individual, based on their past or anticipated usage. The user class of an individual may

change during the year in response to changes in their usage of the facility. User class is determined by a set of objective use criteria for each user.

b) A user profile is established for each individual in the department that identifies percentage of time spent on Administration, Instruction, Departmental Research, and Organized Research activities. The profile is updated for summer, fall, and spring billing cycles.

c) The profile and user-class-based charges are used to allocate costs for the individual's activities to Administration, Instruction, Departmental Research, and Organized Research.

Costs associated with Organized Research are billed to sponsored research projects. Costs for Administration, Instruction, and Departmental Research are billed to university funds.

Facilities and Administrative Costs (F&A): F&A costs have been proposed at a rate of fifty eight percent from April 1, 2007 through June 30, 2007 and fifty-nine percent from July 01, 2007 through March 31, 2009 of Modified Total Direct Cost (MTDC) as approved in Cornell's rate agreement with the Department of Health and Human Services. A copy of this agreement may be found at http://www.accounting.cornell.edu/F&A_Cost_Rates.cfm. MTDC exclusions include Capital Equipment, GRA Allowance and Health Insurance, and Subcontract costs in excess of \$25,000 per subcontract.

The five percent annual escalation for the general expenses is proposed in accordance with University policy.

Research Budget: Purdue

(b)(6)

	BPII	BPII	Total
A. Personnel	64,688	73,780	138,468
B. Fringe Benefits	18,832	19,141	37,973
C. Travel	8,607		8,607
D. Equipment			-
E. Supplies	2,000	1,140	3,140
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	6,308	6,707	13,015
Total Direct Costs	100,435	100,768	201,203
I. Indirect Costs	49,416	49,381	98,797
TOTAL PROJECT COST:	149,851	150,149	300,000

(b)(6)

will co-lead this Purdue portion of the initiative. They will participate in the research involved in the program, in supervision of the graduate student, in dissemination of the results, and in delivering material via classes. As such, all three are listed for support.

Funds have been included for a graduate student who will do the bulk of the background research and data analysis.

Travel funds have been budgeted for travel to conferences and for travel to a small number of sites where we hope to consult with outside experts. This includes trips to Atlanta to consult with the GBI (Georgia Bureau of Investigation) and Washington to work with selected FBI agents.

A small amount has been budgeted for equipments, supplies and telephone costs.

Indirect rates are in accordance with the negotiated Purdue University Indirect cost rate agreement.

Research Budget: Indian

(b)(6)

	BPII	BPIB	Total
A. Personnel	62,069	100,042	162,111
B. Fringe Benefits	9,587	16,231	25,818
C. Travel	13,449	8,013	21,462
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	19,293	32,683	51,976
Total Direct Costs	104,398	156,969	261,367
I. Indirect Costs	44,859	64,008	108,867
TOTAL PROJECT COST:	149,257	220,977	370,234

Budget Justification Second Year

A. SENIOR PERSONNEL

The PI's salary requested for year 1 is based on present salary. Salary is increased by an estimate of 5% as next year's salary is not determined. Professor (b)(6) (b)(6) is requesting 2 summer months of salary and Professor (b)(6) is requesting one and one half summer month of salary for the second year of the grant. The additional time will be spent concentrating on the optimal follow-up from the April 2008 workshop on Insider Threats.

GRADUATE STUDENTS –Five (5) graduate students will receive support for both years of the grant. Four students will receive full support (10 months each year) during this period and one student will receive support for 1 semester (5 months each year) during the duration of the grant.

B. FRINGE BENEFITS

Fringe benefit rate of 21.06% is used for the faculty summer salary. A flat rate of \$1,613 is included for health insurance for the 2 full time graduate students. The amount of \$1001 is used for the part-time student.

C. TRAVEL

The travel cost will cover travel to two events. For the IEEE Symposium being held at Oakland, CA it will cover 3 persons, the 2 PIs and 1 student. 3 persons written in the grant will attend the I3P Workshop on Insider Threats.

H. OTHER COSTS

Fee Remissions are included for the graduate student research assistants in year 1 at the in-state rate of \$ 7,971.00 for the full time students. The cost for the part time student would be \$3,985.50.

I. INDIRECT RATE

Currently the University indirect rate is 51.5%.

Research Budget: Dartmouth College - ISTS

(b)(6)

	BPII	BPIA	Total
A. Personnel	29,620	102,853	132,473
B. Fringe Benefits	3,003	27,454	30,457
C. Travel	9,240	12,320	21,560
D. Equipment	5,000		5,000
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	46,863	142,627	189,490
I. Indirect Costs	25,076	85,433	110,509
TOTAL PROJECT COST:	71,939	228,060	299,999

Personnel: The research staff consists of project manager Prof. (b)(6) who will drive much of the work in the project and take a research term leave to focus more intensely on it. Prof. (b)(6) of the Tuck School will assist in analyzing the information flow and operations in our business domain partners. Ph.D. student (b)(6) will assist in this work and supervise the two WISP (Women in Science Program) interns. (Analyzing information security requirements in real-world domains and designing usable technological solutions to meet them are central parts of (b)(6) the Senior PKI Architect at Dartmouth, will provide invaluable real-world technology expertise.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budgeted travel supports participation in various conferences (location unknown), and other venues to present project progress and results. In person meetings with various team members will be required throughout the project. Our project explicitly intends to reach outside of academia and to mine real-world domains facing insider attack threats. The travel support is necessary to allow trips to these sites.

Equipment: Two laptops for use by the undergraduate students are budgeted.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

I3P Initiative 3 – Cyber Security Workshops

Team leader: (b)(6) P, Dartmouth College

Cost - Budget Period III: \$418,187
(Budget Period II supplement: \$80,909)

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

This budget represents costs for eight workshops, three industry sessions, and three small I3P sponsorships, to be held between April 1, 2008, and March 31, 2009. Costs include travel for key participants, students and organizers, food, room rental, audio visual costs, along with printing, postage, marketing and supply expenses. In addition, consultants and sub-agreements are budgeted for help with key aspects of the workshops. All details are outlined in the workshop proposal.

Workshop # 10 (2.5 days, 60 people, 3 dinners, 1 room)

Title: Critical Infrastructure Protection Conference

Date: March 2009

Location: Hanover, NH

Workshop # 11 (1 day, 80 people, 1 room)

Title: Process Control Systems Security Workshop

Date: February 2009

Location: To be determined

Workshop # 12 (1 day, 50 people, 1 room)

Title: The Second Workshop on the Economics of Securing the Information Infrastructure (WESII 2)

Date: September 2008

Location: Arlington, VA

Workshop # 13 (1 day, 40 people, 1 dinner, 1 room)

Title: Workshop on Insider Threats in the Networked World

Date: April 2008

Location: Durham, NC

Workshop # 14 (1 day, 40 people, 1 room)

Title: Insider Threat Workshop

Date: March 2009

Location: To be determined

Workshop # 15 (2.5 days, 100 people, 1 room)

Title: Hosting and Supporting the Workshop on the Economics of Information Security (WEIS 2008)

Date: June 2008

Location: Hanover, NH

Workshop # 16 (1 day, 40 people, 1 room)

Title: Economics Executive Workshop for CISOs

Date: March 2009

Location: To be determined

Workshop #17 (1.5 days, 40 people, 1 dinner, 1 room)

Title: Business Rationale for Cyber Security Workshop - Making Good Cyber Security Investment Decisions

Date: November 2008

Location: Charlottesville, VA

Travel: Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of members from outside the Dartmouth area.

Airfare \$500

Hotel \$175 / day

Meals \$50 / day

Mileage/taxi/parking (\$60+\$20+\$20) \$100

In some cases student support is budgeted. Registration fees are also anticipated for 3 of the workshops, to offset the overall cost.

Equipment: none.

Materials and Supplies: Budgeted expenditures are for the supplies for the events. Costs are calculated based on an average from historical data based on actual workshops hosted by the I3P. Name tags, folders, labels, pens, pads, tent cards, and lanyards are supplied to participants. When applicable, CDs with presentations are included in the supply costs. A registration vendor is budgeted. Also, conference calls related to conference planning are anticipated.

Publications Costs: None.

Event and Meeting Costs: Costs associated with the workshops include renting space and facilities for the workshops, food (including tax and gratuities), audio/video set up with technical support, postage for materials to and from the venue, and printing costs for proceedings. Printing charges for materials (such as workshop agenda and speaker biographies) and handouts to be distributed before and during the event as well as invitations are budgeted. Printing and design of posters or promotional material is also anticipated. Costs are calculated based on historical data, location, workshop needs, and the number of expected participants. The I3P has hosted several and been involved with many successful workshops. It is the standard industry practice to provide lunch and refreshments for participants. I3P feels it is important to keep people on site and engaged with workshop participants. The meals are incidental to the workshop. Some workshops include a dinner program, with at least one dinner speaker on such evenings. The dinner

program will tie closely to the workshop program (and dinners will be a compulsory part of the program agenda), offering attendees further perspectives and insights into workshop related content.

Consultant Services: Speakers and panelist payments are included for participation in several of the workshops. These experts will help create an interactive environment and will bring the necessary subject matter expertise for successful events.

Sub-agreements: Sub-agreements for work to complete the proposed work are detailed below.

Sponsoring workshops and conferences (1 at \$5,000 each)

Sandia National Labs - \$60,000

SRI International - \$24,968

1. Sandia National Laboratories Statement of Work for I3P Workshops and Outreach

The new I3P project in PCS security, *Survivability and Recovery of Process Control Systems*, builds upon the previous I3P PCS security project managed by Sandia. In support of this new project and the I3P's broader research agenda, Sandia will leverage its understanding of the problem domain and stakeholder community developed through its involvement in both I3P PCS projects and utilize the specialized PCS security curriculum that it developed as a deliverable for the first I3P PCS project.

Task 1. Organize, prepare for, and participate in two outreach events to help communicate the objective of the I3P's new initiative in PCS security, identify industry needs, and increase industry awareness of cyber security risks and mitigation options. Sandia will identify relevant outreach opportunities, and in consultation with the I3P, it will select two events to support. One of these events will likely be the API's 3rd Annual IT Security Conference, which will be held in Houston, Texas in November 2008.

An objective of this outreach task will be to provide asset owners with foundational technical knowledge and first-hand practical experience that will allow them to better understand the vulnerabilities of their control systems to cyber disruptions as well as the steps that they can take to mitigate this risk. Sandia will provide briefings and hands-on demonstrations of security issues and solutions at the outreach events, drawing upon the following collection of materials that it has developed previously for the I3P:

- A basic overview of control system cyber security issues and mitigation strategies
- Industry-specific insights gathered from the oil and gas industry through site visits, workshops, and other interactions
- Tutorial on wireless security featuring an overview of current and emerging wireless technologies and their security features

- Hands-on security awareness and training exercise that highlights security issues and shows how to simply configure and test a hardened security architecture using a DMZ, strict firewall rules, and open-source IDS.

Sandia Budget

Labor - \$48,000

Travel - \$12,000 (travel to two outreach events for four staff, including all travel costs and registration fees)

Total - **\$60,000**

Note: all above numbers are fully loaded based on approved Sandia pricing

2. SRI will support the I3P in preparing and executing the participation in a session at one selected industry event on Process Control System (PCS) security, expected to take place in the United States between April 1, 2008, and March 31, 2009. SRI will assist in the planning of the session, including supporting the preparation of presentations and demonstrations. Two SRI staff members will participate in the event and the execution of the session. This work is limited to the presentation and demonstration of material developed in the I3P PCS Security Research Projects or related efforts – no new research or development will be performed by SRI under this statement of work.

SRI Budget

Personnel - \$18,853

Travel - 2 staff, 3 days, 1 trip. \$3,580

Shipping and printing - \$1,477

Computer usage - \$1,058

Total - **\$24,968**

Note: all above numbers are fully loaded based on approved SRI pricing

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

I3P Initiative 4 – Survivability and Recovery of Process Control Systems

Team leader (b)(6) MIT Lincoln Laboratory

Cost - Budget Period III: \$1,669,330
(Budget Period II supplement: \$351,907)

See Project Narrative for proposal information. This project includes 9 institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: MIT-LL (b)(6)

	BPII	BPII	Total
A. Personnel	71,274	72,550	143,824
B. Fringe Benefits			-
C. Travel	1,682	4,494	6,176
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	72,956	77,044	150,000
I. Indirect Costs			-
TOTAL PROJECT COST:	72,956	77,044	150,000

Research Budget: MIT-LL (b)(6)

	BPII	BPII	Total
A. Personnel	416,078	332,795	748,873
B. Fringe Benefits			-
C. Travel	22,514	19,995	42,509
D. Equipment	2,022	379	2,401
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	3,111	3,106	6,217
Total Direct Costs	443,725	356,275	800,000
I. Indirect Costs			-
TOTAL PROJECT COST:	443,725	356,275	800,000

MIT Lincoln Laboratory has two roles on this project: the first is as team lead and overall coordinator. The team lead is (b)(6) the second is MIT's portion of this initiative, as the sole developer of the testing framework for PCS software. In addition to these tasks, Lincoln will use this funding to support several I3P and academic workshops and conferences (b)(6) will call upon other staff at MIT Lincoln Laboratory to assist with this effort as needed.

Labor rates provided include salary, benefits, and support. The rates used by Lincoln Laboratory are DoD approved and in accordance with DCAA standards. Audit records can be made available to government agencies on request.

Fringe: See above.

Travel: Four trips for two people were assumed to be necessary to attend quarterly team meetings. One workshop for two people per year is assumed as well as two trips to meet with academia, industry and/or vendors. . This budget also includes event registrations. Adjustments will be made to meet with industry and/or DHS as project needs arise.

Equipment: A new computer and associated hardware will be purchased for this program.

Supplies: No costs are expected to be incurred.

Consultants: No costs are expected to be incurred.

Other: No costs are expected to be incurred.

Indirect: No costs are expected to be incurred.

Research Budget: Mitre (b)(6)

	BPII	(b)(6)	Total
A. Personnel	62,646	62,646	125,292
B. Fringe Benefits	63,090	63,090	126,180
C. Travel	10,484	10,484	20,968
D. Equipment			-
E. Supplies	1,151	1,151	2,302
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	137,371	137,371	274,742
I. Indirect Costs	12,629	12,629	25,258
TOTAL PROJECT COSTS	150,000	150,000	300,000

Personnel

(b)(6) will serve as the PI for this project. He will enlist appropriately skilled staff as required. Leveraging of MITRE's Information Security Center will be done through (b)(6) (b)(6) will provide administrative support. (b)(6) will provide financial services.

Fringe

See above.

Travel

The budgeted travel is based on two site meetings for each template development effort. Each site meeting will involve 2-3 team members. Additional travel is budgeted for quarterly Project Team meetings and for one or two outreach events as directed by the Project. Locations are tentative, so a mixture of West-US, Mid-US and East-US trips are postulated.

Equipment

N/A.

Supplies

The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs

N/A.

Indirect Costs

The G&A and COM fees are 7% and 4% respectively.

Research Budget: PNNL

(b)(6)

	BPII	BPIII	Total
A. Personnel	72,309	76,893	149,201
B. Fringe Benefits	25,783	26,823	52,606
C. Travel	11,057	11,290	22,347
D. Equipment			-
E. Supplies	34,735	3,116	37,852
F. Construction			-
G. Consultants/Contracts	4,885	3,992	8,877
H. Other Costs			-
Total Direct Costs	148,769	122,114	270,883
I. Indirect Costs	111,731	117,386	229,117
TOTAL PROJECT COST:	260,500	239,500	500,000

Table A: Personnel

(b)(6) is an expert on Process Control and SCADA systems, and will be the project manager for the PNNL portion of this initiative. (b)(6) (b)(6) are experts on cyber-security, and will be responsible for porting the

existing SHARP software to a ruggedized, industrial-quality appliance. (b)(6)
 manages the SCADA cyber-security program at PNNL, and will assist with industry outreach. Other PNNL staff who will contribute to this project have yet to be named, but will include the following: a Computer Engineer and an additional PCS Engineer to assist with the design and implementation of the SHARP appliance, and an Administrative Professional to assist with project management duties as well as the maintenance of the Fact Sheets for all teams on the I3P PCS project. All of the individuals listed above will charge directly to this project for only that time that is spent on project work.

Direct labor costs are based on average charge-out rates for specific job categories. Average charge-out rates are calculated each fiscal year (FY is October 1 through September 30) as follows:

$$\frac{\text{Average Salary} \times (1 + \text{Fringe Benefit Rate})}{\text{Productive Hours}}$$

Average charge-out rates for FY2007 through FY2009 (FY is October 1 through September 30) were calculated using the following factors:

<u>FY</u>	<u>Salary Increase (compounding annually)</u>	<u>Fringe Benefit Rate</u>	<u>Productive Hours</u>
2007	0.00%	35.7%	1820
2008	4.14%	35.6%	1828
2009	4.10%	34.4%	1820

Salary increases are based on Consumer Price Index forecasts, staff growth, and salary history. The fringe benefit rate for limited term and hourly employees is 15.1%. Productive hours in a year exclude holidays, vacation, and other absences.

Table B: Fringe Benefits

Fringe benefit rates are described above in the section entitled “Table A: Personnel.”

Table C: Travel

The budgeted travel supports travel for (b)(6) or his delegate, for the following purposes:

- Travel to attend four (4) project review meetings. The duration of these trips is estimated to be five (5) days for each trip. Washington, DC was chosen as a representative destination for cost estimation purposes.
- Travel to attend two (2) workshops for the purpose industry outreach. The duration of these trips is estimated to be five (5) days for each trip. Houston, TX was chosen as a representative destination for cost estimation purposes.
- Travel for the purpose of testing the SHARP appliance on the Sandia test bed. The duration of this trip is estimated to be five (5) days. Albuquerque, NM was chosen as a representative destination for cost estimation purposes.
- Travel for the purpose of testing the SHARP appliance on an industry test bed. The duration of this trip is estimated to be five (5) days. Houston, TX was chosen as a representative destination for cost estimation purposes.

The travel costs cover airfare, hotel, rental car, meals and incidental expenses. Staff salary and fringe benefit costs have been included in Tables A and B, and are not included here. Airfare rates have been estimated utilizing non-refundable quotes from Travel Management Partners (TMP). Subsistence costs (meals and lodging) have been estimated using per diem rates published in the Federal Travel Regulations. Travel rates have been escalated at the annual rates listed below:

2007	2.6%
2008	2.4%
2009	2.4%

Table D: Equipment

No special equipment will be purchased on this project.

Table E: Supplies

Budgeted expenditures that are listed for the item “Circuit Boards and Components” are to cover materials for the fabrication of the SHARP appliance. Details on the specific materials to be used will be determined during the initial stages of the project. It is expected that the SHARP appliance will use Commercial, Off-the-Shelf components to the largest extent possible, and thereby limiting the need for costly custom components.

Budgeted expenditures that are listed for the item “Workshop and Presentation Materials” are for handouts, poster boards, and other presentation materials at the two Industry Outreach Workshops discussed under the Travel section.

Table F: Not found

Table G: Consultants/Contracts

No outside consultants will be used on this project.

Within the Contracts table, the charge for the “Office of Fellowship Programs” results from our desire to use undergraduate and post-graduate students on this project. This

charge helps to set up and maintain the program by which students can be used to help staff the project. The benefits to the effort include the following: (1) Fellows provide low cost yet skilled technical help on the project thus reducing project labor costs without sacrificing quality, (2) The industry and society benefit since the pool of skilled professionals that are knowledgeable in security and process control systems grows as more young people are involved in this effort.

Table H: Other Costs

No other costs are expected on this project.

Table I: Indirect Costs

Battelle Memorial Institute, Pacific Northwest Division (Battelle) operates PNNL for the United States Department of Energy. Battelle is obligated to follow Cost Accounting Standards (CAS) 48CFR9904. Battelle has established a direct and indirect cost policy in accordance with 48CFR9904.418 to facilitate the full recovery of all costs. Annually, Battelle submits a proposal for an "Indirect Rate Agreement" to the Department of Energy. Battelle's indirect rates are audited by the Defense Contract Audit Agency (DCAA) and approved by DOE. **A copy of Battelle's Indirect Rate Agreement is available to the Government upon request.**

The following paragraphs describe the elements included under Indirect Costs:

Organizational Overhead

Organizational Overhead for technical organizations represents costs for management, supervision, and administration of technical departments. Organizational Overhead also includes costs for building and utilities and for research equipment such as small tools, lab supplies, laundry, decontamination/waste disposal, maintenance, and expenses associated with equipment with an initial cost of less than \$50,000. The Organizational Overhead rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval.

Program Development and Management

Program development and program management (PDM) costs include costs for business development, planning, and monitoring for a group of projects. Costs are pooled and then applied at the rate of -6.0% of value added (excluding PDM costs), plus materials and subcontracts (excluding OFP, ICP and ILA costs). The PDM rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval.

Technical Management Cost

Technical Management Cost (TMC) includes costs for supervision and administration of a technical organization as well as the organization's technical facility and operations cost. The TMC rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval. The rate per hour for each fiscal year is listed below:

2007	0.15
2008	0.15
2009	0.15

Laboratory Directed Research and Development

LDRD is research and development work of a creative and innovative nature for the purpose of maintaining the scientific and technological vitality of the Laboratory and/or responding to new scientific or technological opportunities. Costs are pooled and then applied at the rate of 8.50% to the value added base. The LDRD rates per direct labor hour have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval.

General and Administrative Expense

G&A includes general functions such as Accounting, Legal, and Personnel department costs, contract administration, replacement cost of laboratory support equipment, etc. G&A is allocated to final objectives by applying the appropriate rate to the value-added base. The G&A rates have been proposed to the US Department of Energy, Pacific Northwest Site Office as part of Battelle's provisional rate package and are pending approval. The G&A rate(s) per FY are as follows:

2007	28.50
2008	29.00
2009	29.00

Service Assessment

Service Assessment includes costs paid to DOE for plant-wide support services such as fire, library, mail, and roads. Service Assessment costs are allocated at applicable rate of total estimated costs. The Service Assessment rate(s) per FY are as follows:

2007	2.40
2008	2.40
2009	2.50

Research Budget: Sandia (Annie McIntyre)

	BPII	BPII	Total
A. Personnel	415,400	418,600	834,000
B. Fringe Benefits			-
C. Travel	28,000	28,000	56,000
D. Equipment	8,000	2,000	10,000
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	451,400	448,600	900,000
I. Indirect Costs			-
TOTAL PROJECT COST:	451,400	448,600	900,000

Personnel: An average technical staff salary cost was used to calculate the personnel costs. This was based on an average 1.3 FTEs per year. (b)(6) will act as the project manager for this Sandia portion of the initiative. (b)(6)

(b)(6) and Other Tech Resources are budgeted.

Fringe: This cost is included in the burdened costs shown in the personnel budget.

Travel: Four trips were assumed to be necessary to attend quarterly team meetings. One workshop per year is assumed as well as two trips to meet with industry and/or vendors. This budget also included event registrations.

Equipment: Extending and expanding the use of the SCADA TestBed at Sandia and this was shown as equipment costs. This would vendor hardware and software for testing scenarios in recovery and response.

Supplies: No costs are expected to be incurred.

Consultants: No costs are expected to be incurred.

Other: No costs are expected to be incurred.

Indirect: No costs are expected to be incurred.

Research Budget: SRI (b)(6)

	BPII	BPII	Total
A. Personnel	172,846	173,034	345,880
B. Fringe Benefits			-
C. Travel	18,434	18,434	36,868
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	8,613	8,350	16,963
Total Direct Costs	199,893	199,818	399,711
I. Indirect Costs			-
TOTAL PROJECT COST:	199,893	199,818	399,711

Personnel

Dr. (b)(6) will serve as the project manager for this portion of the initiative. He will manage SRI's efforts and lead the coordination with other institutions. Mr. (b)(6) (b)(6) Senior Computer Scientist, will provide technical expertise to SRI's effort and support the technology evaluations. Mr. (b)(6) Director of Client Services, will lead the industry outreach activities and support all the technology transition activities. Mr. (b)(6) Deputy Director, will provide technical expertise to SRI's effort and support the industry outreach activities. Ms. (b)(6) Administrative Analyst, will provide administrative services to SRI's effort.

Fringe

Proprietary

Travel

The budgeted travel supports anticipated team meetings.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs include the Computer Science Laboratory (CSL) computer facility.

SRI Proprietary Cost Data

SRI business systems, including our accounting system, undergo continuing review by our cognizant U.S. Government contract administration organization (DCMA) and our cognizant U.S. Government audit agency (DCAA). It is SRI's policy to treat our labor and indirect rates as sensitive, proprietary information that is disclosed only to authorized representatives of the U.S. Government. As a result, SRI is not disclosing those specific rates to Dartmouth. However, SRI will fully cooperate with any assist audit conducted by

DCAA or will provide full costing detail in a sealed envelope addressed directly to the Government contracting agency, at the option of Dartmouth.

Research Budget: Tulsa (b)(6)

	BPII	BPIB	Total
A. Personnel	94,587	99,316	193,903
B. Fringe Benefits	20,505	21,531	42,036
C. Travel	16,000	12,000	28,000
D. Equipment	14,000	10,000	24,000
E. Supplies	2,318	1,933	4,251
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	147,410	144,780	292,190
I. Indirect Costs	52,590	55,220	107,810
TOTAL PROJECT COST:	200,000	200,000	400,000

The University of Tulsa is responsible for developing situational awareness and attack mitigation tools for a Modbus environment for use in the oil and gas industry. The requested funds will cover two months of salary per year for Dr. (b)(6) project manager for this Tulsa portion of the initiative.), Dr. (b)(6) (Co-lead) and Dr. (b)(6) (Collaborator). Funds will also be used to support two graduate students throughout the 24 month period covered by the budget. Budget items for equipment and supplies will be used to support tool development and a demonstration scenario. It is estimated that requested travel funds will cover 12-16 person trips to professional meetings and industry facilities. Fringe benefits at the University of Tulsa are computed as 35% of faculty salaries. Indirect costs are estimated by the University of Tulsa at the current rate of 55.6% of salaries and wages.

Research Budget: UIUC (b)(6)

	BPII	BPIB	Total
A. Personnel	108,969	113,328	222,297
B. Fringe Benefits	20,819	21,652	42,471
C. Travel	10,000	8,000	18,000
D. Equipment	4,500		4,500
E. Supplies	1,004	686	1,690
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	27,173	27,541	54,714
Total Direct Costs	172,465	171,207	343,672
I. Indirect Costs	77,535	78,793	156,328
TOTAL PROJECT COST:	250,000	250,000	500,000

SENIOR PERSONNEL
\$89,034

The project manager, (b)(6) and Co-lead, (b)(6) will be responsible for all project activities for this UIUC portion of the initiative. (b)(6) requests 1 ½ month support per year for a total of 3 months support. The proposal also includes 1 month support for (b)(6) per year for a total of 2 months support.

OTHER PERSONNEL
\$133,263

3 – Graduate Research Assistant

The graduate students will assist the Senior Personnel in conducting the research described in the proposal.

1 – Staff (Academic Professional)

The staff personnel will assist the Senior Personnel by administering the day-to-day operations necessary for the project.

Senior Personnel (Faculty), Academic Professionals, and Graduate Research Assistants at the University of Illinois are paid on a person-month basis, no timesheets are maintained for these groups of employees. An estimate for faculty and academic professionals is 160 hours/1 FTE and 173 hours for 1 FTE for Graduate Research Assistants.

Fringe Benefits
\$42,471

Retirement –	10.82%
Health, Life and Dental Insurance -	21.18%
Termination Benefits –	1.62%
Workmen’s Compensation	0.13%
Medicare -	<u>1.45%</u>
Total Benefits	35.20%

35.2% computed on all salaries **except** Graduate Students

Graduate Student salaries -- Graduate Student Health, Life and Dental Insurance, 5.13% and Workmen’s Comp, 0.13% are calculated at 5.26%

Travel – Domestic
\$18,000

9 trips per year for the PI and Co-PI (2-days) per trip at approximately \$1,000 for meetings, project reviews and/or attendance at technical conferences related to this work effort.

Materials, Supplies and Expensed Equipment
\$6,190

The budget includes \$1,690 for materials and supplies including reference books, hanging files, transparencies, engineering notebooks, storage media, electronic components, repair parts and in-house poster preparation; \$4,500 for expensed equipment. Equipment will be PCs and other devices needed to facilitate the project

Computer Services
\$9,000

The budget includes in-house dedicated computer entities and networking support utilized by research groups housed in the Coordinated Science Laboratory. Logon fee of \$125 per month (CRHC Group) per logon supports salaries, supplies, repairs, maintenance, and equipment upgrades or replacements of the entity.

General Services
\$1,501

Also included in the budget are costs for services related to communications, duplication costs, long-distance tolls, teleconferencing, and maintenance.

Tuition Remission
\$44,213

37% of Graduate Research Assistant salaries

MTDC BASE – Indirect Costs
\$156,328

53% of Total Direct Costs, excluding tuition remission, expensed equipment, and subcontracts over \$25,000 each.

MTDC BASE = \$343,672 less \$44,213 (tuition remission) less \$4,500 (expensed equipment) = \$294,959
\$294,959 x 53% = \$156,328 (rounded) in total indirect costs

Research Budget: USMA (b)(6)

	BPII	BPII	Total
A. Personnel	65,200	65,200	130,400
B. Fringe Benefits	15,700	15,700	31,400
C. Travel	9,000	9,000	18,000
D. Equipment			-
E. Supplies	1,000	1,000	2,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	90,900	90,900	181,800
I. Indirect Costs	9,100	9,100	18,200
TOTAL PROJECT COST:	100,000	100,000	200,000

Personnel costs are for approximately 5 and ½ months of salary and benefits each year of the project. Project manager of this USAM portion of the initiative is (b)(6) Other USMA personnel involved in the effort will have their salaries and benefits provided by USMA.

Travel costs are to attend various technical conferences, estimated at 12 conference attendees at \$1,500 apiece over the 2 yr period.

Materials and Supplies include costs for production of the reports and presentations.

Institutional Facilities and Administration costs for sponsored research are computed as 10% of the Modified Total Direct Costs.

Indirects: The budgeted indirect rates are used in accordance with approved rates for Dartmouth College.

I3P Initiative 5 – Business Rationale for Cyber Security

Team leader: (b)(6) University of Virginia

Cost - Budget Period III: \$907,810
(Budget Period II supplement: \$596,574)

See Project Narrative for proposal information. This project includes Dartmouth College as well as 4 other institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: U of Virginia (b)(6)

	BPII	BPIII	Total
A. Personnel	43,979	45,737	89,716
B. Fringe Benefits	12,447	12,944	25,391
C. Travel	11,000	8,800	19,800
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	15,082	15,027	30,109
Total Direct Costs	82,508	82,508	165,016
I. Indirect Costs	42,492	42,492	84,984
TOTAL PROJECT COST:	125,000	125,000	250,000

Budget Detail

	Year 1 4/1/07- 3/31/08	Year 2 4/1/08- 3/31/09	Total
A. Personnel & Benefits			
1. (b)(6) Principal Investigator 5% (.60 mos.) effort 12 mos. @ \$228,000 CY	11,400	11,400	22,800
Allowance for salary increase	152	614	766
Fringe Benefits - 28.3%	3,270	3,400	6,670
2. Research Scientist 40% (.48 mos.) effort 12 mos. @ \$80,000 CY	32,000	32,000	64,000
Allowance for salary increase	427	1,723	2,150
Fringe Benefits - 28.3%	9,177	9,544	18,721
SUBTOTAL PERSONNEL	\$43,979	\$45,737	\$89,716
SUBTOTAL BENEFITS	\$12,447	\$12,944	\$25,391
B. Travel - Domestic	11,000	8,800	19,800
C. Other Contractual Services			
1. Security Executive Advisory Council	10,000	10,000	20,000
2. Copying, communications	5,092	5,027	10,119
TOTAL DIRECT COSTS	\$82,508	\$82,508	\$165,016
D. F & A (Indirect) Costs - 51.5% Modified Total Direct Costs	42,492	42,492	84,984
TOTAL	\$125,000	\$125,000	\$250,000

Personnel - Faculty appointments are generally effective calendar year (CY/12 mos.) beginning July 1 or Academic Year (AY/9 mos.) beginning September 1 (b)(6) will serve as team leader for this effort. A research scientist will provide support for this effort. Salary and fringe benefits for these individuals will be covered under the budget. Salary Increases - A 4% salary increase is applied to a majority of SEAS proposals, effective 11/25/07, and is accumulated annually from this date. Faculty increases are based on contributions in academic and research areas and are approved by the State of Virginia Budget Office. Staff increases are based on State of Virginia proficiency guidelines. New salaries are given as soon as they are available.

Fringe Benefits - The University of Virginia's proposed fringe benefits rates as they apply to sponsored programs are as follows: 28.30% for faculty and professional staff, 36.8% for classified staff, 14% for part-time faculty and staff and 4.5% for wage employees and summer effort by faculty with AY appointments. Fringe benefits apply to graduate and undergraduate research assistants if not enrolled full time (generally 12 hrs. for undergraduates and 9 hrs. for graduates).

Travel - Trips to related technical conferences, workshops, seminars, etc. The budgeted travel supports the research scientist to travel to team meetings and the workshop and for (b)(6) to travel to Security Executive Advisory Council meetings. Trips to sponsor for technical discussions and presentation of results. Trips for 2 persons to Boston, MA; and Washington, DC for Project Meetings. Trips to IAB Conferences for 2 persons to Boston, MA and Washington, DC.

Other –

- a. Security Executive Advisory Council - \$10,000 per year to support costs for the Security Executive Advisory Council to travel to team meetings, in Boston, MA and Washington, DC, and the workshop in Washington, DC.
- b. Other Costs - Estimated project related costs for photocopying, long distance phone and FAX, etc. are based on prior SEAS research experience. The University of Virginia system, through copy cards, etc., is able to document such costs as related to the project.

Facilities and Administrative (F&A) (Indirect/Overhead) Costs - The University of Virginia's negotiated MTDC F&A rates with DHHS per agreement of 5/23/05 is: 7/1/05 - 6/30/06 – 52.5% "on campus" and 26% "off-campus"; effective 7/1/06 – 51.5% "on Campus" and 26% "off-campus". (Note: The MTDC base consists of total direct costs less individual equipment items in excess of \$5,000, alterations and renovations, patient care costs, stipends, tuition remission and rental costs of off-campus facilities.) Includes F&A on the first \$25,000 of subcontracts.

Research Budget: U of Virginia

(b)(6)

	BPII	BPII	Total
A. Personnel	294,836	302,437	597,273
B. Fringe Benefits	45,785	46,429	92,214
C. Travel	19,200	13,300	32,500
D. Equipment			-
E. Supplies	16,000	13,000	29,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	71,079	72,626	143,705
Total Direct Costs	446,900	447,792	894,692
I. Indirect Costs	203,100	202,208	405,308
TOTAL PROJECT COST:	650,000	650,000	1,300,000

Budget Detail

	Year 1 4/1/07- 3/31/08	Year 2 4/1/08- 3/31/09	Total
A. Personnel & Benefits			
1. (b)(6) Principal Investigator 35% (4.2 mos.) effort 12 mos. @ \$228,000 CY Allowance for salary increase Fringe Benefits - 28.3%	79,800 1,064 22,985	79,800 4,299 23,800	159,600 5,363 46,685
2. (b)(6) Co-Principal Investigator 10% (1.2 mos.) effort 12 mos. @ \$228,800 CY Allowance for salary increase Fringe Benefits - 28.3%	22,880 305 6,562	22,880 1,232 6,824	45,760 1,537 13,386
3. (b)(6) Co-Principal investigator 20% (2.4 mos.) effort 12 mos. @ \$79,500 CY 15% (1.8 mos.) effort 12 mos. @ \$79,500 CY Allowance for salary increase Fringe Benefits - 28.3%	15,900 - 212 4,560	- 11,925 642 3,556	15,900 11,925 854 8,116
4. (b)(6) Co-Principal Investigator 18% (2.16 mos.) effort 12 mos. @ \$78,000 CY Allowance for salary increase Fringe Benefits - 28.3%	14,040 187 4,026	14,040 756 4,187	28,080 943 8,213
5. (b)(6) Co-Principal Investigator 8% (0.96 mos.) effort 12 mos. @ \$106,500 CY Allowance for salary increase Fringe Benefits - 28.3%	8,520 114 2,444	8,520 459 2,541	17,040 573 4,985
6. (b)(6) Principal Investigator 7% (.63 mo.) effort 9 mos. @ \$82,500 AY 2 mos. summer effort @ \$82,500 AY Allowance for salary increase Fringe Benefits - 28.3% - AY Fringe Benefits - 4.5% - Summer	5,775 18,333 103 1,663 824	5,775 18,333 1,070 1,730 958	11,550 36,666 1,173 3,393 1,682
7. (b)(6) Center Coordinator 14% (1.68 mos.) effort 12 mos. @ \$41,617 CY Allowance for salary increase Fringe Benefits - 36.8%	5,826 78 2,173	5,826 313 2,269	11,652 391 4,432

Personnel - Faculty appointments are generally effective calendar year (CY/12 mos.) beginning July 1 or Academic Year (AY/9 mos.) beginning September 1. (b)(6) will serve as project manager for this UVa portion of the initiative. (b)(6) will lead the decision support tool task. (b)(6) will lead the phantom systems modeling and interdependencies task. (b)(6) will lead the analyzing the emergent nature of cyber security effort. (b)(6) will provide support for the modeling effort for the interdependency task. Salary and fringe benefits for these individuals will be covered under the budget.

Center Coordinator -- (Operations Manager) (b)(6) will provide data support, data acquisition, and data management support for the interdependency task.

Graduate Research Assistants (GRAs) and Undergraduate Research Assistants (URAs) - Costs are estimated based on the minimum and maximum payments for the academic year established by the University Office of the Vice-President and Provost. All compensation in SEAS proposals are within these guidelines. For the decision support task two graduate students will carry out the proposed research and support the software development effort. For the interdependency task one graduate student will carry out the proposed research. For the emergent nature of cyber security one graduate student will carry out the proposed research. For the decision support task one undergraduate student will support the software implementation configuration control.

Salary Increases - A 4% salary increase is applied to a majority of SEAS proposals, effective 11/25/07, and is accumulated annually from this date. Faculty increases are based on contributions in academic and research areas and are approved by the State of Virginia Budget Office. Staff increases are based on State of Virginia proficiency guidelines. New salaries are given as soon as they are available.

Fringe Benefits - The University of Virginia's proposed fringe benefits rates as they apply to sponsored programs are as follows: 28.30% for faculty and professional staff, 36.8% for classified staff, 14% for part-time faculty and staff and 4.5% for wage employees and summer effort by faculty with AY appointments. Fringe benefits apply to graduate and undergraduate research assistants if not enrolled full time (generally 12 hrs. for undergraduates and 9 hrs. for graduates).

Travel - Trips to related technical conferences, workshops, seminars, advisory board meetings, etc. Trips to sponsor for technical discussions and presentation of results. These trips will include meetings with the Security Executive Advisory Council and participation in the Workshop related to use of the open source Decision Support Tool developed under this activity. The PIs and graduate students will travel to conferences and workshops to present this effort to include the annual meetings of the multidisciplinary Society for Risk Analysis, the annual meetings of the multidisciplinary Systems, Man, and Cybernetics Society of the IEEE. Funding for this conference travel will be partially covered by funds proposed for this I3P effort.

Materials and Supplies - Laboratory supplies for specific use in the research project (The laptop computers are to be used by the students engaged in creating the open source SW for the economic game activity. The game will be built on top of selected off-the-shelf software packages (e.g., Groove) that will require purchases of licenses. There are also specific software programs that must be used in order to perform project related research. Software will be necessary for interdependency modeling and analysis, e.g. Evolver software from Palisade Corporation.). For the decision support tool effort five laptops will be purchased over a 2 year period to permit the software development and experimental conduct of economic exercises, In addition software licenses will need to be acquired to support the software development effort and the final decision support tool. For the interdependency task one laptop per year will be purchased, and software licenses acquired to support the interdependency modeling effort. Does not include office or other general purpose supplies.

Other –

- a. Tuition Remission - Effective September 1, 1990, it is the policy of the University of Virginia to provide tuition for graduate research assistants as partial compensation for services.
- b. Graduate Research Assistant Health Insurance – Effective July 1, 2005, it is the policy of the University of Virginia to provide health insurance for graduate research assistants as partial compensation for services.
- c. Technical Editor – A professional technical editor will assist in the editing of archival papers, conference presentations and the progress reports submitted to the funding agency. These editing services are absolutely indispensable for the quality control of our publications.
- d. Other Costs - Estimated project related costs for photocopying, long distance phone and FAX, etc. are based on prior SEAS research experience. The University of Virginia system, through copy cards, etc., is able to document such costs as related to the project.

Facilities and Administrative (F&A) (Indirect/Overhead) Costs - The University of Virginia's negotiated MTDC F&A rates with DHHS per agreement of 5/23/05 is: 7/1/05 - 6/30/06 – 52.5% "on campus" and 26% "off-campus"; effective 7/1/06 – 51.5% "on Campus" and 26% "off-campus". (Note: The MTDC base consists of total direct costs less individual equipment items in excess of \$5,000, alterations and renovations, patient care costs, stipends, tuition remission and rental costs of off-campus facilities.) Includes F&A on the first \$25,000 of subcontracts.

Research Budget: RAND

(b)(6)

	BPII	BPII	Total
A. Personnel	49,427	49,427	98,854
B. Fringe Benefits	22,736	22,736	45,472
C. Travel	5,189	5,189	10,378
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	13,097	13,097	26,194
Total Direct Costs	90,449	90,449	180,898
I. Indirect Costs	71,079	71,079	142,158
Fee 8%	12,922	12,922	25,844
TOTAL PROJECT COST:	174,450	174,450	348,900

Personnel

Dr. (b)(6) Senior Information Scientist, will lead the RAND portion of this initiative. Dr. (b)(6) Associate Operations Research Analyst, will take the lead in the task that refines the economic model evaluation framework, extending the work that she is currently performing on the I3P Economics of Cyber Security project. Both (b)(6) will conduct the case study, assisted by (b)(6)

a RAND research assistant with experience in cyber security (b)(6) will support the effort as administrative assistant.

Fringe

Rates based on approved rate agreement.

Travel

One trip to California is budgeted, to be made in support of the case study interviews.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs involve only computing and communications costs to support the researchers in completing the tasks for this project. Charges for desktop PC's at RAND are allocated in proportion to staff time spent on projects. The estimated computing and communications costs for this project include charges for photocopying, printing, telephone and fax, adjusted for inflation.

Indirect Costs and Fee of 8%

Rates based on approved rate agreement.

Research Budget: U of California, Berkeley

(b)(6)

	BPH	BPH	Total
A. Personnel	63,226	63,769	126,995
B. Fringe Benefits	10,063	10,063	20,126
C. Travel	18,670	18,670	37,340
D. Equipment	-	-	-
E. Supplies	6,100	1,000	7,100
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	250	250	500
Total Direct Costs	98,309	93,752	192,061
I. Indirect Costs	52,104	49,689	101,793
TOTAL PROJECT COST:	150,413	143,441	293,854

Personnel: (b)(6), Clinical Professor of Law, and Director of the Samuelson Law, Technology & Public Policy Clinic will serve as Principal Investigator for this project (8% effort). (b)(6) TRUST and ACCURATE Fellow at the Samuelson Clinic will serve as Senior Research Fellow (30% effort). One graduate student will assist Professor (b)(6) (50% effort). Law students will provide research support (at \$15 per hour (b)(6) Associate Director of Policy & Outreach

and Senior Attorney at the Samuelson Clinic, will provide advice and consultation to the project, as needed.

Salary and employee benefits (including Graduate student health insurance and fee remissions) are included for (b)(6) and one graduate student for two years. Salaries are based on current levels with no projected annual increases.

Fringe: See above.

Travel: The budgeted travel supports trips to be shared by a combination of the team members (location to be determined).

Travel costs are obtained via estimated costs for round-trip, coach, non-restricted trips to the East Coast (\$600 total), ground transportation (\$100 total), average per diem costs (\$65 for meal and incidentals), and lodging (\$150 per night).

Specific trips are: a) to I3P meetings; b) to CSO Association meetings; and c) to interview several CSOs within the region in one trip.

Supplies: Supplies and Expenses for the direct benefit of this research include long-distance telephone charges, publication costs, and express shipping charges.

A laptop is requested to assist with data collection and note-taking during field interviews with Chief Security Officers.

Recording equipment is requested to assist with capturing CSO interviews.

A speakerphone is requested to conduct follow-up discussions and conference calls.

Transcription services are requested to memorialize CSO interviews.

Other costs:

Modified total direct costs (MTDC) exclude equipment, graduate student health insurance & fee remissions.

Research Budget: Dartmouth College - IST

(b)(6)

	BPII	(b)(6)	Total
A. Personnel	167,794	174,506	342,300
B. Fringe Benefits	58,863	62,838	121,701
C. Travel	20,000	20,000	40,000
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	246,657	257,344	504,001
I. Indirect Costs	147,747	154,149	301,896
TOTAL PROJECT COST:	394,404	411,493	805,897

Dartmouth College - ISTS (Tuck School of Business)

Personnel and Fringe: Prof (b)(6) will be the project manager for this Tuck portion of the initiative, by overseeing the research effort (b)(6) will be fully involved in the day-to-day planning, organization, coordination, execution, and presentation of the proposed research (b)(6) will also be centrally involved in the research administration and execution. Support for a student is included in the budget; this individual would assist with data reduction, modeling and report/presentation writing. Salary and fringe benefits for these individuals is covered in the budget for this project.

Effort:

Johnson: 1 month/year
Dynes: 12 months/year
Brechbuhl: 3 months/year
Student: 480 hrs/year (equivalent to a summer intern)

Travel: The budgeted travel supports roughly 20 trips per year at \$1000/trip; this should be adequate for travel to interview firms, present at workshops, and travel to I3P inter-group meetings. With respect to interview travel, the goal is for two researchers (b)(6) (b)(6) to visit multiple firms on each trip; from a knowledge capture standpoint having two researchers present at each interview is much more effective than a single interviewer. There will be 3 different people making the trips. Generally, based on historical trips from the Hanover area, the Tuck School of Business uses on average \$1,000 per trip. This roughly breaks down to \$450 for airfare, \$175 per night for 2 nights, \$50 per day for food for 2 days, and \$100 for mileage, parking, taxis (or rental car) per trip. These trips are necessary to meet and gather data from various key stakeholders, as well as attend conferences and team meetings in order to successfully complete the project.

Indirect Costs: The budgeted indirect cost rate is used in accordance with the DHS approved rates for the Tuck School of Business at Dartmouth College.

I3P Initiative 6 – Assessable Identity and Privacy Protection

Team leader (b)(6) MITRE Corporation

Cost - Budget Period III: \$863,003

See Project Narrative for proposal information. This project includes 7 institutional subcontracts.

Sub-agreements:

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the I3P research initiatives have been made accordingly.

Management Budget: Mitre ((b)(6)

	BPII	BPIII	Total
A. Personnel	43,138	43,075	86,213
B. Fringe Benefits	43,444	43,381	86,825
C. Travel	3,045	3,121	6,166
D. Equipment			-
E. Supplies	1,904	1,955	3,859
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	91,531	91,532	183,063
I. Indirect Costs	8,469	8,468	16,937
TOTAL PROJECT COST:	100,000	100,000	200,000

Personnel (b)(6) will serve as the team leader for this initiative. Leveraging of MITRE's Information Security Center will be done through (b)(6). (b)(6) will provide administrative support. (b)(6) will provide financial services.

Fringe: The budgeted fringe rates are used in accordance with approved rates.

Travel: The budgeted travel support (b)(6) travel to four team meetings. Expected duration of travel is 2 or 3 days per trip. Locations specified are tentative.

Equipment: N/A

Supplies: The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs: N/A

Indirect Costs: The G&A and COM fees are 7% and 4% respectively.

Research Budget: Mitre (b)(6)

	BPII	BPII	Total
A. Personnel	132,135	132,098	264,233
B. Fringe Benefits	133,074	133,036	266,110
C. Travel	7,536	7,724	15,260
D. Equipment			-
E. Supplies	1,746	1,633	3,379
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs			-
Total Direct Costs	274,491	274,491	548,982
I. Indirect Costs	25,509	25,509	51,018
TOTAL PROJECT COST:	300,000	300,000	600,000

Personnel: (b)(6) will be managed by the project manager for this Mitre portion of the initiative. He will enlist appropriately skilled staff as required. Leveraging of MITRE's Information Security Center will be done through (b)(6). (b)(6) will provide administrative support (b)(6) will provide financial services.

Fringe: The budgeted fringe rates are used in accordance with approved rates.

Travel: The budgeted travel supports travel for two people to four team meetings. Expected duration of travel is 2 or 3 days per trip. Locations specified are tentative.

Equipment: N/A

Supplies: The budget is for producing and mailing hardcopy material distributed under the project.

Other Costs: N/A

Indirect Costs: The G&A and COM fees are 7% and 4% respectively.

Research Budget: UIUC (b)(6)

	BPII	BPII	Total
A. Personnel	131,885	137,161	269,046
B. Fringe Benefits	28,886	30,042	58,928
C. Travel	10,000	8,000	18,000
D. Equipment	3,000	2,515	5,515
E. Supplies	3,000		3,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	27,854	27,040	54,894
Total Direct Costs	204,625	204,758	409,383
I. Indirect Costs	95,375	95,242	190,617
TOTAL PROJECT COST:	300,000	300,000	600,000

SENIOR PERSONNEL

\$106,713

The project manager, (b)(6) and Co-lead (b)(6) will be responsible for all project activities for this UIUC portion of the initiative. (b)(6) requests 1 month support per year for a total of 2 months support. The proposal also includes a 1 month support for each (b)(6) per year for a total of 4 months support.

OTHER PERSONNEL

\$162,333

3 – Graduate Research Assistant

The graduate students will assist the Senior Personnel in conducting the research described in the proposal.

1 – Staff (Academic Professional)

The staff personnel will assist the Senior Personnel by administering the day-to-day operations necessary for the project.

Senior Personnel (Faculty), Academic Professionals (Programmer) and Graduate Research Assistants at the University of Illinois are paid on a person-month basis, no timesheets are maintained for these groups of employees. An estimate for faculty and academic professionals is 160 hours/1 FTE and 173 hours for 1 FTE for Graduate Research Assistants.

Fringe Benefits

\$58,928

Retirement –	10.82%
Health, Life and Dental Insurance -	21.18%
Termination Benefits –	1.62%
Workmen’s Compensation	0.13%
Medicare -	<u>1.45%</u>
Total Benefits	35.20%

35.2% computed on all salaries **except** Graduate Students

Graduate Student salaries -- Graduate Student Health, Life and Dental Insurance, 5.13% and Workmen's Comp, 0.13% are calculated at 5.26%

Travel – Domestic

\$18,000

9 trips per year for the PI and Co-PIs (2-days) per trip at approximately \$1,000 for meetings, project reviews and/or attendance at technical conferences related to this work effort.

Materials, Supplies and Expensed Equipment

\$8,515

The budget includes \$3,000 for materials and supplies including reference books, hanging files, transparencies, engineering notebooks, storage media, electronic components, repair parts and in-house poster preparation; \$5,515 for expensed equipment. Equipment will be PCs and other devices needed to facilitate the project

Computer Services

\$9,000

The budget includes in-house dedicated computer entities and networking support utilized by research groups housed in the Coordinated Science Laboratory. Logon fee of \$125 per month (CRHC Group) per logon supports salaries, supplies, repairs, maintenance, and equipment upgrades or replacements of the entity.

General Services

\$1,681

Also included in the budget are costs for services related to communications, duplication costs, long-distance tolls, teleconferencing, and maintenance.

Tuition Remission

\$44,213

37% of Graduate Research Assistant salaries

MTDC BASE – Indirect Costs

\$190,617

53% of Total Direct Costs, excluding tuition remission, equipment and expensed equipment, and subcontracts over \$25,000 each.

MTDC BASE = \$409,383 less \$44,213 (tuition remission) less

\$5,515 (expensed equipment) = \$359,655

\$359,655 x 53% = \$190,617 (rounded) in total indirect costs

Research Budget: SRI

(b)(6)

	BPII	BPII	Total
A. Personnel	278,942	279,241	558,183
B. Fringe Benefits			-
C. Travel	7,085	7,085	14,170
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	13,940	13,446	27,386
Total Direct Costs	299,967	299,772	599,739
I. Indirect Costs			-
TOTAL PROJECT COST:	299,967	299,772	599,739

Personnel

(b)(6) will serve as project manager for this SRI portion of the initiative, and will coordinate overall architecture issues to ensure SRI's work integrates with the overall project.

(b)(6) will be involved with credentials, cryptography, and protocols.

(b)(6) will be responsible for the demo facility and will contribute to demo development.

Fringe

Proprietary

Travel

The budgeted travel supports anticipated team meetings.

Equipment

N/A

Supplies

N/A

Other Costs

Other costs include the Computer Science Laboratory (CSL) computer facility.

The indirect rates included in this proposal are based on SRI's Forward Pricing Indirect Rate Proposal dated 28 August 2006. Rates may be verified by calling SRI's cognizant ACO, Mr. (b)(6)

Research Budget: Cornell

(b)(6)

	BPII	BPII	Total
A. Personnel	99,434	104,497	203,931
B. Fringe Benefits	6,920	7,267	14,187
C. Travel	15,000	15,751	30,751
D. Equipment			-
E. Supplies	6,912	819	7,731
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	11,415	11,984	23,399
Total Direct Costs	139,681	140,318	279,999
I. Indirect Costs	60,319	59,682	120,001
TOTAL PROJECT COST:	200,000	200,000	400,000

Salaries:

Project manager (b)(6) Assistant Professor, will be the institutional contact and lead for the Cornell portion of this initiative. He will coordinate activities, and collaborate closely with (b)(6) and other members of the team to develop technologies described in the SOWP. This proposal requests salary support for a 0.5 month of summer salary each year.

Co-Lead (b)(6) Professor, and (b)(6) Assistant Professor, will collaborate with Assistant Professor (b)(6) to develop technologies and will share with Assistant Professor (b)(6) funding for graduate students to assist in working on the respective technologies. This proposal request salary support for 0.5 month of summer salary each year.

Graduate Student: Graduate students will assist Assistant Professor (b)(6) Professor (b)(6) and Assistant Professor (b)(6) in developing the technologies described in the SOWP. This proposal requests salary support for one hundred percent of academic year effort for two graduate students each year. The salary support includes the stipend and salary used toward tuition and health insurance each year.

Annual salaries are budgeted with a five percent increase in July of each year.

Employee Benefits: Employee Benefits have been proposed at a rate of thirty-three percent for all non-student compensation as approved by the Department of Health and Human Services. See http://www.accounting.cornell.edu/employee_Benefit_Rates.cfm.

Travel: Funds are requested for travel to enable the project participants to attend conferences and meetings with other team members to promote technology transfer and refine technology demonstration plans. Estimates are based on current airfare costs and relevant associated costs based on historical information.

Material and Supplies: The cost of computer research materials under \$5,000, including computer hardware, computer software, and research books which are primarily related

to the research project. Computer research material costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other – Publications: The costs associated with publications in related technical journals. Publication costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other – Communications: Communication costs consist of project specific conference calls, faxing, modem, lab phone equipment, etc. Communications costs are determined by comparison of similar projects and discussions with the Principal Investigator.

Other – Workstation Support: Workstation support represents hardware and software maintenance, software licensing, networking, printing service, file service, backups and user consulting support for the machines used to conduct research as outlined in this proposal. The costs are calculated based on the effort of the project participants. The following steps are used to bill the costs associated with the Computer Science Department Central Facility:

a) For each used with a computing account in the facility, a user class is assigned to the individual, based on their past or anticipated usage. The user class of an individual may change during the year in response to changes in their usage of the facility. User class is determined by a set of objective use criteria for each user.

b) A user profile is established for each individual in the department that identifies percentage of time spent on Administration, Instruction, Departmental Research, and Organized Research activities. The profile is updated for summer, fall, and spring billing cycles.

c) The profile and user-class-based charges are used to allocate costs for the individual's activities to Administration, Instruction, Departmental Research, and Organized Research.

Costs associated with Organized Research are billed to sponsored research projects. Costs for Administration, Instruction, Departmental Research are billed to university funds.

Facilities and Administrative Costs (F&A): F&A costs have been proposed at a rate of fifty-eight percent from April 1, 2007 through June 30, 2007 and fifty-nine percent from July 01, 2007 through March 31, 2009 of Modified Total Direct Cost (MTDC) as approved in Cornell's rate agreement with the Department of Health and Human Services. A copy of this agreement may be found at http://www.accounting.cornell.edu/F&A/F&A_Cost_Rates.cfm. MTDC exclusions include Capital Equipment, GRA Allowance and Health Insurance, and Subcontract costs in excess of \$25,000 per subcontract.

The five percent annual escalation for the general expenses is proposed in accordance with University policy.

Research Budget: Purdue

(b)(6)

	BPII	BPII	Total
A. Personnel	66,949	66,646	133,595
B. Fringe Benefits	15,134	15,460	30,594
C. Travel	10,000	10,001	20,001
D. Equipment			-
E. Supplies			-
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	9,574	9,537	19,111
Total Direct Costs	101,657	101,644	203,301
I. Indirect Costs	48,343	48,356	96,699
TOTAL PROJECT COST	150,000	150,000	300,000

Personnel:

(b)(6) Professor at Purdue University, will serve as the Purdue project manager for portion of the initiative. (b)(6) will oversee the project for the entire duration; however only 50% of one month of her summer salary will be allocated to the project. The rest of her summer salary will be covered by NSF funding. The research carried with the NSF funding is related to digital identity management and thus synergic with the work to be carried out in the I3P project.

(b)(6), Professor at Purdue University, will oversee the interactions with the stakeholders and conduct research on the credentialing framework. 25% of one month summer salary will be allocated to the project. The rest of his summer salary will be covered by other sources.

A postdoc will be hired to carry on research on the trust negotiation and on implementation of the demo. 50% of the salary of the postdoc will be charged to the project.

A graduate research assistant will be involved in the project. The RA will be supported at 50% during the academic year and 100% during summer months. Tuition fees are also budgeted.

Fringe: Fringe benefits are computer at the negotiated university rate.

Travel: 5 domestic trips have been budgeted for each year of the project. 4 of such trips will be for attending the project meetings; 1 will be for attending a conference in the USA. 2 foreign trips have been budgeted for each year of the project to allow the Purdue team members to attend and collaborate on related initiatives abroad.

Equipment: N/A

Supplies: N/A

Indirect Costs: Indirect costs are charged at the Purdue rate of 52.5%. Indirect costs are not charged on fee remission.

Research Budget: Georgia Tech

(b)(6)

	BPII	BPII	Total
A. Personnel	77,191	80,811	158,001
B. Fringe Benefits	7,135	7,492	14,628
C. Travel	6,000	6,000	12,000
D. Equipment			-
E. Supplies	500	500	1,000
F. Construction			-
G. Consultants/Contracts			-
H. Other Costs	12,096	12,096	24,192
Total Direct Costs	102,922	106,899	209,821
I. Indirect Costs	45,685	47,686	93,371
TOTAL PROJECT COST:	148,607	154,585	303,192

Salaries:

PIs' salaries and the ECE Graduate Research Assistant's (GRA-1) stipend are based on current rates and projected increases of 5% per year. CoC GRA stipends are set to increase on 8/1/2007 and, therefore, the exact current and increased rates are used for GRA-2. Fringe benefits are charged at the rate of 24.1% on the faculty salaries. GRAs do not receive benefits.

The year budget for this proposal contains one month of summer salary for the project manager (b)(6) per year. It also includes support for 2 graduate research assistants for 12 months each year at 50% time, which is full time employment for graduate students.

Travel:

Travel funds will be used for the lead and co-lead to attend semi-annual team meetings at various locations in the U.S. Each person trip is budgeted at \$1500, with estimated breakdown as follows:

- Air fare: \$1000
- Hotel (2 nights) \$300
- Rental car \$100
- Meals/misc \$100

Equipment:

No equipment is requested.

Materials and Supplies:

Funds in this category will be used primarily for purchases of inexpensive software, small hardware, and other miscellany (photocopies, postage etc) needed to support project operation.

GRA Tuitions:

Institute policy requires research grants to pay tuition for graduate research assistants at the rate of \$504 per month per student.

Indirect Costs:

Indirect costs are charged at the negotiated rate of 50.3%. Indirect costs are applied to all direct costs except GRA tuitions.

Indirect Costs:

The budgeted indirect cost rate is used in accordance with the DHS approved rates for Dartmouth College.

ISTS Initiative 7 & 8 – Security and Privacy for Real People and Education and Curriculum Development

Project Lead: Co-PI (b)(6)

Note: In March 2007, A Budget Period II Supplement was submitted for a total of \$3.3M. These dollars were part of the approved Budget Period III plan, and therefore adjustment in the ISTS research projects have been made accordingly. See the following chart for an outline of the total project costs.

ISTS (Initiatives 7 & 8)

	BPI	BPII	BPII supp	Proposed BPII	Total
Fell	75,365	-	-	-	75,365
PKI	67,555	300,716	-	341,756	710,027
HBS	182,189	254,673	-	75,753	512,615
Met		622,625	471,322	143,758	1,237,705
DIS	174,737	1,117,917	274,340	747,603	2,314,598
DVF		88,542	7,779	208,853	305,174
IRID		235,068	25,930	330,442	591,441
AC	100,154	179,780	19,495	101,224	400,654
BES		121,092	-	-	121,092
SIS		79,586	63,960	87,783	231,329
Total ISTS	600,000	3,000,000	862,827	2,037,173	6,500,000

Dartmouth Internet Security Testbed – DIST

Cost - Budget Period III: \$747,603
(Budget Period II supplement: \$274,340)

Personne (b)(6) will lead this project. As Professor of Computer Science and Director of the Center for Mobile Computing (b)(6) brings extensive experience in wireless networks, pervasive computing, and computer security to the project. He also has experience leading several large research projects. Professor (b)(6) will co-lead, responsible for the NSOC component. A visiting professor is also budgeted in order to help oversee the project with Professor (b)(6) is on sabbatical. The budget includes two **technician/programmers** (at typical Dartmouth rates), to assist with the planning and deployment of the test bed. The budget includes two **postdoctoral research associates**, two **computer-science graduate students**, two **engineering graduate students**, and several **undergraduate students**, to assist with the development of software for the testbed and with the research projects described in the proposal.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budgeted travel supports participation in various conferences (domestic and foreign locations as yet unknown) and other venues to present project progress and results.

Participant Fees: Tuition for Thayer school graduate students is billed at a rate of 50% of full tuition.

Materials & Supplies: All equipment and computer components were budgeted in BPII. The project will incur cell phone service fees during the final year of the project.

Sub-agreements: This project will require 2 sub-agreements to support our collaboration with UMass Lowell (Professor (b)(6) and student) and Aruba Networks (b)(6) (b)(6)). These agreements are budgeted in BPII, BPII supplement, and BPIII.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Information Risk in Data-Oriented Enterprises – IRIDOE

Cost - Budget Period III: \$330,442
(Budget Period II supplement: \$25,930)

Personnel: Professor (b)(6) and Tuck Faculty (b)(6) will lead the project. Two **post-docs** are also budgeted. Small amounts also have been allocated for undergraduate **WISP intern** and **graduate students** interns.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Funds to conduct follow-on visits to current partner institutions, as well as similar two-week student visits to commercial banks (such as Bank of America) and possibly other financial services providers (such as H&R Block) are requested.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

MetroSense – Scalable Secure Sensor Systems – Metro

Cost - Budget Period III: \$143,758
(Budget Period II supplement: \$471,322)

Personnel: Professor (b)(6) (lead), Professor (b)(6) and Professor (b)(6) (co-leads) will lead the

project and supervise the students and staff on the research and development. Postdoctoral research fellows will assist with the research and evaluation and assist with supervising research students. Researchers will help with the purchase, configuration, inventory, and deployment of all of the hardware. Graduate and Undergraduate students from both Computer Science and Thayer also will be involved in the project. Costs are budgeted based on current approved rates. Personnel costs were budgeted for this project in the budget period II supplement.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Participant Costs: Tuition for Thayer school graduate students is billed at a rate of 50% of full tuition. Costs were budgeted for this project in the budget period II supplement.

Materials & Supplies: Monthly cell phones plans are needed in order to conduct the research are anticipated.

Indirect Costs: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Interoperability and Usability for PKI Management – PKI

Cost - Budget Period III: \$341,756
(Budget Period II supplement: \$0)

Personnel: Professor (b)(6) will lead this project. An Associate Professor of Computer Science, Dr. (b)(6) brings extensive experience in Public-Key Infrastructure (PKI); he was the founding program chair (and continuing program committee member) of NIST's annual *PKI Research Workshop*, and also served on the founding program committee of *EuroPKI*, the European response to NIST's effort. He founded the PKI Lab at Dartmouth, which has been instrumental in developing a production-quality PKI for Dartmouth College. Sun Microsystems, Cisco Systems, and Intel Corporation have recognized his work with gifts and grants to support his PKI research. He also has experience leading several large research projects. Postdoctoral researcher (b)(6) (100% effort) will play a key role in developing and implementing the outreach effort; (b)(6) is the designer of the original OpenCA software and has been project manager of OpenCA since its creation. Researcher (b)(6) (50% effort beginning January 2008) brings critical expertise as the lead organizer of the Higher-Education Bridge Certificate Authority (HEBCA) at Dartmouth College, and in reaching out to other universities and to The America's Grid Policy Management Authority (TAGPMA).

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with key project stakeholders (both domestic and foreign). Collection and dissemination of research information is also expected. A few trips will involve drives to a regional university to give presentations on the PKI research. We foresee HEBCA

evangelism trips, PKI standards and working group trips, as well as the usual conference trips. In particular we envisage collaboration with the IETF for the standardization efforts (PRPQ). Discussions with TERENA working groups also will be considered to promote the project results and increase its impact over the PKI world community.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Laboratory for Hardware Based Security – HBS

Cost - Budget Period III: \$75,753
(Budget Period II supplement: \$0)

Personnel: Professor (b)(6) will lead this project. Professor (b)(6) has extensive experience in trusted computing hardware, having been a key player on the IBM team that developed the 4758; the first product ever to achieve FIPS level-4 certification. **Student** researchers will include an engineering upperclassman, to work part-time to help set up and maintain the lab and graduate students to help do the research. A **postdoctoral researcher** also will be hired, using some available carry-forward funds from budget period II.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops, and to interact with key project stakeholders (such as Intel). Collection and dissemination of research information is expected during such trips.

Materials and Supplies: A ModelSim XE and Xilinx FPGA are budgeted for use in the lab.

Consultants: (b)(6) noted expert in physical security attacks and defenses, will come up and give two week-long seminars, and also provide consulting advice on an as-needed basis.

Sub-agreements: none.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Digital Video Forensics – DVF

Cost - Budget Period III: \$208,853
(Budget Period II supplement: \$7,779)

Personnel: (b)(6) Professor of Computer Science, will lead the project. Professor (b)(6) has extensive experience in digital image analysis and a long track record applying

statistical techniques to detect tampering in digital images and digital audio. He works closely with many parties with a need for these applications, including the FBI, the federal Office of Research Integrity, and the Associated Press. We also budget for 12 months of a Computer Science graduate student and a full-time programmer.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: The budget includes two trips to present research at national conferences.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Foundations for Practical Autonomic Computing – AC

Cost - Budget Period III: \$101,224

(Budget Period II supplement: \$19,495)

Personnel: Professor (b)(6) will lead this project. As the Dorothy and Walter Gramm Professor of Engineering, Professor (b)(6) brings extensive experience in computer security, mobile computing, wireless networks, agent-based computing, sensor fusion, and parallel computing. He also has experience leading several large research projects. His primary role is in setting the project direction and oversight. Senior Researcher (b)(6) will be the primary technical lead in conducting the research. He too has extensive experience in computer security and sensor fusion. The budget includes twelve months of a Thayer School of Engineering **graduate student**.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth personnel to attend conferences and workshops and to interact with key project stakeholders. Collection and dissemination of research information is expected during these trips. We budget for two trips in this period.

Equipment: none.

Materials & Supplies: An independent Internet connection, with a monthly access fee, is required for the project. It will continue into Budget Period III.

Other Costs: Tuition for Thayer school graduate students is billed at a rate of 50% of full tuition. We budget for conference registration fees at average rates.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

ISTS Initiative 8 – Education and Curriculum Development

Project Lead: Co-PI (b)(6)

Secure Information Systems, Mentoring and Training – SISMAT

Cost - Budget Period III: \$87,783
(Budget Period II supplement: \$63,960)

Personnel: Professor (b)(6) will lead this project. Postdoctoral fellow (b)(6) and research (b)(6) will spend 20-50% of their time devoted to the project to work with industry partners, and to find relevant and interesting internship opportunities for participants. Additional personnel will be brought on for instruction, logistical support and for students to complete internships.

Fringe: The budgeted fringe rates are used in accordance with approved rates for Dartmouth College.

Travel: Travel by Dartmouth to visit regional schools is budgeted. This travel will help to market the program to faculty and students at these schools and to coordinate with visiting faculty we intend to draw from one or more schools.

Materials & Supplies: A small amount of equipment and school supplies will be needed in Budget Period III to assist in preparation. Most costs will be covered by carry-forward funds from Budget Period II.

Event and Meeting: Costs to cover students and professors attending the training is budgeted. Students will stay in Dartmouth dorms and eat at the dining hall.

Consultants: A summer-school instructor will be hired to do preliminary work (developing syllabi and course materials) in the planning phase of the project.

Indirects: The budgeted indirect cost rate is used in accordance with the Department of Health and Human Services approved rates for Dartmouth College.

Appendix A: Detailed Budget Worksheets

Budget Detailed Worksheets

LFP Proposal

Government FY08 Funds - spend during Dartmouth FY08 and FY09

LFP Administration - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08

FY09

Item	Labor (Dartmouth)	Base	Dartmouth FY08			FY09			Total	Inflation				
Faculty														
Staff														
AF	(b)(6)		1.00	0%	0.00%	50	0.00	5%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	90%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	100%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	100%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	100%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	50%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	50%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	100%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	50%	0.00%	50	50	5.0%		
AF	(b)(6)		3.00	0%	0.00%	50	0.00	100%	0.00%	50	50	5.0%		
Subtotal, without fringe						\$0				\$0	\$0			
FAC	Fringe on Faculty					38.5%	50		39.0%	50	50			
AP	Fringe on AP I and AP II					38.5%	50		39.0%	50	50			
UG	Fringe on full-time undergraduates					9.0%	50		9.0%	50	50			
RAA	Fringe on Research Associate A					9.0%	50		9.0%	50	50			
RAB	Fringe on Research Associate B					24.5%	50		24.5%	50	50			
RAC	Fringe on Research Associate C					38.5%	50		39.0%	50	50			
Total fringe						\$0				\$0	\$0			
Subtotal, including fringe						\$0				\$0	\$0			
Indirects on people						35.00%	50			50	50			
Direct materials														
Travel														
Conferences, Meetings and Airfare \$500														
No. of travelers (3) Hotel \$175 / day														
No. of Trips (2) Meals \$50 / day														
No. of nights (3) Mileage/transport														
									\$3,000	\$3,000				
									\$3,150	\$3,150				
									\$900	\$900				
									\$1,800	\$1,800				
Administrative Information Outside of Scope														
equipment														
Breakdown of Equipment														
Participant Support Costs														
Other Direct Costs														
Materials and Supplies														
Replacement laptops														
2 \$2,000											\$4,000	\$4,000		
Cables / batteries / replacement parts														
10 \$500											\$5,000	\$5,000		
Postage to meetings														
1 \$150											\$150	\$150		
Conference Calls														
6 \$40											\$240	\$240		
Software for computers														
3 \$300											\$900	\$900		
Publication Costs														
Communication costs (brochures, posters, photography, printing, letterhead, and mailing)														
1 \$30,000											\$30,000	\$30,000		
Printing of documents														
1 \$16,268											\$16,268	\$16,268		
Conference Registration Fees														
Conference registration fees														
2 \$750											\$1,500	\$1,500		
Event and Meeting Costs														
Food, A/V, set up for consortium meeting (1)														
0 \$7,000											\$0	\$0		
Supplies for Consortium meeting (1)														
0 \$500											\$0	\$0		
Food, A/V, set up for advisory board meetings (9)														
9 \$1,600											\$14,400	\$14,400		
Consultant Services														
Advisory Board Meetings														
Airfare \$500											\$17,500	\$17,500		
No. of travelers (3) Hotel \$175 / day											\$6,125	\$6,125		
No. of Trips (7) Meals \$50 / day											\$1,750	\$1,750		
Mileage/transport (1) \$3,500											\$3,500	\$3,500		
(b)(6) through contract with IBM											\$0	\$0		
Executive Committee payments											1 \$7,938	\$7,938	\$7,938	
Web Design											1 \$25,000	\$25,000	\$25,000	
Indirects on travel, supplies, other costs (NOT equipme						35.00%	\$8,750		\$4,482	\$50,232				
Subawards/Contractual Costs														
Name & Service Provided computation														
Indirect on consultants						35.00%	\$0		\$0	\$0				
Total Directs							\$25,000		\$118,521	\$143,521				
Total Indirects							\$8,750		\$41,482	\$50,232				
Total							\$33,750		\$160,003	\$193,753				

Budget Detailed Worksheets

ISP Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISP Fellowship Program - Budget Period III

Dates: April 1, 2008 to March 31, 2010

Dartmouth FY08

FY09

Item	Labor (Dartmouth)	Base salary			Total
Faculty					
Staff					
Students					
Subtotal, without fringe			\$0		\$0
Total fringe			\$0		\$0
Subtotal, including fringe			\$0		\$0
Indirects on people		35.00%	\$0		\$0
Direct materials	Computation				Total
Travel					
Travel for fellows to consortium meeting Airfare \$500					
	No. of travelers	2	Hotel \$175 / day	\$2,000	\$2,000
	No. of Trips	2	Meals \$50 / day	\$1,400	\$1,400
	No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$400	\$400
Travel for scholars to consortium meeting Airfare \$500					
	No. of travelers	3	Hotel \$175 / day	\$1,500	\$1,500
	No. of Trips	1	Meals \$50 / day	\$300	\$300
	No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$300	\$300
Travel for scholars to initial event Airfare \$500					
	No. of travelers	3	Hotel \$175 / day	\$1,500	\$1,500
	No. of Trips	1	Meals \$50 / day	\$300	\$300
	No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$300	\$300
Travel for fellows to consortium meeting Airfare \$500					
	No. of travelers	2	Hotel \$175 / day	\$2,000	\$2,000
	No. of Trips	2	Meals \$50 / day	\$1,400	\$1,400
	No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$400	\$400
Capital equipment					
Breakdown of Equipment					
	Quantity	Price each	Subtotal	Quantity	Price each
Participant Support Costs					
Other Direct Costs					
Materials and Supplies					
	Review costs (fed-ex, conf calls)			\$200	\$200
Publication Costs					
	Printing/advertising/ mailing costs			\$500	\$500
Conference Registration Fees					
Event and Meeting Costs					
Consultant Services					
	Indirects on travel, supplies, other costs (NOT equipment or	35.00%	\$1,470		\$3,920
					\$5,390
Subawards/Contractual Costs					
	Describe Product or Service				Total
	A memorandum of understanding will be issued to 3 institutes per year to support the ISP fellowship program. These fellowships will to be hosted at various consortium members' institutes. Fellows will be selected based on a scientific review process, for details about the process please see attached narrative proposal. Costs will include: Salary/Benefits Will not exceed \$150,000 per awarded fellowship. Travel allowance/Equipment Indirect costs			\$450,000	\$450,000
	Subaward Program			\$270,000	\$270,000
	Scholar program (average of \$90k per subaward) \$30-40k annual salary, plus \$k in travel, fringe and institutional costs			\$270,000	\$270,000
	Subtotal		\$0	\$670,000	\$670,000
	Indirect on first \$25k each subcontract	35.00%	\$0	\$52,500	\$52,500
Total direct			\$4,200	\$681,200	\$685,400
Total indirects			\$1,470	\$56,420	\$57,890
Total			\$5,670	\$737,620	\$743,290

Budget Detailed Worksheets

ISP Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

\$396,679

ISP Human Behavior - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08

FY09

Item	Units (per month)	Base salary				Total	Inflation
Faculty							
FAC (Associate Professor)	9 month base salary	3 months	0.00%	\$0		\$42,500	5.0%
FAC (Professor)	9 month base salary	5 effort	0.00%	\$0		\$7,703	5.0%
Staff							
RAC (staff)	12 month base salary	15/4 effort				\$20,191	4.0%
Students		Rate per hour					
Undergrads		\$10.00				\$14,000	
CS grad students						\$18,459	3.5%
Subtotal, without fringe				\$0		\$102,853	
FAC Fringe on Faculty			38.5%	\$0	39.0%	\$19,579	\$19,579
AP Fringe on AP I and AP II			38.5%	\$0	39.0%	\$0	\$0
UG Fringe on full-time undergraduates			9.0%	\$0	9.0%	\$0	\$0
RAA Fringe on Research Associate A			9.0%	\$0	9.0%	\$0	\$0
RAB Fringe on Research Associate B			24.5%	\$0	24.5%	\$0	\$0
RAC Fringe on Research Associate C			18.5%	\$0	19.0%	\$7,874	\$7,874
Total fringe				\$0		\$27,454	
Subtotal, including fringe				\$0		\$130,307	
Indirects on people		59.90%		\$0		\$78,054	\$78,054
Direct materials							
Travel							
Conferences, Meetings and Coord	Airfare \$270					\$4,320	\$4,320
No. of travelers	4 Hotel \$300 / day					\$4,800	\$4,800
No. of Trips	4 Meals \$50 / day					\$1,600	\$1,600
No. of nights	1 Mileage/taxi/parking (\$60+\$20+\$20) \$100					\$1,600	\$1,600
Capital equipment							
Breakdown of Equipment							
Participant Support Costs							
Other Direct Costs							
Materials and Supplies							
Publication Costs							
Conference Registration Fees							
Event and Meeting Costs							
Consultant Services							
Indirects on travel, supplies, other costs (NOT equipment or tuition)			59.90%	\$0		\$7,380	\$7,380
Subawards/Contractual Costs							
Base price							
(b)(6)						\$149,518	\$149,518
(b)(6)						\$305,709	\$305,709
(b)(6)						\$300,000	\$300,000
(b)(6)						\$300,000	\$300,000
(b)(6)						\$300,000	\$300,000
(b)(6)						\$150,149	\$150,149
(b)(6)						\$220,977	\$220,977
Subtotal				\$0		\$1,279,397	
Indirect on first \$25k each subcontract			59.90%	\$0		\$0	\$0
Total directs				\$0		\$1,422,024	\$1,422,024
Total indirects				\$0		\$85,433	\$85,433
Total				\$0		\$1,507,457	\$1,507,457

Budget Detailed Worksheets

I3P Proposal

Government FY07 funds - spend during Dartmouth FY07 and FY08

I3P Workshop - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08

FY09

Item	Labor (Dartmouth)	Base				Total
Faculty						
Staff						
Students						
Subtotal, without fringe			\$0			\$0
Total fringe			\$0			\$0
Subtotal, including fringe			\$0			\$0
Indirects on people		15.00%	\$0			\$0
Direct materials		Computation				Total
Travel						
#10 Critical Infrastructure Protection Conference						
I3P Staff						
		Airfare \$500				\$2,000
No. of travelers	4	Hotel \$175 / day				\$3,500
No. of Trips	1	Meals \$50 / day				\$1,000
No. of nights	5	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$400
Registration Fee	3	\$400 per fee				\$1,200
#10 Critical Infrastructure Protection Conference						
Students						
		Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day				\$2,100
No. of Trips	1	Meals \$50 / day				\$600
No. of nights	4	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$900
Registration Fee	3	\$400 per fee				\$1,200
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP III (end of project workshop)						
I3P Staff						
		Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day				\$1,575
No. of Trips	1	Meals \$50 / day				\$450
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$300
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BP III (end of project workshop)						
Team Members						
		Airfare \$500				\$4,000
No. of travelers	8	Hotel \$175 / day				\$4,200
No. of Trips	1	Meals \$50 / day				\$1,200
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$800
#12 WESII 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008						
I3P Staff						
		Airfare \$500				\$1,000
No. of travelers	2	Hotel \$175 / day				\$1,050
No. of Trips	1	Meals \$50 / day				\$300
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$200
#12 WESII 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008						
Team Members						
		Airfare \$500				\$2,500
No. of travelers	5	Hotel \$175 / day				\$1,750
No. of Trips	1	Meals \$50 / day				\$500
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$500
#13 Insider Threat - (April 2008 - North Carolina)						
I3P Staff						
		Airfare \$500				\$2,000
No. of travelers	4	Hotel \$175 / day				\$2,100
No. of Trips	1	Meals \$50 / day				\$600
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$1,200
#13 Insider Threat - (April 2008 - North Carolina)						
Team Members						
		Airfare \$500				\$4,000
No. of travelers	8	Hotel \$175 / day				\$2,800
No. of Trips	1	Meals \$50 / day				\$800
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$1,600
#13 Insider Threat - (April 2008 - North Carolina)						
Students						
		Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day				\$1,050
No. of Trips	1	Meals \$50 / day				\$300
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$300
#14 Insider Threat - BP III (end of Project) - Spring 2009 - DC area						
I3P Staff						
		Airfare \$500				\$2,000
No. of travelers	4	Hotel \$175 / day				\$2,100
No. of Trips	1	Meals \$50 / day				\$600
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$1,200
#14 Insider Threat - BP III (end of Project) - Spring 2009 - DC area						
Team Members						
		Airfare \$500				\$4,000
No. of travelers	8	Hotel \$175 / day				\$2,800
No. of Trips	1	Meals \$50 / day				\$800
No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$1,600
#14 Insider Threat - BP III (end of Project) - Spring 2009 - DC area						
Students						
		Airfare \$500				\$1,500
No. of travelers	3	Hotel \$175 / day				\$1,050
No. of Trips	1	Meals \$50 / day				\$300

I3P Workshop - Budget Period III

Dates:	April 1, 2008 to	March 31, 2009	Dartmouth FY08	Dartmouth FY09	
	No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$300	\$300
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Truck, Hanover NH June 2008 - 2.5 days					
Students			Airfare \$500	\$1,500	\$1,500
	No. of travelers	3	Hotel \$175 / day	\$1,575	\$1,575
	No. of Trips	1	Meals \$50 / day	\$450	\$450
	No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$300	\$300
	Registration Fee	3	\$250 per fee	\$750	\$750
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (truck overnight)					
I3P Staff			Airfare \$500	\$2,000	\$2,000
	No. of travelers	4	Hotel \$175 / day	\$2,100	\$2,100
	No. of Trips	1	Meals \$50 / day	\$600	\$600
	No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$400	\$400
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (truck overnight)					
Team members			Airfare \$500	\$1,500	\$1,500
	No. of travelers	3	Hotel \$175 / day	\$1,050	\$1,050
	No. of Trips	1	Meals \$50 / day	\$300	\$300
	No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$300	\$300
#17 Business Rationale - (end of Project) - Spring 2009 - TBA					
I3P Staff			Airfare \$500	\$1,500	\$1,500
	No. of travelers	3	Hotel \$175 / day	\$1,575	\$1,575
	No. of Trips	1	Meals \$50 / day	\$450	\$450
	No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$900	\$900
#17 Business Rationale - (end of Project) - Spring 2009 - TBA					
Team Members			Airfare \$500	\$1,500	\$1,500
	No. of travelers	3	Hotel \$175 / day	\$1,050	\$1,050
	No. of Trips	1	Meals \$50 / day	\$300	\$300
	No. of nights	2	Mileage/tax/parking (\$60+\$20+\$20) \$100	\$600	\$600
Capital equipment					
Breakdown of Equipment					
Participant Support Costs					
Other Direct Costs					
Materials and Supplies					
	Supplies for Workshop #10	60	\$10/person	\$600	\$600
	Supplies for Workshop #11	80	\$10/person	\$800	\$800
	Supplies for Workshop #12	50	\$10/person	\$500	\$500
	Supplies for Workshop #13	40	\$10/person	\$400	\$400
	Supplies for Workshop #14	40	\$10/person	\$400	\$400
	Supplies for Workshop #15	100	\$10/person	\$1,000	\$1,000
	Supplies for Workshop #16	40	\$10/person	\$400	\$400
	Supplies for Workshop #17	40	\$10/person	\$400	\$400
	Workshop registration software	3	\$250	\$750	\$750
	Conference calls for planning			\$508	\$508
Publication Costs					
Conference Registration Fees					
Event and Meeting Costs					
#18 Critical Infrastructure Protection Conference (2.5 days, 60 people, 3 diners, 1 room) - Dartmouth Spring 2009					
	Food for event	60	Meals (\$70/ day)	\$10,500	\$10,500
	Dinners	60	\$70/day - 3 days	\$12,600	\$12,600
	Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)	\$2,000	\$2,000
	Room rental fee for event		\$3,000 per meeting	\$3,000	\$3,000
	AV equipment for event		\$4,000 per meeting	\$4,000	\$4,000
	Printing		Session information and documents to distribute	\$1,000	\$1,000
	Promotional Materials		Invitations, posters, brochures, advertising	\$1,500	\$1,500
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BPHI (end of project workshop) - 1 day, 80 people, 1 room					
	Food for PCS Workshop	80	Meals (\$80/ day)	\$6,400	\$6,400
	Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)	\$2,000	\$2,000
	Room rental for workshop		\$3,000 per meeting	\$3,000	\$3,000
	AV equipment for workshop		\$5,000 per meeting	\$5,000	\$5,000
	Postage		\$150 for materials to and from venue	\$300	\$300
	Printing		Print session information 120 at \$2 per copy	\$240	\$240
			Printing/burning of CD's with label - 120 at \$3 each	\$360	\$360
	Promotional Materials		Invitations, posters, brochures, advertising	\$1,500	\$1,500
#12 WESII 2 (1 day, 50 people, no dinner, 1 room) - DC area, October 2008					
	Food for event	50	Meals (\$90/ day)	\$4,500	\$4,500
	Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)	\$2,000	\$2,000
	Room rental fee for event		\$3,000 per meeting	\$3,000	\$3,000
	AV equipment for event		\$5,000 per meeting	\$5,000	\$5,000
	Postage		\$150 for materials to and from venue	\$300	\$300
	Promotional Materials		Invitations, posters, brochures, advertising	\$1,500	\$1,500

ISP Workshop - Budget Period III

Dates:	April 1, 2008 to	March 31, 2009	Dartmouth FY08	Dartmouth FY09	
#13 Insider Threat - (April 2008 - North Carolina) - 1 day, 40 people, 1 dinner, 1 room					
	Food for PCS Workshop	40 Meals (\$80/day)		\$3,200	\$3,200
	Dinner	40 \$70/day - 1 day		\$2,800	\$2,800
	Set-up room fee for event	\$2,000 per meeting (essals, markers, tele conf, etc.)		\$2,000	\$2,000
	Room rental for workshop	\$3,000 per meeting		\$3,000	\$3,000
	A/V equipment for workshop	\$5,000 per meeting		\$5,000	\$5,000
	Postage	\$150 for materials to and from venue		\$300	\$300
	Printing	Print session information 120 at \$2 per copy		\$240	\$240
		Printing/burning of CD's with label - 120 at \$3 each		\$360	\$360
	Promotional Materials	Invitations, posters, brochures, advertising		\$1,500	\$1,500
#14 Insider Threat - BPPII (end of Project) - Spring 2009 - DC area- 1 day, 40 people, 1 room					
	Food for PCS Workshop	40 Meals (\$90/day)		\$3,600	\$3,600
	Set-up room fee for event	\$2,000 per meeting (essals, markers, tele conf, etc.)		\$2,000	\$2,000
	Room rental for workshop	\$4,000 per meeting		\$4,000	\$4,000
	A/V equipment for workshop	\$5,000 per meeting		\$5,000	\$5,000
	Postage	\$150 for materials to and from venue		\$300	\$300
	Printing	Print session information 120 at \$2 per copy		\$240	\$240
		Printing/burning of CD's with label - 120 at \$3 each		\$360	\$360
	Promotional Materials	Invitations, posters, brochures, advertising		\$1,500	\$1,500
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days, 100 people					
	Food for PCS Workshop	100 Meals (\$80/day)		\$20,000	\$20,000
	Set-up room fee for event	\$2,000 per meeting		\$4,000	\$4,000
	A/V equipment for workshop	\$4,000 per meeting		\$8,000	\$8,000
	Postage	\$150 for materials to and from venue		\$300	\$300
	Printing	Print session information 120 at \$2 per copy		\$240	\$240
	Promotional Materials	Invitations, posters, brochures, advertising		\$1,500	\$1,500
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (truck oversight) - 1 day, 40 people, 1 room					
	Food for event	40 Meals (\$90/day)		\$3,200	\$3,200
	Dinner	40 \$70/day - 1 day		\$2,800	\$2,800
	Set-up room fee for event	\$2,000 per meeting (essals, markers, tele conf, etc.)		\$2,000	\$2,000
	Room rental for event	\$4,000 per meeting		\$4,000	\$4,000
	A/V equipment for event	\$4,000 per meeting		\$4,000	\$4,000
	Postage	\$150 for materials to and from venue		\$300	\$300
	Promotional Materials	Invitations, posters, brochures, advertising		\$1,500	\$1,500
#17 Business Rationale - (end of Project) - Spring 2009 - TBA - 1.5 days, 40 people, 1 dinner, 1 room					
	Food for PCS Workshop	40 Meals (\$90/day)		\$5,400	\$5,400
	Dinner	40 \$70/day - 1 day		\$2,800	\$2,800
	Set-up room fee for event	\$2,000 per meeting (essals, markers, tele conf, etc.)		\$2,000	\$2,000
	Room rental for workshop	\$4,000 per meeting		\$4,000	\$4,000
	A/V equipment for workshop	\$5,000 per meeting		\$5,000	\$5,000
	Postage	\$150 for materials to and from venue		\$300	\$300
	Printing	Print session information 120 at \$2 per copy		\$240	\$240
	Promotional Materials	Invitations, posters, brochures, advertising		\$1,500	\$1,500
Sum of Workshop Budget Period III					
				\$41,100	\$41,100
Consultant Services					
#10 Critical Infrastructure Protection Conference					
Speakers		Airfare \$500		\$1,500	\$1,500
	No. of travelers	3 Hotel \$175 / day		\$1,575	\$1,575
	No. of Trips	1 Meals \$50 / day		\$450	\$450
	No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100		\$300	\$300
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BPPII (end of project workshop)					
Speakers		Airfare \$500		\$1,000	\$1,000
	No. of travelers	2 Hotel \$175 / day		\$700	\$700
	No. of Trips	1 Meals \$50 / day		\$200	\$200
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100		\$200	\$200
#12 WEIS II (1 day, 50 people, no dinner, 1 room) - DC area, October 2008					
Speakers		Airfare \$500		\$1,000	\$1,000
	No. of travelers	2 Hotel \$175 / day		\$700	\$700
	No. of Trips	1 Meals \$50 / day		\$200	\$200
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100		\$200	\$200
#13 Insider Threat - (April 2008 - North Carolina)					
Speakers		Airfare \$500		\$1,000	\$1,000
	No. of travelers	2 Hotel \$175 / day		\$700	\$700
	No. of Trips	1 Meals \$50 / day		\$200	\$200
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100		\$200	\$200
#14 Insider Threat - BPPII (end of Project) - Spring 2009 - DC area					
Speakers		Airfare \$500		\$1,000	\$1,000
	No. of travelers	2 Hotel \$175 / day		\$700	\$700
	No. of Trips	1 Meals \$50 / day		\$200	\$200
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100		\$200	\$200
#15 Hosting and Supporting the Workshop on the Economics of Information Security (WEIS) - Tuck, Hanover NH June 2008 - 2.5 days					
Speakers		Airfare \$500		\$1,000	\$1,000
	No. of travelers	2 Hotel \$175 / day		\$700	\$700
	No. of Trips	1 Meals \$50 / day		\$200	\$200
	No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100		\$200	\$200
#16 Economics Executive Workshop for CISOs - Spring 2009 - TBA (truck oversight)					
Speakers		Airfare \$500		\$1,000	\$1,000
	No. of travelers	2 Hotel \$175 / day		\$700	\$700
	No. of Trips	1 Meals \$50 / day		\$200	\$200

I3P Workshop - Budget Period III

Dates: April 1, 2008 to March 31, 2009		Dartmouth FY08		Dartmouth FY09	
	No. of nights 2	Miscellaneous/parking (\$60+\$20+\$20) \$100		\$200	\$200
#17 Business Rationale - (end of Project) - Spring 2009 - TBA					
Speakers		Airfare \$500		\$1,000	\$1,000
	No. of travelers 2	Hotel \$175 / day		\$700	\$700
	No. of Trips 1	Meals \$50 / day		\$200	\$200
	No. of nights 2	Miscellaneous/parking (\$60+\$20+\$20) \$100		\$200	\$200
Indirects on travel, supplies, other costs (NOT equipment or tuition)	35.00%	\$0		\$85,641	\$85,641
Subawards/Contractual Costs		Base price			Total
Describe Product or Service		\$0		\$0	\$0
Industry Sessions, 3 to BP111					
	Sandia National Labs	2 for staff time, travel and shipping		\$60,000	\$60,000
	SRI International	1 for staff time, travel and shipping		\$24,968	\$24,968
Sponsoring workshops and conferences (1 at \$5,000 each)				\$5,000	\$5,000
Subtotal				\$89,968	\$89,968
Indirect on first \$25k each subcontract	35.00%	\$0		\$10,489	\$10,489
Total directs			\$0	\$334,656	\$334,656
Total indirects			\$0	\$96,130	\$96,130
Total			\$0	\$418,187	\$418,187

Budget Detailed Worksheets

ISP Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISP Process Control Systems - Budget Period III

Dates: April 1, 2008 to March 31, 2009

		FY08		FY09		Total	
Item	Labor (Dartmouth)	Base					
Faculty							
Staff							
Students							
Subtotal, without fringe			\$0		\$0		\$0
Total fringe			\$0		\$0		\$0
Subtotal, including fringe			\$0		\$0		\$0
Indirects on people		59.90%	\$0		\$0		\$0
Direct materials	Computation						Total
Travel							
Capital equipment							
Breakdown of Equipment							\$0
Participant Support Costs							
Other Direct Costs							
Materials and Supplies							
Publication Costs							
Conference Registration Fees							
Event and Meeting Costs							
Consultant Services							
Indirects on travel, supplies, other costs (NOT equipment or tu		59.90%	\$0		\$0		\$0
Subawards/Contractual Costs	Base price						Total
Describe Product or Service			\$0		\$0		\$0
Manag					\$77,044		\$77,044
MIT-I					\$356,275		\$356,275
Mitre					\$150,000		\$150,000
PNNL					\$239,500		\$239,500
Sandi					\$448,600		\$448,600
SRI it					\$199,818		\$199,818
Tulsa					\$200,000		\$200,000
UIUC					\$250,000		\$250,000
USM					\$100,000		\$100,000
Subtotal			\$0		\$2,021,237		\$2,021,237
Indirect on first \$25k each subcontract		59.90%	\$0		\$0		\$0
Total directs			\$0		\$1,669,330		\$1,669,330
Total indirects			\$0		\$0		\$0
Total			\$0		\$1,669,330		\$1,669,330

(b)(6)

Budget Detailed Worksheets

13P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

13P Business Rationale - Budget Period III

Dates: April 1, 2008 to March 31, 2009

		Dartmouth FY08		FY09		Total
Item	Labor (Dartmouth)	Base				
Faculty						
(b)(6)	9 month base salary	179 effort	\$10,096		\$13,832	\$23,928
	12 month base salary	3 months	\$0		\$37,856	\$37,856
	12 month base salary	100% effort	\$25,310		\$75,929	\$101,238
Students						
UG/Tuck Graduate Student	Rate per hour: \$26.00		\$2,000	480.00 hours	\$10,480	\$12,480
Subtotal, without fringe			\$37,406		\$138,097	\$175,502
FAC	Fringe on Faculty		38.5% \$0		39.0% \$14,764	\$14,764
UG	Fringe on full-time undergraduates		9.0% \$180		9.0% \$943	\$1,123
RAC	Fringe on full-time undergraduates		38.5% \$9,744		39.0% \$29,612	\$39,356
FAC-L	Fringe on Faculty - lower rate		27.0% \$2,726		28.0% \$3,873	\$6,599
Total fringe			\$12,650		\$49,192	\$61,842
Subtotal, including fringe			\$50,056		\$187,289	\$237,344
	Indirects on people	59.90%	\$29,983		\$112,186	\$142,169
Direct materials						
Travel		Computation				Total
Travel to partners	20 trips at \$1,000 per trip per year				\$20,000	\$20,000
Capital equipment						
Breakdown of Equipment			Quantity: 100	Unit Cost: \$50		\$5,000
Participant Support Costs						
Other Direct Costs						
<u>Materials and Supplies</u>						
<u>Publication Costs</u>						
<u>Conference Registration Fees</u>						
<u>Event and Meeting Costs</u>						
<u>Consultant Services</u>						
	Indirects on travel, supplies, other costs (NOT equipment)	59.90%	\$0		\$11,980	\$11,980
Subawards/Contractual Costs						
Describe Product or Service		Base price				Total
Manage U of Vermont	(b)(6)				\$125,000	\$125,000
RAND	(b)(6)				\$650,000	\$650,000
Unver	(b)(6)				\$174,450	\$174,450
Unver	(b)(6)				\$143,441	\$143,441
Subtotal			\$0		\$496,317	\$496,317
	Indirect on first \$25k each subcontract	59.90%			\$0	\$0
Total directs			\$50,056		\$703,606	\$753,661
Total indirects			\$29,983		\$124,166	\$154,149
Total			\$80,039		\$827,771	\$907,810

Budget Detailed Worksheets

13P Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

13P Assessable Identity - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08

FY09

Item	Labor (Dartmouth)	Base salary			Total	
Faculty						
Staff						
Students						
Subtotal, without fringe			\$0	\$0	\$0	
Total fringe			\$0	\$0	\$0	
Subtotal, including fringe			\$0	\$0	\$0	
Indirects on people	59.90%		\$0	\$0	\$0	
Direct materials	Computation				Total	
Travel						
Capital equipment						
Breakdowns of Equipment			Quantity, size and	subtotal	Quantity, size and	subtotal
Participant Support Costs						
Other Direct Costs						
Materials and Supplies						
Publication Costs						
Conference Registration Fees						
Event and Meeting Costs						
Consultant Services						
Indirects on travel, supplies, other costs (NOT equipment)	59.90%		\$0	\$0	\$0	
Subawards/Contractual Costs	Base price				Total	
Describe Product or Service			\$0	\$0	\$0	
Man	(b)(6)			\$100,000	\$100,000	
Mit				\$300,000	\$300,000	
UIU				\$300,000	\$300,000	
SRJ				\$299,772	\$299,772	
Com				\$200,000	\$200,000	
Pur				\$150,000	\$150,000	
Ge				\$154,585	\$154,585	
Fl				\$0	\$0	
Subtotal				\$0	\$863,003	\$863,003
Indirect on first \$25k each subcontract		59.90%		\$0	\$0	\$0
Total directs			\$0	\$863,003	\$863,003	
Total indirects			\$0	\$0	\$0	
Total			\$0	\$863,003	\$863,003	

Budget Detailed Worksheets

Institute for Security Technology Studies Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08

FY09

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				FY09				Total	Inflation	
Faculty													
FAC		9 month base salary	\$165,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$38,500	\$38,500	5.0%
FAC		5 month base salary	\$125,696	0.50	100%	10.00%	\$12,570	2.25	100%	45.00%	\$59,291	\$71,961	5.0%
FAC		9 month base salary	\$143,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$33,367	\$33,367	5.0%
FAC		9 month base salary	\$141,000	0.00	100%	0.00%	\$0	2.00	100%	22.22%	\$32,900	\$32,900	5.0%
FAC		9 month base salary	\$132,000	0.00	100%	0.00%	\$0	2.25	100%	25.00%	\$34,650	\$34,650	5.0%
FAC		9 month base salary	\$189,000	0.00	100%	0.00%	\$0	1.00	100%	11.11%	\$22,050	\$22,050	5.0%
FAC		9 month base salary	\$129,000	0.00	100%	0.00%	\$0	4.00	100%	44.44%	\$57,333	\$57,333	0.0%
							-0.50				(\$8,750)	(\$8,750)	
							-0.25				(\$3,500)	(\$3,500)	
							-0.50				(\$17,514)	(\$17,514)	
							-0.50				(\$7,642)	(\$7,642)	
							-0.50				(\$7,000)	(\$7,000)	
							-0.25				(\$4,667)	(\$4,667)	
Staff													
AP		12 month base salary	\$72,119	3.00	100%	25.00%	\$18,030	3.00	100%	25.00%	\$18,751	\$36,781	4.0%
RAB		12 month base salary	\$67,500	3.00	50%	12.50%	\$8,438	6.00	80%	40.00%	\$28,080	\$36,518	4.0%
RAB		12 month base salary	\$67,500	3.00	50%	12.50%	\$8,438	3.00	100%	25.00%	\$17,550	\$25,988	4.0%
RAC		12 month base salary	\$105,160	1.50	100%	12.50%	\$13,145	7.00	100%	58.33%	\$64,411	\$77,556	5.0%
AP		12 month base salary	\$65,100	3.00	100%	25.00%	\$16,275	6.00	100%	50.00%	\$34,178	\$50,453	5.0%
AP		12 month base salary	\$65,000	3.00	100%	25.00%	\$16,250	6.00	100%	50.00%	\$34,125	\$50,375	5.0%
AP	(b)(6)	12 month base salary	\$65,100	3.00	25%	6.25%	\$4,069	1.00	25%	2.08%	\$1,411	\$5,479	4.0%
AP		12 month base salary	\$44,124	3.00	100%	25.00%	\$11,031	9.00	100%	75.00%	\$34,417	\$45,448	4.0%
RAB		12 month base salary	\$67,000	3.00	100%	25.00%	\$16,750	2.00	100%	16.67%	\$11,613	\$28,363	4.0%
RAB		12 month base salary	\$70,304	3.00	100%	25.00%	\$17,576	0.00	0%	0.00%	\$0	\$17,576	4.0%
RAB		12 month base salary	\$67,200	3.00	100%	25.00%	\$16,800	4.00	100%	33.33%	\$23,296	\$40,096	4.0%
AP		12 month base salary	\$78,500	3.00	100%	25.00%	\$19,625	1.00	100%	8.33%	\$6,803	\$26,428	4.0%
RAC		12 month base salary	\$67,000	3.00	100%	25.00%	\$16,750	2.00	100%	16.67%	\$11,613	\$28,363	4.0%
RAC		12 month base salary	\$75,000	3.00	100%	25.00%	\$18,750	2.50	100%	20.83%	\$16,250	\$35,000	4.0%
RAC		12 month base salary	\$138,646	1.00	25%	2.08%	\$2,888	0.00	0%	0.00%	\$0	\$2,888	4.0%
RAB		12 month base salary	\$67,500	1.00	50%	4.17%	\$2,813	0.00	0%	0.00%	\$0	\$2,813	4.0%
AP		12 month base salary	\$40,000	1.00	20%	1.67%	\$667	0.00	0%	0.00%	\$0	\$667	4.0%
RAB		12 month base salary	\$67,500	3.00	50%	13%	\$8,438	6.00	30%	10%	\$7,020	\$15,458	4.0%
RAB		12 month base salary	\$70,000	3.00	100%	25.00%	\$17,500	6.50	100%	54.17%	\$39,433	\$56,933	4.0%
RAB		12 month base salary	\$60,000	1.00	100%	8.33%	\$5,000	9.00	100%	75.00%	\$46,800	\$51,800	4.0%
RAB		12 month base salary	\$67,600	3.00	100%	25.00%	\$16,900	9.00	100%	75.00%	\$52,728	\$69,628	4.0%
RAC		12 month base salary	\$138,646	2.50	50%	10.42%	\$14,442	0.00	50%	37.50%	\$54,072	\$68,514	4.0%
RAB		12 month base salary	\$67,500	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	4.0%
											(\$117,950)	(\$117,950)	
											(\$50,550)	(\$50,550)	
											(\$56,448)	(\$56,448)	
Students		Rate per hour		hours/week	#weeks	#students		hours/week	#weeks	#students			
DIST Undergrads		\$10.00		10.00	10	3.5	\$3,500	10.00	8	2	\$1,600	\$5,100	
		Mo. Salary			#months	#students			#months	#students			
DIST CS grad students		\$1,992			3	1.0	\$5,976		0	1.0	\$0	\$5,976	5.0%
DIST CS grad students		\$1,992			3	1.0	\$5,976		0.5	1.0	\$1,046	\$7,022	5.0%
DIST Thayer grad students		\$2,102			3	2.0	\$12,612		6	2.0	\$26,485	\$39,097	5.0%
DVE CS grad students		\$1,992			3	1	\$5,976		8	1	\$16,733	\$22,709	5.0%
Metro CS grad students		\$1,992			2	1	\$3,984		6	1	\$12,550	\$16,534	5.0%
SISMAT CS grad students (summer school)		\$1,992			1	1	\$1,992		1	1	\$2,092	\$4,084	5.0%
UG SISMAT Undergrad / Non profit student stip	(b)(6)	\$1,992			0	0	\$0		2	3	\$12,550	\$12,550	5.0%
IRIDOE CS grad students		\$1,992			3	0.5	\$2,988		9	1.0	\$18,824	\$21,812	5.0%
IRIDOE WISP Interns		\$345			3	1	\$1,035		3	2	\$2,070	\$3,105	
AC Thayer grad students		\$2,102			2.5	1	\$5,255		4	1	\$8,828	\$14,083	5.0%
HBS EE student, as lab tech					10.00	5	\$500	10.00	5	1	\$500	\$1,000	
HBS CS grad students		\$1,992			0	1.0	\$0		4	1.0	\$7,321	\$7,321	5.0%
Metro Thayer grad students		\$2,102			3	1	\$6,306		6	1	\$13,243	\$19,549	5.0%
Metro Students Budget Period II Supplement											(\$74,289)	(\$74,289)	
Subtotal, without fringe							\$339,243				\$556,272	\$895,515	
FAC Fringe on Faculty						38.5%	\$4,839		39.0%	\$108,495	\$113,334		
AP Fringe on AP I and AP II						38.5%	\$33,089		39.0%	\$50,577	\$83,666		
UG Fringe on full-time undergraduates						9.0%	\$0		9.0%	\$1,129	\$1,129		
RAA Fringe on Research Associate A						9.0%	\$0		9.0%	\$0	\$0		
RAB Fringe on Research Associate B						24.5%	\$29,069		24.5%	\$55,498	\$84,567		
RAC Fringe on Research Associate C						38.5%	\$25,401		39.0%	\$57,075	\$82,476		
Fringe Budget Period II Supplement											(\$99,080)	(\$99,080)	
Total fringe							\$92,399				\$173,693	\$266,092	
Subtotal, including fringe							\$431,641				\$729,966	\$1,161,607	
Indirects on people			39.90%				\$258,553				\$437,249	\$695,803	

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

Dartmouth FY08

Dartmouth FY09

Direct materials		Computation		Total		notes
Travel						
DIST Conferences, Meetings and Coord	Airfare \$500			\$6,000	\$6,000	
	No. of travelers 2 Hotel \$175 / day			\$6,300	\$6,300	
	No. of Trips 6 Meals \$50 / day			\$1,800	\$1,800	
	No. of nights 3 Mileage/taxi/parking (\$60+\$20+\$20) \$100			\$1,200	\$1,200	
Metro Conferences, Meetings and Coord	(b)(6) Airfare \$600	\$2,000			\$2,000	
	No. of travelers 2 Hotel \$175 / day	\$2,100			\$2,100	
	No. of Trips 2 Meals \$50 / day	\$600			\$600	
	No. of nights 3 Mileage/taxi/parking (\$60+\$20+\$20) \$100	\$400			\$400	
Metro Conferences, Meetings and Coord	(b)(6) Airfare \$500	\$1,000			\$1,000	
	No. of travelers 1 Hotel \$175 / day	\$1,050			\$1,050	
	No. of Trips 2 Meals \$50 / day	\$300			\$300	
	No. of nights 3 Mileage/taxi/parking (\$60+\$20+\$20) \$100	\$200			\$200	
DVF Conferences, Meetings and Coord	Airfare \$500	\$1,000			\$1,000	
	No. of travelers 2 Hotel \$175 / day	\$1,050			\$1,050	
	No. of Trips 1 Meals \$50 / day	\$300			\$300	
	No. of nights 3 Mileage/taxi/parking (\$60+\$20+\$20) \$100	\$200			\$200	
SISMAT Visit regional schools to recruit and promote	Mileage \$150	\$150			\$150	
	No. of travelers 1 Hotel \$175 / day	\$175			\$175	
	No. of Trips 1 Meals \$50 / day	\$50			\$50	
	No. of nights 1 Taxi/parking \$30	\$30			\$30	
SISMAT Visit regional schools after program finishes	Mileage \$150			\$150	\$150	
	No. of travelers 1 Hotel \$175 / day			\$175	\$175	
	No. of Trips 1 Meals \$50 / day			\$50	\$50	
	No. of nights 1 Taxi/parking \$30			\$30	\$30	
IRIDOE Travel to partners	Airfare \$500			\$5,000	\$5,000	
	No. of travelers 2 Hotel \$175 / day			\$3,500	\$3,500	
	No. of Trips 5 Meals \$50 / day			\$1,000	\$1,000	
	No. of nights 2 Mileage/taxi/parking (\$60+\$20+\$20) \$100			\$1,000	\$1,000	
AC Conferences, Meetings and Coord	Airfare \$500	\$1,000			\$1,000	
	No. of travelers 1 Hotel \$175 / day	\$1,050			\$1,050	
	No. of Trips 2 Meals \$50 / day	\$300			\$300	
	No. of nights 3 Mileage/taxi/parking (\$60+\$20+\$20) \$100	\$200			\$200	
PKI Travel for outreach trips				\$300	\$300	
	No. of travelers 2 Rental Car (\$150/day)			\$200	\$200	
	No. of Trips 2 Meals \$50 / day					
	No. of nights 1					
PKI Conferences, Meetings and Coord	Airfare \$500			\$9,000	\$9,000	
	No. of travelers 2 Hotel \$175 / day			\$6,300	\$6,300	
	No. of Trips 9 Meals \$50 / day			\$1,800	\$1,800	
	No. of nights 2 Mileage/taxi/parking (\$60+\$20+\$20) \$100			\$3,600	\$3,600	
HBS Conferences, Meetings and Coord	Airfare \$500	\$4,000			\$4,000	
	No. of travelers 2 Hotel \$175 / day	\$2,800			\$2,800	
	No. of Trips 4 Meals \$50 / day	\$800			\$800	
	No. of nights 2 Mileage/taxi/parking (\$60+\$20+\$20) \$100	\$800			\$800	
HBS Travel for outreach trips				\$450	\$450	
	No. of travelers 2 Rental Car (\$150/day)			\$300	\$300	
	No. of Trips 3 Meals \$50 / day					
	No. of nights 1				\$0	
Travel to meet President Ruggie				\$3,000	\$3,000	
Capital equipment						
Breakdown of Equipment						
Participant Support Costs						
DIST Thayer Tuition		\$11,522		\$12,271	\$23,793	
Metro Thayer Tuition	based on Thayer School rates	\$5,828		\$11,014	\$16,842	
AC Thayer Tuition		\$6,082		\$7,955	\$14,037	
Travel Thayer Support Participant				\$2,640	\$2,640	
Other Direct Costs						
Materials and Supplies						
Metro Cell plans for mobile phones (12 months each)		0	\$1,890	\$0	\$1,890	
SISMAT Keyboard Video monitor		1	\$750	\$750	\$750	
SISMAT Rack with switch		1	\$500	\$500	\$500	
SISMAT Summer-school supplies				\$1,778	\$1,778	
AC Internet Line (\$240/mo)				\$720	\$720	
HBS ModelSim XE III Verilog				\$960	\$1,680	
HBS Xilinx FPGA tools				\$945	\$945	
DIST Activation and termination fees		13	\$211	\$2,743	\$2,743	
DIST Monthly fees, for 12 months (April 2008 through March 2009)		13	\$720	\$9,360	\$9,360	

ISTS Initiatives 7 & 8 - Budget Period III

Dates: April 1, 2008 to March 31, 2009

		Dartmouth FY08		Dartmouth FY09			
Publication Costs							
All Conference Registration Fees							
	5	\$800	\$4,000	4	\$800	\$3,200	\$7,200
Event and Meeting Costs							
SISMAT Summer-school for students 10 students for 2 weeks							
Travel	350	\$350	modest travel allowance	10		\$3,500	\$3,500
Sustenance	510	\$310/week housing and \$200/week food		20		\$10,200	\$10,200
Other	100	Supplies & space cost per student \$100		10		\$1,000	\$1,000
SISMAT Summer-school for professors 10 profs. for 2 weeks							
Travel	500	\$500	modest travel allowance	5		\$2,500	\$2,500
Sustenance	510	\$310/week housing and \$200/week food		20		\$10,200	\$10,200
Other	0	Supplies & space cost per student \$100		0		\$0	\$0
Consultant Services							
SISMAT Summer-school instructor (course development)							
	1	\$250	\$250				\$250
SISMAT Consultant Travel Airfare \$500 \$500 \$500							
	No. of travelers	1	Hotel \$175 / day			\$525	\$525
	No. of Trips	1	Meals \$50 / day			\$150	\$150
	No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100			\$100	\$100
HBS (b)(6) training and seminars						\$10,000	\$10,000
HBS Consultant Travel Airfare \$500 \$500 \$500							
	No. of travelers	1	Hotel \$175 / day			\$875	\$875
	No. of Trips	1	Meals \$50 / day			\$250	\$250
	No. of nights	5	Mileage/tax/parking (\$60+\$20+\$20) \$100			\$100	\$100
Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%	\$43,162			\$1,239	\$44,401
Subawards/Contractual Costs							
		Base price				Total	Inflation
DIST UMass (4/1/08-8/31/08) 1 RA, 1 Summer mon (b)(6)							
			\$0			\$44,566	\$44,566
Subtotal							
Indirect on first \$25k each subcontract		59.90%	\$0			\$29,566	\$29,566
Total directs			\$527,129			\$769,841	\$1,296,970
Total indirects			\$301,715			\$438,489	\$740,203
Total			\$828,844			\$1,208,329	\$2,037,173

**CYBER SECURITY COLLABORATION AND INFORMATION SHARING PROJECT
BUDGET PERIOD III**

A Non-competing Amendment to Award # 2006-CS-001-000001

**DARTMOUTH COLLEGE
I3P AND ISTS PROPOSAL**

for the

**DEPARTMENT OF HOMELAND SECURITY
NATIONAL CYBER SECURITY DIVISION**

January 2008

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Title: Cyber Security Collaboration and Information Sharing Project-Budget Period III

PROJECT SUMMARY

This amendment covers work to be completed during Budget Period III (April 2008-March 2010) of the original NCSD award #2006-CS-001-000001. Dartmouth College's Institute for Information Infrastructure Protection (I3P) and Institute for Security Technology Studies (ISTS) will continue to focus work on topics emphasized as critical priorities for securing cyberspace. The work will be accomplished through research, education and outreach programs that will include communities of researchers nationwide.

Interdisciplinary teams of I3P researchers will address key problems in areas that include process control systems, human behavior, insider threats and awareness, economic incentives and best practices for cyber security, and others. Workshops that include private sector, government and academic participants will be used to guide and highlight the work. The I3P is committed to help increase the national cadre of professionals trained in cyber security, and to increase understanding through educational programs. During this period the I3P will continue to offer educational opportunities through post-doctoral fellowships. The educational opportunities program will also be expanded to provide recent college graduates with a high quality one year work experience performing information security research in residence at one of the I3P Consortium member institutions.

ISTS will continue to focus its efforts during Budget Period III on two main areas: 1) critical long-term research challenges related to security and privacy for real people and 2) education and curriculum development. The research program will include hardware and software support for trusted computing, secure sensor networks, autonomic computing, digital video forensics, and cyber security in large-scale enterprises. The educational programs will include a cyber security program for business executives led by ISTS members from Dartmouth's Tuck School of Business and a summer program for computer science students and their faculty mentors from small colleges. This latter effort will include an internship component which will match the students from the course with corporations or non-profit organizations. ISTS also plans to continue its effort to build a large-scale network security test bed, including a campus-scale sensor-network, as the basis for its research and education efforts.

The overarching benefit of the Cyber Security Collaboration and Information Sharing Project is the development of tangible means to identify and remediate cyberspace vulnerabilities, heighten awareness of cyber security, and increase the nation's educational capacity in cyber security and trust. Outcomes of the work will be disseminated to various constituencies, including the National Cyber Security Division, through demonstrations, workshops, publications and site visits.

INTRODUCTION

The overarching objective of the proposed work is to apply the collective, diverse expertise of the I3P Consortium and the ISTS to a number of topics emphasized in the critical priorities for securing cyberspace that were articulated in the *National Strategy to Secure Cyberspace*¹ issued by President Bush in February 2003, and more recent national research agenda documents. During Budget Period III the I3P and ISTS will continue to focus their efforts in the following eight initiatives:

1. I3P Fellowship Program, including both post-doctoral education/training and opportunities for I3P Fellows to work with DHS and/or Control Systems programs at National Laboratories and educational research opportunities for recent college graduates.
2. I3P Human Behavior, Insider Threat, and Awareness Initiative, including the development of a database that defines how to identify insider threat behavior and the planning and execution of a multidisciplinary project mapping human actions to the technological and organizational environments.
3. I3P Cyber Security Workshops, including hosting a series workshops that address developing a secure organization, process control systems security, and the economics of securing the information infrastructure.
4. I3P Control Systems Initiative, including bi-annual reports on university and academic control systems efforts and demonstration projects on Supervisory Control and Data Acquisition (SCADA) security and next-generation converged network security.
5. I3P Business Rationale for Cyber Security Initiative, including the study of economic incentives vis-à-vis sound security practices.
6. I3P Assessable Identity and Privacy Protection, a nationally recognized research challenge.
7. ISTS Research Initiative, with seven projects on the theme of Security and Privacy for Real People.
8. ISTS Education and Curriculum Development Initiative, including a summer course for computer science undergraduate students from small colleges, and a summer course on business for cyber-security professionals.

Budget Period III will begin April 1, 2008, and run for 24 months. The projects milestones are still in accordance with a March 31, 2009 end date; however the I3P Fellowship and Scholar programs require a March 31, 2010 end date. It should be noted that multiple unavoidable governmental and administrative procedures delayed the start of the projects. As a result, a carry forward request has been made to NCSD to extend the time frame in which Budget Period II funds will be spent. Additionally, because of timing issues related to project work and the academic calendar, it is anticipated that an extension to the individual projects may be needed. As indicated in the initiatives, the I3P will continue to sponsor workshops, will continue the research initiatives begun in Budget Period II, and broaden the I3P Fellowship Program to include educational opportunities for recent college graduates. The ISTS will continue to expand its research and educational programs. Each of these initiatives is discussed more fully in the

¹ U. S. Department of Homeland Security. National Infrastructure Advisory Council. *National Strategy to Secure Cyberspace* 2003. Washington: Government Printing Office, 2003.

individual project management plans. An abstract of the progress on each project is included in the text of this proposal.

The I3P is also requesting funding to support the general management of the Consortium during Budget Period III. Included in the request is funding for continued support of the I3P's administrative staff, Consortium operations, and related tasks that facilitate the work of the Consortium. Specific activities to be supported include travel and logistics for I3P Consortium meetings, supplies and minor equipment needs, and personnel costs.

The following table outlines these eight initiatives, and the requested funding to support the activities undertaken in Budget Period III.

Initiative	Activities	Budget Period III
I3P Initiative 1	I3P Fellowship & Educational Programs	\$743,290
I3P Initiative 2	Human Behavior, Insider Threat, and Awareness	\$1,507,457
I3P Initiative 3	I3P Cyber Security Workshops	\$418,187
I3P Initiative 4	Survivability and Recovery of Process Control Systems	\$1,669,330
I3P Initiative 5	Business Rationale for Cyber Security	\$907,809
I3P Initiative 6	Assessable Identity and Privacy Protection	\$863,003
ISTS Initiative 7	Research: Security and Privacy for Real People	\$1,949,390
ISTS Initiative 8	Education and Curriculum Development	\$87,783
I3P Management	Consortium meetings; general administration	\$193,751
TOTAL		\$8,340,000 ✓

The four I3P research initiatives (I3P Initiatives 2, 4, 5 and 6) underwent mid-term reviews in the week of December 10, 2007 (see External Review Schedule below). Experts from industry and academia (as well as at least one representative from DHS NCSD per project) reviewed the projects based on clear review criteria and provided their feedback; the research teams had the opportunity to respond to the reviewer comments; the reviewer comments and team responses were discussed with the I3P's DHS program manager to craft final recommendations.

External Review Schedule:

Title of I3P Initiative	Review Date	Review Location
I3P Initiative 2: Human Behavior, Insider Threat and Awareness	December 11, 2007	Miami
I3P Initiative 4: Survivability and Recovery of Process Control Systems	December 12, 2007	Dallas
I3P Initiative 5: Business Rationale for Cyber Security	December 13, 2007	Miami
I3P Initiative 6: Assessable Identity and Privacy Protection	December 14, 2007	Miami

As this is an amendment to the original proposal submitted in BP II, the discussions of the I3P research initiatives below will only cover the changes made to the original proposal in response to the project reviews and to incorporate new research directions that were not anticipated in the original research plans. There have been no changes in scope for any of the initiatives.

When we refer to research activities in BP II and BP III in the remainder of this proposal we mean the following:

Budget Period (BP) Quarters	Dates
BP II Q1	April 1, 2007 – June 30, 2007
BP II Q2	July 1, 2007 – September 30, 2007
BP II Q3	October 1, 2007 – December 31, 2007
BP II Q4	January 1, 2008 – March 31, 2008
BP III Q1	April 1, 2008 – June 30, 2008
BP III Q2	July 1, 2008 – September 30, 2008
BP III Q3	October 1, 2008 – December 31, 2008
BP III Q4	January 1, 2009 – March 31, 2009

BUDGET PERIOD III

I3P MANAGEMENT PLAN

In this section we present the objectives and need for the continuation or expansion of I3P Initiatives 1 and 3, ISTS Initiatives 7 and 8, and the new I3P Initiatives 2, 4, 5, and 6 for Budget Period III.

I3P PROJECT MANAGEMENT PLAN

A team leader who works closely with the I3P administration and the Principal Investigator at Dartmouth College coordinates each I3P initiative.

The team leaders are:

- Initiative 1:** Fellowships – (b)(6) I3P, Dartmouth College
- Initiative 2:** Human Behavior, Insider Threat and Awareness – (b)(6) RAND
- Initiative 3:** Cyber Security Workshops (b)(6) Dartmouth College
- Initiative 4:** Survivability and Recovery of Process Control Systems – (b)(6) (b)(6) MIT Lincoln Laboratory
- Initiative 5:** Business Rationale for Cyber Security (b)(6) University of Virginia
- Initiative 6:** Assessable Identity and Privacy Protection – (b)(6) MITRE

Dr. (b)(6) Vice Provost for Research at Dartmouth College is the Principal Investigator on external awards made to the Consortium. He has the responsibility to oversee all the business and operational management of the consortium. He derives no more than 10% of his compensation from the I3P and does not receive any research funding from I3P related awards. Dr. (b)(6) is also a member of the senior administration at Dartmouth, reporting directly to the Provost.

In early 2007 the I3P appointed Dr. (b)(6) as the Director of Research at the I3P. In May of 2007 Dr. (b)(6) stepped down as Chair of the I3P and Dr. (b)(6) assumed that role

as well. Dr. (b)(6) works closely with the Principal Investigator, Executive Director, and the team leads of each initiative. In August 2007, the I3P appointed (b)(6) as Executive Director to be responsible for strategic direction and administrative leadership of the I3P, work to advance the I3P mission and goals, and assist the Chair and Executive Committee. This position is a replacement for the Associate Director who left Dartmouth College in April 2007.

Research Advisory Boards

The I3P has collectively developed a model for the evaluation, management, and oversight of the I3P's research initiatives. The basic principles of the model are that teams of Consortium members work together to formulate a research plan and budget according to specific guidelines and requirements. The plan then undergoes an independent merit review by a Research Advisory Board (RAB) that is established by the I3P Chair and Research Director. The RAB comprises experts in the topic area from government, industry, and academia who are not connected with the I3P. All RAB members complete a conflict of interest statement that is held in confidence at Dartmouth College. The evaluation criteria include intellectual soundness, qualifications of the team members, management plan, impact and benefit to critical infrastructure customers, potential risk, and support of the I3P mission. To maintain a blind review process, the names of the RAB members are only known by the I3P Principal Investigator, the Executive Director and the Research Director. Recommendations and comments from each RAB are sent to the team leaders who organize the team's response. The model has proven to be a robust way to evaluate and manage the work undertaken by the Consortium.

RABs comprising of at least three people were organized to review initiatives 2, 4, 5 & 6. After each RAB member had independently reviewed the proposed research, budgets and management plans, a conference call was held with the Chair, the Associate Director and Research Director to discuss the RAB members' recommendations and to prepare a summary review. The individual reviews and the summary were provided to the team leaders. The final initiatives, presented as part of the non-compete amendment, were revised to take full account of the RAB comments.

Continuing assessment of each initiative has been, and will continue to be, accomplished by close coordination between team leads, the I3P Research Director and the Principal Investigator. Each team is required to submit quarterly progress reports, to present a progress report at each I3P Consortium meeting, and to participate in an annual review of the initiative. The annual reviews are performed by the Executive Committee of the I3P, the Chair/Research Director, as well as outside experts. Conflicts of interest are handled by recusing the person from the review and replacing him/her with a former member of the Executive Committee. An annual review was held for each project during the week of December 10, 2007. In consultation with the reviewers, the I3P Principal Investigator, Executive Director and Research Director recommended changes to projects as necessary. The annual review results and project changes are described individually for each project later in this document.

Non-Disclosure Agreements

To facilitate a meaningful exchange of ideas, particularly with private sector partners, some of the research teams are covered by non-disclosure agreements (NDAs). We will use NDAs as necessary for future initiatives. The Office of Sponsored Projects at Dartmouth will prepare these in consultation with the College Counsel and the relevant people at the institutions engaged in the work. The I3P Chair is covered by all NDAs and so can be party to all information necessary for the purpose of review or evaluation of an initiative's progress.

ISTS MANAGEMENT PLAN

ISTS MANAGEMENT PROCEDURES AND OPERATING PRINCIPLES

Professor (b)(6) recently completed his term as the Executive Director of ISTS. However, he will maintain his status as co-principal investigator on this award until he leaves on sabbatical; he will be on sabbatical from mid-September 2008 through mid-June 2009, and will be out of the country starting in mid-August for the duration. The PI and Co-PI are working closely with the Office of the Provost to provide administrative and technical leadership for this grant throughout the remainder of the grant period. The Office of the Provost is actively working to identify the next Executive Director of ISTS by June 2008. In the interim, ISTS' Associate Directors (b)(6) (b)(6) are forming a "Leadership Team" with the Vice Provost for Research (b)(6). Regarding technical leadership, Professors (b)(6) lead on the DIST project and co-lead on the MetroSense project; we address our plans in each of those project proposals herein.

Supporting the Leadership Team are a Faculty Advisory Committee, and a professional staff. The Faculty Advisory Committee (FAC) includes eighteen faculty members drawn from all corners of the College, appointed annually and meeting quarterly. The primary role of the FAC is to advise the Leadership Team and staff, on strategic priorities, objectives, and programs.

ISTS is currently supported by several staff: (b)(6) Associate Director for Finance and Administration; (b)(6) Associate Director (b)(6), Center Assistant (b)(6) (b)(6) Communication and Events Manager; and (b)(6) Financial Services Accounts Specialist. Several of these staff members are shared with the I3P (b)(6)

(b)(6) As part of the Leadership Team, the Associate Director assists in coordinating outreach efforts with industry, government agencies, and peer academic centers; tracking and encouraging technology transfer; and assisting with the development of large proposals and reports. The Associate Director for Finance and Administration is responsible for all financial and contract management activity, and assists with the preparation of proposals and reports. The other staff members support the Institute's daily operations and efforts such as the website, quarterly newsletter, press and publicity, report preparation, and finances and operations. Finally, ISTS is in the process of transitioning all aspects of its IT support to Dartmouth College's Computing Services Department.

In addition to the professional staff and the FAC, ad hoc committees will be formed as needed to support the Institute's programs. ISTS manages the individual projects outlined in this proposal through several mechanisms.

- Each project has a clearly identified lead, or pair of co-lead, faculty members who are responsible for the day-to-day management of that project.
- The Principal Investigator (PI) is responsible for monitoring progress on all projects. We have used and plan to continue to use the quarterly reports as the primary mechanism for monitoring, in addition to monthly faculty meetings. We have also held annual project reviews, like the one recently held with our DHS/NCSD program management on 17 December 2007. This review provided the basis for budget requests laid out herein.
- Finally, the ISTS Leadership Team further reserves the right to remove funding from underperforming projects.

I3P INITIATIVE 1: I3P FELLOWSHIP PROGRAM

Coordinator (b)(6) Executive Director

The President's Information Technology Advisory Committee (PITAC) report entitled "Cyber Security: A Crisis of Prioritization" (dated February 2005) noted that "there simply aren't enough cybersecurity [sic] researchers, and no good mechanism for producing them. The federal government isn't doing enough to foster cybersecurity [sic] research, and the effects of this shortfall will be felt more in the long term than the short term."

The I3P seeks to expand the future cyber security research community by providing research opportunities for promising researchers as well as opportunities for undergraduates to explore the field of cyber security. Specifically, the I3P will continue its successful fellowship program aimed at post-doctoral researchers, junior faculty and research scientists. In addition we will add a new I3P scholar program for recent graduates of baccalaureate programs. After further consideration the previously proposed undergraduate contact program and student travel program proved infeasible and will not be implemented.

Program Overviews

I3P Fellowship Program

As in the past, this program is open to post-doctoral researchers, junior faculty and research scientists who have received their Ph.D.s no more than three years prior to September 15th of the year the award begins. Current graduate students must complete all degree requirements prior to the commencement of the award. If an applicant has not completed all degree requirements by the submission date, the candidate's advisor must include a statement indicating that he/she expects the requirements to be met on or before September 15th of the year the award begins. Awards may be deferred or withdrawn at the discretion of the I3P fellowship review panel if degree requirements are not complete by the planned start date. Fellowship candidates must have strong backgrounds in fields related to information infrastructure protection, including computer science, engineering, law, economics, and the social sciences, among others. Efforts will be made to draw individuals from academic, industry, and government research center settings.

The I3P appoints up to three fellows each year. Fellows must spend the term of their fellowship in residence at an I3P Consortium member institution. Fellowship funding is provided as a sub-award to the Consortium member institutions that host successful fellowship candidates. The sub-award is up to \$150,000 per fellow per award to cover salary, fringe benefits, indirect costs, travel, and other research expenses. Fellows are encouraged to use travel funds to visit other I3P member institutions or other organizations, such as the Department of Homeland Security and national laboratories, for the purpose of broadening their research focus and informing others of their accomplishments. Fellows and their hosts may submit one-year or multi-year proposals, provided the host commits to provide any needed funds in excess of those supplied by the I3P. Joint appointments at two member institutions will be considered, with a requirement that the fellow spend at least two months at the secondary institution. Fellows are normally expected to begin their fellowships between June and September, although start dates between September and January may be negotiated. The host institution must submit written mid-term and final reports on the fellow's activities and accomplishments to the I3P administrative office. Fellows will be expected to present their work accomplishments at I3P Consortium meetings during the

fellowship, generally at the mid-point and near the end of the terms. Fellows are required to identify the I3P as the sponsor and to use the acknowledgement and disclaimer statements pertaining to the award in all publications describing work done during their fellowships. In addition, fellows will be expected to comply with any guidelines imposed by their host institution regarding disclaimers on publications, and electronic copies of fellows' research publications must be submitted to the I3P administrative office three weeks prior to public release.

I3P Scholar Program

This new program is open to students who received, or expect to receive, a bachelor's level degree from an accredited US institution of higher learning during the current or preceding year. Current students must complete all degree requirements prior to the commencement of the award. Awards may be deferred or withdrawn at the discretion of the I3P if degree requirements are not complete by the planned start date. Candidates must have strong backgrounds in fields related to information infrastructure protection, including computer science, engineering, law, economics, and the social sciences, among others.

The I3P will appoint up to three scholars each year. Scholars must spend the term of their program in residence at an I3P Consortium member institution. Scholar funding is provided as a sub-award to the Consortium member institutions that host scholars. The sub-award is up to \$90,000 per fellow per award to cover salary, fringe benefits, indirect costs, travel, and other research expenses. Scholars will attend an orientation session and present their work accomplishments at the end of the program. Scholars are expected to begin their program between June and September 2008, and remain in the program for one year. The host institution must agree to perform written mid-year and year-end reviews of a scholar's work and submit the reviews to the I3P administrative office.

Management Plans

Post-Doctoral Fellowship Program

Responsibilities

Each year the Fellowship Subcommittee composed of Consortium member representatives and a representative from the Department of Homeland Security (non-voting member) is appointed. Reporting to the I3P Executive Committee, the Fellowship Subcommittee is responsible for oversight of the fellowship program, review of applications, and selection of fellows.

The I3P Executive Director is responsible for providing oversight of the administration of the program, including communication with the Fellowship Subcommittee and appointed fellows, promotion of the program, budget management, progress reports, documentation of policies and procedures, and related administrative functions. The I3P Executive Director and the I3P Chair serve as *ex officio* members of the Fellowship Subcommittee. With assistance from the Fellowship Subcommittee the I3P Administrative office also guides the program evaluation process.

I3P Host institutions that agree to host a fellow must complete and submit their supporting application documents on schedule, keep current their online educational profiles, submit budget and progress reports on schedule, and most importantly provide the research experience as outlined in the original application packet.

Selected fellows are expected to complete a mid-year written review, plan to present their work accomplishments at two Consortium meetings per year, identify I3P as the sponsor and DHS as the funding source in all publications describing work done during the fellowship.

Program Schedule

In general the following annual schedule is followed:

- October: I3P member institutions are contacted to update their educational profiles for the I3P website.
- November: New call for proposals is finalized.
- December: Call is posted on the I3P website and submitted for inclusion in key journals and appropriate websites. The call is also e-mailed to I3P representatives for distribution.
- January: Prospective applicants contact I3P member institutions participating in the program. The I3P Fellowship Subcommittee is appointed.
- February: Applications are due from individual applicants to perspective host institutions. Host institutions submit their application packets to the I3P.
- March: The I3P Fellowship Subcommittee reviews applications.
- April: New I3P Fellows are announced
- September: I3P fellows begin their fellowships.

Procedures

1. Each I3P Consortium Member institution is asked to complete or update their educational profile that is available on the I3P website. Information in the profile includes research focus and point of contact for applicants. The contact person should be available to field inquiries and able to direct potential applicants to individual PIs, as appropriate, within the institution.
2. Staff also begins up-dating electronic mailing lists of best contacts for wide distribution of the call for proposals.
3. A call for fellowship proposals is reviewed by the I3P Fellowship Subcommittee Consortium member institutions prior to its national distribution.
4. The finalized call for proposals is announced and promoted via the I3P website.
5. Using the updated email lists, the call is distributed nationwide.
6. Prospective applicants contact potential host institutions and match their interests to the research focus of the institution.
7. Applicants submit application packets per instructions.
8. Hosting institution completes the application process and submits all information to the I3P. The host institution must submit a letter of recommendation for the applicant/s they wish to support at their facility, as well as a preliminary I3P budget worksheet/s showing how they will use the I3P funds to support the fellow.

9. The I3P distributes the application packets for review to members of the Fellowship Subcommittee.
10. The Fellowship Subcommittee meets and selects fellows to appoint for the coming year.
11. The I3P Chair notifies the selected fellows via a letter outlining the terms and conditions of the award, including the reporting schedule and I3P publication guidelines.
12. The host institution submits quarterly invoices to Dartmouth College based on actual fellowship expenditures. Dartmouth College will retain title to equipment purchases costing more than \$5,000 for the benefit of the I3P. At the end of the fellowship year, the I3P Executive Committee will decide whether to transfer title to the host institution or otherwise make use or dispose of the equipment.

Evaluation

I3P staff members overseeing the Fellowship Program will initiate a program evaluation at the end of Budget Period II. This evaluation will be produced under the guidance of the Fellowship Subcommittee. It should include evaluation on the following performance measures:

- Satisfaction with the experience as demonstrated by the results from an I3P initiated participant's survey. The survey will be administered to participants in the program, as well as program preceptors.
- Successful review by the I3P Executive Committee
- Statistical data reported on gender, race, citizenship, and research interests of participants.
- Post-graduate participants demonstrate through continued research, publishing, and other generally recognized research activity that their I3P experience enhanced ability to move forward in their research careers.

The evaluation information will be used to strengthen the program post-Budget Period II.

I3P Scholar Program

Responsibilities

The I3P administrative office will have oversight of the program, including evaluation of applicants and program evaluation.

The I3P Executive Director is responsible for providing oversight of the administration of the program, including contact with applicants, promotion of the program, budget management, producing progress reports, documentation of policies and procedures, and related administrative functions.

Institutions taking part in the I3P scholar program will be expected to provide a high quality work experience for new graduates, including a broad orientation to the organization, special opportunities for learning about cyber security, and contact with researchers involved in cyber security research.

Scholars are expected to attend an orientation session and to present their work accomplishments at the end of the program.

Program Schedule

Following is the implementation schedule for this new program:

- December 2007: Program requirements and application procedures are finalized
- February 2008: The call for applications is distributed via email to I3P representatives and other institutions.
- April-May 2008: Applications received; candidates selected and linked with host institutions
- June -September: Scholars begin their one year program in residence.

Procedures

1. Calls for applications will be posted at the I3P website and emailed for further distribution to I3P member and other appropriate institutions. Women and minorities will be encouraged to apply, and we will make special efforts to recruit through organizations promoting women in the sciences and other minority serving institutions.
2. The I3P administrative office will collect and review applications.
3. The I3P administrative office will select and place the scholars through close coordination with member institutions.
4. Scholars will attend an orientation session and present their work accomplishments at the end of the program.

Evaluation

The evaluation process will be finalized by the I3P administrative office in consultation with DHS.

13P INITIATIVE 2: HUMAN BEHAVIOR, INSIDER THREAT, AND AWARENESS

Coordinators

(b)(6)

(b)(6)

13P Chair and Research Director

(b)(6)

, Team Leader (RAND Corporation)

Overview of Proposed Research

A major thrust of BP II of the Human Behavior, Awareness, and Insider Threat project was development of a detailed understanding of the nature of the insider threat. Project researchers built a taxonomy of insider activity, based on characteristics such as intent, motivation, and whether de facto and de jure policy were broken or implemented improperly. Accompanying the actions taxonomy is a characterization of possible responses. In concert, the two characterizations assist managers in responding appropriately to prevent untoward activities or mitigation of their effects. In BP III, each project partner will use the characterizations to define not only what aspects of the insider problem are being addressed, but also what is left to future research.

Two primary areas of inquiry will focus and integrate the proposed activities of each project partner: technology exploration and environmental constraints. The first area addresses the need for base technologies to monitor insider behavior, coupled with behavioral descriptions of suspicious, inappropriate or illegitimate events or activities. Because data are usually not available to assist researchers in understanding common insider actions (or sequences of actions), project partners are generating data in several ways: by examining trends in the federal government's Suspicious Activity Reports about misuse of position, by monitoring student behavior at a large university, by planting "honeytokens" such as credit card numbers on the Web and watching how and where they travel, and by running "capture the flag" exercises with volunteers who try to steal the information. In combination, the technology and monitoring will provide a lightweight, robust, and scalable event processing infrastructure that can be deployed in a range of at-risk enterprises (e.g. the U.S. military, banks, chemical plants and refineries, and border and port security systems).

The second area addresses the need for a methodological framework for handling incipient and actual insider behavior once it is recognized. Here, research efforts explore the ethical, legal and policy choices available to technologists and policymakers. Policy choices might include modifying institutional behavior, changing the process for authorizing access, establishing clear policies that are correctly implemented, providing incentives for good behavior, and implementing training programs so that employees will better understand the risks and consequences of their actions. In particular, research partners will investigate how risk perception affects security choices, how user interface can be improved to encourage adherence to stated policies, and which incentives and strategies discourage inappropriate insider behavior. Researchers will also develop a framework for aligning security policy with an organization's ethical framework. Because some inappropriate insider behaviors are illegal and could result in prosecution, project partners will produce a database of documented legal actions and an analysis of when such legal action has been most effective.

Project deliverables, in the form of databases, reports and tools, will inform government's and management's decisions about preventing and dealing with insider threats. Two workshops will be held in BP III: one to engage stakeholders and obtain their feedback on applicability and

realism, and a second near the project's end, to provide stakeholders most affected by this work with a report on project findings and next steps.

Project Review

The project underwent a mid-term review on December 11, 2007. The final review recommendations, which were crafted in consultation with DHS, included the following:

- Due to Cornell's low level of spending on the project in BP II, the I3P will reduce Cornell's BP III funding by \$50,000 for a new total of \$250,000.
- Cornell was asked to clarify the situation with regards to its PI's level of effort and project coordination.
- The I3P will make an additional \$75,000 available to Indiana University in BP III, \$50,000 to focus all of its I3P efforts on its modeling work toward developing a potentially high-value predictive capability, and \$25,000 to ensure continued student support as they wrap up their work on the Business Rationale project (see below).

The project team will continue to follow the 2-year research plan and institutional statements of work and budgets that were initially submitted for BP II. However, some revisions have been made as outlined below in response to the project review and to incorporate new research directions that were not anticipated in the original research plan. Only changes to the original research plan are discussed below.

Team Composition

The following I3P Consortium member institutions will be contributing to the research on this project:

RAND Corporation (Team Leader)
Center for Education and Research in Information Assurance and Security, Purdue University
Columbia University Department of Computer Science
Cornell University
Institute for Security Technology Studies, Dartmouth College
MITRE Corporation
School of Informatics, Indiana University

After considerable negotiation between Dartmouth College and Carnegie Mellon University (CMU), CMU was unable to accept the special conditions of the award. Therefore, an award was not made to CMU. While the institution withdrew from the project, Prof. [redacted (b)(6)] from CMU's H. John Heinz III School of Public Policy and Management will continue to contribute to the project under a sub-contract to team leader RAND.

Management Overview

The RAND Corporation will continue to lead the research effort by serving as team leader. There will be frequent coordination through the use of face-to-face meetings, workshops, and telephone

conference calls. In addition, the participating institutions are using the project website to facilitate collaboration by enabling results, data, project reports, and ideas to be shared.

Changes to the Research Plan

RAND Corporation:

No changes to the research plan in BP III.

Center for Education and Research in Information Assurance and Security, Purdue University:

No changes to the research plan in BP III.

Columbia University Department of Computer Science:

No changes to the research plan in BP III.

Cornell University:

While the PI, Prof. (b)(6) is on sabbatical until his return in spring 2008, he will have 0% effort on I3P-related tasks and will not charge against the I3P funding. Upon his return Prof. (b)(6) will start working on the modified deliverables. The acting PI, Dr. (b)(6) and his students are making strong progress on technological approaches to insider threat defense and will be spending at the required rate in order to ensure successful continuation.

The efforts of Dr. (b)(6) and his students are aligned with the I3P insider threat effort and provide added value to the originally stated goals. Those goals included using the Cayuga stateful event-filtering service in combination with the QuickSilver broadcast service in order to detect suspicious behavior and disseminate notifications.

The goal of Dr. (b)(6) work is to make it more difficult for sophisticated insiders with access privileges to circumvent defenses such as Cayuga and QuickSilver, or other defenses including monitoring and backups. The first thrust, NightWatch, is an epidemiology-based technique for generating probability distribution synopses of distributed data. Using sensors on each machine in a domain, NightWatch can continuously compute a global picture of the output of those sensors in the form of a data distribution synopsis. Should this distribution change in any way, either by exposing new outliers or, say, the 10th percentile changing, then NightWatch can raise an alarm. NightWatch uses epidemics not only for computing the distribution, but also for dissemination. As such it is exceedingly difficult for an attacker, insider or outsider, to disable the NightWatch service other than by disabling NightWatch on every machine in the domain. We intend to combine Cayuga, QuickSilver, and NightWatch into a single sophisticated insider threat defensive system.

While NightWatch detects suspicious behavior, the second thrust of Dr. (b)(6) work attempts to disable malicious behavior altogether. His Nysiad work begins with a distributed system that can tolerate only crash behavior and turns it automatically into a system that can tolerate malicious behavior. It does so by assigning to each host a set of *guards* that check the

behavior of the hosts. Assuming that the guards exhibit sufficient diversity, Nysiad can stop attacks at the moment they occur and before they can do any harm. Since insider threat environments often lack sufficient diversity, thereby enabling one compromised machine to allow compromise of another, we are exploring how to make such a system work across *multiple administrative domains*. This poses some challenges because these domains may not necessarily want to share much specific information, and thus we need to deal with the additional complication of privacy and confidentiality of data.

Dr. (b)(6) started this effort at the end of October 2007. When Prof. (b)(6) returns in the spring he will take over the leadership of the project and begin the Cayuga integration into the system.

The updated tasks for the I3P effort are then as follows:

[BP II Q3] Delivering Cayuga to colleagues at Columbia. Building prototypes of the NightWatch and Nysiad systems and producing initial papers on these efforts.

[BP II Q4] Generating a production version of NightWatch that can be distributed to partners. Further development of Nysiad, including considerations of diversity and confidentiality. Work on efficiency of Nysiad protocols.

[BP III Q1] Start talking with stakeholders about applying Cayuga, QuickSilver, NightWatch, and Nysiad, and develop new requirements for a combined system. Understanding privacy and security considerations is a key goal of this requirement dialog. Final paper on the NightWatch system itself.

[BP III Q2] Start implementation of distributed monitoring prototype that integrates Cayuga stateful filtering technology and Quicksilver platforms. Address privacy and security considerations to the extent currently possible, while articulating open research questions and starting an exploration of them.

[BP III Q3] Completion of debugging, evaluation, preparation of technical papers on distributed monitoring prototype. Working with I3P team members, demonstrate system as part of a comprehensive solution to the insider threat problem at a stakeholder workshop.

[BP III Q4] Receive feedback and suggestions. In this timeframe we hope to also have some good ideas on privacy-protection in the context of insider threat detection systems. Work with vendors and stakeholders to facilitate bi-directional knowledge transfer from domain experts back into our effort, and also to encourage technology adoption from our effort by stakeholders where a strong match arises.

Institute for Security Technology Studies. Dartmouth College:

No changes to the research plan in BP III.

MITRE Corporation:

No changes to the research plan in BP III.

School of Informatics, Indiana University:

Abstract and Summary

Incentives play an important role in mitigating insider threats. On one hand, understanding of an insider's incentives can help a security system to predict his strategy and form an appropriate response. On the other hand, design of a proper incentive mechanism can encourage insiders to behave honestly, thereby eliminating the root of the threats. Unfortunately, research in this important area has been almost nonexistent.

In this project, we will focus on four incentive-related challenges particularly important to the defense against insider threats.

- (1) Application of incentive-based modeling of insider threats using game theory to model insiders' decision making process so as to predict their malicious moves and produce an optimal defense strategy.
- (2) Design of insider incentive mechanisms to encourage good insider behaviors using the results of the modeling in (1).
- (3) Development of innovative mechanisms to alter the behavior of insiders, based upon risk perception studies from economics and risk communications research, and informed by (1) and (2).
- (4) Recent work in social browsing homophily, based on the CERT/CC identification of malicious insiders as often isolated and discordant, will evaluate the likelihood of particular individuals being insiders based on virtual behavior patterns.

In addition to these incentive-related problems, we have one additional goal:

- (5) Develop a prototype of a toolbar or other GUI that integrates the game theoretic, engineering, and risk communications elements of the research into a single user interaction.

The fourth and fifth tasks were added to the original research plan in light of the additional resources provided following the review in December 2007. For this same reason the third task has expanded from being a secondary task to its own independent task.

The potential to create a demonstration for the Insider Threat workshop to be held on 15-16 April 2008 enhances the ability of research diffusion into the corporate realm. Another extension of the previous research plan is the development of partnerships at the workshop to enable us to test any prototype or interaction with corporate partners.

We believe this research will greatly improve our understanding of insider threats and help develop better countermeasures.

Needs and Objectives (numbering relates to the numbering in the original BP II proposal)

- 4. Utilization of recent work in social browsing and identity to identify the likely malicious insider.** We will build upon the previous work of CERT/CC which identifies insiders as often isolated from and discordant with other employees. Building geography and organizational charts predict similarity in or likelihood of communication. We will

develop measures of user homophily and implement a mechanism to compare geographically and organizationally similar individuals in order to predict likely insiders by their statistical distance from colleagues.

- 5. Demonstration or prototype of a proof-of-concept of a single application**, with GUI, that integrates incentives, risk communication, social interaction, and detection to mitigate the insider threat.

As additions, these will be discussed in some detail in the following section.

Approach (numbering relates to the numbering in the original BP II proposal)

4. IDENTIFICATION OF DISCORDANT INSIDERS

Cornell is developing mechanisms for identification of behavioral norms. One element of those norms is the pattern of use of applications. CERT/CC has studied the attributes of insiders who have been detected. In particular, there is on-going work on the use of social networks and browsing similarity to evaluate the risk level posed by websites.

We propose to similarly study browsing habits and self-identified social networks to identify those who might be at risk as insiders. We will evaluate the browsing habits and homophily of a group of demographically similar and geographically grouped set of undergraduates (e.g., four wings of a dormitory). We will use this to evaluate the self-similarity of the four wings and the differences between the wings. We will seek to classify the statistical anomalies.

Building upon a previously-developed mechanism for privacy-enhanced social browsing, we can easily develop a mechanism to allow employees to group themselves into social networks. The data structure utilized for enhancing privacy can be altered to enable centralized anonymous comparisons of browsing histories while empowering individuals to implement highly personal and secure mechanisms for web annotation. Comparing the hashed records of the truncated URLs of individuals in the same geographical and organizational units has the potential to identify insiders.

The Indiana and Cornell teams will compare our resulting models and evaluate the potential of this system to be embedded in the Cayuga event monitoring language and system. The identification of the potential for privacy-enhanced monitoring will inform the policy elements of the work done by (b)(6). The analysis of the potential for observations of web behavior to determine outliers will be evaluated in light of the results by MITRE in terms of identification of insiders as opposed to innovators.

5. MITIGATION OF INADVERTANT INSIDERS

The incentive problem in the case of the inadvertent insider threat or the masquerading party differs significantly from the incentive problem in the case of a malicious insider. For example, it is possible to extract payments from or increase rewards for an insider, but it is not necessarily feasible in the case of a masquerade attack. One question becomes how to encourage users not to be risk-ignorant (e.g., inadvertent insiders). Another is how to engineer incentives so either the

risk behaviors incur some cost, to both deter risky behavior and enable end users to detect the results of a misbehaving (e.g., masquerading) account.

We assert that effective security risk communication is critical for handling the problem of the inadvertent insider – the otherwise trustworthy and well-meaning employee who subverts security to get his or her job completed. While there have been studies of user conceptions of privacy and usable security; these have focused on system design rather than behavior-based communication. Changing behavior requires both effectively communicating risk information and motivating the appropriate risk behaviors. The essential point is that the purpose of risk communication is not conveying the complete truth to the users, but rather to prompt them to take an appropriate action to defend their system against a certain threat. While mitigation of a risk requires knowledge of the general nature of that risk, efficacy of the risk communication requires communication that is aligned with the mental model of the target group. Effective risk communication often requires more of an understanding of the risk perception of the communication target, as opposed to a communication optimized for technical accuracy.

For the insider considering violating security policy, the risks corresponding to the policy-forbidden actions are rarely clearly identified. In no case is there an indicator of risk-reducing action that might be taken in order to reduce the risks should the user choose the particular action. For example, if users choose to subvert a policy by using public e-mail providers (e.g., gmail) to share documents, there is no education about encryption. Yet a communication about the risks of sending documents and the option of encryption could be included should the employee go to a free e-mail site. In typical risk communications to the user today, the risks are not associated with the enabling actions. For example, the risk of having a subverted machine and thus being both a victim and an unknowing participant in computer crime is in no way visible in the communication about the action.

Similarly, incentives cannot work unless they are visible. Incentive mechanisms embedded into code must be made visible to function. The work in risk communication will include communication of incentives and appropriate behaviors in non-technical and certainly non-game theoretic terms.

Timeline and Deliverables

TimeLine	Research Tasks	Deliverables
BP II Q4	Initial analysis of risk communication and mental models, and the difference between the mental models of security professionals and naïve users.	A report describing an experiment evaluating the mental models of experts and non-experts with respect to computer security risk.
BP III Q2	Evaluation and prediction of homophile or self-similar browsing based on studies of geographically similar populations (e.g., dorm occupants).	Paper describing an empirical analysis of similarity of browsing and analytical identification of possible indicators of discordant individuals.
BP III Q4	Evaluation of the mechanisms developed to communicate risks and incentives. If possible, evaluation of a prototype.	A report describing a set of mechanisms optimized to communicate risks and incentives.

I3P INITIATIVE 3: CYBER SECURITY WORKSHOPS

Coordinators (b)(6) I3P Associate Director for Research

Abstract

During Budget Period III the I3P will address Initiative 3 through a series of workshops that focus on process control systems security, examining the economics of protecting the information infrastructure, understanding and developing solutions to protect against the insider threat and raising awareness among government and industry leaders about critical infrastructure protection vulnerabilities, threats, challenges and research solutions. The current state of knowledge of cyber security challenges and available or burgeoning solutions is inadequate. Pockets of expertise exist in the security community, but there is an acute need to further inform and educate decision makers and leaders from industry, government and academia about cyber vulnerabilities and existing and emerging remediation options.

This initiative mirrors the priorities outlined in both the *National Strategy for Homeland Security*² and the *National Strategy to Secure Cyberspace*³ by focusing on developing a better understanding of vulnerabilities and threats against critical national infrastructures, including PCS and SCADA systems, as well as raising awareness and improving public-private information sharing in these areas. Moreover, I3P workshops are strongly aligned with the goals and objectives outlined in the *National Infrastructure Protection Plan (NIPP)*⁴ in terms of supporting critical infrastructure and key resources research, development, testing, evaluation and deployment, and disseminating research results, guidelines, and best practices to the user community. The proposed workshop initiative will be a vehicle to provide timely and accurate information and details of solutions to the relevant stakeholders.

These workshops and sessions have the following objectives:

- To provide a trusted forum for a diverse network of researchers, government, and industry representatives to exchange ideas and develop interdisciplinary solutions to critical problems.
- To demonstrate high-impact tools and technologies developed through I3P research.
- To increase awareness of cyber security issues and solutions, and assemble the right coalition of experts to address the most pressing technical and policy challenges.
- To create new understanding and knowledge that will be reported in the form of workshop proceedings, books and other publications.

The I3P has a well established ability to organize high-impact workshops of interest to industry, government and academia, and has used these workshops to gain knowledge about cyber security problems and to demonstrate solutions. The Consortium has previously demonstrated its ability to bring together important stakeholders from a variety of disciplines to discuss security challenges

² Office of Homeland Security. *National Strategy for Homeland Security* 2002. Washington: Government Printing Office, 2002. http://www.whitehouse.gov/homeland/book/nat_strat_hls.pdf

³ U. S. Department of Homeland Security. National Infrastructure Advisory Council. *National Strategy to Secure Cyberspace* 2003. Washington: Government Printing Office, 2003.

⁴ U.S. Department of Homeland Security. *National Infrastructure Protection Plan* 2006. Washington: Government Printing Office, 2006. http://www.dhs.gov/interweb/assetlibrary/NIPP_Plan.pdf

and advance solutions. The I3P has the unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue. We are requesting funds to continue to provide these high-impact events, and to make them more widely accessible to researchers, industry, and policy makers. Such interactions will facilitate an accelerated understanding of information infrastructure vulnerabilities and solutions, and information sharing will help to bring policies and practices together. Where appropriate, the workshops will also serve as demonstration sites for launching the technology transfer process.

Management Overview

The I3P will provide logistical and organizational support for the workshops. The I3P administrative office staff will work closely with researchers and leading experts from industry and government to assure well-organized and effectively run workshops. The I3P will help produce and distribute workshop materials, develop websites promoting the workshops, invite speakers, and provide on-site administrative assistance. I3P staff will also play an active role in developing workshop content and coordinating the sessions. The I3P team will be responsible for all tasks related to logistics, room and equipment reservations, arranging meals, and managing reservations. The post-workshop activities for which the I3P staff will be responsible include managing and archiving information produced from the workshops, and the preparation and distribution, in both electronic and hard-copy format, of publications and reports from the workshops.

Proposed Workshops and Conferences for BP III

Workshop # 10

Title: Critical Infrastructure Protection Conference

Date: March 2009

Location: Hanover, NH

The information infrastructure – comprising computers, embedded devices, networks and software systems – is vital to day-to-day operations in every sector: agriculture, food, water, public health, emergency services, government, defense, information and telecommunications, energy, transportation, banking and finance, chemicals and hazardous materials, and postal and shipping. Global business and industry, governments, indeed society itself, cannot function effectively if major components of the critical information infrastructure are degraded, disabled, or destroyed. The information infrastructure is a vital resource, and serious attempts must be made to draw the security community – governments, private sector entities and researchers – to the shared task of critical infrastructure protection.

Through this effort, the I3P will engage the information security research community to work together on applying scientific principles and engineering techniques to address current and future problems in information infrastructure protection. In addition to engaging the research community, the I3P will draw other interested parties (government agencies, infrastructure owners, operators and vendors, and policy makers) in a constructive dialog on critical infrastructure protection (CIP), and include these stakeholders in the development of mitigations and solutions.

Building on the success of its first two critical infrastructure protection (CIP) conferences held at Dartmouth College in March 2007 and George Mason University in March 2008, respectively, the I3P will hold a third CIP conference for 60 stakeholders in March 2009. The workshop will provide a forum for presenting original, unpublished research results and innovative ideas related to information security and critical infrastructure protection. The workshop will attract key members of the CIP community to examine the current state of research and practice in the discipline, analyze problems and trends, and discuss potential solutions. The workshop will focus on the most pressing research issues related to information security in the context of critical infrastructure protection. The results of the workshop and the accompanying discussions, including original research, practical experiences and innovative ideas in critical infrastructure protection, will be disseminated to the widest possible extent, including in the form of a workshop book. The I3P will coordinate closely with an existing International Federation for Information Processing (IFIP) working group on critical infrastructure protection (IFIP WG 11.10), of which several I3P Consortium members are officers and members. This working group already has broad-based expert membership that can be tapped to serve on the workshop's program committee. IFIP WG 11.10 hosts conferences and technology transfer workshops to showcase advances in critical infrastructure protection research and practice, and to solicit input on research trends and needs.

Workshop # 11

Title: Process Control Systems Security Workshop

Date: February 2009

Location: To be determined

The I3P will organize and support a major workshop on process control systems (PCS) security in the oil and gas industry that will be focused on demonstrating the I3P's security solutions and research findings, and helping to transition them to industry. Efforts will be made to co-locate the workshop with (or closely coordinated it with) the Process Control Systems Forum (PCSF), a DHS-sponsored organization tasked with coordinating national PCS security initiatives, and its regular meetings.

While there are now a number of organizations that deal with the security of PCS and supervisory control and data acquisition (SCADA) systems, they mainly focus on coordination and awareness. There is an urgent need for a workshop that demonstrates existing and emerging security solutions and provides industry and government leaders with the opportunity to work directly with researchers to customize these solutions to their particular needs. Strong turnout at previous I3P PCS security workshops, which took a similar approach to highlighting security issues and demonstrating solutions, underscores this need. The most recent I3P PCS security workshop, held in Houston, TX, on February 15-16, 2007, was attended by well over 100 security experts, including major owner/operator companies and vendors. Another industry event is planned for March 6, 2008 in the Houston area. This workshop will be held in conjunction with an NPRA (National Petrochemical Refiners Association) Cyber Security Workshop.

The workshop will advance PCS and SCADA security to improve the robustness of the nation's interdependent critical infrastructures. Important relationships among government and industry partners, including research institutions, government agencies, standards groups, vendors, and owners, will be developed and nurtured at the I3P event. These relationships will facilitate effective communication of needs and concerns among parties to improve the deployment of

security in PCS, as well as greatly enhancing the capability for technical transfer of security technology from the I3P's researchers into the industry. The event will be an opportunity for the I3P PCS research team to showcase its findings and tools.

The workshop will be for 80 stakeholders in the oil and gas industry (and other critical infrastructure sectors) and will include a variety of technology demonstrations, conducted, in some cases, jointly with the I3P team's research partners from industry. The workshop will be closely coordinated with the leaders of the I3P's research initiative focused on the resiliency of process control systems. The workshop will be held around February 2009. An exact date and venue are not yet available because the I3P team is still coordinating with its industry partners and PCSF to ensure the best arrangements to guarantee that the I3P event is integrated with other government efforts and gets a strong turnout.

Workshop # 12

Title: The Second Workshop on the Economics of Securing the Information Infrastructure (WESII 2)

Date: September 2008

Location: Arlington, VA

The I3P will organize and support the Second Workshop on the Economics of Securing the Information Infrastructure (WESII 2). The event is unique in that it brings together policy makers with security researchers, infrastructure providers and developers, and social scientists to address questions of information security as they relate to the network infrastructure. The event builds on the success of the first Workshop on the Economics of Securing the Information Infrastructure, held in Washington, DC, in October 2006. That event was attended by 60 stakeholders from industry, government and the research community, and had 34 paper submissions.

One goal of the second workshop will be to provide a session during which policy makers can present about the questions that they would like to see the research community addressing. Other topics that could be covered at WESII 2 include examining the economics of deploying security into: The Domain Name System (DNS); BGP & routing infrastructure; e-mail & spam prevention; programming languages; legacy code bases; user interfaces; operating systems; measuring the cost of adding security; models of deployment penetration; empirical studies of deployment; measuring/estimating damages; code origin authentication; establishing roots of trust; identity management infrastructure; data archival and warehousing infrastructure; securing open source code libraries; adding security to/over existing APIs; liability and legal issues; internet politics; antitrust issues; and privacy issues.

The workshop will be for 50 stakeholders involved in information infrastructure security and will include a call for papers, presentations of accepted papers, as well as invited speakers from the policy community and industry. There will be an internationally distinguished program committee in place (with similar composition to the first WESII) to help select workshop papers and make important programmatic decision. It is anticipated that the workshop will be held in September 2008. The planning team is currently working to affiliate the workshop with (or have it co-located with) the TPRC (Telecommunications Policy Research Conference) and schedule it for the day before the start of the TPRC technical program. Co-locating with TPRC will give the workshop additional visibility in the computer science community and simplify travel plans for those attending both events. The WESII 2 workshop and TPRC have significant overlap in topic

areas, program committee members and potential attendees, so co-locating appears to be a good fit. The final decision on date and venue will be made when this issue is resolved.

Workshop # 13

Title: Workshop on Insider Threats in the Networked World

Date: April 2008

Location: Durham, NC

The I3P will organize and support the Workshop on Insider Threats in the Networked World. Networked technology has fundamentally altered the nature of the insider threat. What is the primary source of the new, networked insider threat: a malicious insider who does direct harm or is masquerading as someone else, a well-meaning insider who causes damage inadvertently, or an unaware insider who has somehow empowered a malicious outsider? The I3P Workshop on Insider Threats in the Networked World, which is by invitation-only and will bring together industry leaders concerned with insider threats, will explore answers to these questions and their implications for the future of organizational security in a globally interconnected world.

The workshop will be for 40 stakeholders, mainly from industry, involved in identifying and combating insider threats in their organizations. The program will include a mix of presentations and demonstrations of I3P research findings and tools, as well as panels and discussion sessions with industry experts.

The event will give participants a chance to influence the I3P's cutting-edge research focused on insider threats. The workshop pulls together key findings that can help industry understand when insiders act inappropriately, as well as how to be more effective in responding to the insider threat. By interacting with top researchers in the field, participants can influence the direction that the I3P's future research will take, keeping it realistic and targeting it on key industry issues. The workshop builds on the I3P insider threat project team's June 2007 Workshop on Insider Attack and Cyber Security, held in Arlington, VA.

Workshop # 14

Title: Insider Threat Workshop

Date: March 2009

Location: To be determined

The I3P will organize and support an end-of-project workshop in support of the I3P's Human Behavior, Insider Threat and Awareness research team. The event will build on the other two project workshops and will involve the major stakeholders that have been engaged with the research team throughout the project. The event will cover the nature of the insider threat and various technological and behavioral solutions to it. It will be a culmination of the I3P's insider threat research and will highlight results, findings and technologies developed over the course of the project by the I3P research team. It will present the project's major findings, as well as present a plan for continuing research and interaction. The program for the event, as well as the exact date and location, will be finalized as the project progresses (and by taking into consideration the findings from Workshop# 13 above).

Workshop # 15

Title: Hosting and Supporting the Workshop on the Economics of Information Security (WEIS 2008)

Date: June 2008

Location: Hanover, NH

The I3P, in partnership with the Tuck School of Business and the ISTS, all at Dartmouth College, will host and support the annual WEIS (Workshop on the Economics of Information Security) in the summer of 2008. This is a pivotal event to drive the agenda and help further knowledge in the area of the economics of cyber security. WEIS is an annual series of workshops on the economics of information security, and is the premier forum to present cutting-edge research and to debate and critique new economic and security concepts and ideas.

Information security requires not only technology, but a clear understanding of risks, decision-making behaviors and metrics for evaluating business and policy options. How much should we spend on security? What incentives really drive privacy decisions? What are the trade-offs that individuals, firms, and governments face when allocating resources to protect data assets? Are there good ways to distribute risks and align goals when securing information systems? WEIS 2008 will build on a strong and growing interdisciplinary tradition, bringing together information technology academics and practitioners with social scientists and business and legal scholars to better understand security and privacy threats. Until recently, research in security and dependability focused almost exclusively on technical factors, rather than incentives. However, we know that economic, behavioral, and legal factors often contribute as much as technology to the dependability of information and information systems. The application of economic analysis to these problems has proven to be an exciting and fruitful area of research.

The workshop will be for approximately 100 experts in information security and economics. A call for papers has already been issued. Papers will be reviewed by an internationally distinguished program committee. Several I3P members serve on the WEIS program committee. The workshop will include presentations of accepted papers, as well as invited speakers from the policy and economics communities and industry.

Workshop # 16

Title: Economics Executive Workshop for CISOs

Date: March 2009

Location: To be determined

The I3P, in partnership with the Tuck School of Business at Dartmouth College, will host an executive workshop for CISOs from major companies on the economic aspects of information security. Using a moderated roundtable, panel discussions, and structured breakouts, the workshop will help security executives to better understand good industry practices and provide them with the knowledge and tools to build security into their organizations from the ground up. The event will be informed to a significant extent by knowledge and findings generated as part of the I3P's Business Rationale for Cyber Security research project. It will give participants the opportunity to review and discuss some of the models and concepts developed as part of the project.

The workshop will engage CISOs and other senior cyber security executives at Fortune 500 companies to help them discuss issues surrounding creating a business rationale for cyber security with their peers in a trusted setting. CISOs will exchange views and best practices on the topic of protecting against economically motivated attacks, ultimately driving forward industry knowledge on how to recognize and defend against such potentially damaging incidents. The findings of the event will be published, providing insights to those security executives that were not able to attend the event.

The workshop builds on two previous I3P/Tuck CISO executive events held in 2006 and 2007. The program for the event, as well as the exact date and location, will be finalized closer to the tentative event date in consultation with the I3P business rationale research team and industry partners.

Workshop #17

Title: Business Rationale for Cyber Security Workshop - Making Good Cyber Security Investment Decisions

Date: November 2008

Location: Charlottesville, VA

The I3P, in partnership with the University of Virginia's Center for Risk Management of Engineering Systems, will host a workshop to bring together specialists from the different corporate management areas relating to investment in cyber security to discuss strategies and models for making better security decisions. The event will also showcase the latest version of a collaborative decision-making tool that the University of Virginia is developing as part of the I3P Business Rationale for Cyber Security project.

The workshop will build on a series of past workshops, where early versions of the cyber security investment decision-making framework and tool were explored and discussed. The format of the workshop will help show how an organization could approach security using the decision tool and how that organization can solicit its various knowledge assets to have a holistic viewpoint on the investment in cyber security. The insights gained from the workshop and the supporting decision-making tool will help companies make better, more informed cyber security investment decisions. It will also help organizations better understand how and why they invest as they do, potentially leading to greater security and protection of critical information infrastructures and more effective security investments. Participants will be drawn from a variety of industrial sectors, based on their specialization and interest in cyber security investment strategy.

The workshop is tentatively scheduled to be held at the University of Virginia's Darden School of Business in Charlottesville, VA, in November 2008. The program for the event will be finalized closer to the tentative event date in consultation with the I3P business rationale research team and industry partners.

Title: I3P Control Systems Security Session at an Industry Event (3)

Dates: To be determined

Locations: To be determined

The I3P will support sessions to highlight its research findings, new tools and knowledge, or to provide hands-on tutorials, at non-I3P organized PCS security workshops or conferences. Key

members of the I3P PCS Security research team engaged in outreach (Sandia National Laboratories and SRI International) will use existing industry-focused events to reach a broader audience of stakeholders with its new research findings and technology demonstrations. In addition to its own demonstration workshop, the I3P team also wants to reach oil and gas owner/operator companies (and companies from other critical infrastructure sectors) that take part in other industry security events. There is an urgent need for workshop sessions that demonstrate existing and emerging security solutions and provide industry and government leaders with the opportunity to work directly with researchers to customize these solutions to their particular needs. The advantage of holding demonstration sessions at existing industry events is that it saves time and resources, while gaining access to established industry audiences.

The sessions at industry events will advance PCS and SCADA security to improve the robustness and resilience of the nation's interdependent critical infrastructures. Important relationships and dialogue between government and industry partners, including research institutions, government agencies, standards groups, vendors, and owners will be initiated at the I3P sessions. These relationships will facilitate effective communication of needs and concerns among parties to improve the deployment of security in PCS, as well as greatly enhancing the capability for technical transfer of security technology from I3P's researchers into the industry.

The I3P PCS security research team will choose three industry events and host information and demonstration sessions at these events. I3P research team members will prepare and execute the sessions, including preparing presentations and demonstrations for the sessions, selecting and providing presenters, and assembling session materials. The sessions will be part of the events' main plenary program or break-out or "birds of a feather" sessions at the events. Sessions could also take the form of informational booths where tools and technologies are demonstrated, or they could be day-long tutorials. The sessions will give a detailed technical overview and demonstration of one or several of the technologies being developed by the I3P research team, and/or will provide asset owners with foundational technical knowledge and first-hand practical experience that will allow them to better understand the vulnerabilities of their control systems to cyber disruptions as well as the steps that they can take to mitigate this risk.

As part of its communications and marketing effort, the I3P research team will identify a list of the most important events and will work with the organizers of various events to coordinate the I3P's participation. We have not yet identified the specific set of events because exact dates, venues, and draft agendas are not yet available for relevant workshops and conferences in the April 2008-March 2009 timeframe. However, close coordination and partnerships are anticipated with the PCSF and organizations like NPRA, the American Petroleum Institute (API) and SANS, which all hold regular conferences and meetings.

Sponsoring Conferences and Workshops:

The I3P will provide limited sponsorships -- at the \$5,000 level per event at the most -- to support some of the leading conferences and workshops in the areas of cyber security in which I3P researchers are active and engaged. Conferences and workshops will be supported based on their importance to furthering the I3P's research agenda and goals, and their criticality in their various fields of cyber security and information infrastructure protection. In the past, the I3P has successfully supported the Workshop on the Economics of Information Security (WEIS) and the DIMACS Workshop on Information Security Economics. We anticipate supporting similar events

in the future, including the RAID 2008 workshop on Information Security, to be held in Boston, MA, in September 2008.

I3P sponsorship would be used to support student registration discounts, student and speaker travel scholarships, and best student paper awards for conferences and workshop. The support will enable students and experts from other related disciplines to attend important cyber security events. This interaction will help advance the state of the art in cyber security research by promoting the exchange of ideas in a broad range of topics. In return for I3P sponsorship, event organizers will feature the I3P as an event sponsor on material and handouts for the events, as well as on the event websites. In addition, each student or attendee supported using I3P funds will be notified of the origins of the support, and the I3P will receive a workshop report from the event organizers describing the results of the workshop and the role of I3P funding.

I3P INITIATIVE 4: SURVIVABILITY AND RECOVERY OF PROCESS CONTROL SYSTEMS

Coordinators

(b)(6)

Team Leader (MIT-Lincoln Laboratory)

(b)(6)

I3P Chair and Research Director

(b)(6)

Overview of Proposed Research

Process control systems (PCS) are instrumental in the safe, reliable, and efficient operation of many physical processes in our critical infrastructures. However, the growing dependence of PCS on conventional information technology (IT) elements and their increasing connectedness to the Internet results in their inheritance of known and emerging cyberspace risks and threats, including cyber attacks from adversaries with a range of skills. A successful cyber attack on PCS could adversely affect not only the safe and reliable operation of the directly controlled infrastructure, but also other interconnected and interdependent critical infrastructures, resulting in adverse impact on human safety and the economy.

This proposal seeks to reduce the opportunity for an attack to be mounted against critical components, to increase the likelihood of detection if such an attack is made, and, if successful, enable operators to rapidly recover.

This research plan will be coordinated by MIT-LL and is organized into seven thrusts, using I3P member organizations. In BP III, each thrust will concentrate on accomplishing the following tasks:

Thrust 1, USMA: Continue to track relevant, ongoing research, development, and application efforts to provide overall project guidance and feedback to DHS.

Thrust 2, MITRE: Model the importance of confidentiality in business practices and develop a template for a second critical infrastructure asset owner.

Thrust 3, PNNL & MIT-LL: Ensure survivability of legacy and future platforms, by completing the development and testing of SHARP for legacy applications and DEADBOLT for newly developed applications.

Thrust 4, UIUC: Specify, implement and enforce policy that results in survivable operations, adding support for risk modeling. Continue the process of marketing APT.

Thrust 5, UTulsa: Complete the development and documentation of a situational awareness tool for MODBUS and perhaps other networks.

Thrust 6, Sandia: Ensure system-level survivability and recovery through development of the ROBUST prototype.

Thrust 7, SRI: Work with industry to ensure research is on proper path and that technical transition is happening smoothly, and the second workshop runs smoothly.

Project Review

The project underwent a mid-term review on December 12, 2007. The final review recommendations, which were crafted in consultation with DHS, included the following:

- The reviewers were very impressed with MITRE's RiskMAP technology and its transfer, and were supportive of expanding the effort.

- The I3P will make \$150,000 available for MITRE in BP III to extend the RiskMAP methodology by adding confidentiality to the analysis and by developing model templates for other critical infrastructure sectors.

The project team will continue to follow the 2-year research plan and institutional statements of work and budgets that were initially submitted for BP II. However, some revisions have been made as outlined below in response to the project review and to incorporate new research directions that were not anticipated in the original research plan. Only changes to the original research plan are discussed below.

Team Composition

The following I3P Consortium member institutions will be contributing to the research on this project:

MIT Lincoln Laboratory (Team Leader)
Information Technology and Operations Center. United States Military Academy
Information Trust Institute. University of Illinois at Urbana-Champaign
Center for Information Security. University of Tulsa
MITRE Corporation
Pacific Northwest National Laboratory
Sandia National Laboratory
SRI International

Management Overview

MIT Lincoln Laboratory will continue to lead the effort by serving as team leader. As the project lead MIT-LL will monitor the project to ensure satisfactory progress and will help ensure connection to industry and the government; to support this oversight role, each participating institution will be responsible for providing MIT-LL with monthly written status and a written quarterly status update in the form of a short, 15-minute PowerPoint briefing on their material. This document will include carefully edited descriptive text as part of the notes section, and will be uploaded onto the I3P website's collaborative workspace. This briefing will be presented to the entire team, and will be made available for use in the report to the consortium. In addition, one organization will be required to prepare an in-depth briefing per quarter.

The research team has assembled a project advisory board that has been extremely useful in providing the team feedback on research plans and ideas. Board members receive regular status information and access to detailed information about technical progress. They advise the program of industrial opportunities and changes, and participated in the mid-term project review.

Changes to the Research Plan

MIT Lincoln Laboratory:

MIT Lincoln Laboratory delayed the publication of the denial of service paper to refocus it. A revised paper, now entitled “Analysis of Resource Exhaustion Vulnerabilities” will be prepared in BP III Q2.

Milestones and Deliverables

BP III Q2 - Author a paper in the area of “Analysis of Resource Exhaustion Vulnerabilities”.

Information Technology and Operations Center. United States Military Academy:

No changes to the research plan in BP III.

Information Trust Institute. University of Illinois at Urbana-Champaign:

UIUC will replace its deliverable in BP III Q2, which is a report on methodology for assessing how well formal statements of global policy adhere to best practices, with two new deliverables. These are a website to support the distribution and support of APT dissemination, and a patent application for APT methodologies. This latter item supports the request by the advisory board to incorporate an intellectual property related metric of success for the program.

Milestones and Deliverables

BP III Q2 - Develop a website to support distribution of APT. Complete a patent application on APT technologies.

Center for Information Security. University of Tulsa:

No changes to the research plan in BP III.

MITRE Corporation:

MITRE added a second year of work to the project. In it, the concept of confidentiality will be added to the RiskMAP tool, and an additional template will be developed. This is new work not initially covered in the BP II proposal. The addition of this effort was agreed in consultation with DHS and was based on strong support for the work by the project review panel.

Approach

MITRE will address the problem stated above by applying its Risk-to-Mission Assessment Process (RiskMAP), developed during the previous I3P SCADA Security project. RiskMAP provides a structured approach for the identification and assessment of the risks from cyber threats that can occur throughout a system’s lifecycle. RiskMAP translates the results from a

technical assessment of network risks into terms of business risk to allow decision makers to easily identify, understand, select and justify cost-effective risk mitigation strategies.

BP III: A second year of work will be added with the following goals in mind:

1. Add the treatment of CONFIDENTIALITY issues to the RiskMAP methodology. Currently, RiskMAP addresses issues of INTEGRITY and AVAILABILITY, as these were the issues identified by owner-operators as paramount. However, future use of RiskMAP could be in sectors where CONFIDENTIALITY is of equal or greater importance, such as in the medical, law enforcement, defense or financial sectors. In addition, the RiskMAP development team believes that current users will soon realize the need to protect the intellectual property represented in their PCS equipment settings, lab results, and other operational data. For this reason, the team proposes to add the treatment of CONFIDENTIALITY issues to the current method for determining Information Asset criticality.
2. Create an additional risk mapping template, extending beyond the realm of the oil refineries addressed in the previous work. Candidate installations include, among others, pipeline operations that move liquids; chemical plants; and rail transportation systems. Development of a template for a pipeline operation will provide a model of a highly-dispersed operation, possibly lending itself to future models of water and/or power distribution systems. A generalized version of the template, sanitized of any proprietary information, will be delivered to the I3P in the form of an update to a previous I3P research report.
3. As done in BP II, educate government, owners/operators, and vendors via presentation and demonstration of the extended RiskMAP methodology at an I3P sponsored workshop. The presentation will highlight the treatment of CONFIDENTIALITY issues as part of a PCS risk assessment approach, and will demonstrate the modeling of a plant based on the new template created above.

The research on the RiskMAP methodology will also provide data useful for the Sandia team – primarily a list of PCS network nodes, ordered by criticality to mission, for a typical oil refinery. The list will form a starting point for Sandia’s analysis and development of mitigating actions.

Milestones and Deliverables

Date	Task	Description
BP III Q1	Add treatment of CONFIDENTIALITY to RiskMAP	Extend the current methodology to include CONFIDENTIALITY; document the effort in a new or updated I3P research report.
BP III Q2	Model a relevant CI business (2 nd of 2)	Partner with industry to develop relevant RiskMAP template distinct from an oil refinery.
BP III Q3	Identify business critical assets	Complete RiskMAP template for a second energy sector industry.
BP III Q4	Complete tech documentation	Update I3P documentation with new template and description; participate in a year-end workshop.

Pacific Northwest National Laboratory:

No changes to the research plan in BP III.

Sandia National Laboratories:

Sandia refined its project concept to include the development of a survivability analysis tool called ROBUST.

Approach and Impact

Development of ROBUST Based on Conops

ROBUST (Resilient Operations Back-Up SwiTch) will provide a validated response approach to ensure critical operational functionality through a cyber disruption, transcending work-to-date on risk awareness, best practices, attack prevention and detection. ROBUST will be developed such that both inputs (system alerts and incident data) and outputs (secure architecture recommendations) will be modular, thus allowing it to interface with other I3P and commercial tools and be applied in both pipeline and refinery operations. This modular design will maximize the flexibility of the tool, allow for its deployment in multiple operational environments, and provide vendors the opportunity to interface with ROBUST. ROBUST will use modularity tools such as Interface Definition Language (IDL) derived from middleware technology to be vendor agnostic. Coordination with MITRE on RiskMAP outputs as ROBUST inputs will be extremely useful in the development phase. Opportunities to coordinate with UIUC on APT will also be explored. ROBUST will be tested and applied in the Sandia testbed and demonstrated at workshops.

Milestones and Deliverables

DATE	TASK	DESCRIPTION
BP III Q1	Preliminary ROBUST prototype	Develop analysis engine, obtain platform, specify inputs and outputs, and draft design document.
BP III Q1	Host API 1164 Meeting	Host the 1164 team at a working group to integrate the latest draft.
BP III Q1	Present at API Pipeline Conference	Provide presentation on wireless technology in PCS environments – Invited Presentation.
BP III Q2	Industry feedback on ROBUST prototype	Leverage existing relationships with industry partners and advisory board to seek feedback on prototype.
BP III Q2	Submit Sections of 1164 Update	Complete final draft of 1164 standard.
BP III Q3	Complete ROBUST Prototype and Testbed.	Complete implementation of ROBUST prototype and testbed.
BP III Q4	Test cyber scenarios	Complete and document testing of ROBUST prototype using cyber scenarios.

SRI International:

No changes to the research plan in BP III.

I3P INITIATIVE 5: BUSINESS RATIONALE FOR CYBER SECURITY

Coordinators: (b)(6) I3P Chair and Research Director (b)(6)
(b)(6) Team Leader (UVA)

Overview of Proposed Research

The Business Rationale effort is a multi-disciplinary research activity that combines the efforts of the Berkeley School of Law, the Tuck Business School at Dartmouth College, the RAND Corporation and the Systems Engineering Department at the University of Virginia (UVA). The major objectives for the research activity are to continue the ongoing development of new tools and methods for business and public policy decision-makers pertaining to investments in cyber security. The individual efforts of the team members address specific community needs and tools related to decision making; Berkeley focusing on the public policy community, Tuck on commercial enterprises, RAND on an instructional case study involving an enduring attack scenario that can provide guidance to all communities, and UVA on the development of collaborative decision-support tools to support investment decisions, and on cost estimation and management support benchmark tools related to software patching. Each of these efforts includes an array of supporting analysis activities including statistical analyses, survey-based analyses and economic analyses, in addition to gathering information from direct one-on-one interactions with leading members of the cyber security community. In addition to the team's developmental efforts, RAND is formally reviewing already existing models and methods in order to provide the modeling and model-using communities with an overarching view of the range of available tools and methods, their areas of applicability and their strengths and limitations.

The individual team member research efforts are integrated in a variety of ways, with the most comprehensive integration activity being a modeling effort that directly deals with understanding the possible results that can emerge from the interactive decisions made by the various information infrastructure community members; i.e., for example, public policies impact corporate decisions (including those of both the users and providers of cyber security technology) on cyber security, and in turn corporate attention to cyber security impacts public policy decisions. The research team is undertaking a joint agent-based modeling activity to explore the interactive nature of the cyber security community's decisions and the impacts of various trends and corresponding scenarios on community decision-making. For example, what will be the impact of the cyber attack threat continuing to become more organized, or what would be the impact of new or modified government regulations. This activity builds on the application of agent-based models in other communities (e.g., national security, emergency response) and is believed to be the initial attempt to do so with regard to developing an understanding of the interactive impacts of cyber security related decisions.

The project will continue to use I3P-sponsored workshops, peer-review journal articles, presentations at cyber security conferences, magazine interviews, I3P website postings, and targeted briefings to potential users of the results as the mechanisms for broadly distributing results. The tool development efforts are already in the process of organizing prototype trials with members of the potential user communities that promise to help in both the validation of the value of the tools and in the refinement of the designs for the tools. The tool efforts are intended to result in distributed products, either through: 1) transfer to corporations who are interested in

pursuing the commercial opportunities that they may provide or 2) open source availability for the community of interested users to continue to apply and improve.

Project Review

The project underwent a mid-term review on December 13, 2007. The final review recommendations, which were crafted in consultation with DHS, included the following:

- The reviewers raised questions about the potential impact and fit of the Indiana team's activities within the overall project, a problem that was brought about, in part, by the departure of MIT-LL from the project. While Indiana's responses helped clarify some of these concerns, others remain.
- The I3P will not fund further work at Indiana University for this project in BP III. Instead, Indiana is asked to focus all its efforts in BP III on the insider threat project (see above).

The project team will continue to follow the 2-year research plan and institutional statements of work and budgets that were initially submitted for BP II. However, some revisions have been made as outlined below in response to the project review and to incorporate new research directions that were not anticipated in the original research plan. Only changes to the original research plan are discussed below.

Team Composition

The following institutions will be contributing to the research plan:

University of Virginia (Team Leader)
RAND Corporation
Samuelson Law, Technology and Public Policy Clinic. Boalt Hall School of Law. University of California, Berkeley.
Tuck School of Business. Dartmouth College

It should be noted that MIT Lincoln Laboratory withdrew from the project due to staff changes there. After reviewing several proposals, the I3P selected the University of California, Berkeley's School of Law to join the project team. As was mentioned earlier, following the mid-term project review it was decided that Indiana University will no longer be part of the project team for BP III.

Management Overview

The University of Virginia will continue to lead the research effort and will serve as team leader. The management aspect of this effort will include communicating the project goals and accomplishments to strategic stakeholders. It will also include keeping the I3P apprised of progress and accomplishments. The overall project's strategic direction will be formed and advocated through this effort providing guidance to the other aspects of the project. Additionally, the effort will identify critical strategic communications opportunities for the project team. UVA will provide reports on team progress at I3P membership meetings, create and maintain slide presentations on the goals and accomplishments of the project team, including descriptive content for use on the I3P website, as well as communicating the impact of the work at other conferences,

association meetings, and any other available opportunities to communicate with the audience of the project. The team leader will provide integrated presentations to the various stakeholders surrounding the Business Rationale effort, document feedback, and stimulate responses from various researchers involved in the effort. To guide the research efforts of the project, the team will continue to utilize its excellent relationships with industry executives.

Changes to the Research Plan

University of Virginia – Management and Integration:

A major aspect of this activity will be the creation of integrated analytical models that account for decision making in the various stakeholder communities that impact the cyber security system of the United States. These models will explore the reaction to the nature and extent of cyber attacks in the United States. The communities of stakeholders to be modeled will include: the business community (national and international), public policy community, Internet technology community, the general public, and the law enforcement community.

Integration Plan

The ongoing interactions with Tuck and UVA on supply chain models, between Berkeley, Tuck and UVA on the various impacts of breach reporting laws, and the UVA integrated efforts on software patching together have highlighted an important project need; namely, the development of models that allow the team to understand and explore the interactions among regulatory decisions, business cyber security investment decisions, consumer responses to cyber attacks, media responses to publicized cyber attacks, the ongoing evolution of the Internet as a system, and potential cyber attack scenarios that can result from decisions derived from a more and more organized community of cyber attackers. A review of the cyber security literature shows that, to date, the cyber security community has used agent-based modeling only to assess the step-by-step interactions between potential attackers and defenders within the confines of a specific attack scenario. Our efforts will use it to look at a strategic analysis of investment decision making and across a broader set of stakeholders than has been addressed before.

The creation of integrated analytical models that account for decision making in the various stakeholder communities will begin with the creation of two models. The first model will be of supply chain cyber disruptions. This effort will be dependent on Berkeley, UVA, and Tuck integrating the results of their individual efforts. The second model will be of the dynamics of vulnerabilities, exploitations, patches and breach reporting laws in the cyber security system. This effort will also be dependent upon Berkeley, Tuck, RAND, and UVA efforts.

The supply chain cyber disruptions analytical model will develop along three major lines: individual firms, the supply chain network, and the public interest perspective. Tuck and UVA will contribute models on individual firm behaviors and the supply chain network dynamics. Berkeley will collaborate with UVA and Tuck in modeling the public interest perspective. The model will be able to provide perspective on the impact of public policy changes, market changes, and cyber threats.

The model of the dynamics of vulnerabilities, exploitations, patches, and breach reporting laws will involve the modeling of multiple stakeholder communities. Tuck will construct business

community models that derive from the individual task work they are undertaking. The public policy community and law enforcement community models will be formulated by Berkeley from their task work. RAND will provide a survey to give context to the analytical model in regards to other analytical models. UVA will model the other communities of technology and the general public. The model will provide insight into how the overall cyber security system can be enhanced to manage vulnerabilities, exploitations, patches, and breach notification laws. The model will also allow stakeholders to improve their overall perspective of the entire cyber security system. A range of attack assumptions will be explored to provoke emergent properties of the entire cyber security system. This will enable us to derive breakpoints in stakeholder behaviors that can be used for planning the evolution of business rationale. Through the work already accomplished by the project the emergence of the following properties has become evident; minor e-commerce site customer response to breach reports, customer financial liability management by financial institutions, the limited role of insurance, and companies complaining about the cost of breach reporting.

These models will form the basis for more concrete results gathered from a continuing effort to improve the models. The computing platform for these models will be decided by March 2008. The first version of these models will be completed by September of 2008 and will be used to highlight needed additions and define the scenarios analyzed in the refined versions of the models to be completed by March of 2009.

Integration plans for parts of Tasks 2.2 and Task 2.3 have been removed because Indiana will no longer be part of the research team.

Deliverables

BP III Q2 - Report on the integrated supply chain analytical model.

BP III Q2 - Report on the integrated analytical model of the dynamics of vulnerabilities, exploitations, patches, and breach reporting laws.

BP III Q4 - Report on the application of agent based modeling to cyber security business rationale analysis.

University of Virginia – SOWP:

Needs and Approach (numbering relates to the numbering in the original BP II proposal)

Subtask 1.3.5 Benchmarking and Cost Models for Security Patching

A major way that industry deals with attacks is through discovering software vulnerabilities highlighted through actual exploitations and developing and distributing software patches to address those vulnerabilities. Different companies and industries respond with patching policies that are highly variable, and there are no benchmarks to help companies determine the most appropriate approach to address patching. Depending on the company and the cyber related risks that it faces, different policies with different costs would be most suitable.

As a result of a partnership with Cisco to extend the Common Vulnerability Scoring System, CVSS, to include a cost model of patching vulnerabilities, an effort has been started to develop

software patching process benchmarks and cost models. As part of this effort a benchmarking survey is being undertaken jointly by UVA and CSO Magazine. The results of the survey will serve to develop cost models of patching policies and business' rationale for software patching. The potential uses of this research include identifying costs of patch process upgrades and predicting future budget implications based on patch trends. These models will include possible ways for companies to reduce costs by more efficiently managing the queue of software patches posted by software vendors.

Subtask 1.4.5 Tool Distribution and Open Source Development

This research activity has clear motivations for industrial application of the collaborative tools over the course of the contract year. This subtask will respond to the possibility for initial industry application of the tools. For example, initial discussions with key members of the Information Sharing and Analysis Centers Council, ISAC community, have pointed towards establishing an application relationship with one or more of the ISACs. In anticipation of this occurring we define a Subtask 1.4.5 that would involve the efforts required to apply our collaborative computing tools to ISAC cyber security risk modeling activities. Additionally this subtask includes reporting on progress made with distribution of the tool to industry and the ISAC Council.

Subtask 2.1.3 Time Series Analysis on Software Patching Process

A major way that the industry deals with attacks is through discovering software vulnerabilities highlighted through actual exploitations and developing and distributing software patches to address those vulnerabilities. Different vendors respond to exploitation vulnerabilities by releasing patches at different rates and bundled with other software patches. Companies must then ascertain the patches to implement and the impact to their cyber risks.

A data analysis project is being undertaken to complement the cost modeling of the patching process project under task 1.3, PSM and Interdependencies Arising From Business' Information and Physical Supply Chains. This task will look at patch release rates to model trends and perform data analysis related to the business rationale of cyber security. Additionally this effort will help develop models to address the clustered nature in which software patches arrive for companies.

Deliverables

Subtask 1.3 - Report on the benchmarking survey of the software patching process and contributions to the anticipated CSO Magazine article on patching (initial report 3 months after survey completion and a final report including refinement data collections in BP III Q4).

Subtask 1.4 - A report on the tool distribution (BP III Q4).

Subtask 2.1 - A report on the data analysis of software patch rates (BP III Q4).

RAND Corporation:

No changes to the research plan in BP III.

Samuelson Law, Technology and Public Policy Clinic. Boalt Hall School of Law. University of California, Berkeley:

No changes to the research plan in BP III.

Tuck School of Business. Dartmouth College:

No changes to the research plan in BP III.

I3P INITIATIVE 6: ASSESSABLE IDENTITY AND PRIVACY PROTECTION

Coordinators (b)(6) I3P Chair and Research Director (b)(6)
(b)(6) Team Leader (MITRE)

Overview of Proposed Research

Our objectives for BP III are consistent with those from BP II: Research, develop, demonstrate, and transfer to stakeholders solutions that allow sharing of identity and credential information across organizations in ways that are sufficiently accurate, cost-effective, and privacy respecting.

To achieve our objectives, we will:

- partner with stakeholders from representative sectors (financial and health), from government, and from the public,
- collaborate with other efforts investigating identity and privacy protection solutions, especially in the area of credentialing, to dovetail with them,
- refine a framework for describing digital credential requirements and solutions, to enable comparisons and facilitate the identification of gaps,
- develop a proof-of-concept demonstration of a new set of capabilities that are foundational to the credentialing framework, in partnership with stakeholders, and
- identify and take advantage of opportunities to transfer our technology to stakeholders and other groups

With respect to stakeholders, we will build upon some of the important relationships we established during BP II, such as with Kaiser Permanente, Partners Healthcare, and Harvard Medical School. We also look to establish relationships with new stakeholders such as Aetna and Blue Cross/Blue Shield, as recommended by the review panel. We also plan on further engaging government and standards groups.

In refining the framework, we will ensure that the framework is complementary and leverages other frameworks, models, specifications, terminology, and reference implementations in the identity management domain. We will also further refine it so that it can be easily applied by stakeholders.

In terms of our proof-of-concept demonstration, we will continue developing a use case scenario involving a doctor with privileges at both a clinic and a hospital, a lab which runs tests on a patient at the request of the doctor, and a patient who accesses his test results from home. Each of our planned technologies enables the exchange of credentials that needs to take place in order for this to happen electronically. The team will collaborate to further define these technologies and explore any areas of overlap. As definitions become clearer and we confirm how our technologies fit together within the use case scenario, we will begin implementation. Later in the year, we will demonstrate technologies to stakeholders and within their own environments. By the end of BP III, we hope to have a cohesive demonstration of our technologies and a list of vendors and other stakeholders who will take these technologies to the next step.

For the purposes of outreach and communications this project will be referred to in future as the 'Safeguarding Digital Identity' project.

Project Review

The project underwent a mid-term review on December 14, 2007. The final review recommendations, which were crafted in consultation with DHS, did not include funding changes or major programmatic changes for this project.

The project team will continue to follow the 2-year research plan and institutional statements of work and budgets that were initially submitted for BP II. However, some revisions have been made as outlined below in response to the project review and to incorporate new research directions that were not anticipated in the original research plan. Only changes to the original research plan are discussed below.

Team Composition

The following institutions will be contributing to the research plan:

MITRE Corporation (Team Leader)
Center for Education and Research in Information Assurance and Security, Purdue University
Cornell University
Georgia Tech Information Security Center
Information Trust Institute, University of Illinois at Urbana-Champaign
SRI International

Management Overview

The MITRE Corporation will continue to lead this research effort. (b)(6) will take over from (b)(6) as the team leader for this project in BP III. Ms. (b)(6) will no longer be available as project team leader due to other demands on her time at MITRE. MITRE Corporation will establish and coordinate the vision for the project, ensure quality products are produced, outcomes are coherent, integrated, and usable, and determine the proper emphasis on various aspects of the project by all institutions, especially engagement of stakeholders and technology transfer. MITRE will ensure that project objectives are met. This function will include monitoring the performance of each institution and, if necessary, making project changes in coordination with the I3P based on performance.

Team coordination will primarily take place through e-mail and using team teleconferences. The team will meet face-to-face at least twice per year for one-day information exchange sessions. During these sessions, the team will work together to address particular challenges. Team members will also take advantage of other opportunities (e.g., I3P events, cyber security conferences) to collaborate on project events. Each team member will share information developed under this project with other members of the team. Sharing of information will take place via an I3P collaborative workspace.

MITRE will communicate the project goals and accomplishments to strategic stakeholders and keep the I3P apprised of progress and accomplishments. MITRE will report on team progress at I3P Consortium meetings and will create and maintain presentations on the goals and accomplishments of the project team including preparing descriptive content to be used on the I3P website.

Changes to the Research Plan

Overall Research Plan: (numbering reflects the original BP II proposal)

2.4.1.1 Establish a Basis for Trust in a Web Services Environment

We have identified a problem experienced by several stakeholders: the easy technical parts of federation are delayed by very difficult problems of establishing business trust. Business trust is hard to build in the present environment. Existing IT systems require very close integration. Much of the trust that is built is necessary only because poorly designed technology requires it. We will build a lightweight system that allows federation based on a lower level of trust.

3 Management Plan

(b)(6) Principal INFOSEC Engineer at the MITRE Corporation, will be the team leader for this research effort in BP III. Mr. (b)(6) will establish and coordinate the vision for the project; ensure quality products are produced; ensure outcomes are coherent, integrated, and usable; and ensure proper emphasis on various aspects of the project by all institutions (especially engagement of stakeholders and tech transfer). Mr. (b)(6) will work to ensure that project objectives, identified in the research plan, are met. In this role, Mr. (b)(6) will monitor the performance of each institution and will make project changes, in coordination with I3P, based on performance. Mr. (b)(6) has been leading the stakeholder outreach during BP II and has established important connections during that time. These connections have resulted in valuable insights to the project.

MITRE Corporation: (numbering relates to the numbering in the original BP II proposal)

2.1.1 Stakeholders

MITRE will leverage ties with stakeholders to identify stakeholder requirements. The stakeholders listed below are merely representative of those with whom we will actually interact.

2.1.1.2 Healthcare Sector

- Massachusetts Health Data Consortium
- Harvard Medical School
- Beth Israel Deaconess Medical Center
- Partners Healthcare System
- Blue Cross/Blue Shield

2.2 Leverage and Influence other Identity Management Efforts

MITRE will collaborate with other identity management efforts to determine how the framework and capabilities that we develop relate to existing or planned products, services or standards provided by those other efforts. We will also influence these efforts towards this framework and capabilities.

2.3 Establish Credentialing Framework

Based on identified requirements and concerns, and on existing identity management frameworks and initiatives (e.g., Liberty Alliance), we will develop a framework for characterizing technologies and systems in terms of the capabilities they provide, traceable to the goals and objectives they help stakeholders to achieve. The framework will focus on stakeholder concerns and objectives related to *sharing* personal information across organizations in the form of digital credentials. One key aspect of this framework will be the lifecycles of credentials and of identity and credential information. Sharing of identity and credential information will be described in relationship to services and activities in the lifecycle.

Other dimensions of the framework will enable expression of stakeholder concerns in terms of threats and potential harms, and expression of stakeholder requirements and desired properties in terms of objectives and goals. Specific stakeholder requirements will be elicited; however, desired properties are expected to include privacy protection and credential information quality assurance. The framework will thus enable expression of privacy objectives (and capabilities for meeting those objectives) consistent with Fair Information Practices. The framework will also enable representation of threats to privacy (e.g., identity theft, loss of control, inaccurate or misleading information) and risks to business due to dependence on credential information. The framework will illuminate dependencies and conflicts among business and privacy objectives and risks, and thus enable informed trade-offs to be made in different operational and architectural environments. Desirable architectural properties of integrated solutions – e.g., decentralization, interoperability, flexibility, robustness, scalability, and deployability – will be identified; however, the framework will be designed to complement, rather than compete with, existing architectural and service frameworks (e.g., NIST, Liberty Alliance).

Based on the framework, the requirements asserted by stakeholders, and the knowledge of other identity management efforts, we will identify functional gaps – required capabilities for digital credential systems or functions that existing identity management efforts are not expected to provide. In addition, we will identify foundational gaps – capabilities to express credential management policies and to analyze and assess how well different solutions meet policy and functional gaps.

2.4 Develop Proof-of-Concept Demonstration

As the framework is established in further detail, we will develop technology and a demonstration of same that materially improve the identity and credential management infrastructure as measured by the framework.

We have identified a problem experienced by several stakeholders: the easy technical parts of federation are delayed by very difficult problems of establishing business trust. Business trust is hard to build in the present environment. Existing IT systems require very close integration.

Much of the trust that is built is necessary only because poorly designed technology requires it. We will build a lightweight system that permits federation based on a lower level of trust.

There are several technologies that exist at MITRE that could be used to fill functional and foundational gaps to achieve the proof-of-concept demonstration. Filling functional gaps will enable stakeholders to establish an infrastructure for credential management that meets sector requirements; filling foundational gaps will enable stakeholders to assess the risks and compliance-related benefits of solutions.

A credential management infrastructure includes credential lifecycle services, offered in the context of an architecture (or type of architecture, such as a Service-Oriented Architecture), a set of design patterns, and/or a set of standards. The context we will use includes SOAs, web services and identity management services as currently implemented, and emerging Web Service standards as appropriate to stakeholder requirements.

One facet of the identity and privacy challenge for the financial and medical communities involves establishing trust among the entities involved throughout the credentialing lifecycle. Trust in a web services environment relies on the ability to express security and privacy goals for identity information in a standard way such that they can be uniformly implemented and enforced, and, if desired, validated.

MITRE will define a standard way to express goals for identity information in a credential management system and will work with other team members and/or stakeholders to document relevant credentialing protocols. We will define a methodology for validating that those goals are met for interactions among the services, subsystems, or component systems in a credential management infrastructure. We will apply this methodology to existing credential management services and products, as recommended by stakeholders.

MITRE will leverage prior work on software design patterns and trust engineering, applying our expertise to web services-based credential management applications as defined in the framework. We will identify design patterns for enabling proper use of secure web services and work with those developing applications under this project, both to improve those capabilities and to demonstrate to stakeholders the usefulness of the methodology. MITRE will validate that the web applications do, in fact, satisfy the stakeholders' trust management goals and identify flaws in credentialing applications, where applicable.

Center for Education and Research in Information Assurance and Security. Purdue University:

No changes to the research plan in BP III.

Cornell University:

Cornell changed its PI for this project after the BP II proposal had been submitted, but before the award had been put in place between Dartmouth and Cornell. The PI changed from (b)(6) (b)(6) Cornell received written approval from Dartmouth for this change.

Project Abstract

A second set of activities will focus on exploring new ways of representing and implementing identity management, which have the potential of being more secure by virtue of leaking less information about identity, eliminating potential single-point failures, and enabling new styles of identity management applications. This second task carries some risk, since our development activity might not yield a solution wholly superior to existing commercial standards. However, the insight gained by creating new options is believed to outweigh the risk that the new options might have their own limitations. In addition, those same insights would likely provide valuable guidance to those existing commercial standards.

Objectives and Need

The goal of the overall project is the development of a system for secure identity establishment and credential management. The main technological elements underlying the envisioned solution are a new way to implement a single sign-on (SSO) abstraction, coupled with a new way to disseminate credential information.

In our I3P work, we are exploring two directions that build on this observation. The first explores technical issues such as scalability associated with the “standard” way of implementing identity management:

We propose a new way of implementing a single sign-on abstraction, one in which the task of user authentication is factored out of applications and concentrated in secure authentication servers. A user is considered authenticated if she can collect sufficient credentials from authentication servers to reach an application-defined threshold. Thus the compromise of a number of authentication servers below the threshold does not affect the security of applications, which is in contrast with today's state of the art. Further, the user can coalesce credentials acquired from multiple authenticators into a single token using threshold signatures, thus reducing the load on application servers stemming from credential checking. We have developed the architecture and implementation for this new single sign-on abstraction, called CorSSO, and propose to incorporate it with the other aspects of the I3P project.

We also propose a new way of disseminating information in wide-area systems in a scalable and failure resilient way using gossip protocols. Specifically, as part of the Quicksilver project, we plan to develop a message bus layer over our lower-level group multicast infrastructure, integrate it with our planned security architecture and debug the resulting software. This system provides a publish-subscribe platform which we then plan to use, as part of an integrated demonstration with other I3P team members, to implement a credential distribution platform that addresses the needs of our stakeholders.

Our second line of study will develop new and completely different identity management solutions:

We propose to develop and evaluate new zero-knowledge protocols for authentication and authorization, based on the cryptographic methods under development by (b)(6) these have the potential both to expand the technology options available to stakeholders, and also to create powerful new metrics for evaluating the security of identity management systems relying on the notion of zero knowledge.

We are also developing an innovative new identity management paradigm. In traditional identity management solutions, a set of organizations each maintains its own database. Users obtain separate credentials for each organization, but then hand these to a single sign-on service (such as CorSSO), which offers a single password through which the user can access all of his or her credentials. The downside is that if the single sign-on service is compromised, the security of all the federated services is lost. In effect, if Health Care Provider A contracts with Acme single sign-on, and Acme is compromised, Health Care Provider A's records may be at risk.

Such scenarios would likely erode confidence in the single sign-on service. The alternative we are exploring doesn't use a single sign-on service at all. Instead, we explicitly represent a graph of identity relationships: if Cayuga Medical Center (CMC) has a record for John Doe, and Mary's Pharmacy also has a record for the same person, an edge links the two records. However, our scheme is able to create these links without either end-point knowing what entity lives at the other end of the link: CMC knows that there is some other entity with a matching record, but not which one. Our basic methodology then compiles queries into a decentralized form that permits us to answer questions ("Is John Doe under any form of treatment that might represent a contraindication for this medicine?") without disclosing information beyond the answer to the query. We are using cryptographic mix technology to securely handle join operations. Beyond the novelty of the approach, we face challenges in dealing with scalability, fault-tolerance, and assessment of the privacy protection properties of the solution.

Establishing Credentialing Framework

The new identity management options we are exploring have the potential to eliminate the need for a traditional single sign-on service, replacing the functionality of such a service with a new form of decentralized query capability. In doing so, we eliminate a potential single point failure.

For purposes of scalability, we expect that our solution will require a distributed, secure and scalable event notification architecture. For this purpose, we are proposing to use Quicksilver, a new Cornell-developed platform. Past work has shown that strong guarantees, such as the exactly-once semantics provided by the TIB system, the leading software package in the publish-subscribe space, require excessive network overhead. The Quicksilver system instead provides probabilistic guarantees of delivery. Through stakeholder discussions, we will either ascertain that these guarantees are sufficient "as is" for credential management, or we will develop new protocols for disseminating credential-related data that provide stronger guarantees on top of our Quicksilver platform.

Cryptographic Security of Credentialing Solutions

Identity management systems rely on the security of cryptographic protocols to both establish the credentials of a user and to protect the user's privacy. Traditionally, under the simplest framework for security analysis, the security of cryptographic protocols is analyzed in *isolation*; that is, a protocol is analyzed under the assumption that no other cryptographic protocols are executed in the network. However, it has been shown that cryptographic protocols that are secure in isolation often *do not remain secure* when executed concurrently (with other protocols). Concurrent execution of protocols is inevitable and pervasive in large-scale systems, as is clearly the case on the Internet.

At Cornell, we aim to develop *new frameworks for security analysis* that provide the best aspects of traditional analysis:

- protocols can be designed and analyzed in a *stand-alone* fashion (i.e., the protocol is analyzed *in isolation* without taking into account the existence of any other protocols);
- stand-alone security of a protocol implies its concurrent security (i.e., stand-alone secure protocols *remain secure when executed concurrently with arbitrary other protocols*).

Our definitions will be based on the notion of zero-knowledge, but will extend beyond its traditional usage. Progress in this direction promises to have significant long-term implications for the design and security analysis of new identity management systems.

Finally, our work will leverage ongoing work on zero-knowledge protocols and secure multi-party protocols to create practical ways of measuring “knowledge” flow into and out of IDM systems. Our work will focus on developing new methods for defining knowledge flow, and on constructing new zero-knowledge identification protocols.

Specific anticipated tasks are as follows:

BP II Q1 Initial planning discussions and meetings with other team members to establish contact with stakeholders and develop plans for an initial requirements specification on identity management, to identify commonalities between our efforts and those underway elsewhere, and to refine our technology demonstration plans. Coordinate with other proposal participants to identify common stakeholder concerns and converge on a common demonstration scenario.

Status: Completed

BP II Q2

Develop a refined project plan for our new identity management framework and its use of the underlying Quicksilver platform, reflecting information gained through dialog with stakeholders. Develop a project plan for our new security framework. Design an implementation plan for the resulting architecture. Coordinate with other proposal participants to establish a common credential framework. Determine functional boundaries and establish an early API for each component.

Status: Completed

BP II Q3

Start implementation of the proposed new architecture. Identify suitable specific tasks (such as e.g., identification protocols) and develop efficient and concurrently secure protocols for this task. Complete the development of CorSSO.

Status: Completed. CorSSO software distribution now available from the Cornell “area” on the SourceForge site, with support available from Cornell’s CorSSO development team.

BP II Q4

Initial debugging and evaluation efforts for Quicksilver security architecture. Initial demonstration of the proposed architecture. Extend our security framework to more general tasks. Begin development of deniable zero-knowledge protocols.

Deliverables: (1) Initial “alpha” distribution of the new Quicksilver and Live Objects framework in a form suitable for early pre-production research tasks. (2) Internal technical report summarizing design of our new identity management architecture. (3) Research results (paper submissions, technical reports, protocols) for deniable zero-knowledge protocols.

BP III Q1

Completion of evaluation and preparation of our new systems, including the new identity management architecture and Quicksilver, particularly to the extent that Quicksilver may need to be extended for this application. Evaluate our new general security framework. Coordinate with other proposal participants to ensure operation as part of the common credential framework.

Deliverables: (1) General distribution of the Quicksilver and Live Objects framework in a form suitable for simple experiments, use

- **in classroom projects, prototyping. (2) Demonstration of our new identity management architecture suitable for use within the I3P team. (3) Research results (paper submissions, technical reports, protocols) for new identity management architecture and for deniable zero-knowledge protocols.**

BP III Q2

Working with I3P team members, demonstrate our technologies and solutions as part of a comprehensive solution to the identity management problem to stakeholders. Receive feedback and suggestions.

Deliverables: (1) Initial “alpha” version of our identity management architecture for use within the I3P team. (2) Research results (paper submissions, technical reports, protocols) for deniable zero-knowledge protocols. (3) Presentations at workshops and conferences on our I3P research and results.

BP III Q3

Refine and extend our platforms on the basis of feedback, improve evaluation and demonstration technologies to better showcase innovative content.

Deliverables: (1) Refinement of our identity management architecture for use as an I3P demonstration. (2) Research results (paper submissions, technical reports, protocols) for deniable zero-knowledge protocols. (3) Presentations at workshops and conferences on our I3P research and results.

BP III Q4

Work with vendors and stakeholders to facilitate bidirectional knowledge transfer from domain experts back into our effort, and also to encourage technology adoption from our effort by stakeholders where a strong match arises.

Deliverables: (1) Final release of our identity management architecture for research use by I3P clients. (2) Research results (paper submissions, technical reports, protocols) for deniable zero-knowledge protocols. (3) Presentations at workshops and conferences on our I3P research and results.

Georgia Tech Information Security Center:

Develop Proof-of-Concept Demonstrations

The skeleton application service will be based on a health care IT use case, as described next. Our technology demonstration will focus on applying our minimum disclosure credentials technology to personal health records (PHRs). PHRs are maintained by individuals who want to retain some control over when and how their personal medical information is used. There are a number of existing services that provide this function to interested parties. A vision for PHRs is also laid out in the ONCHIT/AHIC Use Case entitled "Consumer Access to Clinical Information". The following are some requirements for the PHR vision to be fulfilled. The source of a piece of information in a PHR must be verifiable. Integrity of PHR information must be maintained. A user should be able to annotate (but not overwrite or modify) information in their PHR. Users should be able to selectively disclose information contained within their PHR to different parties. We believe that our minimum disclosure credentials can be used to implement PHRs while satisfying all of these requirements. Health care providers will be able to sign a set of health information when transferring it to an individual's PHR. Individuals will then be able to supply subsets of that information to other parties, while preserving integrity of the information and source verifiability, through the root hash signed by the provider of the information. Our prototype demonstration will show health information being transferred from a dummy health care provider to an individual's PHR and then having a subset of the information sent by the individual to a third party, which will verify the information source and integrity. The ability to annotate the PHR as well as to set policies on information disclosure to different parties will also be demonstrated.

Milestones

In addition to the general project milestones indicated in the "Project Timetable", we will have several project-specific milestones as follows:

- 1) BP II Q4: demonstrate prototype of minimum disclosure credential management system.
- 2) BP III Q2: demonstrate skeleton application service for maintaining personal health records.
- 3) BP III Q4: demonstrate prototype of personal health record management system, which uses minimum disclosure credential mechanisms.

Information Trust Institute, University of Illinois at Urbana-Champaign:

No changes to the research plan in BP III.

SRI International:

No changes to the research plan in BP III.

ISTS INITIATIVE 7: SECURITY AND PRIVACY FOR REAL PEOPLE

Coordinator: (b)(6) Professor of Computer Science, Principal Investigator

In the third period of this initiative we continue the efforts on our originally proposed seven research projects. In this section we briefly describe the theme underlying these projects that was justified in greater detail in the original proposal.

When our original proposal was submitted in August 2006, we conducted an extensive and rigorous review process before arriving at the set of projects and budgets described below. In short, (a) the faculty lead(s) on each project prepared a full proposal detailing the motivation, plan, novelty, and impacts for the proposed research; (b) the full proposal was shared with a Research Advisory Board (RAB) comprising several external experts from industry, government, and academia; (c) we provided their written comments (de-identified) to the proposal authors; (d) the authors prepared a written response; (e) the ISTS Executive Director discussed the proposal with the RAB in a teleconference, and shared a written summary of the discussion with the RAB and the authors; (f) the authors prepared a final version of the proposal. In two cases the RAB asked to see a revised version of the proposal, thus repeating the steps above. This process provided critical input that shaped the scope and quality of the proposals, guided the ISTS Executive Director (Co-PI) in preparing the budget, and ensured that we are proposing only high-quality, novel research for funding.

This past December we held a Project Review of all our ongoing efforts funded through DHS/NCSD. Those participating on the review team from Dartmouth and ISTS included the Vice Provost for Research (b)(6) then Executive Director of ISTS (b)(6) and Associate Director of ISTS (b)(6). From DHS/NCSD, Director of Future Operations Richard Harris and Program Manager for Education and Training Brenda Oldfield participated. Each project lead and co-lead (as well as student and research representatives from various projects) provided detailed overviews of their work to date. Comments were provided to each project team at the time of the presentation and the teams have been working with the ISTS staff to address any outstanding questions.

Abstract

We are headed into an increasingly digital world. Today, we all engage with each other and with our organizations through computers, cell phones, and the Internet. Digital technology mediates much of what happens in the workplace, our schools, and our daily personal and civic lives. And yet we are faced with increasing threats to the security of our systems and to the privacy of our information. Tomorrow, the challenge only increases as the world fills with embedded devices, including not only computational and communications capabilities, but also the ability to sense and affect the physical world. Furthermore, the variety of roles and the tensions between organizational policies and end users' desired services leads to challenging social, economic, and technical issues for security and privacy.

As we seek solutions to improve our security and protect our privacy, we must develop solutions that work for "real people", meaning everyday employees, students, citizens --and their organizations. To this distinguishing feature we add an interdisciplinary approach, in which an understanding gained through sociological experiments -- or business-oriented studies of current practices -- informs technology development. The core research theme is aimed at security and privacy for everyone, with particular emphasis on how these issues relate to mobile computing and embedded devices.

Thus, our theme is Security and Privacy for Real People. As detailed in our original proposal, this theme addresses national needs, as defined by numerous recent research agendas.

In Budget Period III we plan to continue our efforts on the following seven projects.

AC – Foundations for Practical Autonomic Computing

Project Lead: [redacted] (b)(6)

This project is investigating technical, economic, business and social aspects of autonomic computing systems from the point of view of security and robustness.

DIST – Dartmouth Internet Security Testbed

Project Lead: [redacted] (b)(6)

We continue to deploy a large-scale testbed on the Dartmouth campus, including over 200 wireless “sniffers” and a set of servers for refining and scaling novel intrusion-detection and analysis tools. In addition to supporting intrinsic research on event-correlation tools and wireless intrusion-detection tools, this testbed will support research in the MetroSense, PKI, and possibly HBS projects, as well as other ISTS projects.

DVF – Digital Video Forensics

Project Lead: [redacted] (b)(6)

There is a significant need for mathematical and computational algorithms to detect tampering in digital media. This project is working to develop new techniques for authenticating digital video (in the absence of any watermarks or signatures).

HBS – Laboratory for Hardware-Based Security

Project Lead: [redacted] (b)(6)

We continue to set up a lab and to explore security applications of new directions in trusted computing hardware. The project supplies the equipment and staffing to get the lab going, in support of several intrinsic subprojects as well as other ISTS projects.

IRIDOE – Information Risk in Data-Oriented Enterprises

Project Lead: [redacted] (b)(6)

This interdisciplinary project will continue its examination of both the underlying organizational and business causes, as well as the business costs, of risky information security practices in enterprises. During this budget period we will focus on the healthcare industry.

MetroSense – Scalable Secure Sensor Systems

Project Leads: [redacted] (b)(6)

We will continue to study, analyze, design, deploy, and evaluate MetroSense, a scalable secure sensor architecture and system capable of reliable real-time monitoring and data fusion for large-scale critical infrastructure, resources, and assets. Results from this project will serve as a foundation for building secure sensor networks.

PKI – Interoperability and Usability for PKI Management

Project Lead: (b)(6)

We continue our focus on three different but related topics: making PKI technology usable, integrating it with the rest of the enterprise infrastructure, and interoperating it with other public key infrastructures external to the enterprise.

Project Overviews

FOUNDATIONS FOR PRACTICAL AUTOMATIC COMPUTING (AC)

Project lead: (b)(6)

Other investigators: (b)(6)

Background

Autonomic systems research is offering a seductive vision. Systems that can automatically diagnose, repair, defend and improve themselves would revolutionize information technology as we now know it. Current estimates of network maintenance costs, software complexity, and labor force trends paint a grim picture of the future for networked computer systems in terms of functionality, security and affordability. New directions and approaches are needed.

One possible approach to addressing these challenges is to encourage simplification and homogenization of the underlying software and application architectures. That is, one can deal with affordability, complexity and labor force constraints by insisting on simplicity and uniformity, essentially rebuilding the modern software base and the Internet from scratch. Not only has this approach failed to develop a business case over the years, it has actually been seriously questioned because of the monoculture risks it introduces. That is, diversity defends against single points of failure while, unfortunately, simultaneously catering to the lock-in strategy of many computer system and application software vendors.

Given these realities, we are exploring the basic science and technology for building self-aware, self-healing and self-configuring systems within the context and constraints of real-world information technology as it presently exists and will likely continue to evolve. Such systems would ultimately require user interaction only when key decisions need to be made, operating the majority of the time autonomously as individual devices and services as well as collectively as teams of machines and services. Such systems are called *autonomic* or *self-**.

This project is investigating technical, and to a lesser extent the economic, business and social, aspects of autonomic computing systems from the point of view of security and robustness. We first focus on critical government and business systems that are typically more managed and better defined in terms of functionality. Later in this project, we investigate the possible impact that our findings can have on consumer technologies that “real people” are more likely to use. Consumer autonomic systems are in some ways more challenging because of their dynamic nature and the lower degree of management found in consumer information processing systems.

Budget Period III Update

The project proposal defined several specific tasks, whose status is outlined below.

1. Design and implementation of an open, extensible sensing, analysis and actuation software architecture as a platform for this research. This task addresses the hypothesis that an open, extensible (that is, non-proprietary) framework can be developed for experimentation and evaluation. *This task has been completed with the completion of* (b)(6) *MS thesis work.*
2. Automated learning of operating modes, self-calibration of models for estimation and detection of those states, and learning of appropriate actuations. This task explores the hypothesis that operating modes, mechanisms for their effective, robust detection and resulting autonomic responses can be learned and tuned automatically, with minimal administrative input. *We have been exploring ways to compute and display a variety of simple regression-based profile system learning and predictions. We have been creating an interface to perform live learning and prediction in situ. This activity comprises one of the major intellectual and technical tasks of the project and will be continued through BP-III.*
3. Design and evaluation of performance and effectiveness metrics. This task is based on the hypothesis that autonomic systems' performance and effectiveness can be based on concrete metrics relevant to user, business and/or mission requirements. *We have begun to define quantitative metrics and started an investigation of the overall pitfalls/disadvantages of the basic approach. We have been working to validate the approach using different datasets collected from experiments conducted in a testbed setting. These activities will continue into BP-III.*
4. Identification of business and social implications of autonomic computing systems. This task addresses the hypothesis that autonomic computing may have significant positive and possibly negative economic and social implications if and when it is realized. *This task will be conducted toward the end of the project in BP-III.*

We have continued experimentation with various data mining concepts in an attempt to find relevant information for creating system profiles that would aid in detecting anomalies in system behavior. We have implemented and evaluated regression-based techniques using previously collected experimental data that simulates different workloads on a system. We have promising preliminary results using multiple regressions to create simple profiles that consist of regression coefficients determined from training data. Predictions using these coefficients appear to be promising for detecting anomalies in behavior. We are currently working on extending experiments to validate our approach, evaluating the results and writing a paper on the work done. We developed and deployed various actuation techniques.

DARTMOUTH INTERNET SECURITY TESTBED (DIST)

Project lead: (b)(6)

Other investigator: (b)(6)

Subcontracts: UMass Lowell, Aruba Networks

Background

This nation needs research that addresses fundamental challenges faced in the design, deployment, evaluation and validation of security solutions in a large, complex, heterogeneous operational network, and research that begins to address security and privacy challenges of the Internet of tomorrow – one built on wireless networks and populated with a wide variety of Internet-enabled mobile devices. We proposed to develop the Dartmouth Internet Security Testbed (DIST), a large-scale deployment designed to support these research challenges. The Institute for Security Technology Studies (ISTS), in collaboration with Dartmouth’s Peter Kiewit Computing Services, will deploy this integrated testbed comprising a wireless-network measurement infrastructure, a network-security monitoring center, and a suite of Wi-Fi capable mobile devices. The unprecedented reach of this testbed, with real-time monitors covering a substantial portion of the production campus network, set DIST apart from other security testbeds and other wireless testbeds. In support of the “Security and Privacy for Real People” theme of the ISTS projects under this award, this testbed will support many of the research projects proposed under this award, nurture new research initiatives, and create new educational opportunities in the form of advanced student projects based on real world operational problems.

Budget Period III Update

In this document (January 2008) we update the DIST project proposal (February 2007) to reflect changes regarding our plans for Budget Period III (April 2008 through March 2009). Please refer to the original proposal for background, motivation, related work, and details of our original plan. This document focuses on changes in scope, deliverables, milestones, and personnel.

DIST contains three components: a wired-network testbed (NSOC: Network Security Operations Center), a wireless-network testbed, and a pool of mobile devices (smart phones) for security research. We discuss each in turn, and then present an updated table of milestones.

It is important to note that this project is exploring new technical approaches and challenges in enterprise-scale information systems security and is therefore dealing with uncharted policy and process territory with respect to what security-related network information can be monitored, how that information can be monitored and what safeguards are in place to achieve the basic anonymity and privacy expectations of a campus-like community. In our discussions with both industry and government agencies, these issues are factors even when employees have consented to monitoring.

As a result, the DIST project has been resolving several important but necessary issues related to wide-spread network monitoring through internal discussions with the many different stakeholders. The resolution of those issues and the specific roles that different stakeholders are playing in the discussions will benefit future efforts in industry, academia and government who might undertake similar projects. However, these discussions have introduced some delays into the operational timeline of parts of the DIST project.

Dartmouth College, like most enterprises, values the privacy of its network users and wants to ensure that any privacy risks are well managed. In addition to completing the required

Institutional Review Board (IRB) review, we needed to conduct an in-depth review of the legal and ethical issues in the wireless- and wired-network monitoring aspects of the DIST project, and consult with senior management of Dartmouth College for approval to proceed. As a result of these internal reviews, the Provost agreed to allow the wireless-testbed research to continue, subject to certain conditions. Research on the wired-network testbed is still on hold, pending completion of the IRB review and on clarification of some of the legal issues involved; the testbed is physically complete and work continues on developing its software, so research can start as soon as all approvals are in place. The issues that have surfaced and their resolution over time will be documented to assist future research and development efforts at other institutions.

Note: Professor (b)(6) DIST leader, will be on sabbatical from mid-September 2008 through mid-June 2009, and will be out of the country starting in mid-August for the duration. Professor (b)(6) DIST co-leader, will be at Dartmouth and become the senior project lead. We have budgeted for 8.5 months of a Visiting Professor to take a leadership role in the wireless portion of the DIST project from mid-July 2008 through the end of March 2009. The PI will work with Prof. (b)(6) to select and appoint a suitable candidate before summer.

Wired testbed (NSOC)

The DIST Network Security Operations Center (NSOC) has been stood up and the capability (in principle but not in practice) to move data between the operational Dartmouth network and the NSOC servers has been established. Additionally, a variety of high-performance, low-level network traffic monitoring and analysis software systems have been designed, deployed and evaluated in off-line artificial testbeds in order to debug code and explore scalability issues. A kiosk for public display of network analysis data has been procured and has been prepared for placement in Dartmouth's main library foyer. Issues surrounding privacy and anonymity have informed the ongoing design of hash algorithms and storage techniques.

Several techniques for performing zero-th, first- and second-order correlations of network traffic and security event alerts have been identified and explored. By zero-th order correlation, we mean simply a listing of traffic and security events. By first order, we mean statistical summaries and trends in those event types. By second-order, we mean Markovian analysis that would suggest causal relationships between different types of events over time and across event category. This hierarchy of modeling is inspired by classical information theoretical processing originated by Shannon.

Since we have not yet started to process actual network traffic at scale, the major part of the exploratory evaluation and redesign efforts anticipated have not been happening. As a result, research staff time devoted to those tasks has not kept pace with original expectations. We will be allocating staff and conducting the proposed deployments and evaluations in the first two quarters of calendar year 2008.

Tasks: The original tasks follow, as numbered as in the original proposal. We follow each with an italicized comment on how we will address this task in Budget Period III (BP-III).

1. Developing a secure Network Security Operations Center (NSOC).

- (a) Establish a dedicated security Network Operations Center. *The physical space and technology required to make the baseline NSOC operational are in place. We developed access-control policies and mechanisms. This task has been essentially completed in BP-II.*

- (b) Obtain raw network-data and campus network security data feeds. *We have demonstrated the ability to obtain such raw data at scale although no data is flowing operationally at this time due to the need to address policy and legality issues. This subtask will be completed in BP-III.*
- (c) Implement mechanisms to anonymize sensitive data feeds. *We identified baseline techniques, but policy issues dictate using auditable mechanisms and techniques that can guarantee high levels of anonymity. This subtask will be completed in BP-III.*
- (d) Refine and deploy sensing and analysis software within the center. *This subtask will be undertaken after at-scale data begins to flow into the NSOC. The bulk of this subtask will be completed in BP-III.*

2. Monitoring and Analysis Technologies Research.

- (a) Advanced correlation of network security events and their dynamic display. Campus-wide network flow aggregation. Discover emerging “business processes” in an enterprise. Discover rootkit, botnet, spyware and other malware activity. *We identified several basic algorithms and conducted some off-line experiments. Meaningful development and evaluation will be done in BP-III.*
- (b) Analysis of reconfiguration of routers and firewalls. Integration of MAP, sensor data collected from projects such as MetroSense, with location indicators and building monitors. Incident response and forensics. *No effort yet on this subtask. Meaningful development and evaluation will be done in BP-III.*
- (c) Deploy, integrate and evaluate existing commercial solutions. Identify and commercialize promising technologies. *We have identified a variety of existing and developmental commercial technologies relevant to DIST. Meaningful evaluation will be done in BP-III.*
- (d) Monitor and analyze the user community’s response to security information. *Meaningful development and evaluation will be done in BP-III.*
- (e) Develop use cases and analyses for educational and outreach activities. *Meaningful development and evaluation will be done in BP-III.*

3. Educating students and the Dartmouth community at large.

- (a) Publicly visible displays. *We have procured and set up the public kiosk, which is part of the educational activity. We conducted initial experiments with a variety of visualizations. We will continue development and evaluation in BP-III.*
- (b) Classroom education in network security and incident handling. *Project personnel have been meeting regularly with Dartmouth Computing Services’ security team and students have been involved in actual security management and incident response on campus. Activity will continue in BP-III.*

Wireless testbed

The deployment of hundreds of wireless sniffers (“air monitors”, or AMs) across campus has been even more time-consuming than we expected. We currently have AMs deployed in one building, and will be installing AMs in several more buildings before the end of Budget Period II. Based on our detailed examination of network traffic statistics, visits to buildings around campus,

and discussion with campus leaders, we have developed a final list of buildings and an updated estimate of the number of AMs to install and of the installation costs. Our current estimate is that we will install 200 AMs, rather than 250 as proposed, due to higher installation costs and increased installation time. We expect to purchase one server and a disk-capacity upgrade to one of our existing servers, to support the new data-collection capacity of this network. We hope to complete installations by June 2008, but (assuming final approvals can be obtained soon) to begin experiments on the existing deployment within the next month or two.

In the proposal we anticipated that the network of AMs would also be used as a platform for stationary sensors, supporting the MetroSense project. The MetroSense project was using *motes*, small sensing/computing/communicating devices, which could plug into the USB port on the AMs we have been installing. It now appears that MetroSense may use few, if any, of our AMs for sensing. One reason is that the MetroSense project has shifted its emphasis toward cell-phone platforms and away from motes; the other reason is that it has been difficult to site AMs in locations where sensing would be of interest to MetroSense.

Personnel changes: (b)(6) is no longer involved with MAP or DIST, as he has chosen to focus on MetroSense. (b)(6) postdoc at the time we wrote the proposal, left for Google and we hired postdoc (b)(6) a recent graduate of Columbia University.

Partners:

- **UMass Lowell.** DIST includes a subcontract to Professor (b)(6) at the University of Massachusetts Lowell. Professor (b)(6) collaborates closely with the MAP team; his work will focus on developing an 802.11 MAC-layer state machine that allows a sniffer to follow the activity of Wi-Fi clients and to detect anomalies when a client behaves outside the standard parameters of the protocol.
- **Aruba Networks.** Our APs and AMs are products of Aruba Networks, and the MAP group has been collaborating with Aruba Networks research staff from its beginning. In Budget Period III we will jointly focus effort on translational research, developing one or more of three MAP ideas into advanced prototypes that are ready for entry into the Aruba product line: (1) a ring buffer of frames captured at each AM, which can be quickly snapped up by the central server (for later off-line analysis) after anomalies are detected; (2) spoof detection, a mechanism for recognizing when an attacker is pretending to be a legitimate Wi-Fi device so as to launch an attack; (3) active fingerprinting, leveraging earlier ISTS work that can remotely determine the brand and version of a Wi-Fi client's network card.
- **Intel.** We have an existing grant from Intel Corporation's University Research Council. In the recent phase of that grant, July 2007 through June 2008, we are collaborating with Intel on developing a distributed Wi-Fi attack-detection system. Although primarily based on Wi-Fi clients, we anticipate comparing and integrating this work with the MAP system developed on DIST.

Tasks: The original tasks follow, as numbered as in the original proposal. We follow each with an italicized comment on how we will address this task in Budget Period III (BP-III).

4. Developing a large-scale wireless-network monitoring facility.

- (a) Examine statistics from the existing wireless network, and conversations with Computing Services, to identify a set of buildings for the deployment of the testbed. Seek a representative sample of building types. *Completed in BP-II.*

- (b) Purchase and install sniffers after evaluating several technology options. *Evaluation completed in BP-II; 150 of 200 sniffers (AMs) purchased; some installed. Remaining purchases and installation to complete in BP-III.*
- (c) Refine the MAP architecture and in particular the configuration-management software to scale to a testbed of this size. *Rewrote the configuration software during BP-II; some refinements and improvements likely needed in BP-III after we can test it at scale.*
- (d) Develop software adapters that allow this wireless facility to supply a real-time feed of alerts and network activity to the NSOC above. *Not yet begun, due to delays in the installation of AMs and the operational status of NSOC.*

5. MAP wireless-network intrusion detection research.

- (a) Develop and evaluate methods for coordinated channel sampling. *Initial development complete in BP-II; evaluation and refinements may continue into early BP-III. In particular, we need the larger DIST testbed to evaluate at scale and in locations other than the Computer Science department.*
- (b) Develop and evaluate methods for refocusing. *Initial development complete in BP-II; evaluation and refinements may continue into early BP-III. In particular, we need the larger DIST testbed to evaluate at scale and in locations other than the Computer Science department.*
- (c) Improve the robustness of detectors, in the face of sampling and data loss. *We will focus on the spoof detector, evaluating and enhancing its ability to function in the face of sampling. Develop and evaluate a novel rogue-AP detector. UMass Lowell has completed its evaluation in BP-II, to the extent possible.*
- (d) Develop and evaluate VoIP-related anomaly detectors. *UMass Lowell has developed a mechanism that operates inside of the AP; we hope to evaluate this mechanism first at UMass and then in a limited number of AMs (used as APs) at Dartmouth.*
- (e) Develop methods to locate attackers. *We hope to investigate mechanisms based on robots that carry AMs (or similar sniffers).*
- (f) Evaluate our methods at scale; revise algorithms and implementations as needed. *This is the most important task, and the most likely to benefit from a testbed like DIST. We expect to conduct this work in April-August 2008.*
- (g) Release sanitized data sets for researchers around the world. *This task may or may not be possible, depending on our ability to sanitize the data and yet retain some research content. Thus, a major new thrust of our work will be to develop new, robust algorithms for sanitizing network traces.*

Smart phones

In the proposal we anticipated that the mobile devices would be “smart phones,” that is, portable personal devices with Internet capability as well as mobile telephony. We intend to purchase 13 smart phones, rather than 25, after more carefully estimating our needs and the cost of the devices and the cellular plans.

After carefully evaluating several different vendors and phones, including Nokia N800, N80, N95, and the Apple iPhone and iPod Touch, we chose the Apple iPhone as our platform. Our staff have already developed expertise in developing software for the device, it has embedded sensors that would be of use in the MetroSense project, it has Bluetooth, Wi-Fi, and cellular network interfaces, and it has Wi-Fi localization capability provided by Skyhook Wireless, a Boston-area company with which we collaborate.

We anticipate using this pool of smart phones to support several projects; this sharing makes more effective use of the devices. Some projects require user studies, in which the volunteers will use or carry the devices for a few days or a few weeks. During a user study that project will need a lot of phones, but in between studies it may only need a few for development purposes. We will arrange a schedule of such studies so that the phones can be shared by multiple projects. Currently, we anticipate using the phones for

- MetroSense, security team: evaluating our system for anonymous tasking and reporting.
- PKI project: evaluating PorKI and other authorization tools in the Dartmouth campus and partner medical environments, both to test usability and to gain insight into requirements for authorization technology in this space.

Tasks: The original tasks follow, numbered as in the original proposal. We follow each with an italicized comment on how we will address this task in Budget Period III (BP-III).

6. Establishing a testbed of smart phones for research.

The goal of this task is to acquire and configure a small collection of smart phones for use by research projects – to include the PorKI project described above. Specifically:

- (a) Study available smart phone products to identify which appear to be suited to the research projects we have planned. *As discussed above, we decided in BP-II to use iPhones because of their technical capabilities. Additionally, we believe that these devices' recent popularity in the media may aid in attracting user study participants.*
- (b) Purchase and configure these smart phones. *Project personnel are working in BP-II to refine software development environment for iPhones. Apple plans to release official SDK in February 2008; we anticipate that this software will make development for this platform significantly easier for research teams.*
- (c) Provide them to researchers and project groups as needed to conduct their research; maintain tight control on inventory; update software as needed. *MetroSense and PorKI teams will continue their development on a limited number of purchased iPhones. The teams will coordinate their use of the pool of devices for conducting both long- and short-term studies.*

The PorKI research is funded outside this proposal, although enabled by the equipment provided in this proposal.

Milestones

Many of the milestones have shifted to later quarters, due to: (1) delays in obtaining project approvals, (2) delays in deploying wireless hardware, and (3) delays in shifting MAP staff to DIST, due to a no-cost extension on prior MAP funding and the need to wrap up tasks there. Although many tasks are starting late, we anticipate completing all research by the end of the grant period (except in specific tasks as described above).

	TASK 1	TASK 2	TASK 3
Jun. 30 ('07)	Find space, install NSOC	2a start, 2d (as needed), 2e as appropriate throughout the project	3a start (public display)
Sep. 30		2a, 2b start, 2d	
Dec. 31	Maintenance, and upkeep	2a, 2b, 2d	3a
Mar. 31 ('08)	Acquire feeds	2a, 2b, 2c start, 2d	3a (create website)
Jun. 30	1b, 1c, 1d	2a, 2b, 2c, 2d	3a, 3b (spring term class)
Sep. 30	...	2a, 2b, 2c, 2d	3a (public displays)
Dec 31	...	2a, 2b, 2c, 2d	3a
Mar 31 ('09)	Maintenance, and upkeep	2a, 2b, 2c, 2d	3a

	TASK 4	TASK 5	TASK 6
Jun. 30 ('07)	4a start	(MAP on other funding)	6a start
Sep. 30	4a end; 4b start	(MAP on other funding)	No activity (internship)
Dec. 31	4b continues; 4c start	(MAP on other funding)	6a continues
Mar. 31 ('08)	4bc continues	5d starts on DIST	6b purchase, configure
Jun. 30	4bc end; 4d	5abcfehg starts on DIST; 5abc complete	6c – phones available
Sep. 30	Maintenance, and upkeep	5efg continue; 5f complete	6c – phones available
Dec 31	...	5eg continue	6c – phones available
Mar 31 ('09)	Maintenance, and upkeep	5eg complete	6c – phones available

DIGITAL VIDEO FORENSIC (DVF)

Project lead (b)(6)

Background

We are living in a world where seeing and hearing are no longer believing. The technology that allows for digital media to be manipulated and distorted is developing at break-neck speeds. These advances in digital technology are affecting nearly every corner of our lives: law enforcement, the courts, the media, scientific journals, medicine, business and more. At the same time our understanding of the technological, ethical, and legal implications is lagging behind. To this end, there is a significant need for mathematical and computational algorithms to detect tampering in digital media.

We have developed several new techniques for authenticating digital video. As described in our original proposal, these include detecting double MPEG-compressed video, detecting duplicated frames or regions in video, detecting inconsistencies in interlaced and de-interlaced video, and detecting bootleg video created by filming a video from a theater screen. In addition, we have developed techniques for stabilizing and enhancing low-quality video.

Budget Period III Update

Our plan for this coming year is to complete the development of several more video forensic tools, which includes detecting blue-screening, and digitally inserted video into an authentic video. We also propose to port these tools from their current MatLab implementation to our Java-based forensic software. To this end, we have budgeted additional funds to help support a part-time programmer, and one additional month for Professor (b)(6) as project lead. The programmer (b)(6) has been working with Professor (b)(6) for two years in the development of our image forensic software. (b)(6) will be responsible for porting our video forensic tools into our forensic software. In so doing, we make these tools more accessible to law-enforcement agencies.

LABORATORY FOR HARDWARE-BASED SECURITY (HBS)

Project lead: (b)(6)

Other investigator (b)(6)

(b)(6)

Background

Securing computation persists in being a significant unsolved hard problem in our nation's information infrastructure. A simple look at history—or the most recent issues of BugTraq or even The New York Times—show that, over and over again, society cannot manage to build and deploy computing applications that actually are secure.

When a problem persists in being unsolvable, it's time to consider changing the problem. In this case, an inescapable fact of computation is that it must take place on computing hardware. Consequently, a promising approach to making this hard problem easier is to change this basic hardware. This idea is not just a pie-in-the-sky lab dream, but rather is something coming in the next wave of real systems. Trusted Platform Modules (TPMs) are already shipping, and the Trusted Computing Group (TCG) consortium continues to crank out new specifications; Intel will

be shipping CPUs enabling virtualization (the VT chipset) and secure hypervisors (LT); AMD has its own alternatives. IBM is shipping the multicore CELL processor that uses hardware structure to protect user processes from malicious kernels; Intel promises that multicore will soon give us more processors at the client than we'll know what to do with.

The goal of this project is to establish a laboratory. Rather than piecemeal exploration via paper designs and occasional hardware, we want to establish a foundation to systematically explore the security implications of this next wave of architecture. This work will broach several fronts: vulnerabilities in current trusted computing architectures; designs and prototypes to fix these vulnerabilities; designs and prototypes of new architectures; and prototypes of applications of current and new architectures.

Budget Period III Update

In BP III, we see thrusts in the following areas:

YASIR

We plan to develop an FPGA (Field Programmable Gate Array) prototype of the YASIR solution, and eventually the YASIR 2.0 solution (which we're working on now). We would also like to push for standardization of YASIR. Our goal is to finish all these YASIR efforts by the end of BP-III, but progress depends on whether we can recruit new students to tackle this task.

Data-structure Authentication

Our "Faerieplay" project looked at how to efficiently do general computation when only a small device is trusted. Our batch pairing and DSA work looked at how to accelerate certain types of cryptographic operations when only a weak device is trusted.

In the future, we plan to continue this work and explore additional techniques in data-structure authentication or encryption. We want to identify a real-world scenario, exploit its uniqueness, and develop a solution for it. One possibility: RAM encryption at the OS level with hardware help to efficiently control the processes' access to the memory space.

Build a Better TPM

So far, we have designed a "puzzle security module" to combat distributed denial-of-service (DDoS) attacks, and (in (b)(6) thesis) worked on extending TPM measurements to take memory changes into account. We would like to extend both of these projects. First, we'd like to prototype the PSM. More ambitiously, we'd like to integrate our trusted container/TPM work with dtrace-based OS instrumentation, and thus extend things such as attestation and key-binding from *static* functions of *measured memory* to *dynamic* functions of more general system behavior.

CPUs

We plan to get to the point where we can build security-relevant experimental CPU changes into OpenSPARC, and then prototype and evaluate the design in FPGAs. We would also like to carry out the "integration with RSE" idea sketched in our original proposal: taking techniques such as Faerieplay, our crypto and data structure work, and new things we come up with, and building these as options into UIUC's "Reliability and Security Engine" framework.

Nymble

Toward the end of the Nymble project, we hope to test it using an IBM 4764 as a high-performance trusted server.

Education

Over the last several years, Professor (b)(6) s had a chance to revive both the undergraduate and graduate OS courses at Dartmouth, by focusing on how textbook concepts get implemented in real-world systems, and then letting students get their hands dirty seeing it for themselves. As part of the HBS project, the Lab is building up expertise in digital design and simulation (and, with OpenSPARC, real CPU exercises). It would be nice to leverage this expertise to similarly revive the architecture courses, by giving students the chance to get their hands dirty. (This aspiration is in addition to the security-specific education we have targeted.)

While we are generally on track in our execution of the research, we are underspent for several reasons (loss of the original co-leader of the project, a difficulty recruiting new students, slower equipment purchasing in some cases, and much more cost-efficient purchasing in other cases). We revised the budget to reflect these changes, and some remaining funds will be reallocated to other projects.

INFORMATION RISK IN DATA-ORIENTED ENTERPRISES (IRIDOE)

Project leads: (b)(6)

Other investigators: (b)(6)

Background

Many modern industries share and operate on information. As with the rest of society, these industries are moving their operations into electronic settings. In some fields (such as the financial sector), operating on data electronically offers a vital competitive edge; in other fields (such as in health care), operating on data electronically can be a very desirable cost-cutting measure. In both cases, firms are faced with the challenge of channeling the right information to employees, while ensuring that these information systems do not provide data entitlements that inappropriately enable misuse or violate customer privacy.

With a research team from computer science and business, we are investigating how information risk can be articulated and monetized with the goal of developing lifecycle management approaches to information provisioning. We are developing models of both the organizational and system application structure to allow us to simulate the effectiveness of potential technical and access policy changes. For example, a model of an organization that allows the simulation of employee hiring, termination, promotion, and supervisory relationship changes enables us to predict how auto-provisioning users with a certain role at a certain lifecycle event would affect the overall system. We are also examining the role of incentives within organizations to reduce over-access to information. Using game theory, we will examine how policy changes could reduce risk. This interdisciplinary project will benefit data-oriented enterprises by both analyzing many current “best practices” for provisioning and developing new approaches that reduce information risk.

We see this project as building on our *Information Risk in the Professional Services (IRIPS)* project (funded by NIST), and feeding ideas and tools into our Institute for Information Infrastructure Protection (I3P) *Insider Threat* project.

Budget Period III Update

We are grateful for the positive comments from the reviewers during the December project review. As requested by the reviewers, moving forward we will be careful to explain any

perceived overlap between the IRIDOE project and the I3P projects (Insider Threat or Economics). In the case where we leverage learning or results from another project, we will call that out explicitly in our report. Moving forward, we will also clearly outline personal or student involvement in specific projects.

For BP-III we plan to continue as we originally outlined in the proposal, without any changes in the deliverables. We note the following time shifts of work between BP-II and BP-III:

1. **Staffing:** We are addressing personnel underspending in BP-II with the addition of a new postdoc in BP-III.
2. **Workshop:** We deferred the planned workshop until winter 2009 for several reasons:
 - a. We ran another workshop (funded by I3P) in October 2007 that allowed us to get part of the feedback and ideas we needed at that point.
 - b. We decided it would be better to run the workshop later when we could share our modeling results, thus improving the technology transfer of the project.
3. **Travel to partners:** We shifted a planned 2-week internship with an industrial partner into BP-III for several reasons, including:
 - a. We had a very successful initial internship (funded outside of this project) and several subsequent visits with our partners both in New York City and Hanover, NH. From that we learned much of what was needed to drive phase I.
 - b. Thus, we decided that we wanted to defer a second extended visit until our modeling efforts could be shared with our partner.

METROSENSE: SCALABLE SECURE SENSOR SYSTEMS (METROSENSE)

Project lead:
Other invest

(b)(6)

Background

Sensor networks will provide a foundation to protect and monitor our national infrastructure, including economically important businesses with global reach (e.g., stock markets), critical transport and industrial facilities, the enterprise, and our international borders. These tiny, low-cost wireless devices embed on-board sensing, are fully programmable, and can spontaneously form large sensor webs with thousands of distributed sensor devices. In this project, we will study, analyze, design, deploy, and evaluate MetroSense, a radically different scalable secure sensor architecture and system capable of reliable real-time monitoring and data fusion for large-scale critical infrastructure, resources, and assets. MetroSense opportunistically leverages mobile sensors when available to deal with sparse coverage and communications when sensing. We plan to develop a campus-area sensing architecture based on three integrated components (sensing and communications, sensor security, and sensor fusion) and deploy the system incrementally across campus with the goal of using static and mobile sensors for reliable monitoring and data fusion of campus plant, spaces, and people flow. Results from this project will serve as a foundation for building secure sensor networks capable of monitoring large-scale critical infrastructures.

Status

The MetroSense proposal identified a number of important research tasks for each of the three research strains, that is, Metro-Sense, Metro-Sec, and Metro-Fuse. The project is divided into two phases: Phase 1 funded by a NIST grant, and Phase 2 funded by this NCSA grant. In what follows, we discuss the progress of the overall project, its impact on the broader research

community, and revisions to the initial project goals (mostly in terms of more emphasis on mobile sensing using mobile phones and their interaction with embedded sensors) and Phase 2 milestones.

The overall project is making good progress on the Phase 1 schedule, given its late start due to several delays in recruiting staff and students. We now expect the NCSD-funded Phase 2 of the project to end March 2009. There has been significant progress on the main aim of the research project: to study, design, analyze, develop, secure, and evaluate a radically sensor network that could scale to operations in very dense environments such as a town, city, or metropolis. We focus on revisions to the Phase 2 tasks later in this report.

The project has delivered against a number of the tasks in the areas of sensing, communications, security, and fusion. We have developed software and systems, built and experimented with applications. The project has published 18 papers in top conferences and leading journals, presented talks and keynotes at several conferences and workshops, and helped spawn new international meetings on the topic on the project. As a result, the broader MetroSense project is widely seen as a leader in the new field of large-scale sensing for urban environments. The project is also supported by grants and equipment from Intel Corporation, Nokia, and Motorola, showing broader relevance to industry.

In recent months the project has focused more on mobile sensing rather than on static sensors. We believe that future city-scale sensor networks will be based on a hybrid approach where scale is gained from the convergence of the mobile phones and their interaction with embedded sensors. We have pushed hard in this direction and are developing new sensing, security, and fusion paradigms for sensor-enabled mobile phones that we believe will be ubiquitous over the next decade. An interesting question is: how best can these resources be exploited to address security issues that are critical to national security and the protection of people and infrastructure. We believe the MetroSense project will provide research findings relevant to this question.

Over the next year we will be conducting large-scale experiments around the Dartmouth campus and Hanover area, feeding large numbers of live sensor streams to the fusion models developed by the Metro-Fuse strand. The ability to securely task these mobile devices and exploit their resources in an opportunistic manner is a primary area of interest. The Metro-Sec strand has recently developed breakthrough technology to address the problem of anonymously tasking mobile phones and anonymously collecting sensor reports. The Metro-Sense strand has developed fundamental algorithms for sensing and communications.

Note: Professor (b)(6) MetroSense co-leader, will be on sabbatical from mid-September 2008 through mid-June 2009, and will be out of the country starting in mid-August for the duration. However, his portion of the project will be largely complete by August 2008. Only Dr. (b)(6) postdoc, will remain on the project beyond August and only through October. These extra months will allow (b)(6) to wrap up work on the Metro-sec components, with Professor (b)(6) collaborating remotely. Profs. (b)(6) can provide on-site oversight as needed.

In what follows, we discuss each research strand and then summarize the revised Phase 2 milestones and discuss any changes to scope.

Metro-Sec Research Strand

We are on track with respect to our proposed Phase 1 tasks (numbered as in the proposal):

1. Formalize a security model. Basically complete.

2. Explore whether this model is reasonable. Basically complete.
3. Design a system for anonymous tasking and reporting: *AnonySense*.
4. Develop a protocol for secure tasking and reporting. Mostly complete.

We are wrapping up these tasks in the remaining months of our NIST funding. In this NCSD grant, we planned to start Phase 2 during Budget Period II:

5. Develop a protocol for delivering reports via multi-hop links. We have decided to set aside this approach, because we have shifted the project's focus to mobile devices (such as cell phones and PDAs) that have frequent reliable connections to the network infrastructure (via cellular or Wi-Fi links).
6. Testing the Phase-1 methods at scale. In Fall 2007 we tested our methods in the lab, with detailed performance measurements. In the remainder of Budget Period II, and in Budget Period III, we plan to purchase additional devices and test the methods with a larger number of nodes.
7. Develop protocol for anonymous tasking and reporting. Mostly complete.

There are many details remaining to be resolved in the above tasks, and in Budget Period III we will address some of those details. In the time saved by dropping task 5, we can address some of the optional tasks. In the course of the work, however, we have identified two important, and interesting, research problems:

- (a) *Data integrity*. How does the system assure the integrity of the sensor data returned by anonymous mobile nodes? Our current approach is to assume that mobile nodes include trusted hardware (TPM) that can certify that the mobile node is running the right software and is untampered. There are many subtle issues, however, and we also seek to find a solution that may not require trusted hardware.
- (b) *Identifiable data*. Our focus thus far has been on delivering the original MetroSense vision, in which nodes anonymously sense and report data for other user's applications. Many useful applications, however, require or benefit from the association of user identity with the data. For example, health-related applications that collect medical data for use by the person, his family, and his medical doctor. For another example, social-networking applications in which users wish to share sensor context with their friends. We seek to integrate mechanisms for non-anonymous reports into AnonySense, and to incorporate the necessary access-control mechanisms.

Metro-Fuse Research Strand

The MetroFuse activity is focused on sensor signal processing and fusion. We have initiated study of a real-time complex data feed that is notionally similar to MetroSense sensor data when that becomes fully operational and continuous. That effort has involved building an appropriate API as well as data structures for holding data for *in situ* processing. The group has continued to develop various approaches to learning of behaviors using regression, automata theory and epsilon machines.

A major area of our investigation is process detection within a sensor network framework. There are three specific subtasks related to MetroFuse, as follows.

Subtask 1. Support two phases of an eventual campus-wide rollout of a building and infrastructure sensor network; the first phase being instrumentation of several buildings; the second phase being a wider deployment to other buildings and infrastructure. We will build preliminary models of simple infrastructure-relevant processes such as fires, power outages, and communications network outages, for evaluation in the PQS engine with the available sensing infrastructure. The major hypothesis of this subtask is that the proposed security, communications and fusion techniques are not mutually exclusive and can be implemented simultaneously, effectively and efficiently. **Status:** Actual deployment of building instrumentation is pending approvals of the IRB and other efforts on this project. A standalone testbed of acoustic sensors has been implemented to experiment with sensor calibration and various process learning approaches and algorithms.

Subtask 2. Implement and evaluate process-based analysis using existing Process Query Systems technology to support scenarios such as those described above as well as campus-wide incidents. The associated models will include larger outage and fire events that affect multiple buildings and more heterogeneous sensing capabilities. The major hypothesis of this subtask is that process-based fusion techniques can be implemented effectively and efficiently in the MetroSense framework. **Status:** We have conducted a comprehensive survey of process and state-machine learning technologies and results, reviewing results going back to the 1980's. Depending on the learning criteria, there are a wide variety of both positive and negative results. For example, learning minimal representations of automata has been shown to be NP-Complete by Pitt and Warmuth, while on the other hand, PAC-learning of probabilistic deterministic finite automata has been shown very recently. Additionally, there have been several positive results on the learnability of PDFAs in the computational dynamics/physics community, most notably by Crutchfield in the early 2000's. We have started a program of algorithmic design and experimentation based on matrix algorithms such as the SVD for process learning, which appears to be a new approach for the discrete automata domain.

Subtask 3. Implement and evaluate security and integrity checks on a campus-wide sensor network deployment using the foundations developed in subtasks 1 and 2 from above. This subtask will involve integration with the project's security work. The major hypothesis of this subtask is that the proposed security, communications and fusion techniques are synergistic in the sense that data fusion capabilities can be used to determine failures and attacks against the sensing infrastructure. This functionality is in addition to the environmental data fusion and alarming described above in subtasks 1 and 2 of this task. That is, we will determine whether and to what extent sensors have been compromised or are failing otherwise. This hypothesis will be evaluated on this subtask's deployment with respect to the key fusion metrics of false positives and false negatives but now with respect to attacks or failures on the sensor modules, sensor reporting mechanisms and communications architecture. That is, we will determine the false positive/negative rates with respect to compromises and failures of the MetroSense implementation itself. **Status:** This subtask will be initiated when the deployment becomes closer to being operational so no effort has been expended on this subtask yet.

Metro-Sense Research Strand

We are on track with respect to our proposed Phase 1 tasks (numbered as in the proposal):

We have made several important advances have been made, in our earlier work, in developing an architecture that underpins large-scale secure sensor networks. Briefly, we have developed a

comprehensive architectural framework for the MetroSense project, investigated problems such as scaling (subtask 1) and asymmetrical transport design with our contribution on SIMON, ACORN and mobile IEEE 802.15.4 measurement analysis (subtask 2), tiered network deployment (subtask 3), mobile sensing (subtask 6), application design (CenceMe, BikeNet, more recently MetroTrack) (subtask 5), and real-time and delay-tolerant sensing (subtask 7), and testbed deployment across the Computer Science department (subtask 9).

We considered several new problems including calibration and scalable inferencing of activity on mobile phones.

We are wrapping up some of these tasks in the remaining months of our NIST funding. In this NCSD grant, we planned to start Phase 2 during Budget Period II; however, due to various delays many of the staff have yet to move from NIST funding to NCSD funding and thus most work on these tasks will not begin until Budget Period III.

We plan continue the design, implementation, and testing of *in situ* sensor sharing, CenceMe and SIMON among others. Our end goal is to develop the technology to a 100% working prototype and publication in a top-tier conference. We plan to grow the static network out to another building and study the interaction of phone-based sensing with the static sensor web. We further plan to implement the CenceMe system and conduct a large-scale experiment.

We plan to develop out a more streamlined BlueCel. We plan to develop the MetroTrack application and build it over the MetroSec algorithms and software for anonymous tasking. We plan to conduct a large-scale experiment with 40 people in February and provide the data sets to the fusion group for analysis. In March and April 2008 we will develop a paper from the experiments. We will be working closely with the Metro-Fuse group during this phase of the project. To some degree this is the first experiment that will yield significant mobile sensing data to be modeled and analyzed by the Metro-Fuse group.

Revised Phase 2 Milestones

The project end date is now March 2009. We focus on revisions to the phase 2 tasks below.

June 30, 2008

Mobile sensing: Move toward 30-person mobile experiment with continuous operation over a two-week period. Based on the CenceMe application running on mobile phones and backend infrastructure, we will feed streams for analysis to the Metro-Fuse group.

Security: Evaluate anonymous tasking and reporting protocols in a larger testbed (a dozen devices, at least). Design and prototype a solution for assuring integrity of sensor data. Design and prototype a solution for handling identifiable sensor data, and integrate with our existing AnySense framework. Write and submit one paper.

Fusion: analyze large numbers of continuous mobile sensor streams, evaluate the impact on network performance and assess the security requirements.

Testbed: Integrate building monitoring system for Computer Science and Thayer School of Engineering. Build out the mobile phone sensor network and study its integration with the static networks in Computer Science and Thayer. Evaluate CenceMe sensing application.

September 30, 2008

Mobile sensing: Design, implement and evaluate data sharing and distributed sensing protocols localized in control zones around a mobile phone. Integration of mobile phones and the already

mature static sensor network deployed in Computer Science. Identify scalability principles and remaining challenges.

Security: Evaluate our solutions for assuring data integrity and for identifiable sensor data; write and submit one paper.

Fusion: develop scalability principles for the MetroSense mobile sensing testbed. Explore the design and development of a process design software tool for building complex infrastructure models based on the experiences of the first 18 months.

Testbed: Extend the mobile sensor testbed.

December 31, 2008

Security: (Although most security-team members will leave the project well before December, one or two may remain active in this reporting period.) Revise and present papers. Identify scalability principles and remaining challenges.

March 31, 2009

Demonstrate the interworking of MetroSense components METRO-SENSE, METRO-SEC, and METRO-FUSE using a set of mobile and static sensor applications across several campus spaces (building and outdoor spaces). We will choose applications that include static building-wide monitoring and fusion and people-centric applications, with the aim of using 500 mobile sensors in an experiment using faculty and students.

Testbed: Complete and evaluate CenceMe application.

INTEROPERABILITY AND UsABILITY FOR PKI MANAGEMENT (PKI)

Project lead:

Investigators

(b)(6)

Background

Enabling the humans and organizations that use the real-world information infrastructure to easily make the right trust judgments about other entities in this system is an ongoing problem. Public-key cryptography is a critical building block here because it can enable verifiable assertions between parties who do not share secrets beforehand. However, the public-key infrastructure (PKI) that effectively solves these trust problems still eludes us. The existing technology provides pieces of solutions, but still leaves us with obstacles. This project aims to overcome these obstacles by focusing on how to fit the technology to human requirements, rather than imposing upon the humans the trust structures convenient for the technology.

Budget Period III update

This project consists of three components, research, development, and outreach. Each component of the project is proceeding generally in line with the original proposal, although some items are delayed and others are actually ahead of schedule, making the overall progress about on par with original plans.

Development

We designed, implemented, and released *LibPKI*, an easy-to-use high-level open-source PKI library and API specification. This library helps application developers to focus more on functionality than on technical details – which, in many cases, are

difficult for inexperienced developers. LibPKI also helps code portability among different cryptographic libraries, i.e., it provides an abstraction layer similar to what *PKCS#11* provides for hardware tokens.

With respect to the original proposal, the development of LibPKI is proceeding as expected. We do not envision major changes in the proposed milestones regarding the development of LibPKI. The software already has been made public and it is currently mirrored across the world. Although the envisioned objectives of LibPKI have been met, because of the delay in the Phase 3 of the research agreement between Sun Microsystems and Dartmouth, we were not able to leverage the OpenCA-NG project as a test bed for LibPKI.

In the next period we will focus the development of LibPKI on providing easy access to TPM and PKCS#11 devices. Moreover, we will proceed to study and design a PKI Management Messaging protocol that will enable querying CAs for certification services.

Research

We developed and prototyped the *PKI Resource Query Protocol (PRQP)* and promoted it in the real world via an Internet Draft. The new PRQP protocol addresses the unavailability of PKI resource locators (such as certificate repository URLs) by providing an efficient and easy method for a client to request the needed data.

The PRQP proposal is moving much faster than we expected. We were able to propose and discuss PRQP at a major PKI conference last summer. At IETF, we were able to push for the proposal to be voted on for adoption as an Experimental working group item. The straw poll vote passed in December 2007.

With respect to the original proposal, the publication of the first Internet Draft on PRQP (originally expected by April 2008), as outlined above, has already occurred. At the next meeting of the IETF, in March 2008, the Working Group will decide if it becomes an Internet RFC. This advance in the research portion of the project also pushed us to develop a PRQP server and client ahead of schedule (originally expected by April 2008). We expect to publish an update of the draft of the protocol soon. One unexpected effect of our early results is the interest demonstrated by the Computing Grid community.

Our activities for the next year will be focused on the standardization effort for PRQP and its Peer-2-Peer extension. Although we expect to achieve tangible results by the fall, we have already started, and we will continue, to study the available options on how to extend PRQP to provide a reliable discovery system that leverages existing P2P networks. By combining PRQP together with Peer-to-Peer (P2P) technology, we plan on providing a distributed solution to the PKI resource discovery problem.

Outreach

Some of the original outreach activities have been delayed to coordinate with industry and community partners who are participating in (and sometimes controlling) the agendas of the targeted events. It was always anticipated that the final phase of the project would include more outreach activities than the earlier phases, to showcase and promote the outputs of the research and development components of the earlier phases. Due to the success of the project to date, it is anticipated that demand for participation in outreach activities relating to all components of the project will increase during the final phase.

Over the remainder of the project, we will continue to focus on five main objectives:

1. Continue to participate in PKI-related working groups and industry forums and discussion lists, hold PKI training sessions for higher-education institutions where appropriate, and seek to establish a PKI Usability working group in the most appropriate forum;
2. Continue to promote PRQP and LibPKI in PKI-related working groups and industry meetings and discussion lists, along with PKI Usability as mentioned above;
3. Publish research papers demonstrating the applicability and use of PRQP and LibPKI, and the importance of and issue surrounding PKI usability;
4. Seek a viable strategy for the long-term sustainability of the HEBCA project through the development of a business plan with the assistance of students from the Tuck School of Business at Dartmouth;
5. Continue the development of CAPSO-- an easy to install and run CA platform-- as an interim alternative to OpenCA-NG.

A research and development project achieves the best results when coupled with a comprehensive set of outreach activities. To promote the project's results we plan to attend the following conferences:

January 2008 – March 2008

- Identity Assurance SIG kick-off meeting, January 30, Washington D.C.
- EDUCAUSE CAMP Workshop, "Bridging Security and Identity Management", February 13-15, Tempe, AZ
- Open Grid Forum #22, February 25-29, Cambridge, MA
- 7th Symposium on Identity and Trust on the Internet (IDtrust 2008), March 4-6, Gaithersburg, MD
- 71st IETF meeting, March 9-14, Philadelphia, PA

April 2008 – March 2009

- TAGPMA F2F #7, April 2-4, 2008, Oakland CA
- Internet2 Member Meeting, April 21-23, 2008, Arlington, VA
- Open Grid Forum #23, June 2-6, 2008, Barcelona, Spain
- Fifth European PKI Workshop, 16-17 June, 2008, Trondheim, Norway
- Fed-Ed PKI Coordination Meeting #16, June 19, 2008, Washington, DC
- TAGPMA F2F #8, July 21-23, 2008, Merida, Venezuela
- 72nd IETF, July 27 - August 1, 2008, TBD Europe (Provisional)
- Internet2 Member Meeting, October 21-23, 2008, New Orleans, LA
- 73rd IETF, November 16-21, 2008, Minneapolis, MN
- TAGPMA F2F #9, December 2-4, 2008, La Plata, Argentina
- Fed-Ed PKI Coordination Meeting #17, December 11, 2008, Washington, DC USA
- EDUCAUSE CAMP Workshop, "Bridging Security and Identity Management", February, 2009, Tempe, AZ
- Open Grid Forum #25, February, 2009, TBD USA
- 8th Symposium on Identity and Trust on the Internet (IDtrust 2009), March 2009, Gaithersburg, MD

ISTS INITIATIVE 8: EDUCATION AND CURRICULUM DEVELOPMENT

Coordinator (b)(6) professor of Computer Science and Principal Investigator

In this initiative we are conducting two educational projects. We developed and reviewed these two education projects using the same RAB process we used for research projects described in the management plan. The Secure Information Systems Mentoring and Training (SISMAT) project was reviewed during the December 2007 project reviews as well (the Business Education for the Security Professional [BESP] project was not as no work had yet been conducted).

Abstract

Numerous information-security policy documents have emphasized the need to educate a new generation of researchers and developers who can help design and build a secure cyber infrastructure for the nation and the world, and the need to encourage and support faculty who move into this field. The objective of ISTS in this initiative is to use educational programs to build the nation's capacity to conduct advanced research in cyber security and trust and to train undergraduate and graduate students in cyber security. These programs are highlighted below. Since the BESP project requires no funds from Budget Period III, we include no BESP proposal in this document. (The course will be held during Budget Period III, using funds carried forward from Budget Period II.) We include an update on SISMAT progress in a section below.

BESP – Business Education for the Security Professional:

Building the Security-to-Business Bridge

Project Lead: (b)(6)

The Tuck School of Business at Dartmouth will conduct this pilot management education program for information-security professionals this Spring. The program will convey business concepts and skills that are particularly relevant for the information-security professional to grasp in order to better create and communicate a business case for security investments, and manage a team to deliver against the strategy and business cases.

SISMAT – Secure Information Systems Mentoring and Training

Project Lead: (b)(6)

The project team is quickly moving forward on this ambitious educational program in preparation for this summer's two-week intensive course. The program will: provide undergraduates from various New England colleges with the knowledge and support needed to participate in internships; provide opportunities for secure systems research and development to traditionally underrepresented student populations; and facilitate the development of secure systems curricula at other academic institutions.

Project Overviews

SECURE INFORMATION SYSTEMS MENTORING AND TRAINING (SISMAT)

Project lead: S	(b)(6)	nt)
Investigators:	(b)(6)	
Others Support	(b)(6)	

Background

We are moving forward with an ambitious educational program over the next two years, addressing a growing need to respond to cyber security threats. Business, government, and non-profit institutions have expressed difficulty finding personnel with appropriate training in cyber security tools. Such training requires hands-on experience with secure systems work, yet many institutions of higher learning lack the resources to provide that experience. This initiative proposes to meet regional and national needs by implementing a pilot program in mentoring and training that will bring the extensive expertise of researchers and teachers at Dartmouth College in the areas of PKI and trusted systems together with students and faculty from other New England colleges, as well as interested corporate and non-profit partners. We explicitly target regional colleges whose curricula will have prepared upper-level undergraduates for this hands-on work but cannot offer it themselves; we target cyber security focus areas in which we have leadership and expertise; and we target external partners that have communicated a need for training in these areas. The training program will provide undergraduates with the knowledge and support needed to participate in internships, provide opportunities for secure systems research and development to traditionally underrepresented student populations, and facilitate the development of secure systems curricula at other academic institutions.

Budget Period III Update

The SISMAT project is kicking into high gear. With the recent addition of (b)(6) to coordinate efforts and build the curriculum and course infrastructure, we can begin recruiting students in earnest and get firm commitments from potential internship corporations and organizations, as the latter should now know whether or not they have budget for summer interns.

Our goal in the short term is to develop the syllabus and set up the course infrastructure. By March, we will have ordered the necessary course materials and finalized the curriculum. In April and May, we will set up the equipment and lab space needed for the course. We have two weeks of flex-time at the beginning of June, and then the workshop will be held June 16 to June 27. We will spend July disassembling and storing the lab (if required by space considerations) and the summer months will be spent moderating the Wiki and providing support for the participants. In early Fall, we will consult with the faculty mentors on plans for the mentored research projects. In early December, we plan to hold a 1.5-day workshop so that students can present their semester's work and their internship experience.

Planned Activities: January 2008 -- March 2008

In January, we held kickoff meetings, started a Wiki and a website for the project, identified a broad array of curriculum topics, finalized our application requirements, and began planning our participant recruiting trips. We have commitments from three local Subject Matter Experts (SME) to lead 1 or 2 lectures and lab sessions.

We have made the budget needs much more specific and begun tailoring them to the expected expenditures as anticipated by (b)(6) has budgeted 50% of his time during this period to SISMAT. We will order equipment toward the end of this period. At the end of this period we will have the syllabus finalized.

The project is ramping up quickly; with the support of several ISTS staff and students, we should be back on track in a little over a month (early March). The most pressing needs are to obtain commitments from potential student participants and from internship hosts. Beyond that, obtaining a solid commitment on space (so that we can have time to set up the lab and run through the exercises) is of major importance.

We now have four major priorities:

1. Finishing the syllabus
2. Designing course assignments and lecture topics
3. Student recruiting (late January through February)
4. Internship sponsor recruiting (late February through mid-March).

We anticipate working in parallel on these major items. (b)(6) will handle most of the recruiting and help fill any gaps (b)(6) will handle most of the syllabus and course development with input from (b)(6) will liaise with the CS Department to identify space for the class and its equipment. Toward the end of this period, we will select participants. We will also poll a list of keynote and guest speakers.

April 2008

April is a pivotal month. At this point, we should have major milestones (course syllabus, lecture topics, assignments, a collection of student participants, a set of committed internship locations) accomplished. We will notify applicants about whether they were selected. At this stage, we may play matchmaker between internships and students. We need to select someone to oversee this process (b)(6) might be the best choices.

We anticipate taking delivery of the course materials for the students (books, USB keys) as well as the infrastructure equipment. We will finalize commitments to the lecture schedule. Early in the month, we will poll our list of potential guest speakers again. Late in the month, we will obtain a commitment from a guest lecturer. Early in this period, we need commitment from an undergraduate (perhaps a WISP intern) or a graduate student (MS-level) to act as an "apprentice" for the May equipment setup (b)(6) should be at 40% to 50%.

May 2008

During May, we anticipate setting up the course infrastructure equipment for 2 weeks. We will spend the remainder of the month running through all the labs, demos, and assignments for "homework (open lab)" period. (b)(6) should be spending about 65% of his time on SISMAT at this point. We will also document all the steps of equipment setup for a text or course packet for future iterations of the course.

June 2008

In June, the course takes place. The first two weeks of June will be spent finalizing travel plans for participants and mentors. These two weeks will also serve as a flex period for late or delayed tasks from April and May, including any late deliveries of equipment. The course runs from June 16 to June 27 (b)(6) will be at 100% during this time.

The course will begin with Arrival and check-in on Monday morning from 8:00 AM to 11:30 AM. There will be a Welcome Lunch with a welcome address by SISMAT personnel. After lunch and a break for students to settle into their dorms, there will be a group activity centered on a demo of some key network security tools.

Each day of the course will follow this rough structure:

- | | |
|--------------------------------------|----------------|
| 1. Light Breakfast | 8:00 to 8:45 |
| 2. Lecture Session 1 | 9:00 to 10:30 |
| 3. Lecture/Demo Session 2 | 11:00 to 12:00 |
| 4. Lunch (on your own via flex card) | 12:00 to 1:30 |
| 5. Lab Session 1 | 2:00 to 3:30 |
| 6. Break | 3:30 to 4:00 |
| 7. Open Lab Session 2 | 4:00 to 5:30 |

The course will also contain an Invited Lecture from a senior security researcher. The course will close with a dinner on Thursday and final lectures on Friday. We anticipate having the faculty mentors gather the weekend of the 20th and 21st for professional development and to learn what the students have been doing in the first half of the course. Finally, we will plan some social activities so that the students have some time to decompress and interact outside the lab and lecture room environment.

July 2008

The month of July should ramp down to a low level of activity. We anticipate the first week to be spent cleaning up the lab (if required by space considerations within the Computer Science department) and the second week debriefing those involved in the execution of the program (i.e., not the participants). We expect to monitor the wiki to moderate it and continue remotely mentoring the participants. (b)(6) should be at about 20% effort.

August 2008

The month of August should involve a similarly low level of activity. We will continue to monitor the wiki and provide mentoring to participants. We will begin discussing lessons learned from the process and the course and whether this leads to publishable research results on security or information-assurance education. (b)(6) should be at 12% effort.

September 2008

The main activity for September will be to debrief participants on their internships and to coordinate with faculty mentors on research projects and support. We will begin planning a short December workshop. (b)(6) should be at 20% effort.

October 2008

October will see a very low level of activity. We will provide some support and mentoring for faculty mentored research projects and continue planning the workshop. (b)(6) should be at 12% effort.

November 2008

(b)(6) will be at 25% effort. We will begin packaging up course materials, syllabus, etc. We will start to assemble the final report on project and discuss publications with colleagues.

December 2008

(b)(6) will be at 25%. The post-Thanksgiving workshop (one and a half days) allows students to return and demonstrate their research project and present on their internship experience. We will package course materials for the next iteration and commit to publication actions, if any.

ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

<p>* SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL</p> <p>(b)(6)</p>	<p>* TITLE</p> <p>Assistant Director</p>
<p>* APPLICANT ORGANIZATION</p> <p>Trustees of Dartmouth College</p>	<p>* DATE SUBMITTED</p> <p>01/28/2008</p>

Standard Form 424B (Rev. 7-97) Back

Pages 184 through 265 redacted for the following reasons:

(b)(6)

Renwick, Tya

From: (b)(6)
Sent: Wednesday, February 06, 2008 12:10 PM
To: Renwick, Tya; Rick Harris
Cc: (b)(6)
Subject: I3P request

Attachments: 2006-CS-001-000001 Carry-forward request.pdf



2006-CS-0
001 Carry-f
Rick and Tya -

As promised, attached is our formal carry forward request for I3P and ISTS projects. If you have any questions, please feel free to contact myself or Sarah Brooks.

Thank you,

(b)(6)

Executive Director, The I3P
Dartmouth College
Hanover, NH 03755

(b)(6)



Dartmouth College

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(b)(6)

(b)(6)

Vice Provost for Research
Francis and Mildred Sears Professor of Physics

February 4, 2008

Mr. Rick Harris
Director, Future Operations
US-CERT
National Cyber Security Division
Department of Homeland Security

Dear Rick:

With this letter, Dartmouth College submits its carry forward request and justification for Award Number 2006-CS-001-000001. As you requested, expenditures have been summarized as of 12/31/07. The proposal for Budget Period III of this award was submitted to the Department of Homeland Security on January 28, 2008. To ensure seamless continuation of research projects Dartmouth requests approval of this carry forward in conjunction with its Budget Period III award.

15,960,000 - Total Award
+ 8,340,000 - TS request

The original award from DHS to Dartmouth College was \$24.3M to be spent over three budget periods. All of these funds have been encumbered across the various research projects and there has been no change in project scope. Due to a variety of administrative delays across multiple institutions, as well as time required to ramp up the projects (hire personnel, purchase equipment, etc.), this carry forward request became necessary. Dartmouth's overarching goal is to spend these government funds responsibly and ensure projects are carried out in a legal and ethical manner.

We are pleased to work with the Department of Homeland Security. Should you have any questions regarding the attached information feel free to contact me.

Best Regards,

(b)(6)

Cc: Tya Renwick

Carry-Forward Request - Justification

Award Number: 2006-CS-001-000001
Dartmouth College
February 2008

In April 2007, the Institute for Information Infrastructure (I3P) and Institute for Security Technology Studies (ISTS) at Dartmouth College received approval for Budget Period II (BPII) funding for award # 2006-CS-001-000001 from the National Cyber Security Division (NCSD) at the Department of Homeland Security. The total awarded in BPI and BPII was approximately \$11.5M for the I3P, and \$4.5M for ISTS. Included in these numbers is a \$3.3M supplemental award granted by NCSD to Dartmouth that was not intended for expenditure before Budget Period III (BPIII), beginning in April of 2008.

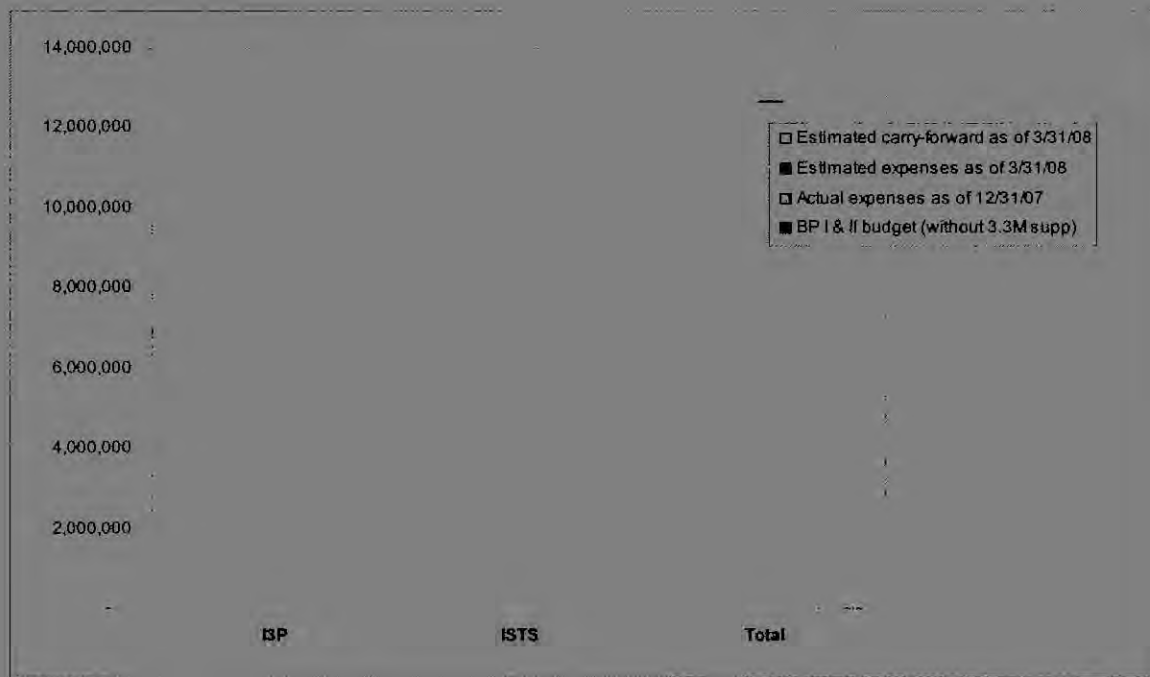
The I3P is a unique research consortium. Although managed by Dartmouth College, research teams are formed and funded across the consortium's 27 members. This creates administrative challenges for the appropriate and effective distribution of grant funding from NCSD. The complexity and effect of these challenges are apparent in this carry forward request.

For the I3P for example, some of the administrative challenges include:

- Four research projects and the fellowship program required 34 sub-awards between Dartmouth College and different members of the I3P consortium
- Most sub-awardees must invoice Dartmouth **after** work is completed. The invoice process creates a significant lag time between performance of work and payment for its completion
- All of the research projects had delayed starts due to the time required for project ramp-up (space, personnel, equipment, etc.)

As we continue to advance the ISTS and I3P projects funded by NCSD, Dartmouth requests that remaining funds from BPII be carried-forward and spent in BPIII. All of these funds have been encumbered in sub-awards to I3P members and at ISTS and work is ongoing. The BPIII proposal was submitted to grants.gov on January 28, 2008 and outlined those funds accordingly. Please note that NCSD asked that the total carry forward request reflect amounts spent as of 12/31/07. BPII does not conclude until 3/31/08, so the actual carry forward from BPII to BPIII will be lower than this request. Each project budget shows how carry-forward funds will be spent starting January 1, 2008. In addition, the BPII supplement of \$3.3M has been incorporated in each projects' current budget, even though such funds will not begin to be spent until April 1, 2008. Budget narratives, justifying budgeted costs, have been submitted with prior proposals.

The table below shows total award, expenses to date, estimated expenses at the conclusion of BPII, and the estimated total carry-forward amount. As has been discussed, all of the award funds are encumbered, and a great deal of work has been completed but not yet reflected as spent due to invoice timing.



Short narratives for each project follow. We are requesting approval for each research project mentioned to carry-forward funds into BPIII. For I3P workshop funds, the projected balance from BPII is re-allocated to the I3P administration budget. This change request is reflected in the attached budget sheets.

While most projects will be substantially complete by March 31, 2009, several projects, most notably, the I3P Fellowship and the I3P Scholars program will extend to March 31, 2010. Additionally, we expect that invoice timing issues will continue. Funds for the I3P administration are budgeted and projected to be used until the end of the NCSD funding.

Attachment A includes a detailed budget for each project, outlining how the carry-forward funds will be spent.

Summary of request by category

Personnel	\$638,456	\$1,108,047	\$1,746,503
Fringe Benefits	\$237,030	\$288,781	\$525,811
Travel	\$78,095	\$106,695	\$184,790
Equip	\$5,000	\$124,256	\$129,256
Participant Fees		\$77,062	\$77,062
materials and supplies	\$8,146	\$175,129	\$183,275
Publication Costs	\$29,257		\$29,257
Conf Reg Fees	\$1,500	\$8,400	\$9,900
Event Fees	\$149,062	\$45,705	\$194,767
Consultant costs	\$100,478	\$13,750	\$114,228
Contractual	\$6,468,640	\$85,000	\$6,553,640
Indirect	\$640,200	\$1,053,173	\$1,693,372
Total	\$8,355,863	\$3,085,998	\$11,441,861

I3P (Initiatives 1-6 and Management)

I1: I3P Fellowship	530,271	51,541	478,730
I2: Human Behavior	2,228,055	387,821	1,840,234
I3: Workshop	850,013	222,768	273,063 difference has moved to Mgmt budget
I4: PCS	2,615,156	1,615,296	999,860
I5: Business Rationale	2,267,964	540,206	1,727,758
I6: Assessable Identity	2,244,753	299,303	1,945,449
I3P Management	760,962	24,375	1,090,769
Total I3P	11,497,174	3,141,309	8,355,863

I1: I3P Fellowship

The I3P Fellowship program awarded 3 fellowships in BPII. These fellowships will be completed late in 2008. Additional Fellowships are budgeted in BPIII. Travel to attend consortium meetings to present their work is budgeted. These fellows are funded through sub-awards from Dartmouth. These sub-awardees invoice Dartmouth on a monthly basis. Note that as of 12/31/07, not all sub-awardees are up to date with invoicing.

I2: Human Behavior

This project includes Dartmouth College as well as 6 other institutional subcontracts. Most sub-awardees invoice Dartmouth on a monthly basis. Note that as of 12/31/07, not all sub-awardees are up to date with invoicing. In addition, some contracts encountered unavoidable governmental and administrative procedures that delayed the start of the projects. There has

been no change in scope from the original BPII proposal, where all budget justifications were made. Additional information has been provided in quarterly progress reports as well as the BPIII proposal. The following chart outlines the total awarded to each team member under this initiative.

Initiative 2: Human Behavior, Insider Threat and Awareness

Participant	Final BPII	Proposed BPIII	Total
RAND (manage)	149,518	149,518	299,036
RAND (research)	305,709	305,709	611,418
MITRE	300,000	300,000	600,000
Columbia	300,000	300,000	600,000
Cornell	300,000	250,000	550,000
Purdue	149,851	150,149	300,000
Indiana	149,257	220,977	370,234
Dartmouth	71,939	228,060	299,999
I3P indirects	104,825		104,825
Total	1,831,099	1,904,413	3,735,512

I3: Workshop

I3P sponsors several workshops each year. As presented in the BPI and II proposals, these workshops are in accordance with the needs of each initiative and to further the mission of The I3P. Only a portion of the budgeted workshop dollars are being requested to carry-forward. The remaining workshop dollars will be reallocated to the Administration budget. As discussed in prior progress reports, there were 3 main workshops that were budgeted but not scheduled. These were the high-level cyber security forum, the Second Workshop on the Economics for Securing the Information Infrastructure (WESII 2), and red cell exercises to be held in conjunction with the Second Annual IFIP Working Group 11.10 Conference. Note that WESII 2 has been appropriately budgeted in the BPIII proposal.

I4: PCS

This project has 9 institutional subcontracts. Most sub-awardees invoice Dartmouth on a monthly basis. Note that as of 12/31/07, not all sub-awardees are up to date with invoicing. In addition, some contracts encountered unavoidable governmental and administrative procedures that delayed the start of the projects. There has been no change in scope from the original BPII proposal, where all budget justifications were made. Additional information has been provided in quarterly progress reports as well as the BPIII proposal. The following chart outlines the total awarded to each team member under this initiative.

Initiative 4: Survivability and Recovery of Process Control Systems

Participant	Final BP II	Proposed BP III	Total
MIT-LL (manage)	72,956	77,044	150,000
MIT-LL (research)	443,725	356,275	800,000
MITRE	150,000	150,000	300,000
PNNL	260,500	239,500	500,000
Sandia	451,400	448,600	900,000
SRI	199,893	199,818	399,711
Tulsa	200,000	200,000	400,000
UIUC	250,000	250,000	500,000
USMA	100,000	100,000	200,000
I3P indirects	134,775		134,775
Total	2,263,249	2,021,237	4,284,486

15: Business Rationale

This project includes Dartmouth College as well as 5 other institutional subcontracts. Most sub-awardees invoice Dartmouth on a monthly basis. Note that as of 12/31/07, not all sub-awardees are up to date with invoicing. In addition, some contracts encountered unavoidable governmental and administrative procedures that delayed the start of the projects. There has been no change in scope from the original BP II proposal, where all budget justifications were made. Additional information has been provided in quarterly progress reports as well as the BP III proposal. The following chart outlines the total awarded to each team member under this initiative.

Initiative 5: Business Rationale for Cyber Security

Participant	Final BP II	Proposed BP III	Total
UVa (manage)	125,000	125,000	250,000
UVa (research)	650,000	650,000	1,300,000
Rand	174,450	174,450	348,900
Dartmouth (Tuck School)	394,404	411,492	805,897
Indiana	101,098	-	101,098
U of Calif - Berkeley	150,413	143,441	293,854
I3P indirects	74,875		74,875
Total	1,670,240	1,504,383	3,174,624

I6: Assessable Identity

This project has 9 institutional subcontracts. Most sub-awardees invoice Dartmouth on a monthly basis. Note that as of 12/31/07, not all sub-awardees are up to date with invoicing. In addition, some contracts encountered unavoidable governmental and administrative procedures that delayed the start of the projects. There has been no change in scope from the original BPII proposal, where all budget justifications were made. Additional information has been provided in quarterly progress reports as well as the BPIII proposal. The following chart outlines the total awarded to each team member under this initiative.

Initiative 6: Assessable Identity and Privacy Protection

Participant	Final BPII	Proposed BPIII	Total
MITRE (manage)	100,000	100,000	200,000
MITRE (research)	300,000	300,000	600,000
UIUC	300,000	300,000	600,000
SRI	299,967	299,772	599,739
Cornell	200,000	200,000	400,000
Purdue	150,000	150,000	300,000
Georgia Tech	148,607	154,585	303,192
I3P indirects	104,825		104,825
Total	1,603,399	1,504,357	3,107,756

I3P Management

Budget narratives from BPII and III explain the costs associated with management of the consortium.

ISTS (Initiatives 7-8)

Fel	(b)(6)	75,365	74,509	856	final charges posted in Jan 2008
PK	(b)(6)	368,271	250,602	117,668	
HB	(b)(6)	436,862	116,259	320,602	
Me	(b)(6)	1,093,947	131,114	962,833	
DIS	(b)(6)	1,566,994	511,069	1,055,925	
DV	(b)(6)	96,321	21,152	75,171	
IRII	(b)(6)	260,998	69,536	191,463	
AC	(b)(6)	299,429	200,248	99,181	
BE	(b)(6)	121,092	2,341	118,751	
SIS	(b)(6)	143,547	-	143,548	
Total ISTS		4,462,826	1,376,829	3,085,998	

ISTS Fellows

(b)(6)

The ISTS fellows program will be spent and closed in January 2008.

Interoperability and Usability for PKI Management (PKI)

(b)(6)

As mentioned in the BPIII proposal, some of the original outreach activities needed to be delayed to coordinate with industry and community partners who are participating in (and sometimes control) the agendas of the targeted events. We have identified several conferences that we may attend to promote the project's results, most of which occur late in 2008.

Laboratory for Hardware-Based Security (HBS)

(b)(6)

As we noted in the December review and in the BPIII proposal our spending is behind initial projections. Personnel and equipment costs were lower than expected.

We have revised the budget accordingly in BPIII, taking into account the anticipated carry-forward amount. Overall, we have lowered the planned student support, and revised the equipment and consultant support to accurately reflect the overall needs of the project.

MetroSense: Scalable Secure Sensor Systems (Metro)

(b)(6)

We are requesting that remaining BPII funds to be carried forward to be spent in BPIII. The three strains (Metro-Sec, Metro-Sense, Metro-Fuse) in the MetroSense project met delays in starting the project. It should be noted that the project was not scheduled to start until September 2007. In the next few months, as the project ramps up personnel and final equipment specifications are confirmed, the burn rate will increase significantly.

Dartmouth Internet Security Testbed (DIST)

(b)(6)

This project has experienced delays in the operational deployment of the DIST technology mainly due to careful oversight of Dartmouth College in the area of the project's planned widespread network monitoring. Dartmouth College wants to ensure that any privacy risks are well managed. In addition to completing the required Institutional Review Board (IRB) review, an in-depth review of the legal and ethical issues in the wireless- and wired-network monitoring aspects of the DIST project was conducted. While these actions have slowed the progress of the project, it has resulted in the addition of an outside consultant (cost paid by Dartmouth College) to conduct audits of the research to ensure all necessary and legal procedures are in place.

These delays have led to a slow-down in the overall personnel costs and equipment purchasing. The final group of wireless sniffers ("air monitors", or AMs) will be purchased in the next few months and we hope to complete installations by June 2008. The purchase of mobile devices (smart phones) will occur in the first or second quarter of 2008.

Digital Video Forensic (DVF)

(b)(6)

Professor Farid is requesting to carry-forward funds on this effort, because of a change in his teaching schedule: his research term will be in Spring 2008 instead of Winter 2008. The bulk of the carry-forward funds will be used to support his research leave.

Information Risk in Data-Oriented Enterprises (IRIDOE)

(b)(6)

Professor (b)(6) requests all carry-forward of unspent funds from BPII into BPIII. The key areas of delayed spending in BPII were personnel, the planned workshop and travel as outlined below.

Staffing. Postdoc, (b)(6) hired in September rather than July. There has been a delay in charging Professor (b)(6) time due to summer/academic availability.

Workshop. The planned workshop has been delayed until Winter 2009 when (b)(6) will have a research leave term. Also, a decision to hold the workshop later in the process when more modeling results would be available seemed valuable to improving the technology transfer of the project.

Travel. Fewer partner visits, particularly a planned two week internship with a partner in New York City were conducted. This internship will be conducted during BPIII. While the executive-in-residence program did happen, many partners funded their own travel to Dartmouth. These funds will be maintained for visits in Fall 2008.

Foundations for Practical Automatic Computing (AC)

(b)(6)

Carry-forward of funds is requested. Spending on this effort was slowed when the student completed his thesis in the Fall 2007, but the need for completing the basic evaluations and metrics is one of the major remaining issues. We will allocate staff to this research question this coming quarter. We will add a student to replace the recent graduate, travel to present results at professional meetings and coordinate with potential transition partners (notably parts of the US government and industry), and purchase equipment to support the final phase's experiments.

Business Education for the Security Professional (BESP) program

(b)(6)

The reason for this request is that we determined that the best time to offer the BESP course here at the Tuck School of Business is the week of May 12, 2008. While we had originally planned to offer the course in the first quarter of calendar year 2008, as we discussed development and marketing lead-times and scrubbed hotel, classroom and faculty availability, it became apparent that the May timeframe was better. We indicated that this request would be forthcoming in our quarterly report for the period ending on September 30, 2007.

We therefore request an extension through September 30, 2008 to ensure we can incorporate final bills on all expenses, etc. The overall budget, as submitted in BPII, has not changed.

Secure Information Systems Mentoring and Training (SISMAT)

(b)(6)

We are requesting a carry-forward of funds for personnel, equipment purchases and for most of the travel expenses associated with the Secure Information Systems Mentoring and Training (SISMAT) project.

The major reason for this request was the delay in postdoc (b)(6) start date: no one else was able to budget significant effort for SISMAT through December 2007. (b)(6) is now 50% allocated to this project through April and a smaller percentage through the end of June. Given the delays, the budget requested in the BPIII proposal has been adjusted accordingly.

Attachment A

Budget Detailed Worksheets

I3P Proposal

Government FY07 funds - spend during Dartmouth FY07 and FY08

I3P Fellowship Program - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2010

		FY07	Da	FY08	Total	Inflation
Item	Labor (Dartmouth)	Base salary				
Faculty						
Staff						
Subtotal, without fringe		\$0			\$0	\$0
AP	Fringe on AP I and AP II	38.0%	\$0	39.0%	\$0	\$0
Total fringe		\$0			\$0	\$0
Subtotal, including fringe		\$0			\$0	\$0
	Indirects on people	35.00%	\$0		\$0	\$0
Direct materials		Competition			Total	notes
Travel						
Travel for fellows to consortium m Airfare \$500					\$3,000	\$3,000
No. of travelers	3 Hotel \$175 / day				\$2,100	\$2,100
No. of Trips	2 Meals \$50 / day				\$600	\$600
No. of nights	2 Mileage/tax/parking (\$80+\$20+\$20) \$100				\$600	\$600
Scholars Travel Airfare \$500					\$2,000	\$2,000
No. of travelers	2 Hotel \$175 / day				\$1,400	\$1,400
No. of Trips	2 Meals \$50 / day				\$400	\$400
No. of nights	2 Mileage/tax/parking (\$80+\$20+\$20) \$100				\$400	\$400
Capital equipment						
Breakdown of Equipment		Quantity	Unit cost	Subtotal	Quantity	Unit cost
Other Direct Costs						
<u>Materials and Supplies</u>						
Printing/advertising/ mailing costs					\$1,000	\$1,000
Review costs (fed-ex, conf calls)					\$763	\$763
Indirects on travel, supplies, other costs (NOT equipment or tuition)		35.00%	\$0		\$4,292	\$4,292
Consultants		Base price			Total	Inflation
Name & Service Provided	computation		Days fully staffed	Subtotal		5.0%
Indirect on consultants	35.00%	\$0			\$0	\$0
Subcontracts		Base price			Total	Inflation
Describe Product or Service				\$0	\$0	5.0%
A memorandum of understanding will be issued to 3 institutes per year to support the I3P fellowship program. These fellowships will be hosted at various consortium members' institutes. Fellows will be selected based on a scientific review process, for details about the process please see attached narrative proposal. Costs will include:						
Salary/Benefits	Will not exceed \$150,000 per awarded fellowship (initial portion of RPI to be funding with a different source of I3P funding)					
Travel allowance/Equipment						
Indirect costs						
Uva					\$104,962	\$104,962
Purdue					\$141,895	\$141,895
U of California					\$150,000	\$150,000
Dartmouth (see I3P proposal)					\$11,000	\$11,000
Subtotal		\$0			\$446,857	\$446,857
Indirect on first \$25k each subcontract		35.00%	\$0		\$0	\$0
Total directs		\$0			\$459,120	\$459,120
Total indirects		\$0			\$19,610	\$19,610
Total		\$0			\$478,730	\$478,730

Budget Detailed Worksheets

13P Proposal

Government FY07 funds - spend during Dartmouth FY07 and FY08

13P Workshop - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2009

Dartmouth FY08

Dartmouth FY09

Item	Labor (Dartmouth)	Base				Total
Faculty						
Staff						
Students						
Subtotal, without fringe				\$0		\$0
Total fringe				\$0		\$0
Subtotal, including fringe				\$0		\$0
Indirects on people		35.00%		\$0		\$0
Direct materials	Computation					Total
Travel						
#3 PCS Security Workshop						
13P Staff						
	Airfare \$500		March 2008	\$1,500		\$1,500
No. of travelers	3	Hotel \$175 / day		\$1,575		\$1,575
No. of Trips	1	Meals \$50 / day		\$450		\$450
No. of nights	3	Mileage/tax/parking (\$60+\$20+\$20) \$100		\$300		\$300
#3 PCS Security Workshop						
Team Members						
	Airfare \$500			\$4,000		\$4,000
No. of travelers	8	Hotel \$175 / day		\$4,200		\$4,200
No. of Trips	1	Meals \$50 / day		\$1,200		\$1,200
No. of nights	3	Mileage/tax/parking (\$80+\$20+\$20) \$100		\$800		\$800
#5 Critical Infrastructure Protection Conference						
13P Staff						
	Airfare \$500		March 2008	\$2,500		\$2,500
No. of travelers	5	Hotel \$175 / day		\$4,375		\$4,375
No. of Trips	1	Meals \$50 / day		\$1,250		\$1,250
No. of nights	5	Mileage/tax/parking (\$60+\$20+\$20) \$100		\$500		\$500
Registration Fee	4	\$400 per fee		\$1,600		\$1,600
Capital equipment						
Breakdown of Equipment						
			Quantity	Price each	Subtotal	
Participant Support Costs						
Other Direct Costs						
Materials and Supplies						
	Supplies for Workshop #3	90	\$10/person	\$900		\$900
	Supplies for Workshop #5	75	\$10/person	\$750		\$750
Publication Costs						
Conference Registration Fees						
Event and Meeting Costs						
#3 PCS Security Workshop						
Food for PCS Workshop	90	Meals (\$90/ day)		\$8,100		\$8,100
Room rental for workshop		\$4,000 per meeting		\$4,000		\$4,000
AV equipment for workshop		\$8,000 per meeting		\$8,000		\$8,000
Postage		\$150 for materials to and from venue		\$300		\$300
Printing		Mail 120 packets, 40 pages and CD, \$2 per packet		\$240		\$240
		Print session information 120 at \$2 per copy		\$240		\$240
		Printing/burning of CD's with label - 120 at \$3 each		\$360		\$360
Promotional Materials		Invitations, posters, brochures, advertising		\$2,000		\$2,000
#5 Critical Infrastructure Protection Conference (3 day conference)						
Food for event	75	Meals (\$90/ day)		\$20,250		\$20,250
Dishware	75	\$70/day - 3 days		\$15,750		\$15,750
Set-up room fee for event		\$2,000 per meeting (assets, markers, tele conf, etc.)		\$2,000		\$2,000
Room rental fee for event		\$3,000 per meeting		\$3,000		\$3,000
AV equipment for event		\$4,000 per meeting		\$4,000		\$4,000
Postage		\$150 for materials to and from venue		\$300		\$300
Printing		Paper Invitations 800 x .75		\$600		\$600
		Session information and documents to distribute		\$1,000		\$1,000

I3P Workshop - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2009

		Dartmouth FY08	Dartmouth FY09	
	Promotional Materials	Invitations, posters, brochures, advertising	\$1,500	\$1,500
#4 Securing the Information Infrastructure (UVA in November 2007)				
Hotel final invoice (paid in January 2008)			\$12,822	\$12,822
Budget Period II Supplement - In support of workshops #10 and #11 as presented in the BPA (approved by the Office of Procurement)			\$49,400	\$49,400
#10 Critical Infrastructure Protection Conference (2.5 days, 60 people, 3 dinners, 1 room) - Dartmouth Spring 2009				
Food for event	60 Meals (\$70/day)			
Dinner	60 \$70/day - 3 days			
Set-up room fee for event	\$2,000 per meeting (assets, markers, tele conf, etc.)			
Room rental fee for event	\$3,000 per meeting			
AV equipment for event	\$4,000 per meeting			
Printing	Session information and documents to distribute			
Promotional Materials	Invitations, posters, brochures, advertising			
Workshop #11 Travel for PCS Security Workshops (Spring 2009 and location TBA) - BPHI (end of project workshop) - 1 day, 80 people, 1 room				
Food for PCS Workshop	80 Meals (\$80/day)			
Set-up room fee for event	\$2,000 per meeting (assets, markers, tele conf, etc.)			
Room rental for workshop	\$3,000 per meeting			
AV equipment for workshop	\$5,000 per meeting			
Postage	\$150 for materials to and from venue			
Printing	Print session information 120 at \$2 per copy			
Promotional Materials	Printing/burning of CD's with label - 120 at \$3 each			
	Invitations, posters, brochures, advertising			
Consultant Services				
#3 PCS Security Workshop				
Speakers	Airfare \$500	\$1,500		\$1,500
No. of travelers	3 Hotel \$175 / day	\$1,050		\$1,050
No. of Trips	1 Meals \$50 / day	\$300		\$300
No. of nights	2 Mileage/tax/parking (\$60+\$20+\$20) \$100	\$300		\$300
Workshop #3: Consultant for PCS Security Workshops (recording of proceedings)		\$12,000		\$12,000
#5 Critical Infrastructure Protection Conference				
Speakers	Airfare \$500	\$1,500		\$1,500
No. of travelers	3 Hotel \$175 / day	\$1,575		\$1,575
No. of Trips	1 Meals \$50 / day	\$450		\$450
No. of nights	3 Mileage/tax/parking (\$60+\$20+\$20) \$100	\$300		\$300
Indirects on travel, supplies, other costs (NOT equipment or tuition) 35.00%		\$45,268	\$17,710	\$62,978
Subawards/Contractual Costs		Base price		Total
Describe Product or Service		\$0	\$0	\$0
SRI (remainder of subaward)			\$13,000	\$13,000
Subtotal			\$13,000	\$13,000
Indirect on first \$25k each subcontract 35.00%		\$0	\$4,550	\$4,550
Total directs		\$129,337	\$63,600	\$192,937
Budget Period II Supplement - Indirects on equipment			\$12,599	\$12,599
Total indirects		\$45,268	\$22,260	\$67,528
Total		\$174,604	\$98,459	\$273,063

Budget Detailed Worksheets
 I3P Proposal
 Government FY07 Funds - spend during Dartmouth FY07 and FY08
 I3P Process Control Systems - Budget Period II carry-forward request
 Dates: January 1, 2008 to March 31, 2009

		FY07		FY08		Total	Inflation
Item	Labor (Dartmouth)						
Faculty							
Staff							
Subtotal, without fringe			\$0		\$0	\$0	
FAC Fringe on Faculty			38.0%		39.0%	\$0	\$0
Total fringe			\$0		\$0	\$0	\$0
Subtotal, including fringe			\$0		\$0	\$0	\$0
Indirects on people		59.90%	\$0		\$0	\$0	\$0
Direct materials							
Computation						Total	notes
Travel							
Capital equipment							
Breakdowns of Equipment		Quantity	Price each	Subtotal	Quantity	Price each	Subtotal
Non-Capital equip, supplies							
By Type							
Other Costs							
By Type							
Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%	\$0		\$0	\$0	\$0
Consultants							
Base price						Total	Inflation
Name & Service Provided		computation	Days	Daily rate	Subtotal		5.0%
Indirect on consultants		59.90%	\$0		\$0	\$0	\$0
Subcontracts							
Base price						Total	Inflation
Describe Product or Service			\$0		\$0	\$0	5.0%
Man					\$0	\$0	
MIT					\$0	\$0	
Mtu					\$150,000	\$150,000	
PNN					\$0	\$0	
Saud					\$0	\$0	
SRI					\$118,446	\$118,446	
Tula					\$199,814	\$199,814	
UTU					\$107,744	\$107,744	
USN					\$42,111	\$42,111	
Subtotal			\$0		\$970,021	\$970,021	
Indirect on firm \$25k each subcontract		59.90%	\$0		\$0	\$0	\$0
Total directs			\$0		\$970,021	\$970,021	
Total indirects			\$0		\$29,839	\$29,839	
Total			\$0		\$999,860	\$999,860	

(b)(6)

Budget Detailed Worksheets
 I3P Proposal
 Government FY07 funds - spend during Dartmouth FY07 and FY08
 I3P Business Rationale - Budget Period II carry-forward request
 Dates: January 1, 2008 to March 31, 2009

				FY07	FY08	Total	Inflation
Item	Labor (Dartmouth)	Base salary					
Faculty							
FA	(b)(6)	9 month base salary	1/9 effort	\$8,700		\$13,350	\$22,050
		12 month base salary	3 months	\$0		\$36,400.00	\$36,400
Staff	(b)(6)	12 month base salary	100% effort			\$73,008.00	\$73,008
Student		Rate per hour			hours		
	UG Track Graduate Student	\$25.00		\$2,000	480.00	\$10,900	\$12,000
Subtotal, without fringe				\$10,700		\$132,758	\$143,458
	FAC Fringe on Faculty			38.0%	\$0	\$14,196	\$14,196
	UG Fringe on full-time undergraduates			9.0%	\$180	\$900	\$1,080
	RAC Fringe on full-time undergraduates			38.0%	\$0	\$28,473	\$28,473
	FAC-L Fringe on Faculty - lower rate			26.0%	\$2,262	\$3,605	\$5,867
Total fringe				\$2,442		\$47,174	\$49,616
Subtotal, including fringe				\$13,142		\$179,932	\$193,074
	Indirects on people		59.90%	\$7,872		\$107,779	\$115,651
Direct materials							
Computation						Total	notes
Travel							
	Travel to partners	12 trips at \$1,000 per trip per year				\$12,000	\$12,000
Capital equipment							
Breakdown of Equipment							
Non-Capital equip, supplies							
By Type							
Other Costs							
By Type							
	Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%	\$0		\$7,188	\$7,188
Consultants							
Name & Service Provided				computation	Base price	Base price	Total
	Indirect on consultants		59.90%	\$0		\$0	\$0
Subcontractors							
Description				Base price		Total	Inflation
	Man	(b)(6)				\$101,010	\$101,010
	U of	(b)(6)				\$386,894	\$386,894
	RAN	(b)(6)				\$101,087	\$101,087
	India	(b)(6)				\$48,569	\$48,569
	Univ	(b)(6)				\$150,413	\$150,413
	RAN	(b)(6)					
	Univ	(b)(6)					
Subtotal				\$0		\$1,384,264	\$1,384,264
	Indirect on first \$25k each subcontract		59.90%	\$0		\$0	\$0
Total direct				\$13,142		\$1,576,196	\$1,589,338
Total indirects				\$7,872		\$136,548	\$136,429
Total				\$21,014		\$1,706,744	\$1,727,758

Budget Detailed Worksheets

ISP Proposal

Government FY07 funds - spend during Dartmouth FY07 and FY08

ISP Assessable Identity - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2009

Item	Labor (Dartmouth)	Base salary	Dartmouth FY07		Dartmouth FY08		Total	Inflation
Faculty								
Staff								
Students								
Subtotal, without fringe				\$0		\$0	\$0	
FAC	Fringe on Faculty		38.0%	\$0	39.0%	\$0	\$0	
AP	Fringe on AP I and AP II		38.0%	\$0	39.0%	\$0	\$0	
UG	Fringe on full-time undergraduates		9.0%	\$0	9.0%	\$0	\$0	
RAA	Fringe on Research Associate A		9.0%	\$0	9.0%	\$0	\$0	
RAB	Fringe on Research Associate B		24.5%	\$0	25.5%	\$0	\$0	
RAC	Fringe on Research Associate C		38.0%	\$0	39.0%	\$0	\$0	
Total fringe				\$0		\$0	\$0	
Subtotal, including fringe				\$0		\$0	\$0	
	Indirects on people	59.90%		\$0		\$0	\$0	
Direct materials			Computation			Total		notes
	Travel							
	Capital equipment							
	Breakdown of Equipment							
	Other Direct Costs							
	Materials and Supplies					15,250	15,250	
	ERROR in Dec - being corrected in Jan 2008							
	Indirects on travel, supplies, other costs (NOT equipment or tuition)	59.90%		\$0		\$0	\$0	
Consultants			Base price			Total		Inflation
	Name & Service Provided	computation						5.0%
	Indirect on consultants	59.90%		\$0		\$0	\$0	
Subcontracts			Base price			Total		Inflation
	Description, Product or Service			\$0		\$0	\$0	5.0%
	Man					\$100,000	\$100,000	
	Misc					\$300,000	\$300,000	
	UIU					\$280,211	\$280,211	
	SRI					\$195,368	\$195,368	
	Con					\$182,029	\$182,029	
	Purd					\$110,006	\$110,006	
	Geo					\$99,457	\$99,457	
	Man, 200-249, 11/24/08							
	Man, 250-299, 11/24/08					\$17,466	\$17,466	
	Faculty					\$50,768	\$50,768	
	SKI					\$140,652	\$140,652	
	UBN					\$120,448	\$120,448	
	MIRKE					\$26,000	\$26,000	
	Subtotal			\$0		\$1,908,425	\$1,908,425	
	Indirect on first \$25k each subcontract	59.90%		\$0		\$24,324	\$24,324	
Total directs				\$0		\$1,908,168	\$1,908,168	
Total indirects				\$0		\$37,281	\$37,281	
Total				\$0		\$1,945,449	\$1,945,449	

Budget Detailed Worksheets
 I3P Proposal
 Government FY08 funds - spend during Dartmouth FY08 and FY09
 I3P Administration - Budget Period II carry-forward request
 Dates: January 1, 2008 to March 31, 2010

		FY09				FY10				Total	Inflation
Item	Labor (Dartmouth)	Base salary									
Faculty											
Sta	(b)(6)	4.00	100%	33.33%	\$80,500	3.00	5%	1.25%	\$3,170	\$83,670	5.0%
		4.00	90%	30.00%	\$40,950	3.00	90%	22.50%	\$32,248	\$73,198	5.0%
		4.00	100%	33.33%	\$30,100	3.00	100%	25.00%	\$23,704	\$53,804	5.0%
		4.00	100%	33.33%	\$15,750	3.00	100%	25.00%	\$12,403	\$28,153	5.0%
		4.00	100%	33.33%	\$24,500	3.00	100%	25.00%	\$19,294	\$43,794	5.0%
		4.00	50%	16.67%	\$14,525	3.00	50%	12.50%	\$11,438	\$25,963	5.0%
		4.00	50%	16.67%	\$8,400	3.00	50%	12.50%	\$6,615	\$15,015	5.0%
		4.00	100%	33.33%	\$14,000	3.00	100%	25.00%	\$11,025	\$25,025	5.0%
		6.00	100%	50.00%	\$19,950	3.00	100%	25.00%	\$10,474	\$30,424	5.0%
		6.00	100%	50.00%	\$21,000	3.00	100%	25.00%	\$11,025	\$32,025	5.0%
		6.00	100%	50.00%	\$16,800	3.00	100%	25.00%	\$8,820	\$25,620	5.0%
		6.00	100%	50.00%	\$21,000	3.00	100%	25.00%	\$11,025	\$32,025	5.0%
Subtotal, without fringe					\$307,475				\$161,241	\$468,716	
FAC	Fringe on Faculty			39.0%	\$0			40.0%	\$0	\$0	
AP	Fringe on AP I and AP II			39.0%	\$119,915			40.0%	\$64,496	\$184,412	
UG	Fringe on full-time undergraduates			9.0%	\$0			9.0%	\$0	\$0	
RAA	Fringe on Research Associate A			9.0%	\$0			9.0%	\$0	\$0	
RAB	Fringe on Research Associate B			24.5%	\$0			25.5%	\$0	\$0	
RAC	Fringe on Research Associate C			39.0%	\$0			40.0%	\$0	\$0	
Total fringe					\$119,915				\$64,496	\$184,412	
Subtotal, including fringe					\$427,390				\$225,737	\$653,127	
	Indirects on people		35.00%		\$149,587				\$79,008	\$228,594	
Direct materials		Computation								Total	notes
Travel											
Conferences, Meetings and Ct Airfare \$500										\$8,000	\$8,000
No. of travelers		8		Hotel \$175 / day						\$8,400	\$8,400
No. of Trips		2		Meals \$50 / day						\$2,400	\$2,400
No. of nights		3		Mileage/taxi/parking (\$80+\$20+\$20) \$100						\$4,800	\$4,800
Capital equipment											
Breakdowns of Equipment				Quantity / Price each		Quantity / Price each					\$0
Participant Support Costs											
Other Direct Costs											
Materials and Supplies											
Replacement laptops				1		\$2,200				\$2,200	\$2,200
Cables / batteries / replacement parts				1		\$500				\$500	\$500
Postage to meetings				1		\$150				\$150	\$150
Conference Calls				6		\$40				\$240	\$240
Software for computers				3		\$300				\$900	\$900
Publication Costs											
Communication costs (brochures, posters, photography, printing, letterhead, and mailing)				1		\$15,000				\$15,000	\$15,000
Printing of documents				1		\$14,257				\$14,257	\$14,257
Conference Registration Fees											
Conference registration fees				2		\$750				\$1,500	\$1,500
Event and Meeting Costs											
Food, A/V, set up for consortium meeting (2)				2		\$7,000				\$14,000	\$14,000
Supplies for Consortium meeting (2)				2		\$500				\$1,000	\$1,000
Consultant Services											
Consortium meeting (2)											
Consortium members		Airfare \$500								\$20,000	\$20,000
No. of travelers		20		Hotel \$175 / day						\$14,000	\$14,000
No. of Trips		2		Meals \$50 / day						\$4,000	\$4,000
No. of nights		2		Mileage/taxi/parking (\$80+\$20+\$20) \$100						\$8,000	\$8,000
Ron Trelue (PCS project)										\$35,503	\$35,503
Indirects on travel, supplies, other costs (NOT equipme		35.00%								\$54,198	\$54,198
Subawards/Contractual Costs		Base price								Total	Inflation
Name & Service Provided		computation									
Indirect on consultants		35.00%								\$0	\$0
Total directs										\$427,390	\$380,977
Total indirects										\$149,587	\$282,792
Total										\$576,977	\$1,090,769

Budget Detailed Worksheets

Institute for Security Technology Studies Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISTS PKI Project - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2009

Dartmouth FY08

Dartmouth FY09

Item	Labor (Dartmouth)	Base salary	Dartmouth FY08				Dartmouth FY09				Total	Inflation	
Faculty	(b)(6) (Instructor)	9 month base salary	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%	
Staff	(b)(6)	12 month base salary	\$67,600	3.00	100%	25.00%	\$16,900	0.00	100%	0.00%	\$0	\$16,900	4.0%
		12 month base salary	\$138,646	3.00	50%	12.50%	\$17,331	0.00	50%	0.00%	\$0	\$17,331	4.0%
Student	CS undergrad part-time	Rate per hour	\$10.00	hours/week	#weeks	#students	hours/week	#weeks	#students				
				10.00	10	0	10.00	10	0	\$0	\$0	\$0	3.5%
	CS grad students	Mo. Salary	\$1,992	#months	#students		#months	#students					
				0	0.0	\$0	0	0.0	\$0	\$0	\$0	5.0%	
Subtotal, without fringe						\$34,231			\$0	\$0	\$34,231		
FAC	Fringe on Faculty				38.5%	\$0			39.0%	\$0	\$0		
AP	Fringe on AP I and AP II				38.5%	\$0			39.0%	\$0	\$0		
UG	Fringe on full-time undergraduates				9.0%	\$0			9.0%	\$0	\$0		
RAA	Fringe on Research Associate A				9.0%	\$0			9.0%	\$0	\$0		
RAB	Fringe on Research Associate B				24.5%	\$4,141			24.5%	\$0	\$4,141		
RAC	Fringe on Research Associate C				38.5%	\$6,672			39.0%	\$0	\$6,672		
Total fringe						\$10,813			\$0	\$0	\$10,813		
Subtotal, including fringe						\$45,044			\$0	\$0	\$45,044		
	Indirects on people	59.90%				\$26,981			\$0	\$0	\$26,981		
Direct materials			Computation								Total	notes	
Travel													
Conferences, Meetings and Coordination			Airfare \$500								\$5,000		
			No. of travelers 2 Hotel \$175 / day								\$3,500		
			No. of Trips 5 Meals \$50 / day								\$1,000		
			No. of nights 2 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$1,000		
Travel for outreach trips													
			No. of travelers 2 Rental Car (\$150/day)								\$600	\$600	
			No. of Trips 4 Meals \$50 / day								\$400	\$400	
			No. of nights 1										
Conferences, Meetings and Coordination			Airfare \$500								\$7,000	\$7,000	
			No. of travelers 2 Hotel \$175 / day								\$4,900	\$4,900	
			No. of Trips 7 Meals \$50 / day								\$1,400	\$1,400	
			No. of nights 2 Mileage/tax/parking (\$60+\$20+\$20) \$100								\$2,800	\$2,800	
Capital equipment													
Breakdown of Equipment			Quantity				Price each				Subtotal		
Participant Support Costs													
Other Direct Costs													
Materials and Supplies													
Monitor			1				\$945				\$945	\$945	
Publication Costs													
Conference Registration Fees													
Event and Meeting Costs													
Consultant Services													
Indirects on travel, supplies, other costs (NOT equipment or tuition)			59.90%								\$6,856	\$10,243	\$17,098
Subawards/Contractual Costs			Base price								Total	Inflation	
Describe Product or Service											\$0	\$0	5.0%
Subtotal											\$0	\$0	
Indirect on first \$25k each subcontract			59.90%								\$0	\$0	
Total directs											\$56,489	\$17,100	\$73,589
Total indirects											\$33,837	\$10,243	\$44,080
Total											\$90,325	\$27,343	\$117,668

Budget Detailed Worksheets
 Institute for Security Technology Studies Proposal
 Government FY08 funds - spend during Dartmouth FY08 and FY09
 ISTS HBS Project - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2009

FY

FY09

Item	Labor (Dartmouth)										Total	Inflation	
Faculty	(b)(6)	9 month base salary	\$132,000	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	5.0%	
Staff	(b)(6)	12 month base salary	\$70,304	3.00	50%	12.50%	\$8,788	0.00	100%	0.00%	\$0	4.0%	
		12 month base salary	\$67,500	1.00	100%	8.33%	\$5,625	9.00	100%	75.00%	\$52,650	4.0%	
Students		Rate per hour	\$10.00	hours/week	#weeks	#students		hours/week	#weeks	#students			
	EE student, as lab tech			10.00	10	2	\$2,000	10.00	30	1	\$3,000	\$5,000	
	CS grad students	(b)(6)	Mo. Salary \$7,992		#months	#students		#months	#students				
					3	1.5	\$8,964		9	2.5	\$47,061	\$56,025	5.0%
Subtotal, without fringe							\$25,377				\$102,711	\$128,888	
FAC	Fringe on Faculty					38.5%	\$0			39.0%	\$0	\$0	
AP	Fringe on AP I and AP II					38.5%	\$0			39.0%	\$0	\$0	
UG	Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$0	\$0	
RAA	Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	\$0	
RAB	Fringe on Research Associate B					24.5%	\$3,531			24.5%	\$12,899	\$16,430	
RAC	Fringe on Research Associate C					38.5%	\$0			39.0%	\$0	\$0	
Total fringe							\$3,531				\$12,899	\$16,430	
Subtotal, including fringe							\$28,908				\$115,610	\$144,318	
	Indirects on people		59.90%				\$17,316				\$69,251	\$86,567	
Direct materials											Computation	Total	notes
Travel													
Conferences, Meetings and Coord													
	No. of travelers	2	Airfare \$500				\$5,000				\$5,000		
	No. of Trips	5	Hotel \$175 / day				\$3,500				\$3,500		
	No. of nights	2	Meals \$50 / day				\$1,000				\$1,000		
		2	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$1,000				\$1,000		
Travel for outreach trips													
	No. of travelers	3	Rental Car (\$150/day)								\$450	\$450	
	No. of Trips	3	Meals \$50 / day								\$450	\$450	
	No. of nights	1									\$0	\$0	
Capital equipment													
Breakdown of Equipment													
	Smartcard development tool (Raisance)							1	\$7,664		\$7,664	\$7,664	
	IBM 4764							1	\$12,500		\$12,500	\$12,500	
	Multiprocessor Research Accelerator (RAMP2)							1	\$9,415		\$9,415	\$9,415	
Participant Support Costs													
Other Direct Costs													
Materials and Supplies													
	Multicore Desktop PCs (DELL XPS 700)							1	\$2,849		\$2,849	\$2,849	
	Host for IBM 4764							1	\$3,459		\$3,459	\$3,459	
	LT-capable Desktop PCs (DELL XPS 700)							1	\$2,849		\$2,849	\$2,849	
	VT-capable Desktop PCs (DELL XPS 700)							1	\$2,849		\$2,849	\$2,849	
	PDA platforms							2	\$500		\$1,000	\$1,000	
	TPM-enabled laptops					1	\$2,000				\$2,000	\$2,000	
Publication Costs													
Conference Registration Fees													
Event and Meeting Costs													
Consultant Services													
	(b)(6) training and seminars	weekly	\$5,000				\$10,000				\$10,000	\$10,000	
Consultant Travel													
	No. of travelers	1	Airfare \$500				\$500				\$500	\$500	
	No. of Trips	1	Hotel \$175 / day				\$875				\$875	\$875	
	No. of nights	1	Meals \$50 / day				\$250				\$250	\$250	
		5	Mileage/tax/parking (\$60+\$20+\$20) \$100				\$100				\$100	\$100	
	Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%				\$13,478				\$8,330	\$21,807	
Subawards/Contractual Costs											Base price	Total	Inflation
Describe Product or Service											\$0	\$0	5.0%
Subtotal											\$0	\$0	\$0
Indirect on first \$25k each subcontract											59.90%	\$0	\$0
Total directs							\$53,133				\$159,095	\$212,228	
Total indirects							\$30,794				\$77,580	\$108,374	
Total							\$83,927				\$236,675	\$320,602	

Budget Detailed Worksheets
 Institute for Security Technology Studies Proposal
 Government FY08 funds - spend during Dartmouth FY08 and FY09
 ISTS Metrosense - Budget Period II carry-forward request

Dates: January 1, 2008 to December 31, 2008

FY08

FY09

Item	Labor (Dartmouth)	Base salary										Total	Inflation	
Faculty														
FAC	(b)(6)	9 month base salary	\$165,000	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%	
FAC	(b)(6)	9 month base salary	\$141,000	0.00	100%	0.00%	\$0	1.75	100%	19.44%	\$28,788	\$28,788	5.0%	
FAC	(b)(6)	5 month base salary	\$125,696	0.00	100%	0.00%	\$0	0.50	100%	10.00%	\$13,198	\$13,198	5.0%	
Staff														
RAI	(b)(6)	12 month base salary	\$67,000	3.00	100%	25.00%	\$16,750	4.00	100%	33.33%	\$23,227	\$39,977	4.0%	
RAI	(b)(6)	12 month base salary	\$70,304	3.00	50%	12.50%	\$8,788	0.00	50%	0.00%	\$0	\$8,788	4.0%	
RAI	(b)(6)	12 month base salary	\$67,000	2.00	100%	16.67%	\$11,167	6.00	100%	50.00%	\$34,840	\$46,007	4.0%	
RAI	(b)(6)	12 month base salary	\$67,200	1.00	100%	8.33%	\$5,600	2.00	100%	16.67%	\$11,648	\$17,248	4.0%	
RAI	(b)(6)	12 month base salary	\$25,000	1.00	100%	8.33%	\$2,083	1.00	100%	8.33%	\$2,167	\$4,250	4.0%	
AI	(b)(6)	12 month base salary	\$78,500	1.00	100%	8.33%	\$6,542	6.00	100%	50.00%	\$40,820	\$47,362	4.0%	
AI	(b)(6)	12 month base salary	\$45,760	3.00	33%	8.25%	\$3,775	2.00	25%	4.17%	\$1,983	\$5,758	4.0%	
AI	(b)(6)	12 month base salary	\$45,760	3.00	33%	8.25%	\$3,775	2.00	25%	4.17%	\$1,983	\$5,758	4.0%	
RAQ	(b)(6)	12 month base salary	\$67,000	3.00	100%	25.00%	\$16,750	6.00	100%	50.00%	\$34,840	\$51,590	4.0%	
RAQ	(b)(6)	12 month base salary	\$75,000	3.00	100%	25.00%	\$18,750	3.50	100%	29.17%	\$22,750	\$41,500	4.0%	
Students		Rate per hour	\$10.00	hours/week	#weeks	#students		hours/week	#weeks	#students				
	CS undergrad part-time			12	12	2	\$2,880	12	12	2	\$2,880	\$5,760	0.0%	
	CS grad students	Mo. Salary	\$1,992		#months	#students			#months	#students				
					3	4	\$23,904		6	3	\$37,649	\$61,553	5.0%	
	Thayer grad students		\$2,102		3	2	\$12,612		6	1	\$13,243	\$25,855	5.0%	
Subtotal, without fringe							\$133,376			\$270,014	\$403,390			
	FAC Fringe on Faculty					38.5%	\$0			39.0%	\$16,374	\$16,374		
	AP Fringe on AP I and AP II					38.5%	\$5,425			39.0%	\$17,466	\$22,892		
	UG Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$0	\$0		
	RAA Fringe on Research Associate A					9.0%	\$188			9.0%	\$195	\$383		
	RAB Fringe on Research Associate B					24.5%	\$10,365			24.5%	\$17,080	\$27,445		
	RAC Fringe on Research Associate C					38.5%	\$13,668			39.0%	\$22,460	\$36,128		
Total fringe							\$29,645			\$73,576	\$103,221			
Subtotal, including fringe							\$163,021			\$343,590	\$506,611			
	Indirects on people		59.90%				\$97,650				\$205,811	\$303,460		
Direct materials												Computation	Total	notes
Travel														
Conferences, Meetings and Coor (b)(6)														
	No. of persons	2	Airfare \$500				\$5,000					\$5,000		
	No. of Trips	2	Hotel \$175 / day				\$5,250					\$5,250		
	No. of Trips	5	Meals \$50 / day				\$1,500					\$1,500		
	No. of nights	3	Mileage/taxi/parking (\$80+\$20+\$20) \$100				\$1,000					\$1,000		
Conferences, Meetings and Coor (b)(6)														
	No. of persons	2	Airfare \$500				\$2,500					\$2,500		
	No. of Trips	2	Hotel \$175 / day				\$2,625					\$2,625		
	No. of Trips	5	Meals \$50 / day				\$750					\$750		
	No. of nights	3	Mileage/taxi/parking (\$80+\$20+\$20) \$100				\$500					\$500		
Capital equipment														
Breakdowns of Equipment														
(b)(6)		Quantity	Price each				Subtotal		Quantity	Price each		Subtotal	\$0	
	(b)(6)	45	\$368				\$16,560					\$16,560		
	Plastic cases for dongles	45	\$181				\$8,165					\$8,165		
	Development kit	1	\$6,000				\$6,000					\$6,000		
Participant Support Costs														
Tuition														
based on Thayer School rates														
							\$14,003			\$11,014	\$25,017			
Other Direct Costs														
Materials and Supplies (b)(6)														
	Bluetooth GPS accessories for iPhone	18	\$100				\$1,800					\$1,800		
	Sensor accessories for iPhone (USB, serial, or Bluetooth)	10	\$500				\$5,000					\$5,000		
iPhones to be purchased on DIST budget, and shared between both projects														
Materials and Supplies (b)(6)														
	Mobile phones: Nokia N95	30	\$647				\$19,410					\$0	\$19,410	
	Cell plans for mobile phones (12 months each)	3	\$1,890				\$5,670		3	\$1,890		\$5,670	\$11,340	
Publication Costs														
Conference Registration Fees														
	Conference Registration Fees (b)(6)	1.00	\$800				\$800		2.00	\$800		\$1,600	\$2,400	
	Conference Registration Fees (b)(6)	2.00	\$800				\$1,600		0.00	\$800		\$0	\$1,600	
Event and Meeting Costs														
Consultant Services														
Indirects on travel, supplies, other costs (NOT equipment or tuition)							59.90%				\$4,355	\$36,344		
Subawards/Contractual Costs												Base price	Total	Inflation
Describe Product or Service												\$0	\$0	5.0%
Subtotal												\$0	\$0	
Indirect on first 25% each subcontract												59.90%	\$0	\$0
Total directs											\$261,154	\$361,874	\$623,828	
Total indirects											\$129,639	\$210,165	\$339,805	
Total											\$390,793	\$572,040	\$962,833	

Budget Detailed Worksheets

Institute for Security Technology Studies Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISTS DIST - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2009

		FY08						FY09						Total	Inflation		
Item	Labor (Dartmouth)	Base salary						Base salary									
Faculty																	
FAC	(b)(6)	9 month base salary	\$165,000	0.00%	100%	0.00%	\$0	0.50%	100%	5.56%	\$9,625	\$9,625	\$9,625	5.0%			
FAC	(b)(6)	9 month base salary	\$129,000	0.00%	100%	0.00%	\$0	4.50%	100%	50.00%	\$64,500	\$64,500	\$64,500	0.0%			
FAC	(b)(6)	5 month base salary (A)	\$125,696	0.00%	100%	0.00%	\$0	0.00%	100%	0.00%	\$0	\$0	\$0	5.0%			
Staff																	
AP	(b)(6)	12 month base salary	\$72,119	3.00%	100%	25.00%	\$18,030	6.00%	100%	50.00%	\$37,502	\$55,532	\$55,532	4.0%			
RAB	(b)(6)	12 month base salary	\$67,500	0.00%	50%	0.00%	\$0	0.00%	80%	0.00%	\$0	\$0	\$0	4.0%			
RAB	(b)(6)	12 month base salary	\$67,500	0.00%	50%	0.00%	\$0	0.00%	100%	0.00%	\$0	\$0	\$0	4.0%			
RAC	(b)(6)	12 month base salary	\$105,160	3.00%	100%	25.00%	\$26,290	2.00%	100%	16.67%	\$18,403	\$44,693	\$44,693	5.0%			
AP	(b)(6)	12 month base salary	\$65,100	3.00%	100%	25.00%	\$16,275	3.00%	100%	25.00%	\$17,089	\$33,364	\$33,364	5.0%			
AP	(b)(6)	12 month base salary	\$65,000	3.00%	100%	25.00%	\$16,250	3.00%	100%	25.00%	\$17,063	\$33,313	\$33,313	5.0%			
AP	(b)(6)	12 month base salary	\$65,100	3.00%	25%	6.25%	\$4,069	8.00%	25%	16.67%	\$11,284	\$15,353	\$15,353	4.0%			
Students		Rate per hour		hours/week	#weeks	#students	hour/week	#weeks	#students								
	Undergrads	\$10.00		10.00	10	2	\$2,000	10.00	8	1	\$800	\$2,800	\$2,800				
			Mo. Salary		#months	#students		#months	#students								
	CS grad students	(b)(6)	\$1,992		3	1.0	\$5,976		9	1.0	\$18,824	\$24,800	\$24,800	5.0%			
	CS grad students	(b)(6)	\$1,992		3	1.0	\$5,976		8.5	1.0	\$17,779	\$23,755	\$23,755	5.0%			
	Thayer grad students	(b)(6)	\$2,102		3	2.0	\$12,612		3	2.0	\$13,243	\$25,855	\$25,855	5.0%			
Subtotal, without fringe							\$107,478			\$226,111	\$333,588						
FAC	Fringe on Faculty					38.5%	\$0		39.0%	\$28,909	\$28,909	\$28,909					
AP	Fringe on AP I and AP II					38.5%	\$21,030		39.0%	\$32,345	\$53,376	\$53,376					
UG	Fringe on full-time undergrads					9.0%	\$0		9.0%	\$0	\$0	\$0					
RAA	Fringe on Research Associate A					9.0%	\$0		9.0%	\$0	\$0	\$0					
RAB	Fringe on Research Associate B					24.5%	\$0		24.5%	\$0	\$0	\$0					
RAC	Fringe on Research Associate C					38.5%	\$10,122		39.0%	\$7,177	\$17,299	\$17,299					
Total fringe							\$31,152			\$68,431	\$99,583						
Subtotal, including fringe							\$138,629			\$294,542	\$433,171						
	Indirects on people		59.90%				\$83,039			\$176,431	\$259,470	\$259,470					
Direct materials		Computation									Total	notes					
Travel																	
Conferences, Meetings and Coordination																	
Airfare \$500											\$2,000	\$2,000					
No. of travelers: 2 Hotel \$175 / day											\$2,100	\$2,100					
No. of Trips: 2 Meals \$50 / day											\$600	\$600					
No. of nights: 3 Mileage/taxiparking (\$60+\$20+\$20) \$100											\$400	\$400					
Capital equipment																	
Breakdown of Equipment																	
Quantity Price each Subtotal																	
Quantity Price each Subtotal																	
2 CISCO 10/100/1000 24 port switches (GC)													2	\$3,742	\$7,484	\$7,484	
1 50" plasma display case screen (GC)													1	\$3,000	\$3,000	\$3,000	
2 IBM x3455 with e1000 PCI-X NIC sniffer (GC)													1	\$3,700	\$3,700	\$3,700	
Wireless sniffing infrastructure:																	
Access points and antennas													76	\$350	\$26,600	\$26,600	
Switches, 24port, including installation													6	\$2,788	\$16,728	\$16,728	
Server (large disk, large memory, rack mount)													1	\$5,000	\$5,000	\$5,000	
RAID disk array - expansion for existing server (400GB disk x 16)													1	\$1,440	\$1,440	\$1,440	
Participant Support Costs																	
Thayer Tuition											\$15,894	\$22,028	\$37,922				
Other Direct Costs																	
Materials and Supplies																	
Wireless sniffing infrastructure:																	
Access points installation													201	\$100	\$20,100	\$20,100	
Wiring to install access points															\$50,908	\$50,908	
Smart phones (Apple iPhone 8GB)													13	\$399	\$5,187	\$5,187	
7 GBIC fiber connectors (GC)													2	\$250	\$500	\$500	
1 display computer (Mac or HP) (GC)													1	\$2,000	\$2,000	\$2,000	
1 security keylock (GC)													1	\$1,000	\$1,000	\$1,000	
Additional assorted network hardware (GC)													1	\$3,600	\$3,600	\$3,600	
Publication Costs																	
Conference Registration Fees											4	\$800	\$3,200	\$0	\$3,200		
Event and Meeting Costs																	
Consultant Services																	
Indirects on travel, supplies, other costs (NOT equipment or tu											59.90%	\$47,558	\$7,308	\$54,865			
Subawards/Contractual Costs																	
Base price																Total	Inflation
Aruba Networks											\$0	\$50,000	\$50,000				
Umass											\$0	\$35,000	\$35,000				
Subtotal											\$0	\$85,000	\$85,000				
Indirect on first \$25k each subcontract											59.90%	\$29,950	\$29,950				
Total directs							\$283,686			\$427,954	\$711,640						
Total indirects							\$130,596			\$213,689	\$344,285						
Total							\$414,282			\$641,643	\$1,055,925						

Budget Detailed Worksheets
 Institute for Security Technology Studies Proposal
 Government FY08 funds - spend during Dartmouth FY08 and FY09
 ISTS DVF - Budget Period II carry-forward request
 Dates: January 1, 2008 to March 31, 2009

				E			II								
				FY08			FY09			Total	Inflation				
Item	Labor (Dartmouth)	Base sala													
Faculty															
FAI	(b)(6)	9 month base salary	\$143,000	0.00	100%	0.00%	\$0	0.25	100%	2.78%	\$4,171	\$4,171	5.0%		
FAI	(b)(6)	9 month base salary	\$143,000	1.00	100%	11.11%	\$15,888	0.00	100%	0.00%	\$0	\$15,888	5.0%		
Staff															
SA	(b)(6)	12 month base salary	\$44,124	1.00	100%	8.33%	\$3,677	0.00	100%	0.00%	\$0	\$3,677	4.0%		
Students															
		Rate per hour		hours/week	#weeks	#students		hours/week	#weeks	#students					
	CS grad students	(b)(6)	Mo. Salary		#months	#students			#months	#students					
			\$1,992		3	1	\$5,976		0	1	\$0	\$5,976	5.0%		
Subtotal, without fringe							\$25,541		\$4,171		\$29,712				
FAC	Fringe on Faculty					38.5%	\$6,117		39.0%	\$1,627	\$7,744				
AP	Fringe on AP I and AP II					38.5%	\$1,416		39.0%	\$0	\$1,416				
UG	Fringe on full-time undergraduates					9.0%	\$0		9.0%	\$0	\$0				
RAA	Fringe on Research Associate A					9.0%	\$0		9.0%	\$0	\$0				
RAB	Fringe on Research Associate B					24.5%	\$0		24.5%	\$0	\$0				
RAC	Fringe on Research Associate C					38.5%	\$0		39.0%	\$0	\$0				
Total fringe							\$7,533		\$1,627		\$9,159				
Subtotal, including fringe							\$33,074		\$5,797		\$38,871				
	Indirects on people		59.90%				\$19,811			\$3,473	\$23,284				
Direct materials											Computation	Total	notes		
Travel															
Conferences, Meetings and Coord											Airfare \$500	\$0	\$0		
No. of travelers											0 Hotel \$175 / day	\$0	\$0		
No. of Trips											1 Meets \$50 / day	\$0	\$0		
No. of nights											3 Mileage/tax/parking (\$80+\$20+\$20) \$100	\$0	\$0		
Capital equipment															
Breakdown of Equipment											Quantity price each	subtotal	Quantity price each	subtotal	
												\$0		\$0	
Participant Support Costs															
Other Direct Costs															
Materials and Supplies															
Video Cameras												2	\$2,400	\$2,400	
Large disk Storage												1	\$2,200	\$2,200	
High End computer												1	\$2,340	\$2,340	
Publication Costs															
Conference Registration Fees															
Conference registration fees, year 1											\$600	1.00	\$600	\$600	\$1,200
Event and Meeting Costs															
Consultant Services															
												\$0		\$0	
Indirects on travel, supplies, other costs (NOT equipment or											59.90%		\$359	\$4,516	\$4,876
Subawards/Contractual Costs											Base price			Total	Inflation
Describe Product or Service												\$0		\$0	5.0%
Subtotal												\$0		\$0	
Indirect on first \$25k each subcontract											59.90%		\$0	\$0	
Total directs							\$33,674		\$13,337		\$47,011				
Total indirects							\$20,170		\$7,989		\$28,160				
Total							\$53,844		\$21,327		\$75,171				

Budget Detailed Worksheets

Institute for Security Technology Studies Proposal

Government FY08 funds - spend during Dartmouth FY08 and FY09

ISTS IRIDOE - Budget Period II carry-forward request

Dates: January 1, 2008 to March 31, 2009

				Dartmouth FY08				FY09				Total	Inflation	
Item	Labor (Dartmouth)	Base												
Faculty														
FAC	(b)(6)	9 month base salary	\$132,000	0.50	100%	5.56%	\$7,333	0.50	100%	5.56%	\$7,700	\$15,033	5.0%	
FAC	(b)(6)	9 month base salary	\$0	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%	
FAC	(b)(6)	9 month base salary	\$189,000	0.00	100%	0.00%	\$0	0.25	100%	2.78%	\$5,513	\$5,513	5.0%	
Staff														
RAB	Xia Zhao (postdoc)	12 month base salary	\$70,000	3.00	100%	25.00%	\$17,500	0.00	100%	0.00%	\$0	\$17,500	4.0%	
RAB	Ajit Appari (postdoc)	12 month base salary	\$60,000	3.00	100%	25.00%	\$15,000	0.00	100%	0.00%	\$0	\$15,000	4.0%	
Students														
		Rate, per hour		hours/week	#weeks	#students		hours/week	#weeks	#students				
			Mo. Salary			#months	#students			#months	#students			
	CS grad students	(b)(6)	\$1,992			3	0.5			3	1.0	\$2,092	\$5,080	5.0%
	WISP Intern	(b)(6)	\$370			3	2			3	0	\$0	\$2,220	
Subtotal, without fringe							\$45,041			\$15,304		\$60,345		
FAC	Fringe on Faculty					38.5%	\$2,823			39.0%	\$5,153	\$7,976		
AP	Fringe on AP I and AP II					38.5%	\$0			39.0%	\$0	\$0		
UG	Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$0	\$0		
RAA	Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	\$0		
RAB	Fringe on Research Associate B					24.5%	\$7,963			24.5%	\$0	\$7,963		
RAC	Fringe on Research Associate C					38.5%	\$0			39.0%	\$0	\$0		
Total fringe							\$10,786			\$5,153		\$15,939		
Subtotal, including fringe							\$55,827			\$20,457		\$76,284		
	Indirects on people		59.90%				\$33,440				\$12,254	\$45,694		
Direct materials												Total	notes	
Travel														
Travel to partners														
		Airfare \$500										\$2,000	\$2,000	
	No. of travelers	2 Hotel \$175 / day										\$1,400	\$1,400	
	No. of Trips	2 Meals \$50 / day										\$400	\$400	
	No. of nights	2 Mileage/taxi/parking (\$80+\$20+\$20) \$100										\$400	\$400	
2 weeks in NYC for 2 students														
		Airfare \$500										\$1,000	\$1,000	
	No. of travelers	2 Hotel \$295 / day										\$8,850	\$8,850	
	No. of Trips	1 Meals \$50 / day										\$1,500	\$1,500	
	No. of nights	15 Mileage/taxi/parking (\$80+\$20+\$20) \$100										\$3,000	\$3,000	
Exec-in residence costs:														
		Airfare \$500										\$1,000	\$1,000	
	No. of travelers	2 Hannover Inn \$125 / day										\$500	\$500	
	No. of Trips	1 Meals \$50 / day										\$200	\$200	
	No. of nights	2 Mileage/taxi/parking (\$80+\$20+\$20) \$100										\$200	\$200	
Capital equipment														
Breakdown of Equipment														
Participant Support Costs														
Other Direct Costs														
Materials and Supplies														
Publication Costs														
Conference Registration Fees														
Event and Meeting Costs														
Workshop (Info Risk)														
	Food for event	30 Meals (\$60/ day)										\$2,700	\$2,700	
	Set-up room fee for event	\$2,000 per meeting (easels, markers, tele conf, etc.)										\$2,000	\$2,000	
	Room rental fee for event	\$3,000 per meeting/per day										\$3,000	\$3,000	
	A/V equipment for event	\$10,000 per meeting										\$10,000	\$10,000	
	Postage	\$150 for materials to and from venue										\$305	\$305	
		Postage for reports at \$2 per copy										\$1,000	\$1,000	
	Printing	Report printing (Session information and documents to distribute)										\$2,000	\$2,000	
	Promotional Materials/Supplies	Invitations, posters, brochures, advertising										\$2,000	\$2,000	
Consultant Services														
	Indirects on travel, supplies, other costs (NOT equipment or tuition)		59.90%				\$0					\$26,030	\$26,030	
Subawards/Contractual Costs												Total	Inflation	
	Describe Product or Service	Base price					\$0					\$0	\$0	5.0%
	Subtotal						\$0					\$0	\$0	
	Indirect on first \$25k each subcontract		59.90%				\$0					\$0	\$0	
Total directs							\$55,827			\$63,912		\$119,739		
Total indirects							\$33,440			\$38,283		\$71,724		
Total							\$89,268			\$102,195		\$191,463		

Budget Detailed Worksheets
 Institute for Security Technology Studies Proposal
 Government FY08 Funds - spend during Dartmouth FY08 and FY09
 ISTS AC - Budget Period II carry-forward request
 Dates: January 1, 2008 to October 31, 2008

		FY08				Dartmouth FY09				Total	Inflation		
Faculty	(b)(6) Professor	5 month base salary (QT)	\$125,696	0.00	100%	0.00%	\$0	0.00	100%	0.00%	\$0	\$0	5.0%
Staff	(b)(6) staff	12 month base salary	\$105,160	3.00	100%	25.00%	\$26,290	0.00	100%	0.00%	\$0	\$26,290	5.0%
Students	Thayer grad students	(b)(6)	Mo. Salary \$2,102		#months 3	#students 1	\$6,306		#months 1	#students 1	\$2,207	\$8,513	5.0%
Subtotal, without fringe							\$32,596				\$2,207	\$34,803	
FAC	Fringe on Faculty					38.5%	\$0			39.0%	\$0	\$0	
AP	Fringe on AP I and AP II					38.5%	\$0			39.0%	\$0	\$0	
UG	Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$0	\$0	
RAA	Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	\$0	
RAB	Fringe on Research Associate B					24.5%	\$0			24.5%	\$0	\$0	
RAC	Fringe on Research Associate C					38.5%	\$10,122			39.0%	\$0	\$10,122	
Total fringe							\$10,122				\$0	\$10,122	
Subtotal, including fringe							\$42,718				\$2,207	\$44,925	
	Indirects on people	59.90%					\$25,588				\$1,322	\$26,910	
Direct materials		Computation										Total	notes
Travel													
Conferences, Meetings and Co Airfare \$500							\$1,000					\$1,000	
No. of travelers 1 Hotel \$175 / day							\$1,050					\$1,050	
No. of Trips 2 Meals \$50 / day							\$300					\$300	
No. of nights 3 Mileage/taxi/parking (\$80+\$20+\$20) \$100							\$200					\$200	
Capital equipment													
Breakdowns of Equipment													
Participant Support Costs													
Tuition based on Thayer School rate		\$22,196					\$5,828				\$8,295	\$14,123	
Other Direct Costs													
Materials and Supplies													
Upgrades and Maintenance to ISTS Cluster (ACRP)							\$5,000					\$5,000	
Internet Line (\$240/mo)							\$720					\$720	
Publication Costs													
Conference Registration Fees													
Conference registration fees, yet		\$500		0.00	\$500		\$0		0.00	\$500		\$0	
Event and Meeting Costs													
Consultant Services												\$0	
												\$0	
Indirects on travel, supplies, other costs (NOT equipment or		59.90%					\$4,954				\$0	\$4,954	
Subawards/Contractual Costs		Base price										Total	Inflation
Describe Product or Service							\$0				\$0	\$0	5.0%
Subtotal							\$0				\$0	\$0	
Indirect on first \$25k each subcontract		59.90%					\$0				\$0	\$0	
Total directs							\$56,816				\$10,502	\$67,318	
Total indirects							\$30,542				\$1,322	\$31,864	
Total							\$87,357				\$11,824	\$99,181	

Budget Detailed Worksheets

Institute for Security Technology Studies Proposal

Government FY07 funds - spend during Dartmouth FY07 and FY08

ISTS Business Education for the Security Professional (Tuck Executive Education Course) - Budget Period II carry-forward request

Dates:		April 1, 2007 to	March 31, 2008							FY		Total	Inflation				
Item	Labor (Dartmouth)																
Faculty																	
FAC	TBA (Course Development)	12 month base salary	\$60,000	3.00	6%	1.50%	\$900	9.00	6%	4.50%	\$2,835	\$3,735	5.0%				
FAC	TBA (Course Development)	12 month base salary	\$140,000	3.00	5%	1.25%	\$1,750	9.00	5%	3.75%	\$5,513	\$7,263	5.0%				
NSL	TBA (Course Development)	4 days of non-salaried effort @	\$5,000								\$20,000	\$20,000					
NSH	TBA (Course Delivery)	3.5 days of non-salaried effort @	\$5,800								\$20,300	\$20,300					
Staff																	
AP	Staff Coordinator (Course Delivery)	12 month base salary	\$32,500	0.00	0%	0.00%	\$0	8.00	13%	8.67%	\$2,958	\$2,958	5.0%				
Subtotal, without fringe											\$2,650	\$51,605	\$54,255				
FAC	Fringe on Faculty					38.0%	\$1,007			39.0%	\$3,256	\$4,263					
AP	Fringe on AP I and AP II					38.0%	\$0			39.0%	\$1,153	\$1,153					
NSH	Non-Salaried Effort (Tuck Policy)					24.5%	\$0			25.5%	\$10,277	\$10,277					
Total fringe											\$1,007	\$14,685	\$15,692				
Subtotal, including fringe											\$3,657	\$66,290	\$69,947				
	Indirects on people		35.00%				\$1,280				\$23,202	\$24,482					
Direct materials																	
Travel																	
To visit Executives																	
		Airfare \$500					\$1,500					\$1,500					
	No. of travelers	3 Hotel \$175 / day					\$1,050					\$1,050					
	No. of Trips	1 Meals \$50 / day					\$300					\$300					
	No. of nights	2 Mileage/rentalparking (\$60+\$20+\$20) \$100					\$300					\$300					
To visit Executives																	
		Airfare \$600									\$2,000	\$2,000					
	No. of travelers	4 Hotel \$175 / day					\$1,400				\$1,400	\$1,400					
	No. of Trips	1 Meals \$50 / day					\$400				\$400	\$400					
	No. of nights	2 Mileage/rentalparking (\$60+\$20+\$20) \$100					\$600				\$800	\$800					
Capital equipment																	
Breakdown of Equipment																	
Participant Support Costs																	
Other Direct Costs																	
Materials and Supplies																	
Materials & Shipping																	
													1.0	\$2,000	\$2,000	\$2,000	
Marketing																	
													1.0	\$3,265	\$3,265	\$3,265	
Publication Costs																	
Conference Registration Fees																	
Event and Meeting Costs																	
Transportation																	
													1.0	\$1,000	\$1,000	\$1,000	
Tuck Program for cyber-educating executive																	
													1.0	\$4,000	\$4,000	\$4,000	
Consultant Services																	
Indirects on travel, supplies, other costs (NOT equipment re-tuition)													35.00%	\$1,103	\$5,203	\$6,305	
Subcontracts																	
Describe Product or Service																	
Subtotal														\$0	\$0	\$0	5.0%
Indirect on first \$25k each subcontract													35.00%	\$0	\$0	\$0	
Total direct														\$6,807	\$81,156	\$87,963	
Total indirect														\$2,382	\$28,405	\$30,788	
Total														\$9,189	\$109,561	\$118,751	

Budget Detailed Worksheets
 Institute for Security Technology Studies Proposal
 Government FY08 funds - spend during Dartmouth FY08 and FY09
 ISTS Summer Program - Budget Period II carry-forward request

Date:		January 1, 2008 to		March 31, 2009		FY		FY09		Total	Inflation					
Item	Labor (Dartmouth)	Base salary								Total	Inflation					
Faculty	(b)(6)	9 month base salary		0.50	100%	5.56%	\$7,333	0.00	100%	0.00%	\$0	\$7,333	5.0%			
Staff	(b)(6)	12 month base salary	\$138,646	2.00	25%	4.17%	\$5,777	0.00	0%	0.00%	\$0	\$5,777	4.0%			
	(b)(6)	12 month base salary	\$67,500	1.00	50%	4.17%	\$2,813	0.00	0%	0.00%	\$0	\$2,813	4.0%			
	(b)(6)	12 month base salary	\$40,000	1.00	20%	1.67%	\$667	0.00	0%	0.00%	\$0	\$667	4.0%			
	(b)(6)	12 month base salary	\$67,500	1.00	25%	2%	\$1,406	0.00	20%	0%	\$0	\$1,406	4.0%			
	(b)(6)	12 month base salary	\$67,500	2.00	50%	8%	\$5,625	0.00	0%	0%	\$0	\$5,625	4.0%			
Students		CS undergrad part-time	\$10.00	\$1,600	40.00	#weeks	4	#students	1	\$1,600	0.00	0	0	\$0	\$1,600	3.5%
		CS grad students (summer-school teaching assistant)	(b)(6)	Mo. Salary		#months	2	#students	1	\$3,984	0	1	\$0	\$3,984	5.0%	
		UG Undergrad (Non profit student stipends)	\$1,992				0		0	\$0	0	3	\$0	\$0	5.0%	
Subtotal, without fringe										\$0	\$29,205					
	FAC	Fringe on Faculty					38.5%	\$2,823			39.0%	\$0	\$2,823			
	AP	Fringe on AP I and AP II					38.5%	\$257			39.0%	\$0	\$257			
	UG	Fringe on full-time undergraduates					9.0%	\$0			9.0%	\$0	\$0			
	RAA	Fringe on Research Associate A					9.0%	\$0			9.0%	\$0	\$0			
	RAB	Fringe on Research Associate B					24.5%	\$2,412			24.5%	\$0	\$2,412			
	RAC	Fringe on Research Associate C					38.5%	\$2,224			39.0%	\$0	\$2,224			
Total fringe										\$0	\$7,716					
Subtotal, including fringe										\$0	\$36,920					
		Indirects on people	59.90%					\$22,115			\$0	\$22,115				
Direct materials																
Travel																
		Visit regional schools to recruit and promote	Mileage \$160					\$2,400				\$2,400				
		No. of travelers	8 Hotel \$175 / day					\$5,600				\$5,600				
		No. of Trips	2 Meals \$50 / day					\$1,600				\$1,600				
		No. of nights	2 Taxiparking \$30					\$480				\$480				
		Visit regional schools after program finishes	Mileage \$150					\$600				\$600				
		No. of travelers	2 Hotel \$175 / day					\$1,400				\$1,400				
		No. of Trips	2 Meals \$50 / day					\$400				\$400				
		No. of nights	2 Taxiparking \$30					\$240				\$240				
Capital equipment																
Breakdown of Equipment																
								Quantity - see each		Quantity - see each		Quantity - see each				
												\$0	\$0			
Participant Support Costs																
Other Direct Costs																
Materials and Supplies																
		Computers for set-up and non-profit students as needed		6	\$2,000			\$12,000				\$12,000				
		PowerEdge 860		3	\$2,300			\$6,900				\$6,900				
		Summer-school supplies						\$1,508				\$1,508				
Publication Costs																
Conference Registration Fees																
Event and Meeting Costs																
		Summer-school for students						10 students for 2 weeks								
		Travel	350 \$350 modest travel allowance					\$0			10	\$0	\$0			
		Sustenance	510 \$310/week housing and \$200/week food					\$0			20	\$0	\$0			
		Other	100 Supplies & space cost per student \$100					\$0			10	\$0	\$0			
		Summer-school for professors						10 profs. for 2 weeks								
		Travel	500 \$500 modest travel allowance					\$7,500			10	\$7,500	\$7,500			
		Sustenance	510 \$310/week housing and \$200/week food					\$10,200			20	\$10,200	\$10,200			
		Other	0 Supplies & space cost per student \$100					\$0			0	\$0	\$0			
Consultant Services																
		Summer-school instructor (course development)						1	\$750			\$750	\$750			
		Consultant Travel	Airfare \$500					\$500				\$500	\$500			
		No. of travelers	1 Hotel \$175 / day					\$525				\$525	\$525			
		No. of Trips	1 Meals \$50 / day					\$150				\$150	\$150			
		No. of nights	3 Mileage/taxiparking (\$80+\$20+\$20) \$100					\$100				\$100	\$100			
		Indirects on travel, supplies, other costs (NOT equipment or tuition)	59.90%					\$30,078			\$1,581	\$31,659				
Subawards/Contractual Costs																
		Describe Product or Service						\$0			\$0	\$0	5.0%			
		Subtotal						\$0			\$0	\$0				
		Indirect on first \$25k each subcontract	59.90%					\$0			\$0	\$0				
Total directs											\$87,133					
Total indirects											\$52,193					
Total											\$139,326					
											\$4,221					
											\$89,773					
											\$53,774					
											\$143,548					

Grant and Cooperative Agreement

CHOOSE ONE:

- COOPERATIVE AGREEMENT
 GRANT

CHOOSE ONE: EDUCATION FACILITIES RESEARCH SDCR TRAINING

1. GRANT/COOPERATIVE AGREEMENT NUMBER 2006-CS-001-000001		2. SUPPLEMENT NUMBER A002		3. EFFECTIVE DATE 09/30/2006		4. COMPLETION DATE 07/31/2009	
5. ISSUED TO NAME/ADDRESS OF RECIPIENT (No., Street, City/County, State, Zip) TRUSTEES OF DARTMOUTH COLLEGE OFFICE OF SPONSORED PROJECTS 11 ROPE FERRY RD #6210 HANOVER NH 037551404				6. ISSUED BY U.S. Dept. of Homeland Security Mailing Address: Office of Procurement Operations Grants & Financial Assistance Div. 245 Murray Lane, SW Building 410 Washington DC 20528			
7. TAXPAYER IDENTIFICATION NO. (TIN)				9. PRINCIPAL INVESTIGATOR/ORGANIZATION'S PROJECT OR PROGRAM MGR. (Name & Phone) DR. (b)(6)			
8. COMMERCIAL & GOVERNMENT ENTITY (CAGE) NO.							
10. RESEARCH, PROJECT OR PROGRAM TITLE CYBER SECURITY COLLABORATION AND INFORMATION SHARING							
11. PURPOSE The purpose of this amendment is to provide a no-cost extension of the Project Period and the Budget Period through July 31, 2011.							
12. PERIOD OF PERFORMANCE (Approximately) 09/30/2006 through 07/31/2009							
13A. PREVIOUS		AWARD HISTORY		13B. PREVIOUS		FUNDING HISTORY	
		\$930,000.00				\$930,000.00	
THIS ACTION				THIS ACTION			
		\$0.00				\$0.00	
CASH SHARE				TOTAL			
		\$0.00				\$930,000.00	
NON-CASH SHARE							
		\$0.00					
RECIPIENT SHARE							
		\$0.00					
TOTAL		\$930,000.00					
14. ACCOUNTING AND APPROPRIATION DATA							
PURCHASE REQUEST NO.		JOB ORDER NO.		AMOUNT		STATUS	
15. POINTS OF CONTACT							
	NAME		MAIL STOP	TELEPHONE	E-MAIL ADDRESS		
TECHNICAL OFFICER	ANNABELLE LEE		8570		(b)(6)		
NEGOTIATOR							
ADMINISTRATOR	David L. Batcheller		OPO		(b)(6)		
PAYMENTS							
16. THIS AWARD IS MADE UNDER THE AUTHORITY OF: Section 308(b)(1) of the Homeland Security Act of 2002 (Public Law 107-296). P.L. 109-90							
17. APPLICABLE STATEMENT(S), IF CHECKED:				18. APPLICABLE ENCLOSURE(S), IF CHECKED:			
<input type="checkbox"/> NO CHANGE IS MADE TO EXISTING PROVISIONS <input type="checkbox"/> FDP TERMS AND CONDITIONS AND THE AGENCY-SPECIFIC REQUIREMENTS APPLY TO THIS GRANT				<input type="checkbox"/> PROVISIONS <input type="checkbox"/> SPECIAL CONDITIONS <input type="checkbox"/> REQUIRED PUBLICATIONS AND REPORTS			
UNITED STATES OF AMERICA				COOPERATIVE AGREEMENT RECIPIENT			
CONTRACTING/GRANT OFFICER David L. Batcheller			DATE	AUTHORIZED REPRESENTATIVE			DATE

Grant and Cooperative Agreement

ITEM NO. (A)	ITEM OR SERVICE (Include Specifications and Special Instructions) (B)	QUANTITY (C)	UNIT (D)	ESTIMATED COST	
				UNIT PRICE (E)	AMOUNT (F)
	DUNS Number: 041027822+0000				



Homeland Security

May 1, 2009

(b)(6)

Ph.D.

Vice Provost for Research
Trustees of Dartmouth College
11 Rope Ferry Road
Parkhurst -- HB 6004
Hanover, NH 03755-1404

RE: 2006-CS-001-000001-03, Amendment 2

Dear Dr

(b)(6)

Enclosed please find Amendment 2 for the above mentioned Award. The purpose of this amendment is to extend, at no additional cost to the Government, the Project Period through July 31, 2011.

Should you have any questions concerning this amendment, please contact me directly by phone at 202-447-5272 or by email at david.batcheller@dhs.gov.

Sincerely

(b)(6)

David L. Batcheller, Grants Officer
Grants and Financial Assistance Division
Office of Procurement Operations
Office of the Chief Procurement Officer

Enclosure

cc:

(b)(6)



Homeland Security

COOPERATIVE AGREEMENT TERMS AND CONDITIONS

RECIPIENT: Trustees of Dartmouth College

RECIPIENT DUNS NUMBER: 041027822

AGREEMENT NO: 2006-CS-001-000001-03

AMENDMENT NO: 2

TITLE: Cyber Security Collaboration and Information Sharing

CFDA NO: 97.001

AMENDMENT:

The purpose of this amendment is to provide a no-cost extension of the Project Period and the Budget Period through July 31, 2011.

ARTICLE III – PERIOD OF PERFORMANCE

A. Project Period.

1. The Project Period shall be from September 30, 2006 through July 31, 2011, unless extensions are approved. This is contingent on acceptable performance of the project as determined by the Department of Homeland Security (DHS), acceptance and approval of each non-competing continuation application by the DHS, and available annual DHS appropriations.

B. Budget Period.

1. The Budget Period shall be for a period of 36 months, from August 1, 2008 through July 31, 2011.

2006-CS-001-000001-03

ALL OTHER ARTICLES REMAIN IN EFFECT.

(b)(6)

David Batcheller, Grants Officer
Grants and Financial Assistance Division
Office of Procurement Operations
Office of the Chief Procurement Officer
Department of Homeland Security

5/1/09
Date

(b)(6)



Dartmouth College HANOVER • NEW HAMPSHIRE • 03755-3529
Office of the Provost • 6004 Parkhurst Hall, Rm. 204 • Tel (603)646-4091 • Fax (603)646-3773

(b)(6)

(b)(6)

*Vice Provost for Research
Francis and Mildred Sears Professor of Physics*

Marilyn J. Morgan
Director, Grants and Financial Assistance Division
Office of Procurement Operations
Office of the Chief Procurement Officer

Ronald Ford
Program Manager, I3P and ISTS
National Cyber Security Division
Department of Homeland Security

Dear Marilyn and Ron:

As requested, I3P will be submitting an application for supplemental funding to grant #2006-CS-001-000001 by May 15, 2009. Having spoken with Marilyn, we realize that when the supplement is processed in the June 2009 timeframe, the entire award will be given a revised end date of July 31, 2011. We therefore request that the end date be extended now, prior to the processing of the supplement, in order to ensure that work plans can continue, personnel obligations are secured, and sub-award extensions can be processed in a timely manner for on-going projects.

All projects that continue work past July 31, 2009 are in accordance with the original statement of work. Below are some of the projects that will continue for programmatic reasons. This is not an exhaustive list of programs that will continue; others not listed below are also anticipated to need additional time. No additional funding is requested in order to complete the projects and there are no anticipated changes in scope.

I3P Fellowship Program: There are currently 2 I3P fellows that will complete their fellowship in the fall 2009 timeframe. Additional fellows will begin in summer 2009 and continue through summer 2010. In order to ensure program continuity and that offers can be made to the best candidates in a timely manner, a revised end date is needed.

Administration: I3P continues to use the grant to support the overall administration in overseeing the I3P consortium and I3P project initiatives.

Research Projects:

I3P - PCS: Validation and verification of developed tools by industry partners will continue. Final publication of the IFIP working group book by Tulsa is anticipated in fall 2009.

I3P - Insider Threat: MITRE plans to perform a more thorough analysis of the extensive data they have collected.

I3P - Identity Management: MITRE plans to use the SPICI framework as a tool to facilitate the development of a multilateral data sharing agreement in the healthcare sector.

I3P - Business Rationale: Work with financial partners will continue as the modeling tools are refined. Additionally, a workshop is scheduled for November of 2009.

ISTS - DIST: Due to the time taken for the comprehensive internal reviews and approvals that were needed to ensure that data is protected and handled in a compliant manner, additional time is needed to complete this project.

ISTS - SISMAT: The educational program is schedule for June 2009, and will involve internships and follow-on reviews throughout summer 2009.

ISTS - IRIDOE: A final workshop is anticipated to take place in fall 2009.

All information and detailed updates have been provided to NCSD and our program manager through monthly conference calls and quarterly progress reports. We look forward to continued success and working with NCSD throughout the supplemental funding period.

Best regards,

(b)(6)

Grant and Cooperative Agreement

CHOOSE ONE:

- COOPERATIVE AGREEMENT
 GRANT

CHOOSE ONE: EDUCATION FACILITIES RESEARCH SDCR TRAINING

1. GRANT/COOPERATIVE AGREEMENT NUMBER 2006-CS-001-000001	2. SUPPLEMENT NUMBER A001	3. EFFECTIVE DATE 09/30/2006	4. COMPLETION DATE 07/31/2009
---	------------------------------	---------------------------------	----------------------------------

5. ISSUED TO
 NAME/ADDRESS OF RECIPIENT (No., Street, City/County, State, Zip)
 TRUSTEES OF DARTMOUTH COLLEGE
 OFFICE OF SPONSORED PROJECTS
 11 ROPE FERRY RD #6210
 HANOVER NH 037551404

6. ISSUED BY U.S. Dept. of Homeland Security
Mailing Address: Office of Procurement Operations
 Grants & Financial Assistance Div.
 245 Murray Lane, SW
 Building 410
 Washington DC 20528

7. TAXPAYER IDENTIFICATION NO. (TIN)

9. PRINCIPAL INVESTIGATOR/ORGANIZATION'S PROJECT OR PROGRAM MGR. (Name & Phone)

8. COMMERCIAL & GOVERNMENT ENTITY (CAGE) NO.

DR (b)(6)

10. RESEARCH, PROJECT OR PROGRAM TITLE
 CYBER SECURITY COLLABORATION AND INFORMATION SHARING

11. PURPOSE

The Purpose of this amendment is to change the designated DHS Grants Officer and DHS Program Officer (Article XIII.A. and B.)

12. PERIOD OF PERFORMANCE (Approximately)

09/30/2006 through 07/31/2009

13A.	AWARD HISTORY	13B.	FUNDING HISTORY
PREVIOUS	\$930,000.00	PREVIOUS	\$930,000.00
THIS ACTION	\$0.00	THIS ACTION	\$0.00
CASH SHARE	\$0.00	TOTAL	\$930,000.00
NON-CASH SHARE	\$0.00		
RECIPIENT SHARE	\$0.00		
TOTAL	\$930,000.00		

14. ACCOUNTING AND APPROPRIATION DATA

PURCHASE REQUEST NO.	JOB ORDER NO.	AMOUNT	STATUS

15. POINTS OF CONTACT

	NAME	MAIL STOP	TELEPHONE	E-MAIL ADDRESS
TECHNICAL OFFICER	ANNABELLE LEE	8570	(b)(6)	
NEGOTIATOR				
ADMINISTRATOR	David L. Batcheller	OPO		
PAYMENTS				

16. THIS AWARD IS MADE UNDER THE AUTHORITY OF:

Section 308(b)(1) of the Homeland Security Act of 2002 (Public Law 107-296). P.L. 109-90

17. APPLICABLE STATEMENT(S), IF CHECKED:

- NO CHANGE IS MADE TO EXISTING PROVISIONS
 FDP TERMS AND CONDITIONS AND THE AGENCY-SPECIFIC REQUIREMENTS APPLY TO THIS GRANT

18. APPLICABLE ENCLOSURE(S), IF CHECKED:

- PROVISIONS SPECIAL CONDITIONS
 REQUIRED PUBLICATIONS AND REPORTS

UNITED STATES OF AMERICA

COOPERATIVE AGREEMENT RECIPIENT

CONTRACTING/GRANT OFFICER

DATE

AUTHORIZED REPRESENTATIVE

DATE

David L. Batcheller

Grant and Cooperative Agreement

ITEM NO. (A)	ITEM OR SERVICE (Include Specifications and Special Instructions) (B)	QUANTITY (C)	UNIT (D)	ESTIMATED COST	
				UNIT PRICE (E)	AMOUNT (F)
	DUNS Number: 041027822+0000				

copy



Homeland Security

COOPERATIVE AGREEMENT

TERMS AND CONDITIONS

RECIPIENT: Trustees of Dartmouth College

RECIPIENT DUNS NUMBER: 041027822

AGREEMENT NO: 2006-CS-001-000001-03

AMENDMENT NO: 1

TITLE: Cyber Security Collaboration and Information Sharing

CFDA NO: 97.001

AMENDMENT:

The purpose of this amendment is to change the designated DHS Grants Officer and DHS Program Officer (Article XIII.A. and B).

ARTICLE XIII – DEPARTMENT OF HOMELAND SECURITY OFFICIALS

- A. The Program Officer shall be the DHS staff member responsible for monitoring the completion of work and technical performance of the projects or activities described in the application under the Program Narrative Statement.

Ronald M. Ford, Program Officer
National Cyber Security Division (NCSD)
Department of Homeland Security
Mail Stop 8570
Department of Homeland Security
245 Murray Lane, SW, Bldg. 410
Washington DC 20528-0300
Office:
Fax: 703-235-5962
Email:



The Grants Officer is the DHS official that has the full authority to negotiate, administer and execute all terms and conditions of this Award in concurrence with the Program Officer.

David Batcheller, Grants Officer
Grants and Financial Assistance Division
Office of Procurement Operations
Office of Chief Procurement Officer
Department of Homeland Security
245 Murray Lane, S.W., Bldg. 410, Mail Stop 0115
Washington, D.C. 20528-0115

(b)(6)

ALL OTHER ARTICLES REMAIN IN EFFECT.

(b)(6)

~~David Batcheller, Grants Officer~~
Grants and Financial Assistance Division
Office of Procurement Operations
Office of the Chief Procurement Officer
Department of Homeland Security

1/22/09

Date



Homeland Security

GRANT

TERMS AND CONDITIONS

RECIPIENT: Trustees of Dartmouth College

RECIPIENT DUNS NUMBER: 041027822

AGREEMENT NO: 2006-CS-001-000001-03

AMENDMENT NO: N/A

TITLE: Cyber Security Collaboration and Information Sharing

CFDA NO: 97.001

ARTICLE I - AUTHORIZING LEGISLATION

Section 308(b)(1) of the Homeland Security Act of 2002 (Public Law 107-296). P.L. 109-90.

ARTICLE II - PROGRAM DESCRIPTION

The Recipient shall perform the work described in the Program Narrative, as submitted in the Grant Application dated January 28, 2008.

ARTICLE III - PERIOD OF PERFORMANCE

The Period of Performance is the Project Period approved for the supported activity and is comprised of one or more Budget Periods.

A. Project Period.

1. The Project Period shall be from September 30, 2006 through July 31, 2009, unless extensions are approved. This is contingent on acceptable performance of the project as determined by the Department of Homeland Security (DHS), acceptance and approval of

each non-competing continuation application by the DHS, and available annual DHS appropriations.

2. The Recipient shall only incur costs or obligate funds within the Project Period for approved activities.

B. Budget Period.

1. The Budget Period shall be for a period of 12 months, from August 1, 2008 through July 31, 2009.
2. The Recipient shall not, without the prior written approval of the DHS, request reimbursement, incur costs or obligate funds for any purpose pertaining to the operation of the project, program, or activities prior to the approved Budget Period.

ARTICLE IV – TERMS AND CONDITIONS SPECIFIC TO THIS AWARD

- A. Travel: Foreign travel must be approved by DHS in advance and in writing. Any request for foreign travel must be submitted to the Grants Officer 60 days prior to the commencement of travel.
- B. Human Subjects: Recipient agrees to meet all DHS and HHS requirements for studies using human subjects prior to implementing any work with these subjects. These requirements are given in 45 Code of Federal Regulations (CFR) Part 46, Subparts A-D. Subpart A of 45 CFR Part 46 is HHS's codification of the Federal Policy for the Protection of Human Subjects (also known as The Common Rule) which represents the basic foundation for the protection of human subjects in most research conducted or support by U.S. Federal departments and agencies. No actual work involving human subjects, including recruiting, may be initiated before DHS has received a copy of the applicant's Institutional Review Board's (IRB) approval of the project or determination that it is exempt from human subjects requirements, and DHS has provided approval, although development of tools (e.g., survey instruments), protocols and data gathering approaches may proceed. Where human subjects are involved in the research, the recipient must provide evidence of subsequent IRB reviews, including amendments or minor changes of protocol, as part of annual reports.
- C. Workshops and conference planning actions should be shared with DHS. Advance notice of conference and workshop postings on I3P and ISTS websites will be provided to DHS during planning stages. It is imperative that Dartmouth closely coordinate major conference/workshop and exercise dates and schedules with the NCS D Program Manager in order to avoid conflicts with DHS and NCS D events that may be aimed at similar audiences.
- D. Red Cell exercises planning should be shared with DHS.

ARTICLE V - AMOUNT OF AWARD

- A. This Award is subject to the availability of funds and the administration and completion of an approved Homeland Security program/project within the Period of Performance. Funds provided by this Award shall not be used for other purposes.
- B. Approved Budget. The approved budget for the Budget Period August 1, 2008 through July 31, 2009, for this Award by category is:

OBJECT CLASS CATEGORY	TOTAL APPROVED BUDGET
Personnel	\$1,173,870
Fringe Benefits	\$355,387
Travel	\$177,455
Equipment	\$0
Supplies	\$15,663
Contractual	\$5,097,581
Construction	\$0
Other	\$348,608
Total Direct Charges	\$7,168,564
Indirect Charges	\$1,171,436
TOTAL	\$8,340,000

- C. Cost Share/Match. There is no cost-share or match funding required for this Award. The Department of Homeland Security will pay up to 100% of the allowable costs identified in the approved budget listed under Article IV, paragraph B. Subject to Article III, the maximum funding for this Award for the Budget Period is \$8,340,000. If costs exceed the maximum amount of DHS-approved funding, the Recipient shall pay the costs in excess of the approved budget.

ARTICLE VI - DEPARTMENT OF HOMELAND SECURITY OFFICIALS

DHS officials for the Award are as follows:

- A. The Program Officer shall be the DHS staff member responsible for monitoring the completion of work and technical performance of the projects or activities described in the Program Narrative Statement.

Annabelle Lee
Mail Stop 8570
Department of Homeland Security
245 Murray Lane, SW, Bldg. 410
Washington, DC 20528-0300

(b)(6)

- B. The Grants Officer is the DHS official that has the full authority to negotiate, administer and execute all terms and conditions of this Award in concurrence with the Program Officer.

Tya Renwick
Mail Stop 500
Department of Homeland Security
245 Murray Lane, SW, Bldg. 410
Washington, DC 20528-0300

(b)(6)

- C. The Regulatory Compliance Officer is the DHS official responsible for overseeing the DHS Regulatory Compliance Office (RCO) and implementing procedures to ensure that the Recipient of this award complies with federal regulations and DHS policies for the protection of human subjects, animal care and use, biosafety and select agent security.

Nicole Marcson
Deputy Associate General Counsel
Science and Technology Directorate
Department of Homeland Security
Washington, D.C. 20528

(b)(6)

The RCO shall collect relevant documentation pertaining to this award on behalf of the Regulatory Compliance Officer. Specific RCO points of contact for documentation submissions and inquiries are provided in the Terms and Conditions below.

- D. The DHS Grants Officer shall promptly notify the Recipient in writing of any change of the Program Officer, the Grants Officer, or the Regulatory Compliance Officer, or their respective contact information. Such notification (by fax, email or letter, as appropriate) will supersede the information listed here.

ALL TERMS AND CONDITIONS REFLECTED IN THE NOTICE OF GRANT AWARDS DATED SEPTEMBER 25, 2006, APRIL 3, 2007, AND ALL AMENDMENTS THERETO REMAIN IN EFFECT.

(b)(6)

Tya Renwick, Grants Officer
Grants and Financial Assistance Division
Office of Procurement Operations
Office of the Chief Procurement Officer
Department of Homeland Security

5/20/08

Date



January 28, 2011

(b)(6)

Inette Furey
Program Officer
Attn: National Cyber Security Division/Preparedness Directorate
Department of Homeland Security
Washington, DC 20528

Dear Ms. Furey:

On behalf of the Institute for Information Infrastructure Protection (I3P) and the Institute for Security, Technology, and Society (ISTS), we are pleased to submit this Cyber Security and Information Sharing Progress Report, providing detailed information on the research and development efforts funded under award number 2006-CS-001-000001. This report covers ISTS and I3P activities between October 1, 2010 and December 31, 2010.

We trust this report illustrates the progress the two institutes have made to address the approved project(s) objectives. We look forward to working closely with you as we move the I3P and ISTS forward. If you require any further information please contact me at either (b)(6) or

(b)(6)

Thank you for your continued support.

Sincerely,

(b)(6)

Principal Investigator

cc: Marsha Mathis, Grants Officer





The Institute for Information Infrastructure Protection

and



The Institute for Security, Technology, and Society

Quarterly Progress Report
For the period October 1 – December 31, 2010

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Institute for Information
Infrastructure Protection

I3P Report

Overview

The objective of this project is to apply the collective, diverse expertise of Dartmouth College's Institute for Information Infrastructure Protection (I3P) to critical priorities tied to the mission of the Institute. A number of topics outlined in the I3P's February 2009 report "*National Cyber Security Research and Development Challenges Related to Economics, Physical Infrastructure, and Human Behavior: An Industry, Academic, and Government Perspective*," as well as other national research agenda documents will drive the selection of high quality and relevant workshops, outreach and research to be coordinated by I3P management and performed by I3P consortium members. The I3P will hold workshops and perform outreach activities to highlight and disseminate I3P research results, design and run forums to provide a holistic view into the information infrastructure protection challenges faced by the private and public sectors, and conduct a research program. The I3P will also continue the postdoctoral fellowship program, perform its general management activities, and initiate new research projects with multidisciplinary research teams.

The work will be accomplished through workshops and outreach, education and research programs involving communities of researchers nationwide. This fourteenth progress report reflects I3P activities and progress made in addressing goals outlined in the proposals dated February 2007 and April 2009. The following four initiatives will be discussed in greater detail:

- **Initiative 1:** I3P Workshops and Outreach
- **Initiative 2:** I3P Postdoctoral Fellowship Program
- **Initiative 3:** I3P Management
- **Initiative 4:** I3P Research

Activities

Initiative 1: I3P Fellowship Program

1. Project title and lead

Initiative title: I3P Workshops and Outreach

Initiative lead: (b)(6) I3P Administrative office

2. Description

The I3P has a well-established and nationally recognized ability to organize high impact workshops of interest to industry, government and academia, and has used these workshops to gain knowledge about cyber security problems and to demonstrate

solutions. The consortium has shown its abilities to bring together important stakeholders from a variety of disciplines to discuss security challenges and advance solutions. The I3P has a unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue.

We will continue to provide these high-impact events and make them widely accessible to researchers, industry participants and policy makers. We envision at least five events, in similar scope and scale to prior workshops, which will focus on areas highlighted in I3P research. These interactions will facilitate an accelerated understanding of information infrastructure vulnerabilities and solutions, and information sharing to help to bring policies and practices together. Where appropriate, the workshops will also serve as demonstration sites for launching the technology transfer process. Workshop topics will be chosen by the I3P Research Director in consultation with the I3P Executive Committee and the I3P's program manager at NCSD.

The I3P administrative office staff will provide logistical and organizational support for the workshops. The I3P staff will work closely with researchers and leading experts from industry and government to assure well-organized and effectively run workshops. The I3P will help produce and distribute workshop materials, develop websites promoting the workshops, invite speakers, and provide on-site administrative assistance. I3P staff will also play an active role in developing workshop content and coordinating the sessions. The I3P team will be responsible for all tasks related to logistics, room and equipment reservations, arranging meals, and managing reservations. The post-workshop activities for which the I3P staff will be responsible include managing and archiving information produced from the workshops, and the preparation and distribution, in both electronic and hard-copy format, of publications and reports from the workshops.

3. Participating institutions

This initiative is run by the I3P administrative office, working in partnership with I3P consortium members and others as needed on specific events.

4. Subcontractors

The original award was made to Dartmouth College.

5. Relationships with academia, industry, or government

The I3P administrative office works closely with its industry, government and academic partners and stakeholders to plan and organize workshops and conferences that add significant value to the field, and provide attendees with useful knowledge or tools. The I3P regularly recruits high-level speakers and attendees from all the major stakeholder groups for I3P events.

6. Activities and progress

a. Recent activities and progress

The I3P consortium met in Bedford, MA October 13-14, 2010, hosted by the MITRE Corporation.

On October 14th, [REDACTED] (b)(6) Senior Technical Advisor to the I3P, delivered a keynote address at the MITRE Corporation in support of National Cybersecurity Awareness Month.

On October 29th, [REDACTED] (b)(6) the I3P's Research Director, served as a judge at an NYU-Poly event in honor of Cybersecurity Awareness Week: the AT&T Award for Best Applied Cyber Security Research Paper.

Rethinking Cyber Security: A Systems-Based Approach: The I3P is organized a workshop titled “Rethinking Cyber Security: A Systems-Based Approach” at the University of Virginia, Charlottesville, VA November 16-17, 2010. This workshop brought together stakeholders at the national, state and local levels to advance the adoption of a systems engineering process for cyber security. The workshop was comprised of four sessions; each session focused on a key dimension of secure-systems computing, culminating in a discussion of lessons learned and prospects for moving forward. The sessions were titled:

- A Systems-Based Approach to Cyber Security
- Application-Based Security
- Opportunities and Risk Posed by Cloud Computing
- Moving Collaboratively Forward

A written report of workshop proceedings is being prepared and will be distributed by the I3P.

For the third year, the I3P hosted a process control systems security workshop in partnership with the American Petroleum Institute. As in previous years, the November 9th workshop served as the kickoff event to the API's annual IT Security Conference. This year's event, co-hosted by the I3P and Sandia National Laboratories, had 62 registrants from IT, vendor and oil and gas companies. In addition to I3P staff the agenda featured researchers from I3P member institutions, including the University of Illinois and SRI International.

The I3P has also increased its media interactions, reaching out to reporters from the Wall Street Journal, the Washington Post, National Public Radio and WHRO, a public media station in Virginia. In addition, journalists from the BBC, GovInfoSecurity News and SC magazine have contacted the I3P seeking expert advice on various topics, notably insider

threat and privacy, and as a result, conducted interviews with the I3P's Research Director,

(b)(6)

b. Where we stand

In the past quarter, the workshops and meetings the I3P was involved with were well attended and considered successful.

c. Plans

The I3P consortium will meet in Charlottesville, VA, March 14-15, 2011, hosted by the University of Virginia.

The “Fifth Annual IFIP Working Group 11.10 International Conference on Critical Infrastructure Protection”, will be held at Dartmouth College, Hanover, NH March 23-25, 2011. A selection of papers from the conference will be published in an edited volume – the fifth in the series entitled *Critical Infrastructure Protection* (Springer) – in the fall of 2011. Revised and/or extended versions of outstanding papers from the conference will be published in the *International Journal of Critical Infrastructure Protection* (Elsevier).

Two workshops are in the planning stages. The workshop topics are workforce development and non-governmental cyber response models. The workforce development workshop will take place April 27-28 at Georgia Tech in Atlanta, GA; the non-governmental cyber response models workshop will take place in late October or early November in the Washington, DC area.

At the end of the Leveraging Human Behavior to Reduce Cyber Security Risk project, a workshop is being planned for June 28-29, 2011.

d. Obstacles

There are no significant project obstacles to report at this time.

Initiative 2: I3P Postdoctoral Fellowship Program

1. Project title and lead

Project title: I3P Fellowship Program

Project lead: (b)(6) I3P Administrative office

2. Description

Since 2003 the I3P has sponsored a fellowship program open to postdoctoral researchers, junior faculty, and research scientists. The fellowship program is designed to build a nationwide cadre of investigators focused on critical infrastructure research challenges.

The program also advances the I3P's national research agenda and provides expanded research opportunities at I3P consortium member institutions. The I3P may appoint up to two fellows for one-year terms. Fellows spend the term of their fellowship in residence at an I3P member institution and are expected to travel to at least one I3P Consortium meeting during the fellowship to present their research.

A portion of NCSF funding supports the continuation of the I3P Fellowship program begun in 2005.

The two current I3P fellows are (b)(6), under the direction of (b)(6) at SRI International, who is working on "Ensuring Security and Availability through Model-based Cross-Layer Adaptation", an (b)(6) who received a joint appointment under the direction of (b)(6) at Lawrence Berkeley National Laboratory and (b)(6) at University of California, Davis. His project is titled "Quantifying Uncertainty: Metric-Based Anomaly Detection." Both I3P fellows for the 2010/2011 program year will present their work at the June, 2011 consortium meeting.

(b)(6) at the University of California, Davis, researching obfuscation engines under the direction of (b)(6) finished his fellowship December 31, and (b)(6) at Georgia Tech, researching Domain Name System (DNS) security under the direction of (b)(6) also completed work on December 31. They will be filing final reports.

The I3P postdoctoral fellowship call for proposals for the 2011/2012 program year was published in November, with applications due to the I3P by February 18th.

Initiative 3: I3P Management

1. Project title and lead

Initiative title: I3P Management

Initiative lead: (b)(6) I3P Administrative office

2. Description

The I3P consortium is managed and administered by a small administrative staff, all of whom are employees of Dartmouth College. The management of the consortium includes planning and administering of consortium meetings and workshops, overseeing and evaluating all research projects, assisting in the evaluation of research proposals, administering the subaward process to fund projects, and ensuring compliance with all governmental and institutional rules and regulations regarding overall grant management. The I3P staff also manages the educational initiatives associated with the consortium.

D [redacted] (b)(6) Vice Provost at Dartmouth College, is the Principal Investigator on external awards made to the consortium. He has the responsibility to oversee all the business and operational management of the consortium. Dr. [redacted] (b)(6) is also a member of the senior administration at Dartmouth reporting directly to the Provost.

[redacted] (b)(6) Executive Director of the I3P, is responsible for the day-to-day management and strategic direction of the I3P. She is also responsible for advancing the I3P mission and goals and assisting the Executive Committee and Research Director of the I3P. No more than 20% of this position is funded by the I3P management budget.

Dartmouth College has hired a new Research Director for the I3P, [redacted] (b)(6) [redacted] (b)(6) started on September 1, and is working closely with the Executive Director to ensure I3P research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. No more than 35% of this position is funded by the I3P management budget.

The I3P Executive Committee will meet in Charlottesville, VA on March 13th, and the next consortium meeting will be hosted by the University of Virginia, March 14-15, 2010.

Initiative 4: I3P Research

1. Project title and lead

Initiative title: I3P Research

Initiative lead [redacted] (b)(6)

2. Description

The I3P Human Behavior, Insider Threats, and Awareness, Survivability and Recovery of Process Control Systems, Business Rationale for Cyber Security, and Assessable Identity and Privacy Protection projects completed work in July 2009. The team leaders have filed final reports, and a comprehensive final report on these projects will be completed in the future.

Currently, I3P research consists of several components: planning projects, small research projects, white papers, and seed projects. The focus of the projects will be on nationally identified cyber security research priorities, with an emphasis on promoting cyber security protection, preparedness, awareness, and education. Project priorities are established in consultation with the I3P's program manager at NCSD. As with all I3P

funded research, projects have been and will continue to be chosen through a competitive process within the consortium.

a. Planning projects: The planning projects were designed to assess the current literature in the proposed research areas, identify appropriate priorities for critical cyber security research and development, and develop research proposals addressing these priorities. These planning projects are critical because relevant field experts and other stakeholders often participate in reviewing and commenting on future directions of research, leading to strong and valuable research projects. The four planning projects completed work March 31, 2010.

b. Research projects:

- Leveraging Human Behavior to Reduce Cyber Security
 - Team members: MITRE (team lead), Dartmouth & the I3P's Research Director

Objectives of this project include:

- To identify existing behavioral science findings that can enhance cyber security in the near term,
- To identify potential behavioral science findings that will form the core of a set of empirical evaluations of their effects on cyber security,
- To hold a workshop bringing together representatives of the behavioral science community and the information infrastructure protection community,
- To create groups of researchers interested in designing and administering replicated empirical assessments of the effects of behavioral science findings on cyber security,
- To establish an initial repository of information about behavioral science and cyber security, and
- To make the results available to organizations committed to designing, building and using the information infrastructure in ways that incorporate behavioral science findings.

This project will produce several deliverables:

- A repository of behavioral science findings with demonstrated or likely relevance to information infrastructure protection. This repository will include citations of seminal papers, links to evaluations (where they exist), and links to information about products and processes that incorporate the findings.
- Data and documentation from several example evaluations performed as a result of the workshop groups.
- Publications and conference presentations describing this work, with the target audience being not only the multiple disciplines involved but also the

Project update:

After working with InfoSec to develop the technology and materials for the first study on spear phishing emails and obtaining MITRE Institutional Review Board approval, the first trial of spear phishing emails was deployed. In addition, with the help of MITRE InfoSec, MITRE developed the design of the second study on incentives for improving cyber security posture.

The long version of the project's descriptive paper was submitted to IEEE Transactions on Information Forensics and Security. Although the paper was initially rejected because it exceeds the journal's length limits, it is currently being separated into two smaller but related papers and will be resubmitted by the end of January.

The I3P Research Director has been interviewed by many media editors about I3P's work in insider threat and behavioral science. These interviews have resulted in articles on the BBC website, SC magazine, and a podcast at govinfosecurity.com. She is also currently working with workshop participants to find funding for parallel efforts to the DHS-funded efforts; these efforts include study replications, to build a body of evidence about the effectiveness of the techniques being studied. The most promising includes potential work with the financial community, performed by Georgia Tech and Columbia University.

At Dartmouth, project team member (b)(6) met with Tuck's director of IT and Assistant Dean to gain internal support for replicating the spear phishing project. He also briefed the Dean. An exemption request was filed to Dartmouth's IRB (request for study approval without going before a full committee review). Unfortunately, that request was denied, which meant it had to be re-filed for committee review. (b)(6) also briefed his proposed work to Dartmouth's Director, Administrative Computing (deputy CIO). The proposal was received positively, and they have filed an IRB Study Plan for Expedited Review.

o I3P Privacy Project

A new I3P research project has been planned to generate frameworks permitting new ways of assessing, assuring and making more visible, usable and correctable an object's privacy in the context in which the attribute and activity data are used. This 18-month project is expected to start in February 2011, and will address three sets of key questions:

- Perception and awareness: How do different cultures think about privacy? How do those differences affect the way we implement privacy controls? How can privacy controls be made more usable and effective? What are expectations of

privacy in different contexts? How does someone know that the context has changed and therefore changes are needed to privacy controls? Is it possible for the data owner to find out when data are being used in a new context without the owner's permission or knowledge?

- Policy: How should we define and document a privacy policy? How do we include context and effects of contextual changes? How do we compare or combine two privacy policies? How do we model the effects of privacy policy on commerce, public health and welfare, etc.?
- Privacy metrics: Does it make sense to measure levels of privacy? What would they look like? What would we do with them, and how would their use change discourse or practice? Is there a difference between actual and perceived privacy? How could various levels of privacy be reported and enforced?

Project Roles

This project will be staffed according to the major roles needed to address the three sets of issues described above:

- Anthropologists: The anthropologists will provide expertise on cultural differences, to address the various ways that cultures value privacy.
- Psychologists: The psychologists will provide expertise on privacy awareness and perceptions.
- Human factors experts: The human factors experts will address concerns about ensuring that data owners can understand and set privacy controls as well as monitor their privacy.
- Legal experts: The legal experts will address legal issues related to data capture, control and retention.
- Economists: The economists will explore behavioral economics issues related to privacy. They will also examine the varying effects of privacy protection on commerce.
- Public policy specialists: Public policy specialists will look at frameworks for expressing privacy policy.
- Computer scientists specializing in formal methods: Computer scientists specializing in formal methods will work with the public policy experts to express and analyze privacy policies and to reconcile two different policies. These experts will apply the significant work already done in this field, so that the result is usable and reflects the perspectives of the other roles.

- Project manager: The project manager will be responsible for holding project meetings, managing the interactions among the experts working on separate but interdependent issues, and producing deliverables.

Deliverables will include the following:

- Three papers submitted for publication to a refereed periodical, one for each topic area. Each paper will address the questions expressed in the project description.
- An annotated bibliography of the resources used in performing this project. At minimum, study citations will be annotated with information about the source (citation), findings, sample size, representativeness, limitations, and external validity.
- A brief project report to be published on the I3P website. The project report will include the problem statement, a summary of the project activities, a description of the project outcomes, the impact of those outcomes, and a description of suggested next steps for furthering the research. When the three papers are published, the I3P website will link this project report to sites where the three papers can be accessed.
- Project meetings will be held at least monthly with all of the key project experts and the I3P research director. The meetings may be in-person or teleconference, at the discretion of the project manager.

An independent Privacy Project Advisory Board will be convened by the I3P. Consisting of 3 to 5 members representing both government and private enterprise privacy specialists, the Advisory Board will participate quarterly in project meetings, review intermediate project materials, and advise both the I3P and the project members about the quality and impact of project activities and deliverables.

Project workshops will be held at the discretion of the project team when they are consistent with the mission and focus of the project. A final project workshop will be held in June 2012 in Washington, DC; key stakeholders will be invited to this workshop, and the workshop will present the project's results to them, as well as next steps to further the research and its impact.

Project update:

The project team has been selected, and will include Georgia Tech, Indiana, Dartmouth, UC Berkeley and Carnegie Mellon. In January, the project plan will be finalized and individual scope of work plans and contracts put in place.

The process for selecting the participants was as follows:

1. After consultation with the Executive Committee, the I3P Research Director circulated the project description to the I3P member representatives along with an explanatory email.
2. The project was discussed at the I3P Consortium Meeting in at MITRE in Bedford, MA, in mid-October, so to ensure potential participants understood the project topic, management, funding, and expected outcomes.
3. I3P researchers interested in participating submitted the following items for consideration to the I3P Research Director by December 6:
 - a. Candidates for one or more roles. A role may be filled by more than one person, but at least one person must be considered an expert in that role.
 - b. Documentation of the candidate(s)'s expertise and experience, including relevance to the problem statement and project description.
 - c. Description of proposed approach to addressing at least one of the three issues in the problem statement. Including description of collaboration with other roles, and citations of relevant previous and current work, which would in future form the basis for the institution's formal statement of work as well as the overall project description.
 - d. A high-level budget for the total cost over the 18 month period, including personnel effort, travel, other project costs and all institutional overhead. If the I3P member institution proposed more than one person in a role, then the cost, percentage and availability for each person was to be included, as well as the institution's total.
4. The I3P Research Director, I3P Associate Research Director, I3P Senior Technical Advisor, I3P Executive Director, I3P Principal Investigator, and one independent expert reviewed the submissions and then made a recommendation to the sponsoring agency and the I3P Executive Committee. Agreement was reached on the final selection of project team members. The criteria for inclusion on the team was:
 - a. Degree of expertise and experience
 - b. Past engagement with and contribution to the I3P
 - c. Diversity of team membership (so that no one member institution fills all roles or dominates the budget)
 - d. Total value for cost.
5. The team was announced December 15, 2010, with information about how and why the decision was made (including feedback to researchers not selected).
6. The I3P staff will work with the project team to finalize a statement of work that describes the project as a whole and each institution's responsibilities and expected contributions. A detailed final budget from each institution will be

- submitted and approved by the I3P. These statements of work and other required documentation will be completed and submitted no later than January 4, 2011.
7. Contracts will be put in place with each member so that the funds are available no later than February 1, 2011.

c. White papers: White papers will allow members to explore security threats, to include the problems, impacts and possible approaches to solutions. These papers will add value to many stakeholders in industry, government and academia. Up to two white papers are anticipated in the future.

d. Seed projects: Seed projects are designed to quickly assess the practicality, utility and maturity of novel approaches to information security. These projects are critical because they enable the exploration of ideas that would otherwise be lost, potentially leading to strong and valuable research projects. Up to four seed projects may be considered during the remainder of this funding period.



ISTS Report

Overview

The Institute for Security, Technology, and Society (ISTS) is a community of researchers, students, and educators working together with a common focus on technology critical for cyber security, privacy, and trust. Our research, education and outreach programs contribute to the nation's security by providing knowledge discovery, science and engineering workforce development, and technology transfer. ISTS also nurtures leaders and scholars, educates students and the community, and collaborates with its partners to develop and deploy IT, and to better understand how IT relates to socio-economic forces, cultural values and political influences.

In this document, we describe the activity of ISTS' one remaining project supported by grant number 2006-CS-001-000001 awarded by the National Cyber Security Division (NCSA) of the Department of Homeland Security (DHS). During this period, we provide a brief update on the Dartmouth Internet Security Testbed (DIST) project, which we anticipate will conclude next quarter.

ISTS Highlights: October 2010 – December 2010

We provide specific highlights of our final ongoing research project (DIST) below. In addition to this work, ISTS has been involved in a number of initiatives to advance information security research and education. A few examples of these initiatives follow:

- Dartmouth again joined the National Cyber Security Alliance (NCSA) in promoting National Cyber Security Awareness Month (NCSAM) during October. ISTS sponsored two talks. [redacted (b)(6)] CEO of IT GlobalSecure, delivered a lecture entitled, "[Protecting Computer Games and Entertainment Security](#)" and [redacted (b)(6)] a professor of criminology at Durham University in the UK spoke on "[Policing Cybercrimes: responding to the transnational challenges of cybercrime](#)".
- ISTS kicked off what will become a series of events focused on "Diversity in IT" with a videoconference between female computer science majors at Dartmouth and female CS majors at the American University of Kuwait (AUK). The next event in this series will be a lecture in January given by [redacted (b)(6)] of the Utah State University's WebAIM (Web Accessibility In Mind), who will discuss accessibility issues on the web for handicapped persons. More events will follow in the winter and spring terms.
- ISTS is actively recruiting students for the DoD's Information Assurance Scholarship Program, the ISTS Cyber Security Summer Camp (for high school students), the ISTS internship program, and the Secure Information Systems Mentoring and Training (SISMAT) program. SISMAT was formerly funded by DHS/NCSA and is now funded by the NSF. Information on this year's program can be found at: <http://www.ists.dartmouth.edu/events/sismat/>.
- ISTS will, again, co-host the Securing the eCampus conference with Dartmouth's Computing Services office this July. This will be the fifth year the conference is run.

Specific Project Highlights

Each report in the following sections outlines recent efforts by the project teams. The information below provides a brief overview of project progress during the last quarter.

Dartmouth Internet Security Testbed (DIST)

DIST Wireless

In this reporting period, the DIST “Wireless” team wound down the project by executing a number of activities designed at maintaining the network and making it useful for future research. Some examples of such efforts included:

- Developing a legal agreement and operational parameters to allow non-Dartmouth researchers access to the DIST network of wireless access points for use as a mesh-network testbed, extending the useful life of the infrastructure and making good research use of this valuable resource.
- Submitting a paper and giving a presentation on previous DIST activities.
- Conducting a comprehensive review and update of the DIST security document.
- Verifying and examining the system’s stability and scalability, the team conducted a long-term (more than one and a half months) test run of the whole DIST infrastructure (without merger).

DIST Wired

The “Wired” team completed their project during 2010 Quarter 3 and will present their final report with the overall DIST report (including “Wireless”) in the next quarterly update.

Communication and Outreach Efforts

In addition to our newsletter¹, distributed to over 1,000 people, we regularly provide updates via email to our many mailing lists. Our website details upcoming programs, recent publications, news items, and a great deal more.

As noted above, our on-campus outreach efforts include a speaker series. We have an ambitious schedule planned for the winter and spring and have confirmed the following speakers, to this point:

- (b)(6) Director of WebAIM (Web Accessibility In Mind), will deliver a lecture entitled, “[Web accessibility in civil society: Persons with disabilities in today’s educational environments](#)” on January 25th.
- (b)(6) of the University of Leuven (Belgium), will deliver a lecture discussing how many classic case studies in software vulnerabilities can be reduced to familiar principles of computation theory. They will further discuss the implications of this reduction for the future of the current Internet protocols and the design of new secure ones. The lecture is scheduled for

¹ Our newsletters can be downloaded at: <http://www.ists.dartmouth.edu/news/newsletters.html>

February 17th.

- (b)(6) of the University of Minnesota will give a talk on how to deal with insecure cyberinfrastructure. The talk will take place on April 13th.
- We also are in the planning stages to host a panel discussion in May that will consider cyberwarfare.

The Institute, our faculty, and postdoctoral affiliates also continued to receive a good deal of attention in the press. For links to stories on our faculty, staff and students² and for a complete listing of ISTS publications, please see our website.³

ISTS will continue to advance its efforts in information security and continue its mission through research, education and outreach.

² See a listing of ISTS press online at <http://www.ists.dartmouth.edu/news/index.html>

³ ISTS papers: <http://info.ists.dartmouth.edu/library/>

Dartmouth Internet Security Testbed (DIST)

1. Project leads.

Project lead (Wireless portion): [redacted] Computer Science Department
Project lead (Wired portion): [redacted] Thayer School of Engineering

2. Summary of Project Progress: October 1 through December 31, 2010.

Brief Description

The DIST project uses the Dartmouth network infrastructure as a testbed for multiple purposes, primarily for access to complex, dynamic real-world network traffic for the evaluation of advanced security technologies.

The DIST project is divided into two portions: wireless and wired. The wireless portion of the effort is, to the best of our knowledge, the largest infrastructure of 802.11 wireless monitors deployed in academia. The goal of DIST is to provide real-world link-layer data from a live active production network to researchers interested in various aspects of 802.11 network performance, privacy, and usability. The DIST wireless infrastructure is operated in collaboration with Peter Kiewit Computing Services, Dartmouth's central IT organization.

Progress (DIST wired)

Work on the DIST Wired portion of the project was completed during 2010 Q3. The DIST Wired final report will be delivered next quarter along with the DIST Wireless final report.

Progress (DIST wireless)

The DIST wireless project is winding down, though with several activities related to the maintenance of the sniffer infrastructure, the use of that infrastructure for other research projects, and the completion of scientific papers about our earlier work. Such activities include:

- Developing a legal agreement and operational parameters to allow non-Dartmouth researchers access to the DIST network of wireless access points for use as a mesh-network testbed, extending the useful life of the infrastructure and making good research use of this valuable resource.
- Submitted a paper *From MAP to DIST: the evolution of a large-scale WLAN monitoring system* to the ACM Conference on Wireless Network Security (WiSec) 2011.
- Presented an overview of DIST, as part of an invited 10-year retrospective talk (“Ten years of capturing, sanitizing, and sharing Wi-Fi traces: lessons and future challenges”), at the Workshop on Scenarios for Network Evaluation Studies (SCENES), San Francisco, November 2010.

- Redesigning the DIST *merger* software to process the new PCAP “combo-frame” capture format produced by our new high-efficiency sniffer software (Saluki) mentioned in earlier reports. As part of the process, we adapted the sniffing program to using different frame-timing sources and collected traces under multiple different configurations. The necessary code rewrites are now complete, and have been tested with input traces/streams in the new format.
- Research on distribution-based wireless anomaly detection: the DIST infrastructure was used last spring to capture traffic containing some wireless attack related anomalies. We applied distribution-based methods with the goal of detection of those attacks, and some results from this work have been reported in the DIST paper that was submitted to WiSec 2011 (above).
- A comprehensive review and update of the DIST security document, reflecting the changes to the AM sniffer and merger architecture introduced since the release of the original document (primarily through graduate student (b)(6) development efforts). In particular, the new version documents the changes in the captured frames transfer protocol and in the role of the merger. These periodic updates were part of our security plan when DIST was designed.
- From October through November, Dartmouth’s IT services department continued moving DIST air monitors (AMs) and servers to a new configuration of VLANs (a change also reflected in the Security document). This required resolving several routing configuration issues on DIST servers.
- To verify and examine the system’s stability and scalability, we conducted a long-term (more than one and a half months) test run of the whole DIST infrastructure (without merger).
- Migrated the DIST “launchpad” (the core server from which all DIST software is launched) from *airy* (old server) to *goode* (new server) to improve system health, and installed a bigger RAID to prepare us for full-scale traces.
- Finished preparation work for DIST’s first long-term trace collection.

3. Future Plans.

Evaluate the scalability of DIST based on the long-term campus-wide trace-collection effort in January. (We have been running a campus-wide trace collection since January 3, 2011.)

Use those traces for experiments with our distribution-based wireless anomaly detection algorithms, and for trace-sanitization algorithms.

Use the DIST AMs in the Layer 1/2 fingerprinting project (funded by another source, on which Research Associate Professor (b)(6) is a PI), likely in the first half of 2011 (so far, the project has focused on 802.15.4 rather than 802.11 for various technical reasons).

If all organizational permissions can be obtained, assist non-Dartmouth researchers in using the DIST infrastructure as a mesh-network testbed.

Opportunity Title:	Dartmouth Supplemental Funding
Offering Agency:	Office of Procurement Operations - Grants Division
CFDA Number:	97.001
CFDA Description:	Pilot Demonstration or Earmarked Projects
Opportunity Number:	2006-CS-001-000001
Competition ID:	
Opportunity Open Date:	04/02/2009
Opportunity Close Date:	05/15/2009
Agency Contact:	Marilyn Morgan Director, GFAD/OPO
	(b)(6)

This electronic grants application is intended to be used to apply for the specific Federal funding opportunity referenced here.

If the Federal funding opportunity listed is not the opportunity for which you want to apply, close this application package by clicking on the "Cancel" button at the top of this screen. You will then need to locate the correct Federal funding opportunity, download its application and then apply.

This opportunity is only open to organizations, applicants who are submitting grant applications on behalf of a company, state, local or tribal government, academia, or other type of organization.

* Application Filing Name: (b)(6) 3P supp_DHS

Mandatory Documents

	Move Form to Complete
	Move Form to Delete

Mandatory Documents for Submission

SF424 (R & R)
Research And Related Other Project Information
Research & Related Budget

Optional Documents

R & R Subaward Budget Attachment(s) Form
Research & Related Senior/Key Person Profile
Disclosure of Lobbying Activities (SF-1LL)

Move Form to Submission List
Move Form to Delete

Optional Documents for Submission

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Instructions

- 1 Enter a name for the application in the Application Filing Name field.**

 - This application can be completed in its entirety offline; however, you will need to login to the Grants.gov website during the submission process.
 - You can save your application at any time by clicking the "Save" button at the top of your screen.
 - The "Save & Submit" button will not be functional until all required data fields in the application are completed and you clicked on the "Check Package for Errors" button and confirmed all data required data fields are completed.
- 2 Open and complete all of the documents listed in the "Mandatory Documents" box. Complete the SF-424 form first.**

 - It is recommended that the SF-424 form be the first form completed for the application package. Data entered on the SF-424 will populate data fields in other mandatory and optional forms and the user cannot enter data in these fields.
 - The forms listed in the "Mandatory Documents" box and "Optional Documents" may be predefined forms, such as SF-424, forms where a document needs to be attached, such as the Project Narrative or a combination of both. "Mandatory Documents" are required for this application. "Optional Documents" can be used to provide additional support for this application or may be required for specific types of grant activity. Reference the application package instructions for more information regarding "Optional Documents".
 - To open and complete a form, simply click on the form's name to select the item and then click on the => button. This will move the document to the appropriate "Documents for Submission" box and the form will be automatically added to your application package. To view the form, scroll down the screen or select the form name and click on the "Open Form" button to begin completing the required data fields. To remove a form/document from the "Documents for Submission" box, click the document name to select it, and then click the <=> button. This will return the form/document to the "Mandatory Documents" or "Optional Documents" box.
 - All documents listed in the "Mandatory Documents" box must be moved to the "Mandatory Documents for Submission" box. When you open a required form, the fields which must be completed are highlighted in yellow with a red border. Optional fields and completed fields are displayed in white. If you enter invalid or incomplete information in a field, you will receive an error message.
- 3 Click the "Save & Submit" button to submit your application to Grants.gov.**

 - Once you have properly completed all required documents and attached any required or optional documentation, save the completed application by clicking on the "Save" button.
 - Click on the "Check Package for Errors" button to ensure that you have completed all required data fields. Correct any errors or if none are found, save the application package.
 - The "Save & Submit" button will become active; click on the "Save & Submit" button to begin the application submission process.
 - You will be taken to the applicant login page to enter your Grants.gov username and password. Follow all onscreen instructions for submission.

APPLICATION FOR FEDERAL ASSISTANCE
SF 424 (R&R)

3. DATE RECEIVED BY STATE	State Application Identifier

1. * TYPE OF SUBMISSION
 Pre-application Application Changed/Corrected Application

4. a. Federal Identifier 2006-CS-001-000001
b. Agency Routing Number

2. DATE SUBMITTED 05/15/2009
Applicant Identifier

5. APPLICANT INFORMATION * Organizational DUNS: 0410278220000
* Legal Name: Trustees of Dartmouth College
Department: Office of Sponsored Projects Division:
* Street1: 11 Rope Ferry Road, #6210
Street2:
* City: Hanover County / Parish: Grafton
* State: NH: New Hampshire Province:
* Country: USA: UNITED STATES * ZIP / Postal Code: 037551404

Person to be contacted on matters involving this application
Prefix: * First Name (b)(6) Middle Name:
* Last Name: Suffix:
* Phone Number (b)(6) Fax Number: 603-646-3670
Email: (b)(6)

6. * EMPLOYER IDENTIFICATION (EIN) or (TIN): 020222111

7. * TYPE OF APPLICANT: O: Private Institution of Higher Education
Other (Specify):
Small Business Organization Type Women Owned Socially and Economically Disadvantaged

8. * TYPE OF APPLICATION:
 New Resubmission A. Increase Award B. Decrease Award C. Increase Duration D. Decrease Duration
 Renewal Continuation Revision E. Other (specify):
* Is this application being submitted to other agencies? Yes No What other Agencies?

9. * NAME OF FEDERAL AGENCY: Office of Procurement Operations - Grants Div
10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 97.001
TITLE: Pilot Demonstration or Earmarked Projects

11. * DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Cyber Security Collaboration and Information Sharing Project

12. PROPOSED PROJECT: * Start Date 08/01/2009 * Ending Date 07/31/2011
*** 13. CONGRESSIONAL DISTRICT OF APPLICANT** NH-002

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION
Prefix: Dr. * First Name: (b)(6) Middle Name:
* Last Name: (b)(6) Suffix:
Position/Title: Vice-Provost for Reserach
* Organization Name: Trustees of Dartmouth College
Department: Provost Division:
* Street1: Parkhurst - HB 6004
Street2:
* City: Hanover County / Parish: Grafton
* State: NH: New Hampshire Province:
* Country: USA: UNITED STATES * ZIP / Postal Code: 037551404
* Phone (b)(6) Fax Number: 603-646-0660
* Email:

<p>15. ESTIMATED PROJECT FUNDING</p> <p>a. Total Federal Funds Requested <input type="text" value="2,250,000.00"/></p> <p>b. Total Non-Federal Funds <input type="text" value="0.00"/></p> <p>c. Total Federal & Non-Federal Funds <input type="text" value="2,250,000.00"/></p> <p>d. Estimated Program Income <input type="text" value="0.00"/></p>	<p>16. * IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?</p> <p>a. YES <input type="checkbox"/> THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE: <input type="text"/></p> <p>b. NO <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E.O. 12372; OR <input type="checkbox"/> PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW</p>
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17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

* I agree

* The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

18. SFLLL or other Explanatory Documentation

19. Authorized Representative

Prefix: * First Name: Middle Name:

* Last Name: Suffix:

* Position/Title:

* Organization:

Department: Division:

* Street1:

Street2:

* City: County / Parish:

* State: Province:

* Country: * ZIP / Postal Code:

* Phone: Fax Number:

* Email:

* Signature of Authorized Representative * Date Signed

20. Pre-application

Administrative Information Outside of Scope

RESEARCH & RELATED Other Project Information

1. * Are Human Subjects Involved? Yes No

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations? Yes No

If yes, check appropriate exemption number. 1 2 3 4 5 6

If no, is the IRB review Pending? Yes No

IRB Approval Date:

Human Subject Assurance Number:

2. * Are Vertebrate Animals Used? Yes No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending? Yes No

IACUC Approval Date:

Animal Welfare Assurance Number

3. * Is proprietary/privileged information included in the application? Yes No

4.a. * Does this project have an actual or potential impact on the environment? Yes No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? Yes No

4.d. If yes, please explain:

5. * Is the research performance site designated, or eligible to be designated, as a historic place? Yes No

5.a. If yes, please explain:

6. * Does this project involve activities outside of the United States or partnerships with international collaborators? Yes No

6.a. If yes, identify countries:

6.b. Optional Explanation:

7. * Project Summary/Abstract

8. * Project Narrative

9. Bibliography & References Cited

10. Facilities & Other Resources

11. Equipment

12. Other Attachments

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: 0410278220000

* Budget Type: Project Subaward/Consortium

Enter name of Organization: Trustees of Dartmouth College

* Start Date: 08/01/2009 * End Date: 07/31/2011 Budget Period 1

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary (\$)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)
1.	Dr.	Martin		Wybourne		PD/PI		1.20			0.00	0.00	0.00
2.													
3.													
4.													
5.													
6.													
7.													
8.													

9. Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person 0.00

Additional Senior Key Persons:

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
7	Management staff - see justification for details	29.50			163,913.00	62,623.00	226,536.00
7	Total Number Other Personnel						

Total Other Personnel 226,536.00

Total Salary, Wages and Fringe Benefits (A+B) 226,536.00

Close Form

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: []

* Budget Type: Project Subaward/Consortium

Enter name of Organization: []

* Start Date: [] * End Date: [] Budget Period 1

C. Equipment Description

List items and dollar amount for each item exceeding \$5,000

	Equipment item	* Funds Requested (\$)
1.	[]	[]
2.	[]	[]
3.	[]	[]
4.	[]	[]
5.	[]	[]
6.	[]	[]
7.	[]	[]
8.	[]	[]
9.	[]	[]
10.	[]	[]
11.	Total funds requested for all equipment listed in the attached file	[]
	Total Equipment	[]

Additional Equipment: []

Add Attachment

Close Section

View Attachments

D. Travel

	Funds Requested (\$)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	122,875.00
2. Foreign Travel Costs	[]
Total Travel Cost	122,875.00

E. Participant/Trainee Support Costs

	Funds Requested (\$)
1. Tuition/Fees/Health Insurance	[]
2. Stipends	[]
3. Travel	[]
4. Subsistence	[]
5. Other []	[]
[] Number of Participants/Trainees	Total Participant/Trainee Support Costs []

RESEARCH & RELATED Budget {C-E} (Funds Requested)

Close Form

RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

* ORGANIZATIONAL DUNS: []

* Budget Type: Project Subaward/Consortium

Enter name of Organization: []

* Start Date: [] * End Date: [] Budget Period 1

F. Other Direct Costs

Funds Requested (\$)

1. Materials and Supplies	7,550.00
2. Publication Costs	7,183.00
3. Consultant Services	37,875.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	1,375,000.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Event costs	106,500.00
9. []	
10. []	

Total Other Direct Costs 1,534,108.00

G. Direct Costs

Funds Requested (\$)

Total Direct Costs (A thru F) 1,883,519.00

H. Indirect Costs

Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1. MTDC - research rate	58.00	325,000.00	188,500.00
2. MTDC - non research rate	35.00	508,519.00	177,981.00
3. []			
4. []			

Total Indirect Costs 366,481.00

Cognizant Federal Agency Dept of Health & Human Svcs (b)(6)
(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

Funds Requested (\$)

Total Direct and Indirect Institutional Costs (G + H) 2,250,000.00

J. Fee

Funds Requested (\$)

[]

K. * Budget Justification Budget Narrative_05-13-09.pdf
(Only attach one file.)

PDF Attachment

Delete Attachment

View Attachment

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals (\$)
Section A, Senior/Key Person		0.00
Section B, Other Personnel		226,536.00
Total Number Other Personnel	7	
Total Salary, Wages and Fringe Benefits (A+B)		226,536.00
Section C, Equipment		
Section D, Travel		122,875.00
1. Domestic	122,875.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		1,534,108.00
1. Materials and Supplies	7,550.00	} = 521,608 not 51,958 per F94
2. Publication Costs	7,183.00	
3. Consultant Services	37,875.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	1,375,000.00	} = 1,071,150 per F94
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	106,500.00	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		1,883,519.00
Section H, Indirect Costs		366,481.00
Section I, Total Direct and Indirect Costs (G + H)		2,250,000.00
Section J, Fee		

Budget values

Mat of Equip 7,550
 Pub 7,183
 Consultant 37,875
 Subawards 1,375,000
 Other 1 106,500
 Total 1,534,108

Total by Side

Normal

51,958
 107,000
 1,375,000

 1,534,108

OK
ajm

RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS:

* Budget Type: Project Subaward/Consortium

Enter name of Organization:

* Start Date: * End Date: Budget Period ?

A. Senior/Key Person

	Prefix	* First Name	Middle Name	* Last Name	Suffix	* Project Role	Base Salary (\$)	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)
1.	Dr.	Martin		Wybourne		PD/PI							
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.	Total Funds requested for all Senior Key Persons in the attached file												
												Total Senior/Key Person	

Additional Senior Key Persons:

B. Other Personnel

* Number of Personnel	* Project Role	Cal. Months	Acad. Months	Sum. Months	* Requested Salary (\$)	* Fringe Benefits (\$)	* Funds Requested (\$)	
<input type="text"/>	Post Doctoral Associates							
<input type="text"/>	Graduate Students							
<input type="text"/>	Undergraduate Students							
<input type="text"/>	Secretarial/Clerical							
<input type="text"/>								
<input type="text"/>								
<input type="text"/>								
<input type="text"/>								
<input type="text"/>								
<input type="text"/>								
<input type="text"/>								
<input type="text"/>	Total Number Other Personnel						Total Other Personnel	
							Total Salary, Wages and Fringe Benefits (A+B)	

Close Form

RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS: [text box]

* Budget Type: Project Subaward/Consortium

Enter name of Organization: [text box]

* Start Date: [text box] * End Date: [text box] Budget Period 2

F. Other Direct Costs

Funds Requested (\$)

- 1. Materials and Supplies [text box]
- 2. Publication Costs [text box]
- 3. Consultant Services [text box]
- 4. ADP/Computer Services [text box]
- 5. Subawards/Consortium/Contractual Costs [text box]
- 6. Equipment or Facility Rental/User Fees [text box]
- 7. Alterations and Renovations [text box]
- 8. [text box] [text box]
- 9. [text box] [text box]
- 10. [text box] [text box]

Total Other Direct Costs [text box]

G. Direct Costs

Funds Requested (\$)

Total Direct Costs (A thru F) [text box]

H. Indirect Costs

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1.	[text box]	[text box]	[text box]	[text box]
2.	[text box]	[text box]	[text box]	[text box]
3.	[text box]	[text box]	[text box]	[text box]
4.	[text box]	[text box]	[text box]	[text box]
Total Indirect Costs				[text box]

Cognizant Federal Agency [text box]

(Agency Name, POC Name, and POC Phone Number)

I. Total Direct and Indirect Costs

Funds Requested (\$)

Total Direct and Indirect Institutional Costs (G + H) [text box]

J. Fee

Funds Requested (\$)

[text box]

K. * Budget Justification [text box]

(Only attach one file.)

Add Attachment

Delete Attachment

View Attachment

Close Form

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 2

* ORGANIZATIONAL DUNS:

* Budget Type: Project Subaward/Consortium

Enter name of Organization:

* Start Date: * End Date: Budget Period 2

C. Equipment Description

List items and dollar amount for each item exceeding \$5,000

	Equipment item	* Funds Requested (\$)
1.	<input type="text"/>	<input type="text"/>
2.	<input type="text"/>	<input type="text"/>
3.	<input type="text"/>	<input type="text"/>
4.	<input type="text"/>	<input type="text"/>
5.	<input type="text"/>	<input type="text"/>
6.	<input type="text"/>	<input type="text"/>
7.	<input type="text"/>	<input type="text"/>
8.	<input type="text"/>	<input type="text"/>
9.	<input type="text"/>	<input type="text"/>
10.	<input type="text"/>	<input type="text"/>
11.	Total funds requested for all equipment listed in the attached file	<input type="text"/>
	Total Equipment	<input type="text"/>

Additional Equipment:

D. Travel

	Funds Requested (\$)
1. Domestic Travel Costs (Incl. Canada, Mexico and U.S. Possessions)	<input type="text"/>
2. Foreign Travel Costs	<input type="text"/>
Total Travel Cost	<input type="text"/>

E. Participant/Trainee Support Costs

	Funds Requested (\$)
1. Tuition/Fees/Health Insurance	<input type="text"/>
2. Stipends	<input type="text"/>
3. Travel	<input type="text"/>
4. Subsistence	<input type="text"/>
5. Other <input type="text"/>	<input type="text"/>
<input type="text"/> Number of Participants/Trainees	
Total Participant/Trainee Support Costs	<input type="text"/>

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - Cumulative Budget

		Totals (\$)
Section A, Senior/Key Person		0.00
Section B, Other Personnel		226,536.00
Total Number Other Personnel	7	
Total Salary, Wages and Fringe Benefits (A+B)		226,536.00
Section C, Equipment		
Section D, Travel		122,875.00
1. Domestic	122,875.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		1,534,108.00
1. Materials and Supplies	7,550.00	
2. Publication Costs	7,283.00	
3. Consultant Services	37,875.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	1,375,000.00	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	106,500.00	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		1,883,519.00
Section H, Indirect Costs		366,481.00
Section I, Total Direct and Indirect Costs (G + H)		2,250,000.00
Section J, Fee		

I3P Research

Team leader: Dartmouth PI, I3P, Dartmouth College

Budget: \$1,563,500

This budget represents costs for research conducted by I3P's consortium members. The three research areas, as outlined in the project narrative, are small research projects, planning projects and white papers. Research will be done between August 1, 2009, and July 31, 2011. Throughout May and June 2009 detailed budgets and statements of work will be given to the I3P for review and approval. Below we outline an estimate of the amount of subawards.

Subawards (\$1,375,000):

Small Research Projects:

* 3 projects, each project consisting of 2 subawards for \$150k each

Total of: \$900,000

Planning Projects:

* 5 subawards, each award consisting of \$85k each

Total of: \$425,000

White Papers:

* 2 subawards - each for \$25,000

Total of: \$50,000

Current consortium member institutions eligible to receive subawards from I3P include:

Purdue University, Center for Education and Research in Information Assurance and Security	US Military Academy, Information Technology and Operations Center
University of Tulsa, Center for Information Security	University of Illinois Urbana-Champaign, Information Trust Institute
University of Idaho, Center for Secure and Dependable Systems	New York University, Institute for Civil Infrastructure Systems
Columbia University Department of Computer Science	Dartmouth College, Institute for Security, Technology, and Society
UC Davis, Computer Security Research Laboratory	Lawrence Berkeley National Laboratory
Cornell University	MIT Lincoln Laboratory
George Mason University School of Law, Critical Infrastructure Protection Program	MITRE Corporation
Georgia Tech Information Security Center	Pacific Northwest National Laboratory
Carnegie Mellon University, H. John Heinz III School of Public Policy and Management	RAND Corporation
Idaho National Laboratory	Sandia National Laboratories
Johns Hopkins University, Information Security Institute	Indiana University, School of Informatics
	Carnegie Mellon University, Software Engineering Institute
	SRI International
	University of California at Berkeley
	University of Massachusetts Amherst
	University of Virginia

Indirects: In accordance with our negotiated agreement (dated 3/12/2009) with the Department of Health and Human Services, Dartmouth College uses a 58% MTDC indirect cost rate for research and 35% for non research activities. Total direct costs exclude participant costs, capital expenditures equipment over \$5,000, and the portion of each subaward in excess of \$25,000 ($\$25,000 \times 58\% = \$14,500$).
(13 subawards x \$14,500 = \$188,500)

I3P Management

Project Lead: PI,

Budget: \$458,316

The management budget is separate from the research and workshop budgets. The management budget supports staff salaries and costs of running the consortium and related workshops, and to coordinate and report on research projects. The main responsibilities are outlined in the project narrative. **Please note that prior approved administration dollars are currently being used to fund these positions. Five additional months of support are budgeted from the supplemental funding.**

✓ **Personnel (\$163,913):** All personnel are Dartmouth employees. The Dartmouth Fiscal Year ends on June 30 of each year. Annual salary raises take affect on July 1 of each year. The following is a list of job descriptions found in the research and related budget worksheet. Note only seven employees are budgeted in the supplemental funding.

PI: Dr. is the Vice-Provost for Research at Dartmouth College. Management dollars allocated in prior budget submissions will support Dr. effort. Hence, no dollars from this supplemental funding are requested.

Director of Research: The Director of Research reports to the Vice-Provost for Research. The position will also act as Chair of the I3P. The Director of Research is responsible for providing the vision and leadership for the I3P Consortium's research portfolio. The Director of Research works closely with the Executive Director, the Executive Committee, and the I3P membership to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. The Director of Research oversees the implementation of new research programs and activities, and works to secure research funding to meet the research goals. The Director of Research represents the work of the Institute internally and externally, and cultivates strong ties to government agencies, industry, and academia. This position is currently unfilled. Approximately 50% of this position is budgeted under this supplemental award.

Executive Director: The Executive Director is responsible for the day-to-day management and strategic direction of the Institute. On behalf of the I3P Chair, the Executive Director works to advance the I3P mission and goals, fosters a cohesive and collaborative membership, and helps to build and sustain an effective research consortium. The Executive Director also supports and develops a close working relationship with and among the members of the I3P

Executive Committee and enables the Executive Committee to conduct its work on behalf of the Consortium. Approximately 60% of this position is budgeted under this supplemental award.

Associate Director for Research: The Associate Director collaborates with research teams, monitoring progress and guiding teams in organizational and substantive capacities. The Associate Director coordinates reports on I3P research to government sponsors, and initiates and implements centrally-driven I3P activities in pursuit of the institute's mission. This includes hosting workshops and events, conducting studies, and liaising with subject matter experts, as well as tracking and documenting the progress of current and new research initiatives. The Associate Director actively participates in the strategic development of the I3P and is a member of the senior management staff, and represents the I3P at conferences and meetings with industry, academia, and government. 100% of this position is budgeted under this supplemental award.

Assistant Director for Communications and Outreach: The Assistant Director manages and cultivates I3P external relations, including those with government agencies, executives in private industry, and various aspects of the public media. The Assistant Director serves as a public information and program information liaison to current and potential sponsors, and in addition provides administrative support in relation to I3P policy (by-laws, membership, elections). The Assistant Director actively participates in the strategic development of the I3P and is a member of the senior management staff, and represents the I3P at conferences and meetings. 100% of this position is budgeted under this supplemental award.

Events Manager: The Event Manager plans, directs and manages coordination, administration, and execution of internal and external Institute events. The position defines the strategies, tactics, budgets and related duties relevant to the successful planning and execution of all Institute events, to include workshops and external meetings. 80% of this position is budgeted under this supplemental award.

Program Assistant: The Program Assistant provides administrative support to the Institute's management and staff; assists in the collection, production, and archiving of material for research; supports the I3P staff and researchers in the coordination for as well as the planning and execution of meetings, conferences, symposia, reports, and other major outreach events; and creates and maintains departmental files and records. 100% of this position is budgeted under this supplemental award.

Communications Assistant: The Communications Assistant provides support to the Assistant Director for Communication and Outreach in the form of coordination and execution of internal and external information provided via the I3P website and the Institutes' hard-copy publications and communication materials. 100% of this position is budgeted under this supplemental award.

I3P/ISTS Associate Director, Finance and Administration: The Associate Director, Finance and Administration is responsible for the administrative and business affairs of the I3P, including facility management, space, equipment, hiring, and finance; manages day-to-day

activities of the Institute's operational staff; and ensures achievement of Institute goals and objectives. The person in this position reviews budgetary aspects of grant proposals, monitors grant and contract expenditures, handles relations with relevant personnel at Dartmouth's Office of Sponsored Projects and other universities regarding financial matters, and develops and monitors the Institutional budgets. 0% of this position is funded under this supplemental award.

ISTS Financial Services Account Specialist (position shared with I3P): The Financial Services Account Specialist is responsible for post-award administration of grants and contracts. In close association with the Associate Director for Finance and Administration, the person in this position oversees the financial management of sponsored projects, including monitoring expenses for authorization, allocability and consistency with Principal Investigators and sponsor objectives, and determines appropriate expenditure levels to avoid cost overruns. 0% of this position is funded under this supplemental award.

Fringe (\$62,623): In accordance with our negotiated agreement (dated 3/12/2009) with the Department of Health and Human Services, Dartmouth College uses the following approved fringe rate. Faculty & Senior personnel: 38% in FY10, with a 1% anticipated increase each fiscal year.

Travel (\$61,000): Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of consortium members from outside the Dartmouth area.

External conferences, coordination, training, and reporting: Trips are required to participate in meetings, conferences, and seminars in the process of developing research and overall I3P development requirements, collaborating technical solutions, leveraging capabilities and opportunities, and promoting outreach and technical support. Registration fees for three trips are also budgeted.

I3P Consortium Meetings: Consortium members and industry and government partners will meet throughout the performance periods to work on defined tasks. Current proposed level is three meetings per year, with an estimate of 30 participants each. In addition, speakers and guest participants may be invited from time to time. Note, travel for one meeting is budgeted in the supplemental funding.

34 total trips are budgeted:
Airfare \$500
Hotel \$175 / day
Meals \$50 / day
Mileage/taxi/parking (\$60+\$20+\$20) \$100

Administrative Information Outside of Scope

Administrative Information Outside of Scope

Other Direct Costs (\$51,958)

Materials and Supplies: Budgeted expenditures are for the purchase of minor expendable equipment, postage and conference calls.

Publication Costs: I3P related communication costs (brochures, posters, photography, printing, and mailing) are anticipated.

Event and Meeting Costs: Consortium meetings are held three times per year. In the supplemental funding, we budget for one meeting, which includes all associated costs of supplies, food, set-up, and transportation.

Consultants:

Executive Committee payments made according to the I3P bylaws. Five months of these payments are budgeted in this supplemental funding.

Granite Edge Consulting: I3P utilizes a consulting firm to help with communication and outreach activities.

Indirects: In accordance with our negotiated agreement (dated 3/12/2009) with the Department of Health and Human Services, Dartmouth College uses a 58% MTDC indirect cost rate for research and 35% for non research activities. Total direct costs exclude participant costs, capital expenditures equipment over \$5,000, and the portion of each subaward in excess of \$25,000.

(\$339,494 x 35% = \$118,822)

Cyber Security Workshops & Outreach

Team leader (b)(6) I3P, Dartmouth College

Budget: \$228,184

This budget represents costs for five workshops to be held between August 1, 2009, and July 31, 2011. Additional details are included in the project narrative. Costs are based on historical workshop expenses. Registration fees collected will be used to offset additional costs as appropriate.

Travel (\$61,875): Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of consortium members from outside the Dartmouth area. Nine trips for I3P staff, team members, and potentially students, are budgeted for each of the anticipated five workshops.

Airfare \$500
Hotel \$175 / day
Meals \$50 / day
Mileage/taxi/parking (\$60+\$20+\$20) \$100



Other Direct Costs: (\$107,150)

Materials and Supplies: Budgeted expenditures are for the supplies for the events. Costs are calculated based on an average from historical data based on actual workshops hosted by the I3P. Nametags, folders, labels, tent cards, and lanyards are supplied to participants. Conference calls in direct support of workshop planning are anticipated. A workshop registration vendor is also budgeted in order to process registrations.

Event Fees: Costs associated with the workshops include renting space and facilities for the workshops, food (including tax and gratuities), audio/video set up with technical support, postage for materials to and from the venue, and printing costs for proceedings. Printing charges for materials (such as workshop agenda and speaker biographies) and handouts to be distributed before and during the event, as well as invitations are budgeted. Costs are estimated based on historical data, location, workshop needs, and the number of expected participants.

Costs based on an average of 50 participants

Meals (\$80/ day) - two days

Set-up room fee for event and room rental – \$5,000 per meeting

A/V equipment for event - \$5,000 per meeting

Postage - \$300

Printed materials - \$1,500

Some expenses may be supplemented with registration fees, or funds from additional sources if available.

Consultants: Speakers and panelist payments are included for participation in several of the workshops. These experts will help create an interactive environment and will add the necessary subject matter expertise for successful events.

Indirects: In accordance with our negotiated agreement (dated 3/12/2009) with the Department of Health and Human Services, Dartmouth College uses a 58% MTDC indirect cost rate for research and 35% for non research activities. Total direct costs exclude participant costs, capital expenditures equipment over \$5,000, and the portion of each subaward in excess of \$25,000.

(\$169,025 x 35% = \$59,159)

BUDGET NARRATIVE

Award Number 2006-CS-001-000001
 Supplemental Funding: 2006-CS-001-000001-03
 Dartmouth College
 May 2009
 I3P: Cyber Security Collaborations and Information Sharing Project

The following three areas are presented for the \$2,250,000 supplemental funding. Funding will be spent through July 31, 2011:

I3P Research
 I3P Management
 I3P Workshops & Outreach

Summary breakdown by category:

Object Class Categories:		TOTAL	Budget Period I - Nov 2006	Budget Period II - Feb 2007	Supplement Budget Period II - March 2007	Budget Period III - May 2008	Proposed Supplement May 2009
a.	Personnel	3,536,319	187,367	1,415,283	595,886	1,173,870	163,913
b.	Fringe Benefits	1,065,157	53,625	398,449	195,073	355,387	62,623
c.	Travel	666,450	49,765	266,205	50,150	177,455	122,875
d.	Equipment	418,082	158,992	259,090	-	-	-
e.	Supplies	157,556	14,000	87,160	26,000	15,663	14,733
f.	Contractual	15,420,875	130,640	7,038,024	1,779,630	5,097,581	1,375,000
g.	Construction	-	-	-	-	-	-
h.	Other	1,058,390	89,008	401,299	75,100	348,608	144,375
i.	Total Direct Charge	22,322,829	683,397	9,865,510	2,721,839	7,168,564	1,983,519
j.	Indirect Charges	4,227,171	246,603	1,864,490	578,161	1,171,436	366,481
k.	TOTAL	26,550,000	930,000	11,730,000	3,300,000	8,340,000	2,250,000

Project Summary

This amendment covers work to be completed during the supplemental funding period (August 1, 2009 – July 3, 2011) of award number 2006-CS-001-000001 from NCSD. Dartmouth College's Institute for Information Infrastructure Protection (I3P) will focus on continuing the cyber security collaboration and information sharing activities established under this award and the previous award number 2003-TK-TX-0003. The work will be accomplished through research, planning, and outreach programs that will include communities of researchers nationwide.

Interdisciplinary teams of researchers will focus on problems in areas identified in the I3P report "*National Cyber Security Research and Development Challenges*" published in February of 2009. Individual I3P consortium members may also be tasked with planning additional research projects that expand on results achieved on current projects in Insider Threat, Identity Management, Process Control Systems, and Business Rationale for Cyber Security. As outlined in the funding opportunity description, one focus of the research will be on examining ways to establish metrics for cyber security protection and preparedness. Workshops that include private sector, government, and academic participants will be used to guide and highlight the work.

The benefit of the Cyber Security Collaboration and Information Sharing Project is to bring together researchers, stakeholders, and other constituencies to focus on the development of tangible means to identify and remediate cyberspace vulnerabilities, as well as to heighten awareness of cyber security nationwide. Outcomes of the work will be disseminated to various constituencies, including the National Cyber Security Division, through demonstrations, workshops, publications, and site visits.

Cyber Security Collaboration and Information Sharing Project

Supplemental Funding Request

Project Narrative

Introduction

The overarching objective of the proposed work under this supplemental funding is to apply the collective, diverse expertise of the Institute for Information Infrastructure Protection (I3P) to critical priorities tied to the mission of the Institute. A number of topics outlined in the I3P's February 2009 report "*National Cyber Security Research and Development Challenges – Related to Economics, Physical Infrastructure, and Human Behavior – An Industry, Academic, and Government Perspective,*" as well as other national research agenda documents will drive the selection of high quality and relevant research to be performed by I3P consortium members. During the period of performance the I3P will initiate new research projects with multidisciplinary research teams, hold workshops and perform outreach activities to highlight and disseminate research results from these projects as well as projects completed previously under the original award. The I3P will also continue to perform its general management activities. Additionally, workshops and outreach activities in order to highlight research are anticipated.

Project Plan

There are three areas outlined in the project plan:

1. I3P Research
2. I3P Management
3. I3P Workshop and Outreach

I3P Research

The proposed research will be accomplished during the performance period of August 1, 2009 through July 31, 2011. Research will consist of three components: Small research projects, planning projects, and white papers. The focus of the projects will be on nationally identified cyber security research priorities, with an emphasis on examining ways to establish metrics for cyber security protection and preparedness in the areas of Process Control Systems, Human Behavior, and Economics. Project priorities will be established in consultation with the I3P's program manager at NCSA. As with all I3P funded research, projects will be chosen through a competitive process among and between consortium members (see Appendix A for a list of current I3P members). Teams of I3P researchers will be identified who have the appropriate skill sets to address the identified topics. The consortium as a whole will determine whether the topic areas are of a critical nature in the area of cyber security and should be pursued by an I3P research team. This collaborative process has worked well for prior funded projects.

Research projects: Teams of I3P researchers will conduct small research projects; team size may range from two to up to five I3P member institutions. It is anticipated that the duration of each small research project will be between 18 and 24 months. Three projects are anticipated with the supplemental funding.

Potential projects may include:

- Security and privacy of health information
- Process control system security metrics for “smart grid” technology
- Protection from insider threat metrics for the financial services industry
- Risk pricing and business incentives for investments in cyber security

Planning projects: The planning projects are designed to assess the current literature in the proposed research areas and identify appropriate priorities for critical cyber security research and development. These planning projects are critical because they often include relevant field experts to review and comment on future directions of research, leading to strong and valuable research projects. Five planning projects are anticipated with the supplemental funding.

White papers: The white papers will allow members to explore security threats, to include the problems, impacts and possible approaches to solutions. The final paper will add value to many stakeholders in industry, government and academia. Two white papers are anticipated with the supplemental funding.

The I3P has developed a model for the evaluation of I3P’s research initiatives. Each research team is required to submit a quarterly progress report, to present updates at each I3P consortium meetings, and participate in periodic reviews of I3P research by research advisory boards. It is our experience that review results can strengthen the project and reveal additional research areas for future exploration.

I3P Management

The I3P consortium is managed and administered by a small administrative staff who are employees of Dartmouth College. The management of the consortium includes planning and administering and consortium meetings and workshops (additional details below), overseeing and evaluating all research projects, assisting in the evaluation of research proposals, administering the subaward process to fund projects, and ensuring compliance with all governmental and institutional rules and regulations regarding overall grant management. The I3P staff also manages the educational initiatives associated with the consortium.

For this award, the I3P will award and manage the small research projects, planning projects, and white papers, with continued management of the I3P fellowship and workshop programs. Each research project will have an institutional leader from one of the I3P member institutions who will work closely with the Executive Director, Research Director, and Principal Investigator at Dartmouth College.

Dr. [redacted] (b)(6) Vice Provost for Research at Dartmouth College is the Principal Investigator on external awards made to the consortium. He has the responsibility to oversee all the business and operational management of the consortium. He derives no more than 10% of his compensation from federal funds awarded for I3P management. Dr. [redacted] (b)(6) is also a member of the senior administration at Dartmouth reporting directly to the Provost.

(b)(6)

Executive Director of the I3P, is responsible for the day-to-day management and strategic direction of the I3P. She is also responsible for advancing the I3P mission and goals, and assisting the Executive Committee and Research Director of the I3P. Approximately 60% of this position is funded by the I3P management budget.

The Research Director of the I3P will work closely with the Executive Director to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. This position is currently vacant, but we anticipate it will be filled before July 31, 2009. Approximately 50% of this position is funded by the I3P management budget.

I3P Workshops/Outreach

The I3P has a well established and nationally recognized ability to organize high-impact workshops of interest to industry, government and academia, and has used these workshops to gain knowledge about cyber security problems and to demonstrate solutions. The consortium has shown its abilities to bring together important stakeholders from a variety of disciplines to discuss security challenges and advance solutions. The I3P has a unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue.

We are proposing to continue to provide these high-impact events and make them widely accessible to researchers, industry participants and policy makers. We envision at least five events, in similar scope and scale to prior workshops, which will focus on areas highlighted in I3P research. These interactions will facilitate an accelerated understanding of information infrastructure vulnerabilities and solutions, and information sharing to help to bring policies and practices together. Where appropriate, the workshops will also serve as demonstration sites for launching the technology transfer process. Workshop topics will be chosen by the I3P Executive Director in consultation with the I3P Executive Committee and the I3P's program manager at NCSD.

The I3P administrative office staff will provide logistical and organizational support for the workshops. The I3P staff will work closely with researchers and leading experts from industry and government to assure well-organized and effectively run workshops. The I3P will help produce and distribute workshop materials, develop websites promoting the workshops, invite speakers, and provide on-site administrative assistance. I3P staff will also play an active role in developing workshop content and coordinating the sessions. The I3P team will be responsible for all tasks related to logistics, room and equipment reservations, arranging meals, and managing reservations. The post-workshop activities for which the I3P staff will be responsible include managing and archiving information produced from the workshops, and the preparation and distribution, in both electronic and hard-copy format, of publications and reports from the workshops.

Appendix A – Current I3P consortium members

Purdue University, Center for Education and Research in Information Assurance and Security
University of Tulsa, Center for Information Security
University of Idaho, Center for Secure and Dependable Systems
Columbia University Department of Computer Science
UC Davis, Computer Security Research Laboratory
Cornell University
George Mason University School of Law, Critical Infrastructure Protection Program
Georgia Tech Information Security Center
Carnegie Mellon University, H. John Heinz III School of Public Policy and Management
Idaho National Laboratory
Johns Hopkins University, Information Security Institute
US Military Academy, Information Technology and Operations Center
University of Illinois Urbana-Champaign, Information Trust Institute
New York University, Institute for Civil Infrastructure Systems
Dartmouth College, Institute for Security, Technology, and Society
Lawrence Berkeley National Laboratory
MIT Lincoln Laboratory
MITRE Corporation
Pacific Northwest National Laboratory
RAND Corporation
Sandia National Laboratories
Indiana University, School of Informatics
Carnegie Mellon University, Software Engineering Institute
SRI International
University of California at Berkeley
University of Massachusetts Amherst
University of Virginia

Mitchell, Dionne

From: [redacted] (b)(6)
Sent: Wednesday, July 08, 2009 9:57 AM
To: Dionne Mitchell
Subject: FW: ATTN: [redacted] (b)(6) Cyber Security Collaboration and Information Sharing Project - Questions about supplemental budget

Attachments: travel&event questions 7-6-09.pdf



travel&event questions 7-6-09....

Hi Dionne,
I hear that Joan is out of the office. I thought you may be able to move this along, so I am forwarding.

Please let me know if you have further questions.
Thanks.

[redacted] (b)(6)

-----Original Message-----

From: [redacted] (b)(6)
Sent: Wednesday, July 08, 2009 9:49 AM
To: [redacted] (b)(6)
Cc: [redacted] (b)(6)
Subject: ATTN: [redacted] (b)(6) Cyber Security Collaboration and Information Sharing Project - Questions about supplemental budget

Hi Joan,

I'm sorry we missed each other on Monday before your departure. Attached is a detailed breakdown of the costs noted below. Please let me know if you have any additional questions.

Thank you,

[redacted] (b)(6)

[redacted] (b)(6) ~~~~~

Proposal Development Coordinator
Office of Sponsored Projects
Dartmouth College
11 Rope Ferry Road, #6210
Hanover, NH 03755-1404

Phone: [redacted] (b)(6)

Fax: (603) 646-3670

<http://www.dartmouth.edu/~osp/>

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--- Forwarded message from "Keiser, Joan" ---

>Disposition-Notification-To: "Keiser, Joan" [redacted] (b)(6)  
>Date: Wed, 1 Jul 2009 17:48:43 -0400  
>Thread-Topic: ATTN: [redacted] (b)(6); Cyber Security Collaboration and Information Sharing Project - Questions about supplemental budget  
>Thread-Index: Acn6lbPt34+4jTGtTlCjMDF8HejCRA==  
>Priority: Urgent  
>Importance: high

>From: "Keiser, Joan" <(b)(6)>  
>To: (b)(6)  
>Subject: ATTN: (b)(6): Cyber Security Collaboration and  
>Information  
Sharing Project - Questions about supplemental budget

Hi (b)(6)

I'm the grants officer assigned to this project.

I'm working through the budget proposal, and, for some reason, I can't seem to make the travel numbers work, to verify your costs.

Under I3P Management, you've provided a basis for costs for 34 trips. ✓  
What is the duration you used for each trip? What is the number of people for whom you are requesting travel funds?

5                      228,184                      61,875.

Under Cyber Security Workshops & Outreach, you provided your basis for costs and stated that you anticipate 9 workshops. What is the duration of the workshops and how many travelers did you use to derive your estimated travel costs?

Also, regarding event costs: I ran the numbers using your basis of estimate and derive a total of projected event costs of \$107,640.

Dartmouth is requesting \$106,500. I also noted this statement under the event costs discussion: "Some expenses may be supplemented with registration fees, or funds from additional sources if available." I need to reconcile the event costs item.

I called the number listed on the SF-424 for you, but another person's voicemail picked up (b)(6), so I'm dropping you an email as well.

Could you call me either tomorrow or Monday? I have a feeling we might be able to square this up by phone, and confirm by email.

Thanks.

Best,

Joan

Joan F. Keiser  
Grants Officer  
Grants and Financial Assistance Division Office of Procurement Operations Office of the  
Chief Procurement Officer  
Phone: (b)(6)  
Fax: (202) 447-5600

--- End of forwarded text ---



Admin budge travel (\$61,000): The calculation is explained below. Please note that 48 trips are budgeted, as opposed to 34. (34 was incorrectly noted in the submitted justification).

28 trips at 3 nights  
20 trips at 2 nights (consortium meeting)

Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100  
\$430 registration fees (10 of the trips)

48 x \$500 = \$24,000  
124 x \$175 = \$21,700  
124 x \$50 = \$6,200  
48 x \$100 = \$4,800  
10 x \$430 = \$4,300

\*\*\*\*\*

Workshop travel: 5 workshops are budgeted. We base the travel estimate of \$61,875 on the following travel assumptions.

pg 6

13P administration travelers – 4 travelers for 4 nights / each workshop  
Workshop team member travelers – 5 travelers for 3 nights / each workshop  
31 travel nights x 5 workshops = 155 nights

Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100

45 x \$500 = \$22,500  
155 x \$175 = \$27,125  
155 x \$50 = \$7,750  
45 x \$100 = \$4,500

\*\*\*\*\*

Workshop 'Other' Costs: \$107,150

19,8

Event: \$99,000 (\$19,800 x 5 workshops)

Costs based on an average of 50 participants  
Meals (\$80/ day) - two days

Set-up room fee for event and room rental – \$5,000 per meeting  
A/V equipment for event - \$5,000 per meeting  
Postage - \$300  
Printed materials - \$1,500

Supplies: \$2,900 (\$580 x 5 workshops)

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*100000*  
*250*

Consultant costs: \$5,250 (\$1,050 x 5 workshops)

The \$106,500 in the requested summary budget includes the \$99,000 under the workshop budget for events and \$7,500 under event costs in the administration budget (1 consortium meeting, supplies, food, set-up).

Regarding the registration fees. We set these fees based on the type of workshop, the anticipated number of participants and the overall estimated cost of the workshop. We do not have this information at the time of the budget submission. If registration fees are required, those funds go directly against the workshop costs. In the past, if a registration fee was collected, it was a modest \$100-\$150 dollars. Therefore, we do not directly budget for these offsets.



Cost Verifying

**From Budget Narrative Subawards**

|                                       | <b>I3P Management</b>                                                                                                                                    |                          | <b>Cyber Security Workshops &amp; Outreach</b> |                            |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------|----------------------------|
| \$1,375,000                           | Budget:                                                                                                                                                  | \$458,316                | \$228,184                                      | \$2,250,000                |
|                                       | Personnel                                                                                                                                                | \$163,913                | 0                                              | \$163,913                  |
| 900000                                | Fringe                                                                                                                                                   | \$62,623                 | 0                                              | \$62,623                   |
| 425000                                | Travel                                                                                                                                                   | \$61,000                 | \$61,875                                       | \$122,875                  |
| 50000                                 | Other Direct Costs                                                                                                                                       | \$51,958                 | \$107,150                                      | \$159,108                  |
| 1375000                               |                                                                                                                                                          |                          |                                                | \$0                        |
|                                       | Total Directs                                                                                                                                            | \$339,494                | \$169,025                                      | \$1,883,519                |
| 188500                                |                                                                                                                                                          |                          |                                                | \$0                        |
| Indirects:                            | Indirects                                                                                                                                                | \$118,823 rounding error | \$59,159                                       | \$366,482                  |
| (\$25,000 x 58% = \$14,500)           | (\$339,494 x 35% = \$118,822)                                                                                                                            |                          | (\$169,025 x 35% = \$59,159)                   |                            |
| (13 subawards x \$14,500 = \$188,500) | 58% MTDC indirect cost rate for research and 35% for non research activities.                                                                            |                          |                                                | \$2,250,001 rounding error |
|                                       | 14500 Total direct costs exclude participant costs, capital expenditures equipment over \$5,000, and the portion of each subaward in excess of \$25,000. |                          |                                                |                            |
|                                       | 0.35                                                                                                                                                     |                          |                                                |                            |
|                                       |                                                                                                                                                          | \$458,317 rounding error | \$228,184                                      |                            |

| <b>Travel</b>                               | <b>I3P Management</b> |       | <b>Cyber Security Workshops &amp; Outreach</b> |
|---------------------------------------------|-----------------------|-------|------------------------------------------------|
| total                                       | \$61,000              |       | 9 trips                                        |
| 34 total trips are budgeted:                |                       |       | \$61,875                                       |
| Airfare \$500                               |                       |       |                                                |
| Hotel \$175 / day                           |                       |       |                                                |
| Meals \$50 / day                            |                       |       | 47250                                          |
| Mileage/taxi/parking (\$60+\$20+\$20) \$100 | 1050                  | 35700 | \$14,625                                       |
| 30 people                                   | 31500                 |       |                                                |
|                                             | 1.84                  | 1.71  |                                                |

**Other Directs**

|                                                                  | 9 workshops |        |
|------------------------------------------------------------------|-------------|--------|
| <b>Event Costs</b>                                               |             |        |
| Costs based on an average of 50 participants                     |             |        |
| Meals (\$80/ day) - two days                                     | 160         | 5000   |
| Set-up room fee for event and room rental -- \$5,000 per meeting |             | 5000   |
| A/V equipment for event - \$5,000 per meeting                    |             | 300    |
| Postage - \$300                                                  |             | 1500   |
| Printed materials - \$1,500                                      |             | 11980  |
|                                                                  |             | 107640 |
| SF 424 request                                                   | 106500      |        |

*John's CA*

**Award Number:**  
**Recipient:**  
**DUNS Number:**  
**Grants.gov App Number**  
**Project Period:**  
**Budget Period:**

|                                    | # | 424 REQUESTED | Queries      | Answers  | +/- Adjust. | NEGOTIATED | Diff |
|------------------------------------|---|---------------|--------------|----------|-------------|------------|------|
| <b>Prog Mgr/PI (Wybourne)</b>      |   | 0             | Fringe rate: |          |             | 0          | 0    |
| Salary                             |   | 0             | n/a          |          | 0           | 0          |      |
| Fringe                             |   | 0             |              |          | 0           | 0          |      |
| <b>Management Staff</b>            | 7 | 226,536       |              |          |             | 226,536    | 0    |
| Director of Research               |   |               |              |          |             |            |      |
| Salaries                           |   | 163,913       | 38%          | Verified | 0           | 163,913    |      |
| Fringe                             |   | 62,623        | est. rate    | Verified | 0           | 62,623     |      |
| <b>Subtotal Other Personnel</b>    |   | 226,536       |              |          |             | 226,536    | 0    |
| <b>Subtotal Personnel</b>          |   | 226,536       |              |          |             | 226,536    |      |
| <b>Subtotal Equipment</b>          |   | 0             |              |          | 0           | 0          |      |
| <b>Travel</b>                      |   | 122,875       |              |          | 0           | 122,875    | 0    |
| <b>Partic. Support Costs</b>       |   | 0             |              |          | 0           | 0          |      |
| Materials & Supplies               |   | 7,550         |              |          |             | 7,550      |      |
| Publication Costs                  |   | 7,183         |              |          | 0           | 7,183      |      |
| Consultant Svcs.                   |   | 37,875        |              |          | 0           | 37,875     |      |
| ADP/Computer Svcs.                 |   | 0             |              |          | 0           | 0          |      |
| Subawards/Contractual Costs        |   | 1,375,000     |              |          | 0           | 1,375,000  |      |
| Equip. or Facil. Rental/User Fees  |   | 0             |              |          | 0           | 0          |      |
| Alterations & Renovations          |   | 0             |              |          | 0           | 0          |      |
| Event Costs                        |   | 106,500       |              |          | 0           | 106,500    |      |
| <b>Subtotal Other Direct Costs</b> |   | 1,534,108     |              |          |             | 1,534,108  | 0    |
| <b>Total Direct Costs</b>          |   | 1,883,519     |              |          |             | 1,883,519  | 0    |
| Minus Equipment                    |   |               |              |          |             |            |      |
| Minus Fee Remissions               |   |               |              |          |             |            |      |
| IDC Base                           |   |               | IDC Rate:    |          |             |            |      |
| <b>Indirect Costs</b>              |   | 366,481       | split rate   |          |             | 366,481    | 0    |
|                                    |   |               | see below    |          |             |            |      |
| <b>TOTAL</b>                       |   | 2,250,000     |              |          | 0           | 2,250,000  | 0    |

Indirect cost rates

From 424:

|                          | Rate | Base    | Calc                                                     |
|--------------------------|------|---------|----------------------------------------------------------|
| MTDC - research rate     | 0.58 | 325,000 | 188,500                                                  |
| MTDC - non research rate | 0.35 | 508,519 | 177,982 (rounding error - take Dartmouth's lower number) |
|                          |      |         | 366,482                                                  |
|                          |      |         | 366,481                                                  |

Grant Number: 2006-CS-001-000001-03  
 Grantee: Trustees of Dartmouth College  
 DUNS Number: 0410278220000  
 Grants.gov App Number: Not on bottom of my face sheet  
 Project Period: 8/1/2009 - 07/31/2011  
 Budget Period: 8/1/2009 - 07/31/2011

|                                    | # | 424 REQUESTED FY10 |              | 424 REQUESTED FY11 | Queries      | Answers | +/- Adjust. | 2009-2010 |
|------------------------------------|---|--------------------|--------------|--------------------|--------------|---------|-------------|-----------|
| PD/PI                              |   | 0                  | Fringe rate: |                    |              |         |             |           |
| Salary                             |   | 0                  | #DIV/0!      |                    |              |         | 0           |           |
| Fringe                             |   | 0                  |              |                    |              |         | 0           |           |
| <b>Management Staff</b>            |   | <b>179,861</b>     |              | <b>46,656</b>      |              |         |             |           |
| Salary- Res. Dir                   |   | 20,000             | Fringe rate: | 5,150              | Fringe rate: |         | 0           |           |
| Fringe                             |   | 7,600              | 38%          | 2,009              | 39%          |         | 0           |           |
| Salary- Exec Dir                   |   | 27,040             | Fringe rate: | 6,963              | Fringe rate: |         | 0           |           |
| Fringe                             |   | 10,275             | 38%          | 2,716              | 39%          |         | 0           |           |
| Salary- Assoc Dir for Res.         |   | 20,575             | Fringe rate: | 5,298              | Fringe rate: |         | 0           |           |
| Fringe                             |   | 7,819              | 38%          | 2,066              | 39%          |         | 0           |           |
| Salary-Asst. Dir Comm& Out         |   | 24,267             | Fringe rate: | 6,249              | Fringe rate: |         | 0           |           |
| Fringe                             |   | 9,221              | 38%          | 2,437              | 39%          |         | 0           |           |
| Salary-Prog. Asst                  |   | 14,167             | Fringe rate: | 3,648              | Fringe rate: |         | 0           |           |
| Fringe                             |   | 5,383              | 38%          | 1,423              | 39%          |         | 0           |           |
| Salary-Events                      |   | 12,800             | Fringe rate: | 3,296              | Fringe rate: |         | 0           |           |
| Fringe                             |   | 4,864              | 38%          | 1,285              | 39%          |         | 0           |           |
| Salary-Inform                      |   | 11,500             | Fringe rate: | 2,961              | Fringe rate: |         | 0           |           |
| Fringe                             |   | 4,370              | 38%          | 1,155              | 39%          |         | 0           |           |
| <b>Subtotal Other Personnel</b>    |   | <b>179,861</b>     |              | <b>46,656</b>      |              |         |             |           |
| <b>Subtotal Personnel</b>          |   | <b>179,861</b>     |              |                    |              |         |             |           |
| <b>Subtotal Equipment</b>          |   | <b>0</b>           |              |                    |              |         | 0           |           |
|                                    |   | 0                  |              |                    |              |         | 0           |           |
|                                    |   | 0                  |              |                    |              |         | 0           |           |
|                                    |   | 0                  |              |                    |              |         | 0           |           |
| <b>Travel</b>                      |   | <b>122,875</b>     |              |                    |              |         | 0           |           |
| <b>Partic. Support Costs</b>       |   | <b>0</b>           |              |                    |              |         | 0           |           |
| Materials & Supplies               |   | 7,550              |              |                    |              |         | 0           |           |
| Publication Costs                  |   | 7,183              |              |                    |              |         | 0           |           |
| Consultant Svcs.                   |   | 37,875             |              |                    |              |         | 0           |           |
| ADP/Computer Svcs.                 |   | 0                  |              |                    |              |         | 0           |           |
| Subawards/Contractual Costs        |   | 1,375,000          |              |                    |              |         | 0           |           |
| Equip. or Facil. Rental/User Fees  |   | 0                  |              |                    |              |         | 0           |           |
| Alterations & Renovations          |   | 0                  |              |                    |              |         | 0           |           |
| Other - Event Costs                |   | 106,500            |              |                    |              |         | 0           |           |
| <b>Subtotal Other Direct Costs</b> |   | <b>1,534,108</b>   |              |                    |              |         |             |           |
| <b>Total Direct Costs</b>          |   | <b>1,836,864</b>   |              |                    |              |         |             |           |
| MTDC Research Rate                 |   |                    |              |                    |              |         |             |           |
| Indirect (base)                    |   | 325,000            | IDC Rate:    |                    |              |         |             |           |
| Indirect costs                     |   | 188,500            | 56.00%       |                    |              |         |             |           |
| MTDC Non-Research                  |   |                    |              |                    |              |         |             |           |
| Rate Indirect (base)               |   | 508,519            | 35.00%       |                    |              |         |             |           |
| Indirect costs                     |   | 177,981            |              |                    |              |         |             |           |
| <b>Total Indirect Costs</b>        |   | <b>366,481</b>     |              |                    |              |         | 0           |           |
| <b>TOTAL</b>                       |   | <b>2,203,345</b>   |              |                    |              |         | 0           |           |

Notes

1. Budget issues

**Personnel:** Positions outlined in this budget are similar to the year 1 budget, however it is difficult to determine how the \$226,536 was calculated because no base salaries were provided. Also, there appear to be slight differences (e.g. Is the Yr. 1 Communications Manager the same position as this Yr 3 suppl's Communications Assistant? Is the Program Assistant a new position? ) Please include the base salary for each position in your calculations.

June 18 received base salaries, all figures are correct.

2. Human Subjects

The Research & Related form #1 says no human subjects this year. In 2008 award there was a requirement stating that unless IRB req. was met, they could not have HS. Year 3 file contains a letter dated April 28, 2008 that all regulatory requirements were met.

3. Assurances:

Assurances on file in Year 3 application.

4. Key Personnel:

On file in Year 3 application.

5. Cooperative Agreement:

Should this be processed as a cooperative agreement as pg. 2 of project narrative states that a consortium is involved in planning extensive research projects?

NO

**A-133 Audits:**

FY 07 Single Audit for the period ending 6/30/07 submitted 3/31/08.  
No qualified or adverse opinions sited. No disclaimers.

**EPLS:**

No results found by applicant or PI.

**Requisition Missing:**

PR# RNCS-09-00052 for \$2,250,000 on file.

**Mitchell, Dionne**

**From:** (b)(6)  
**Sent:** Thursday, June 18, 2009 8:07 AM  
**To:** Dionne Mitchell; Joan Keiser  
**Cc:** (b)(6)  
**Subject:** FW: Review of Cyber Security Collaboration and Information Sharing Project (2006-CS-001-000001-03) Supplemental Request

**Attachments:** admin salary info.pdf



admin salary info.pdf (16 KB)

Hi Dionne,

Here are the answers:

1. See attached. It is the detail behind the salary numbers.
2. Yr 1 Communications Manager equates to the Yr 3 Assistant Director, Communication and Outreach.

The Program assistant and Communications assistant are new positions. They have replaced the Senior Asst. Dir for Informatics Services, Admin assistant and the Research coordinator.

Yes, the Assoc Dir for Research is the same as the Director for Research and Analysis. The title has been changed.

Let me know if you have further questions.

Thanks,

(b)(6)

--- Forwarded message from "Mitchell, Dionne" ---

>Subject: Review of Cyber Security Collaboration and Information Sharing Project (2006-CS-001-000001-03) Supplemental Request  
>Date: Wed, 17 Jun 2009 14:55:09 -0400  
>Thread-Topic: Review of Cyber Security Collaboration and Information Sharing Project (2006-CS-001-000001-03) Supplemental Request  
>Thread-Index: AcnvfSLPsKk1wf3PRZ+trswBCNki2w==  
>From: "Mitchell, Dionne" (b)(6)  
>To: (b)(6)  
>Cc: "Keiser, Joan" (b)(6)

Dear (b)(6)

I reviewed your application for supplemental funding for the Cyber Security Collaboration and Information Sharing Project (2006-CS-001-000001-03). I need some additional information and clarification of the issues described below. Please send your response to me by Monday, June 22, 2009.

- 1.) Please provide the base salaries on which you based your request of \$226,536.
- 2.) There appear to be slight differences in the position titles making it difficult to calculate how the total was derived. For example, is the Yr. 1 Communications Manger the same position as the Communications Assistant in this Yr. 3 request? Is the Program



Assistant a new position? Is the Assoc Dir for Research the same as the Director for Research and Analysis? Are the Program and Communications Assistants new positions?

You may e-mail a response to me at [redacted] (b)(6) Should you have any questions, I can be reached at [redacted] (b)(6)

Dionne J. Mitchell, MPA  
Grant Specialist  
Department of Homeland Security/OPO/GFAD 7th & D Street, SW 3069-37, Mail Stop: 500  
245 Murray Lane, SW, Building 410  
Washington, DC 20528  
(202) [redacted] (b)(6)  
(202) 447-5600

Email: mail to: [redacted] (b)(6)

cc: Shea McGovern, Assistant Director, Trustees of Dartmouth College

Joan F. Keiser, Grants Officer, Department of Homeland Security

--- End of forwarded text ---

[redacted] (b)(6)

Proposal Development Coordinator  
Office of Sponsored Projects  
Dartmouth College  
11 Rope Ferry Road, #6210  
Hanover, NH 03755-1404

Phone: [redacted] (b)(6)

Fax: (603) 646-3670

<http://www.dartmouth.edu/~osp/>

**I3P Administration - supplement**

Dates: August 1, 2009 to July 31, 2011

| Item  | Labor (Dartmouth)                                               | FY10 Base salary | Dartmouth FY10 |        |        |                  | Dartmouth FY11 |        |       |                 | Total            | inflation |
|-------|-----------------------------------------------------------------|------------------|----------------|--------|--------|------------------|----------------|--------|-------|-----------------|------------------|-----------|
|       |                                                                 |                  | months         | effort | rate   | amount           | months         | effort | rate  | amount          |                  |           |
| Staff |                                                                 |                  |                |        |        |                  |                |        |       |                 |                  |           |
|       | AP Research Director                                            | \$120,000        | 4.00           | 50%    | 16.67% | \$20,000         | 1.00           | 50%    | 4.17% | \$5,150         | \$25,150         | 3.0%      |
|       | AP Martha Austin (Executive Director)                           | \$135,200        | 4.00           | 60%    | 20.00% | \$27,040         | 1.00           | 60%    | 5.00% | \$6,963         | \$34,003         | 3.0%      |
|       | AP Heather Drnan (Assoc Dir for Research)                       | \$61,725         | 4.00           | 100%   | 33.33% | \$20,575         | 1.00           | 100%   | 8.33% | \$5,298         | \$25,873         | 3.0%      |
|       | AP Laurie Burnham (Asst. Director, Communications and Outreach) | \$72,800         | 4.00           | 100%   | 33.33% | \$24,267         | 1.00           | 100%   | 8.33% | \$6,249         | \$30,515         | 3.0%      |
|       | AP Elisabeth Bryan (Program Assistant)                          | \$42,500         | 4.00           | 100%   | 33.33% | \$14,167         | 1.00           | 100%   | 8.33% | \$3,648         | \$17,815         | 3.0%      |
|       | AP Nicole Hall Hewett (Events)                                  | \$48,000         | 4.00           | 80%    | 26.67% | \$12,800         | 1.00           | 80%    | 6.67% | \$3,296         | \$16,096         | 3.0%      |
|       | AP Kei Alarcon (Information)                                    | \$34,500         | 4.00           | 100%   | 33.33% | \$11,500         | 1.00           | 100%   | 8.33% | \$2,961         | \$14,461         | 3.0%      |
|       | <b>Subtotal, without fringe</b>                                 |                  |                |        |        | <b>\$130,348</b> |                |        |       | <b>\$33,565</b> | <b>\$163,913</b> |           |
|       | AP Fringe on AP I and AP II                                     |                  |                |        | 38.0%  | \$49,532         |                |        | 39.0% | \$13,090        | \$62,623         |           |
|       | <b>Total fringe</b>                                             |                  |                |        |        | <b>\$49,532</b>  |                |        |       | <b>\$13,090</b> | <b>\$62,623</b>  |           |
|       | <b>Subtotal, including fringe</b>                               |                  |                |        |        | <b>\$179,881</b> |                |        |       | <b>\$46,655</b> | <b>\$226,536</b> |           |

Salaries: Base salary is for 12 months, with a 3% raise on July 1, 2010.

FY10 = July 1, 2009 to June 30, 2010

FY11 = July 1, 2010 to June 30, 2011

Ex: Research Director:  $\$120,000/12 = \$10,000$  per month

4 months is FY10 x 50% effort = \$20,000

1 month is FY11 x 50% effort = \$5,150

Total budgeted: \$25,150

Fringe: 38% in FY10; 39% in FY11

**Mitchell, Dionne**

**From:** Mitchell, Dionne  
**Sent:** Wednesday, June 17, 2009 2:55 PM  
**To:** (b)(6)  
**Cc:** Keiser, Joan  
**Subject:** Review of Cyber Security Collaboration and Information Sharing Project (2006-CS-001-000001-03) Supplemental Request

Dear (b)(6)

I reviewed your application for supplemental funding for the Cyber Security Collaboration and Information Sharing Project (2006-CS-001-000001-03). I need some additional information and clarification of the issues described below. Please send your response to me by **Monday, June 22, 2009**.

- 1.) Please provide the base salaries on which you based your request of \$226,536.
- 2.) There appear to be slight differences in the position titles making it difficult to calculate how the total was derived. For example, is the Yr. 1 Communications Manger the same position as the Communications Assistant in this Yr. 3 request? Is the Program Assistant a new position? Is the Assoc Dir for Research the same as the Director for Research and Analysis? Are the Program and Communications Assistants new positions?

You may e-mail a response to me at (b)(6). Should you have any questions, I can be reached at (b)(6).

**Dionne J. Mitchell, MPA**  
 Grant Specialist  
 Department of Homeland Security/OPO/GFAD  
 7th & D Street, SW 3069-37, Mail Stop: 500  
 245 Murray Lane, SW, Building 410  
 Washington, DC 20528

(b)(6)

~ (202) 447-5600

(b)(6)

cc: (b)(6) Assistant Director, Trustees of Dartmouth College  
 Joan F. Keiser, Grants Officer, Department of Homeland Security

**Note to File**  
**Re: Allowable Cost - Meals at Meetings**

Per OMB CIRCULAR A-21 (Revised 05/10/04) the meals in this budget are allowable:

CIRCULAR NO. A-21

32. Meetings and Conferences.

Costs of meetings and conferences, the primary purpose of which is the dissemination of technical information, are allowable. This includes costs of meals, transportation, rental of facilities, speakers' fees, and other items incidental to such meetings or conferences. But see section J.17, Entertainment costs.

Dartmouth has documented that the meetings and workshops are working meetings. Documentation may be found in the following files:

**Year 3 Budget**

**I3P Initiative 3 - Cyber Security Workshops**

Per pages 18-19 of the Year 3 Budget under the Event and Meetings Costs justification, Dartmouth reported that dinners closely tie to the workshop and dinners will be a compulsory part of the program agenda), offering attendees further perspective and insights into workshop related content.

**Year 1 Budget**

**I3P Management Costs**

Per the section entitled Budget Periods II&III, I3P Management Costs, Sub-agreements (no page number) Dartmouth reported:

The I3P Consortium Meetings: Working groups composed of Consortia members and industry and government partners will meet throughout the performance periods to work on defined tasks. Current proposed level is four meetings per year, with an estimate of 30-35 participants. In addition, speakers and guest participants may be invited from time to time...

**Grant Number:** 2006-CS-001-000001-03  
**Grantee:** Trustees of Dartmouth College  
**DUNS Number:** 0410278220000  
**Grants.gov App Number:** Not on bottom of my face sheet  
**Project Period:** 8/1/2009 - 07/31/2011  
**Budget Period:** 8/1/2009 - 07/31/2011

|                                        | # | 424 REQUESTED    | Queries      | Answers | +/- Adjust. | NEGOTIATED       |
|----------------------------------------|---|------------------|--------------|---------|-------------|------------------|
| PD/PI                                  |   | 0                |              |         |             | 0                |
| Salary                                 |   | 0                | Fringe rate: |         | 0           | 0                |
| Fringe                                 |   | 0                | #DIV/0!      |         | 0           | 0                |
| <b>Management Staff</b>                |   | <b>226,536</b>   |              |         |             | <b>226,536</b>   |
| Salary                                 |   | 163,913          | Fringe rate: |         | 0           | 163,913          |
| Fringe                                 |   | 62,623           | 38%          |         | 0           | 62,623           |
| <b>Subtotal Other Personnel</b>        |   | <b>226,536</b>   |              |         |             | <b>226,536</b>   |
| <b>Subtotal Personnel</b>              |   | <b>226,536</b>   |              |         |             | <b>226,536</b>   |
| <b>Subtotal Equipment</b>              |   | <b>0</b>         |              |         |             | <b>0</b>         |
|                                        |   | 0                |              |         | 0           | 0                |
|                                        |   | 0                |              |         | 0           | 0                |
|                                        |   | 0                |              |         | 0           | 0                |
|                                        |   | 0                |              |         | 0           | 0                |
| <b>Travel</b>                          |   | <b>122,875</b>   |              |         | 0           | <b>122,875</b>   |
| <b>Partic. Support Costs</b>           |   | <b>0</b>         |              |         | 0           | <b>0</b>         |
| Materials & Supplies                   |   | 7,550            |              |         | 0           | 7,550            |
| Publication Costs                      |   | 7,183            |              |         | 0           | 7,183            |
| Consultant Svcs.                       |   | 37,875           |              |         | 0           | 37,875           |
| ADP/Computer Svcs.                     |   | 0                |              |         | 0           | 0                |
| Subawards/Contractual Costs            |   | 1,375,000        |              |         | 0           | 1,375,000        |
| Equip. or Facil. Rental/User Fees      |   | 0                |              |         | 0           | 0                |
| Alterations & Renovations              |   | 0                |              |         | 0           | 0                |
| Other - Event Costs                    |   | 106,500          |              |         | 0           | 106,500          |
| <b>Subtotal Other Direct Costs</b>     |   | <b>1,534,108</b> |              |         |             | <b>1,534,108</b> |
| <b>Total Direct Costs</b>              |   | <b>1,883,519</b> |              |         |             | <b>1,883,519</b> |
| MTDC Research Rate Indirect (base)     |   | 325,000          | DC Rate:     |         |             |                  |
| Indirect costs                         |   | 188,500          | 58.00%       |         |             |                  |
| MTDC Non-Research Rate Indirect (base) |   | 508,519          | 35.00%       |         |             | n/a              |
| Indirect costs                         |   | 177,981          |              |         |             |                  |
| <b>Total Indirect Costs</b>            |   | <b>366,481</b>   |              |         | 0           | <b>366,481</b>   |
| <b>TOTAL</b>                           |   | <b>2,250,000</b> |              |         | 0           | <b>2,250,000</b> |

**Notes**

**1. Budget Issues**

- a.) Page 2 of the budget is \$688,500 over the award amount or \$2,938,500 (\$1,563,500+\$1,375,000). Is this for In-Kind expenses? The award amount is only for \$2,250,000.
- b.) Page 2 of budget has \$1,375,000 for subawards- For OIG purposes do we need to keep a copy of their policies and procedures on file to show that we are enduring they have fair and open competition? Or do we have a certification statement?
- c.) Personnel- Break out for each position: Salary x % on Yr3Supp1= Requested Salary  
 PI- in-kind, Dir of Resrch 50%, Exec Dir 60%, Assoc Dir 100%. Asst Dir Comm&Outrch 100%. Events Manager 80%, Prog Asst 1005, I3P/ISTS Assoc Dir Fin in-kind, ISTS Fin Srvc Acct Spec- in kind
- d.) Travel- needs to be broken out further for both the I3P Research (pg.5) and the Workshops(pg.6) - how many days per trip @ \$175/day Hotel and \$50/day Meals etc?
- e.) ODC/Consultants- need justification e.g. \$37,875 for consultant services- how many days, rates, etc.

ODC/ Totals do not match. Budget detail worksheet says total ODCs= \$1,534,108. However the budget has \$159,108 (\$51,958 for research pg.6 and \$107,150 for Cyber Sec Wkshps pg.7)  
f.) Indirect Cost Rate- HHS is fed cog. Need calculation for Research portion.

- 2. Human Subjects** The Research & Related form #1 says no human subjects, however Year 3 file states there were.
- 3. Assurances:** None found.
- 4. Key Personnel:** Missing list.
- 5. Cooperative Agreement:** Should this be processed as a cooperative agreement as pg. 2 of project narrative states that a consortium is involved in planing extensive research projects?
- A-133 Audits:**  
FY 07 Single Audit for the period ending 6/30/07 submitted 3/31/08.  
No qualified or adverse opinions sited. No disclaimers.
- EPLS:** No results found by applicant or PI.
- Requisition Missing:** Only found the FY 08 Req. RNCS-08-00021 in PRISM, none for this 09 Supplement.

# EPLS

Excluded Parties List System

**Search Results Excluded By  
Exact Name : Trustees of Dartmouth College  
as of 01-Jun-2009 4:35 PM EDT**

---

**Your search returned no results.**

# EPLS

Excluded Parties List System

**Search Results Excluded By  
Partial Name : Dartmouth  
DUNS : 037551404  
as of 01-Jun-2009 4:36 PM EDT**

---

**Your search returned no results.**





Excluded Parties List System

**Search Results Excluded By  
Exact Name : Wybourne, Martin  
as of 11-Jun-2009 10:27 AM EDT**

---

**Your search returned no results.**

**Data Collection Form for Reporting on  
AUDITS OF STATES, LOCAL GOVERNMENTS, AND NON-PROFIT ORGANIZATIONS  
for Fiscal Year Ending Dates in 2004, 2005, or 2006**

▶ Complete this form, as required by OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations."

**RETURN TO**

**Federal Audit Clearinghouse  
1201 E. 10th Street  
Jeffersonville, IN 47132**

**PART I GENERAL INFORMATION (To be completed by auditee, except for Items 4 and 7)**

|                                                                                                                                                                                                                                                                                                                         |       |        |      |    |      |        |                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------|------|----|------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Fiscal period ending date for this submission</b><br><table border="1" style="width:100%"> <tr> <td>Month</td> <td>Day</td> <td>Year</td> </tr> <tr> <td align="center">06</td> <td align="center">/ 30</td> <td align="center">/ 2007</td> </tr> </table> Fiscal Period End Dates Must Be In 2004, 2005, or 2006 | Month | Day    | Year | 06 | / 30 | / 2007 | <b>2. Type of Circular A-133 audit</b><br>1 <input checked="" type="checkbox"/> Single audit    2 <input type="checkbox"/> Program-specific audit |
| Month                                                                                                                                                                                                                                                                                                                   | Day   | Year   |      |    |      |        |                                                                                                                                                   |
| 06                                                                                                                                                                                                                                                                                                                      | / 30  | / 2007 |      |    |      |        |                                                                                                                                                   |

|                                                                                                                                                                                         |                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <b>3. Audit period covered</b><br>1 <input checked="" type="checkbox"/> Annual    2 <input type="checkbox"/> Biennial    3 <input type="checkbox"/> Other - <input type="text"/> Months | <b>4. FEDERAL GOVERNMENT USE ONLY</b><br>Date received by Federal clearinghouse |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                               |   |   |   |   |   |   |   |   |   |   |                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>5. Auditee Identification Numbers</b><br>a. Primary Employer Identification Number (EIN)<br><table border="1" style="width:100%"> <tr> <td>0</td><td>2</td><td>-</td><td>0</td><td>2</td><td>2</td><td>2</td><td>1</td><td>1</td><td>1</td> </tr> </table> | 0 | 2 | - | 0 | 2 | 2 | 2 | 1 | 1 | 1 | b. Are multiple EINs covered in this report? 1 <input type="checkbox"/> Yes 2 <input checked="" type="checkbox"/> No<br>c. If Part I, Item 5b = "Yes," complete Part I, Item 5c on the continuation sheet on Page 4. |
| 0                                                                                                                                                                                                                                                             | 2 | - | 0 | 2 | 2 | 2 | 1 | 1 | 1 |   |                                                                                                                                                                                                                      |

|                                                                                                                                                                                                                              |   |   |   |   |   |   |   |   |   |   |   |                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d. Data Universal Numbering System (DUNS) Number<br><table border="1" style="width:100%"> <tr> <td>0</td><td>4</td><td>-</td><td>1</td><td>0</td><td>2</td><td>-</td><td>7</td><td>8</td><td>2</td><td>2</td> </tr> </table> | 0 | 4 | - | 1 | 0 | 2 | - | 7 | 8 | 2 | 2 | e. Are multiple DUNS covered in this report? 1 <input type="checkbox"/> Yes 2 <input checked="" type="checkbox"/> No<br>f. If Part I, Item 5e = "Yes," complete Part I, Item 5f on the continuation sheet on Page 4. |
| 0                                                                                                                                                                                                                            | 4 | - | 1 | 0 | 2 | - | 7 | 8 | 2 | 2 |   |                                                                                                                                                                                                                      |

**6. AUDITEE INFORMATION**

a. Auditee name  
TRUSTEES OF DARTMOUTH COLLEGE

b. Auditee address (Number and street)  
37 DEWEY FIELD ROAD

City  
HANOVER

State                      ZIP + 4 Code  
NH                              0 3 7 5 5 -

c. Auditee contact  
Name  
JULIE DOLAN

Title  
ASSOC. VP FOR FISCAL AFFAIRS

d. Auditee contact telephone  
( 603 ) 646 - 0299

e. Auditee contact FAX  
( ) -

f. Auditee contact E-mail  
JULIE.DOLAN@DARTMOUTH.EDU

**7. AUDITOR INFORMATION (To be completed by auditor)**

a. Auditor name  
KPMG LLP

b. Auditor address (Number and street)  
345 PARK AVENUE

City  
NEW YORK

State                      ZIP + 4 Code  
NY                              1 0 1 5 4 - 0 1 0 2

c. Auditor contact  
Name  
LOUIS MEZZINA

Title  
PARTNER

d. Auditor contact telephone  
( 212 ) 872 - 5856

e. Auditor contact FAX  
( 212 ) 954 - 5076

f. Auditor contact E-mail  
LMEZZINA@KPMG.COM

**g. AUDITEE CERTIFICATION STATEMENT** - This is to certify that, to the best of my knowledge and belief, the auditee has: (1) engaged an auditor to perform an audit in accordance with the provisions of OMB Circular A-133 for the period described in Part I, Items 1 and 3; (2) the auditor has completed such audit and presented a signed audit report which states that the audit was conducted in accordance with the provisions of the Circular; and, (3) the information included in **Parts I, II, and III** of this data collection form is accurate and complete. I declare that the foregoing is true and correct.

Signature of certifying official                      Date  
 Month    Day    Year  
 03    /    31    /    2008

Printed Name of certifying official  
**NAME AND TITLE PRINTED BELOW**

Printed Title of certifying official  
 JULIE L DOLAN ASSOC. VICE PRES, FISCAL AFFAIRS

**9. AUDITOR STATEMENT** - The data elements and information included in this form are limited to those prescribed by OMB Circular A-133. The information included in Parts II and III of the form, except for Part III, Items 7, 8, and 9a-9f, was transferred from the auditor's report(s) for the period described in Part I, Items 1 and 3, and **is not a substitute** for such reports. The auditor has not performed any auditing procedures since the date of the auditor's report(s). A copy of the reporting package required by OMB Circular A-133, which includes the complete auditor's report(s), is available in its entirety from the auditee at the address provided in Part I of this form. As required by OMB Circular A-133, the information in **Parts II and III** of this form was entered in this form by the auditor based on information included in the reporting package. The auditor has not performed any additional auditing procedures in connection with the completion of this form.

Signature of auditor                                      Date  
 Month    Day    Year  
 03    /    28    /    2008

**PART II FINANCIAL STATEMENTS (To be completed by auditor)**

1. Type of audit report  
 Mark either: 1  Unqualified opinion **OR**  
 any combination of: 2  Qualified opinion 3  Adverse opinion 4  Disclaimer of opinion
2. Is a "going concern" explanatory paragraph included in the audit report? 1  Yes 2  No
3. Is a reportable condition disclosed? 1  Yes 2  No - SKIP to Item 5
4. Is any reportable condition reported as a material weakness? 1  Yes 2  No
5. Is a material noncompliance disclosed? 1  Yes 2  No

**PART III FEDERAL PROGRAMS (To be completed by auditor)**

1. Does the auditor's report include a statement that the auditee's financial statements include departments, agencies, or other organizational units expending \$500,000 or more in Federal awards that have separate A-133 audits which are not included in this audit? (ACRA Audit Guide, Chapter 12) 1  Yes 2  No
2. What is the dollar threshold to distinguish Type A and Type B programs? (OMB Circular A-133 § .520(b))
3. Did the auditee qualify as a low-risk auditee? (§ .530) 1  Yes 2  No
4. Is a reportable condition disclosed for any major program? (§ .510(a)(1)) 1  Yes 2  No -SKIP to Item 6
5. Is any reportable condition reported as a material weakness? (§ .510(a)(1)) 1  Yes 2  No
6. Are any known questioned costs reported? (§ .510(a)(3) or (4)) 1  Yes 2  No
7. Were Prior Audit Findings related to **direct** funding shown in the Summary Schedule of Prior Audit Findings? (§ .315(b)) 1  Yes 2  No

8. Indicate which **Federal** agency(ies) have current year audit findings related to **direct** funding or prior audit findings shown in the Summary Schedule of Prior Audit Findings related to **direct** funding. (Mark (X) all that apply or None)
- |                                                                            |                                                                      |                                                                           |                                                              |
|----------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------|
| <input type="checkbox"/> 98 U.S. Agency for International Development      | <input type="checkbox"/> 83 Federal Emergency Management Agency      | <input type="checkbox"/> 43 National Aeronautics and Space Administration | <input type="checkbox"/> 96 Social Security Administration   |
| <input type="checkbox"/> 10 Agriculture                                    | <input type="checkbox"/> 39 General Services Administration          | <input type="checkbox"/> 89 National Archives and Records Administration  | <input type="checkbox"/> 18 U.S. Department of State         |
| <input type="checkbox"/> 23 Appalachian Regional Commission                | <input checked="" type="checkbox"/> 93 Health and Human Services     | <input type="checkbox"/> 05 National Endowment for the Arts               | <input type="checkbox"/> 27 Transportation                   |
| <input type="checkbox"/> 11 Commerce                                       | <input type="checkbox"/> 97 Homeland Security                        | <input type="checkbox"/> 06 National Endowment for the Humanities         | <input type="checkbox"/> 21 Treasury                         |
| <input type="checkbox"/> 94 Corporation for National and Community Service | <input type="checkbox"/> 14 Housing and Urban Development            | <input type="checkbox"/> 07 Office of National Drug Control Policy        | <input type="checkbox"/> 87 United States Information Agency |
| <input type="checkbox"/> 12 Defense                                        | <input type="checkbox"/> 03 Institute of Museum and Library Services | <input type="checkbox"/> 59 Small Business Administration                 | <input checked="" type="checkbox"/> 64 Veterans Affairs      |
| <input type="checkbox"/> 84 Education                                      | <input type="checkbox"/> 15 Interior                                 |                                                                           | <input type="checkbox"/> 00 None                             |
| <input type="checkbox"/> 81 Energy                                         | <input type="checkbox"/> 16 Justice                                  |                                                                           | <input type="checkbox"/> Other - Specify:                    |
| <input type="checkbox"/> 66 Environmental Protection Agency                | <input type="checkbox"/> 17 Labor                                    |                                                                           | <input type="text"/>                                         |
|                                                                            | <input type="checkbox"/> 09 Legal Services Corporation               |                                                                           | <input type="text"/>                                         |

Each agency identified is required to receive a copy of the reporting package.

In addition, one copy each of the reporting package is required for:

- the Federal Audit Clearinghouse archives
- and, if not marked above, the Federal cognizant agency

Count total number of boxes marked above and submit this number of reporting packages

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                  | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program<br>(g)                                                       |  | If yes, type of audit report <sup>3</sup><br>(h) | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|----------------------------------------------------------------------------|-------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                                                            |                                                 |                        |                                                                                                                       | Major program                                                              |  |                                                  |                                                          |                                                       |
| 9                                         | 3 .XXX                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH                   | \$ 86,054,300 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | FM                                                       | 2007-1, 2006-2                                        |
| 9                                         | 3 .XXX                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH RESEARCH TRAINING | \$ 3,439,369 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .XXX                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | PUBLIC HEALTH SERVICES CENTER                   | \$ 954,460 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .395                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | AMERICAN COLLEGE OF RADIOLOGY - ACR             | \$ 25,723 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .393                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | ALBERT EINSTEIN COLLEGE OF MEDICINE 9-256-1025  | \$ 23,382 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .000                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BETH ISRAEL DEACONESS MEDICAL CENTER - BIDMC    | \$ 79,285 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .000                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BETH ISRAEL DEACONESS MEDICAL CENTER - BIDMC    | \$ 5,774 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .242                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BOSTON UNIVERSITY - MC 527364 B-AJ              | \$ 213,197 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .242                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BOSTON UNIVERSITY - MC 527365 B-AJ              | \$ 25,450 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .000                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRANDEIS UNIVERSITY - TASK 02                   | \$ 14,498 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |  | U                                                | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |                                                                            |                                                 | \$ 197,358,931 .00     | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |  |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)               | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|----------------------------------------------------------------------------|----------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                                                            |                                              |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3 .399                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BROWN UNIVERSITY - 1404-27409                | \$ 99,304 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .286                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRIGHAM AND WOMEN'S HOSPITAL - 1151941       | \$ 288,490 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .393                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRIGHAM AND WOMEN'S HOSPITAL - 115911        | \$ 154,865 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .397                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRIGHAM AND WOMEN'S HOSPITAL - 101669        | \$ 3,921 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .393                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRIGHAM AND WOMEN'S HOSPITAL - 113956-0003   | \$ 34,847 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .397                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRIGHAM AND WOMEN'S HOSPITAL - 148931        | \$ 205 .00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .393                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRIGHAM AND WOMEN'S HOSPITAL - 115911        | \$ 851 .00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .286                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BRIGHAM AND WOMEN'S HOSPITAL - 766341/151942 | \$ 115,364 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .000                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CELLEX THERAPEUTICS, INC. - CELLEX           | \$ 78,688 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN'S HOSPITAL BOSTON - CHB             | \$ 59,338 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |                                                                            |                                              | \$ 197,358,931 .00     | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
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- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5/2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number<br>Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)      | Amount expended<br>(e) | Direct award<br>(f)                                                        | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------|-------------------------------------|------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                                              |                                                                            |                                     |                        |                                                                            | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - CHB    | \$ 56,825 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - CHB    | \$ 12,510 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - CHB    | \$ 57,888 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - CHB    | \$ 55,351 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - 148195 | \$ 217,611 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - 148196 | \$ 162,203 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - 148199 | \$ 11,555 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - 148200 | \$ 158,654 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .865                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHILDREN S HOSPITAL BOSTON - 148201 | \$ 180,309 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .113                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | COLUMBIA UNIVERSITY - 10            | \$ 12,600 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |

SUBMITTED DATA

TOTAL FEDERAL AWARDS EXPENDED

\$ 197,358,931 .00

IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                 |                 | Research and development (c)                                               | Name of Federal program (d)              | Amount expended (e) | Direct award (f)                                                           | Major program (g)                                                          |               | If yes, type of audit report 3 (h) | Type(s) of compliance requirement(s) 4 (a) | Audit finding reference number(s) 5 (b) |
|-----------------------------|-----------------|----------------------------------------------------------------------------|------------------------------------------|---------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------|------------------------------------|--------------------------------------------|-----------------------------------------|
| Federal Agency Prefix 1 (a) | Extension 2 (b) |                                                                            |                                          |                     |                                                                            | Major program                                                              | Major program |                                    |                                            |                                         |
| 9                           | 3 .393          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | COLUMBIA UNIVERSITY - PRE-AWARD          | \$ 149,160 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .243          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | COMMUNITY CONNECTIONS - COMM CONN        | \$ 7,932 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | COMMUNITY CONNECTIONS - COMM CONNECTIONS | \$ 63,408 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CREARE, INC. - 39475                     | \$ 58,675 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .865          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CREARE, INC. - 36934                     | \$ 3,946 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DSC CORP - SBIR                          | \$ 16,753 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DUKE UNIVERSITY - 2000GGM609             | \$ 52,662 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DUKE UNIVERSITY - 4600024517             | \$ 17,554 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .853          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DUKE UNIVERSITY - 07-SC-NIH-1037         | \$ 11,071 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                           | 3 .867          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DUKE UNIVERSITY - 07-SC-NIH-1035         | \$ 23,703 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |

TOTAL FEDERAL AWARDS EXPENDED

\$ 197,358,931 .00

IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS

1 See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

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3 If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

4 Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

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- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

5 N/A for NONE

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                 | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|----------------------------------------------------------------------------|------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                                                            |                                                |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | EMORY UNIVERSITY SCHOOL OF MEDICINE 5-40635-G2 | \$ 24,772.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | FOXCHASE CANCER CENTER - 16186-03              | \$ 19,535.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | FOXCHASE CANCER CENTER - 16186-02              | \$ 18,760.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HARVARD UNIVERSITY - 148989                    | \$ -137.00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HARVARD UNIVERSITY - 113927-0406               | \$ 205,225.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HARVARD UNIVERSITY - 112904                    | \$ 160,947.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HARVARD UNIVERSITY - 148988                    | \$ 47,970.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HARVARD UNIVERSITY - 148988                    | \$ 45,915.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HARVARD UNIVERSITY - 113927-0306               | \$ 16,737.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3                             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HOWARD UNIVERSITY - 632201-H000037             | \$ 14,144.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |                                                                            |                                                | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE



FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number<br>Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                  | Amount expended<br>(e) | Direct award<br>(f)                                                        | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------|------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                                              |                                                                            |                                                 |                        |                                                                            | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3 .242                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF IOWA - 211843 00                  | \$ 15,723 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .399                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | JOHNS HOPKINS UNIVERSITY 8404-80442-4           | \$ 71,364 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .399                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | JOHNS HOPKINS UNIVERSITY - 2000010034           | \$ 59,990 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .859                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | JOHNS HOPKINS UNIVERSITY - 8505-03012           | \$ 63,663 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .172                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | LEIGHIGH UNIVERSITY - 541370-78002              | \$ 18,794 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .848                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | MAYO CLINIC - 1U01DK65713-01-A                  | \$ 14,896 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .399                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF TEXAS, M D ANDERSON CANCER CENTER | \$ 49,882 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .395                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | MASSACHUSETTS GENERAL HOSPITAL - MASS GENERAL   | \$ 21,678 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .399                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MICHIGAN - F011909                | \$ 58,954 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .399                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MICHIGAN - F012885                | \$ 106,177 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |

SUBMITTED DATA

TOTAL FEDERAL AWARDS EXPENDED

\$ 197,358,931 .00

IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number<br>Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                            | Amount expended<br>(e) | Direct award<br>(f)                                                        | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------|------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                                              |                                                                            |                                                           |                        |                                                                            | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3 .866                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MICHIGAN - PRE-AWARD                        | \$ 100,170.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .399                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MICHIGAN - PRE-AWARD                        | \$ 926.00              | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .866                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MICHIGAN - FD15417                          | \$ 91,971.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .837                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | MAINE MEDICAL CENTER - MAINE                              | \$ 91,653.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .395                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL CHILDHOOD CANCER FOUNDATION - 15134              | \$ 32,341.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .395                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL CHILDHOOD CANCER FOUNDATION - 15134              | \$ 10,447.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .395                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL CHILDHOOD CANCER FOUNDATION - 14028              | \$ 22,763.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .395                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL CHILDHOOD CANCER FOUNDATION - 15134              | \$ -22,513.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .855                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NERCE-BIODEFENSE AND EMERGING INFECTIOUS DISEASES -148988 | \$ 47,970.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 3 .000                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NMT MEDICAL, INC. - NMT                                   | \$ 65,565.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |

TOTAL FEDERAL AWARDS EXPENDED

\$ 197,358,931.00

IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

**FEDERAL PROGRAMS - Continued**

**9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR**

**10. AUDIT FINDINGS**

| CFDA Number                            |                            | Research and development (c)                                               | Name of Federal program (d)                 | Amount expended (e) | Direct award (f)                                                                                                      | Major program                                                              |                                               | Type(s) of compliance requirement(s) <sup>4</sup> (a) | Audit finding reference number(s) <sup>5</sup> (b) |
|----------------------------------------|----------------------------|----------------------------------------------------------------------------|---------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|----------------------------------------------------|
| Federal Agency Prefix <sup>1</sup> (a) | Extension <sup>2</sup> (b) |                                                                            |                                             |                     |                                                                                                                       | Major program (g)                                                          | If yes, type of audit report <sup>3</sup> (h) |                                                       |                                                    |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NEW MEXICO STATE UNIVERSITY - P0021490      | \$ 7,703.00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .396                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NORTHWESTERN UNIVERSITY - 0600070E1401281   | \$ 34,086.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .853                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NORTHWESTERN UNIVERSITY - 0600370S511944    | \$ 20,741.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | OLMSTED MEDICAL CENTER - OMC                | \$ 38,915.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | PRIMATE CONSERVATION INC - SC-42062-1538-47 | \$ 15,001.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | PSYCHOLOGICAL APPLICATIONS - PA             | \$ 128,727.00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | PSYCHOLOGICAL APPLICATIONS - PALLC          | \$ -558.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | PSYCHOLOGICAL APPLICATIONS - PA             | \$ 18,054.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | QUALITY METRICS - QUALITY METRIC            | \$ 38,878.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .855                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF ROCHESTER - 413566-G          | \$ 496,966.00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> → |                            |                                                                            |                                             | \$ 197,358,931.00   | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                               |                                                       |                                                    |

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<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

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- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                          |                 | Research and development (c)                                               | Name of Federal program (d)                    | Amount expended (e) | Direct award (f)                                                                                                      | Major program (g)                                                          |               | If yes, type of audit report 3 (h) | Type(s) of compliance requirement(s) 4 (a) | Audit finding reference number(s) 5 (b) |
|--------------------------------------|-----------------|----------------------------------------------------------------------------|------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------|------------------------------------|--------------------------------------------|-----------------------------------------|
| Federal Agency Prefix 1 (a)          | Extension 2 (b) |                                                                            |                                                |                     |                                                                                                                       | Major program                                                              | Major program |                                    |                                            |                                         |
| 9                                    | 3 .855          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF ROCHESTER - 413134-G             | \$ 158,719 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SOCIAL & SCIENTIFIC SYSTEMS INC 11927          | \$ 62,845 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .283          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 710374                | \$ 78,237 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .283          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 710374                | \$ 127,011 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .283          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 92613                 | \$ 368,474 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .242          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 010-092-7868-092      | \$ 138,335 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .867          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | THOMAS JEFFERSON UNIVERSITY - 080-29000-R78202 | \$ 57,742 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .867          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | THOMAS JEFFERSON UNIVERSITY - 080-29000-R78201 | \$ 4,637 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .393          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF ARIZONA - Y413710                | \$ 42,636 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| 9                                    | 3 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CHICAGO - PRE-AWARD              | \$ 205,009 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No |               | U                                  | O                                          | N/A                                     |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> |                 |                                                                            |                                                | \$ 197,358,931 .00  | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |               |                                    |                                            |                                         |

1 See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

2 Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

3 If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

4 Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

5 N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                          |                 | Research and development (c)                                               | Name of Federal program (d)                      | Amount expended (e) | Direct award (f)                                                                                                      | Major program (g)                                                          |                                    | If yes, type of audit report 3 (h) | Type(s) of compliance requirement(s) 4 (a) | Audit finding reference number(s) 5 (b) |
|--------------------------------------|-----------------|----------------------------------------------------------------------------|--------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------|------------------------------------|--------------------------------------------|-----------------------------------------|
| Federal Agency Prefix 1 (a)          | Extension 2 (b) |                                                                            |                                                  |                     |                                                                                                                       | Major program (g)                                                          | If yes, type of audit report 3 (h) |                                    |                                            |                                         |
| 9                                    | 3 .399          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA IRVINE - 2003-1344      | \$ 111,106 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .399          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA IRVINE - 2003-1343      | \$ 75,218 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .853          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA IRVINE - 2004-1479      | \$ 57,825 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .399          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA IRVINE - 2003-1345      | \$ 76,151 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .866          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF COLORADO - FY06.272.003            | \$ 191,635 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .859          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CONNECTICUT - 5464                 | \$ 646 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .853          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA, SANTA BARBARA - KK6145 | \$ 44,317 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .867          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA, SAN FRANCISCO - 4293SC | \$ 62,024 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .867          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA, SAN FRANCISCO - 4293SC | \$ 3,953 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 9                                    | 3 .393          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA, SAN FRANCISCO - 4293SC | \$ 16,221 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> |                 |                                                                            |                                                  | \$ 197,358,931 .00  | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                    |                                    |                                            |                                         |

1 See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

2 Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

3 If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

4 Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

5 N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

| 9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR |                                              |                                                                            |                                                       |                        |                                                                                                                       |                                                                            | 10. AUDIT FINDINGS                               |                                                          |                                                       |
|-----------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
| Federal Agency Prefix <sup>1</sup><br>(a)     | CFDA Number<br>Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                        | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|                                               |                                              |                                                                            |                                                       |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                             | 3 .837                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CALIFORNIA, SAN FRANCISCO - 2462SC      | \$ 14,663 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .242                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL - 5-32997 | \$ 12,866 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .856                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL - 5-31553 | \$ 160 .00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .113                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CINCINNATI - SRS #16595                 | \$ 96,665 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .853                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF PENNSYLVANIA - 537329-B                 | \$ 1,318 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .393                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF SOUTHERN CALIFORNIA - H35333            | \$ 523,575 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .393                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF SOUTHERN CALIFORNIA - H35327            | \$ 15,132 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .393                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF SOUTHERN CALIFORNIA - H33141            | \$ 5,871 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .396                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF VIRGINIA - GC11088-121663               | \$ 123,397 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                             | 3 .393                                       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF WASHINGTON - 885103                     | \$ 110,115 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>          |                                              |                                                                            |                                                       | \$ 197,358,931 .00     | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

A. Activities allowed or unallowed      E. Eligibility  
 B. Allowable costs/cost principles      F. Equipment and real property management  
 C. Cash management      G. Matching, level of effort, earmarking  
 D. Davis - Bacon Act      H. Period of availability of Federal funds  
 I. Procurement and suspension and debarment  
 J. Program income  
 K. Real property acquisition and relocation assistance  
 L. Reporting  
 M. Subrecipient monitoring  
 N. Special tests and provisions  
 O. None  
 P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                            |                            | Research and development (c)                                               | Name of Federal program (d)                                     | Amount expended (e) | Direct award (f)                                                                                                      | Major program                                                              |                                               | Type(s) of compliance requirement(s) <sup>4</sup> (a) | Audit finding reference number(s) <sup>5</sup> (b) |
|----------------------------------------|----------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|----------------------------------------------------|
| Federal Agency Prefix <sup>1</sup> (a) | Extension <sup>2</sup> (b) |                                                                            |                                                                 |                     |                                                                                                                       | Major program (g)                                                          | If yes, type of audit report <sup>3</sup> (h) |                                                       |                                                    |
| 9                                      | 3 .242                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF WISCONSIN - X214337                               | \$ 96,814 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .242                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF WISCONSIN - PRE-AWARD                             | \$ 17,194 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .393                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | WESTAT - Y590-PO-002                                            | \$ -51 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | WESTAT - 8101-S06                                               | \$ -2,399 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .394                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | WOOMERA THERAPEUTICS INC - PHASE I                              | \$ 24,948 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 9                                      | 3 .996                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | YALE NEW HAVEN HEALTH SYSTEM - YNH-CEPDR                        | \$ 8,004 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 4                                      | 7 .XXX                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL SCIENCE FOUNDATION                                     | \$ 8,483,059 .00    | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 4                                      | 7 .050                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BOSTON UNIVERSITY - GC176992NGA                                 | \$ 525,335 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 4                                      | 7 .075                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | US CIVILIAN RESEARCH & DEVELOPMENT FOUNDATION - GEG2-3342-TB-07 | \$ 755 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| 4                                      | 7 .000                     | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DUKE UNIVERSITY - PRE-AWARD                                     | \$ 13,794 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                             | O                                                     | N/A                                                |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> → |                            |                                                                            |                                                                 | \$ 197,358,931 .00  | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                               |                                                       |                                                    |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)               | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|----------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |      |                                                                            |                                              |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 4                                         | 7                             | .041 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | IOWA STATE UNIVERSITY - 420-25-38            | \$ 89,778.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .076 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | MONTSHIRE MUSEUM OF SCIENCE - B              | \$ 30,445.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .070 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NEW YORK UNIVERSITY - F6111-03               | \$ 5,872.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .078 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | OHIO STATE UNIVERSITY - RF00962318           | \$ 7,719.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .078 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | OHIO STATE UNIVERSITY - RF01016863           | \$ 64,418.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .078 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | OHIO STATE UNIVERSITY - RF01016863           | \$ 484.00              | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .000 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SOUND INNOVATIONS INC. - SOUND               | \$ 33,144.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .078 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF ALASKA FAIRBANKS - UAF 07-0098 | \$ 28,623.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .074 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CONNECTICUT - 5462             | \$ -646.00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 4                                         | 7                             | .070 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CONNECTICUT - 4454             | \$ 41,368.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |      |                                                                            |                                              | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE



FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                            |                 | Research and development (c)                                               | Name of Federal program (d)                | Amount expended (e) | Direct award (f)                                                                                                      | Major program (g)                                                          |                   | If yes, type of audit report 3 (h) | Type(s) of compliance requirement(s) 4 (a) | Audit finding reference number(s) 5 (b) |
|----------------------------------------|-----------------|----------------------------------------------------------------------------|--------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------|------------------------------------|--------------------------------------------|-----------------------------------------|
| Federal Agency Prefix 1 (a)            | Extension 2 (b) |                                                                            |                                            |                     |                                                                                                                       | Major program (g)                                                          | Major program (g) |                                    |                                            |                                         |
| 4                                      | 7 .070          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CONNECTICUT - 4454           | \$ 3,090 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .041          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF GEORGIA - RR185-310/787749   | \$ 108,571 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .070          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF ILLINOIS - 2003-08135-1-01   | \$ 117 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .070          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF ILLINOIS - 2005-04510-04     | \$ 51,632 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .074          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS - 05-003076A01 | \$ 107 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .078          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MAINE - UM-S621              | \$ 753 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .074          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF NORTH CAROLINA - 5-54526     | \$ 208,559 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .078          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - 06-006       | \$ 29,356 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 4                                      | 7 .078          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - PZ07002      | \$ 6,489 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| 1                                      | 2 .XXX          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DEPARTMENT OF DEFENSE                      | \$ 3,114,237 .00    | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                 | O                                  | N/A                                        |                                         |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> → |                 |                                                                            |                                            | \$ 197,358,931 .00  | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                   |                                    |                                            |                                         |

1 See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

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4 Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

5 N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                          |                 | Research and development (c)                                               | Name of Federal program (d)                        | Amount expended (e) | Direct award (f)                                                                                                      | Major program (g)                                                          |                                    | If yes, type of audit report 3 (h) | Type(s) of compliance requirement(s) 4 (a) | Audit finding reference number(s) 5 (b) |
|--------------------------------------|-----------------|----------------------------------------------------------------------------|----------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------|------------------------------------|--------------------------------------------|-----------------------------------------|
| Federal Agency Prefix 1 (a)          | Extension 2 (b) |                                                                            |                                                    |                     |                                                                                                                       | Major program (g)                                                          | If yes, type of audit report 3 (h) |                                    |                                            |                                         |
| 1                                    | 2 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | BATTELLE MEMORIAL INSTITUTE - TCN 06023            | \$ 48,801.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .630          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CENTRAL INTELLIGENCE AGENCY - JN1582-05-12034      | \$ 110,495.00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .910          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U.S. DEPARTMENT OF HOMELAND SECURITY - NBCH2050005 | \$ 696,767.00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | GENERAL ELECTRIC - A02-700118316                   | \$ 57,802.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | HENRY JACKSON FOUNDATION - HJF                     | \$ 68,751.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | PEGASUS CORPORATION - PEGASUS                      | \$ 17,961.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .800          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SECURBORATION INC. - STTR                          | \$ 3,603.00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SECURBORATION INC. - STTR PHASE II                 | \$ 56,784.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SECURBORATION INC. - SBIR PROGRAM                  | \$ 81,766.00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| 1                                    | 2 .000          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SECURBORATION INC. - FUSED INTENT                  | \$ 7,608.00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                  | O                                  | N/A                                        |                                         |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> |                 |                                                                            |                                                    | \$ 197,358,931.00   | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                    |                                    |                                            |                                         |

1 See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

2 Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

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4 Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

5 N/A for NONE

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                          |                        | Research and development                                                   | Name of Federal program                                                    | Amount expended   | Direct award                                                                                                          | Major program                                                              |                                           | Type(s) of compliance requirement(s) <sup>4</sup> | Audit finding reference number(s) <sup>5</sup> |
|--------------------------------------|------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------|------------------------------------------------|
| Federal Agency Prefix <sup>1</sup>   | Extension <sup>2</sup> |                                                                            |                                                                            |                   |                                                                                                                       | Major program                                                              | If yes, type of audit report <sup>3</sup> |                                                   |                                                |
| (a)                                  | (b)                    | (c)                                                                        | (d)                                                                        | (e)               | (f)                                                                                                                   | (g)                                                                        | (h)                                       | (a)                                               | (b)                                            |
| 1                                    | 2 .000                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SOUND INNOVATIONS INC. - SOUND 3                                           | \$ 41,551.00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 1                                    | 2 .630                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CONNECTICUT - 5322                                           | \$ 66,667.00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 1                                    | 2 .431                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNITED STATES ARMY RESEARCH INSTITUTE FOR ENVIRONMENTAL MEDI - IPA-AMES    | \$ 56,790.00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 1                                    | 2 .000                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNITED STATES ARMY RESEARCH INSTITUTE FOR ENVIRONMENTAL MEDI - W911QY-06-P | \$ 28,959.00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 1                                    | 2 .431                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF WISCONSIN F21007                                             | \$ 170,293.00     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 1                                    | 2 .300                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | VIRGINIA TECH - CR-19715-425774                                            | \$ 4,898.00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 4                                    | 3 .XXX                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U.S. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION                         | \$ 2,089,753.00   | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 4                                    | 3 .000                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CREARE INC. - 35010                                                        | \$ -1,942.00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 4                                    | 3 .001                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | CHANDRA X-RAY OBSERVATORY - AR4-5005X                                      | \$ 1,226.00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| 4                                    | 3 .001                 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | JOHN HOPKINS UNIVERSITY - 919067                                           | \$ 20,199.00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                         | O                                                 | N/A                                            |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> |                        |                                                                            |                                                                            | \$ 197,358,931.00 | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                           |                                                   |                                                |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

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- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)                  | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |   | If yes, type of audit report <sup>3</sup><br>(h) | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|-------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |      |                                                                            |                                                 |                        |                                                                                                                       | Major program<br>(g)                                                       |   |                                                  |                                                          |                                                       |
| 4                                         | 3                             | .001 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | JET PROPULSION LABORATORY - 1268519             | \$ 641.00              | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 4                                         | 3                             | .001 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | JET PROPULSION LABORATORY - 126828              | \$ 238,473.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 4                                         | 3                             | .000 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | JET PROPULSION LABORATORY - 1277754             | \$ 6,059.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 0                             | .XXX | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U.S. DEPARTMENT OF AGRICULTURE                  | \$ 402,012.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 0                             | .000 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | PAUL SMITHS COLLEGE - PSSC                      | \$ 8,954.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 1                             | .XXX | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION | \$ 39,859.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 1                             | .400 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | EAST-WEST CENTER - PRE-AWARD                    | \$ 22,405.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 1                             | .432 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MICHIGAN - F014564                | \$ 1,684.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 1                             | .460 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | SAINT LAWRENCE UNIVERSITY - P100980             | \$ -141.00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 1                             | .419 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - 05-932            | \$ 117,032.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |      |                                                                            |                                                 | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |   |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

**FEDERAL PROGRAMS - Continued**

**9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR**

**10. AUDIT FINDINGS**

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)                        | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |   | If yes, type of audit report <sup>3</sup><br>(h) | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|-------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |      |                                                                            |                                                       |                        |                                                                                                                       | Major program<br>(g)                                                       |   |                                                  |                                                          |                                                       |
| 1                                         | 1                             | .XXX | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U.S. DEPARTMENT OF COMMERCE                           | \$ 4,652,783 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 5                             | .224 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | MONTANA STATE UNIVERSITY - G25405W0095                | \$ 742 .00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 5                             | .FFB | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL FISH AND WILDLIFE FOUNDATION - 2004-0010-025 | \$ 57,840 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 1                                         | 6                             | .XXX | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U.S. DEPARTMENT OF JUSTICE                            | \$ 9,987,845 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 2                                         | 7                             | .011 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | VETERAN S ADMINISTRATION                              | \$ 222,081 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 8                                         | 1                             | .XXX | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DEPARTMENT OF ENERGY                                  | \$ 921,115 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 8                                         | 1                             | .049 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NASA AMES - SC-07-302                                 | \$ 1,098 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 8                                         | 1                             | .057 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF CONNECTICUT - 5208                      | \$ 20,671 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 8                                         | 1                             | .000 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MARYLAND - Z700002                      | \$ 8,103 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| 8                                         | 1                             | .049 | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - PZ06105                 | \$ -1 .00              | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U | O                                                | N/A                                                      |                                                       |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |      |                                                                            |                                                       | \$ 197,358,931 .00     | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |   |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                                             | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                                                            |                                                                            |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 8                                         | 1 .000                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF TENNESSEE-BATTELLE - 4000047684                              | \$ 6,918.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 7 .XXX                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DEPARTMENT OF HOMELAND SECURITY                                            | \$ 1,449,142.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 6                                         | 6 .509                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | DUKE UNIVERSITY - 06-SC-EPA-1060                                           | \$ 35,745.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 7 .061                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF COLORADO - 56485                                             | \$ 69,216.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 6 .007                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UNIVERSITY OF MICHIGAN - 3000474161                                        | \$ 7,394.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 7 .065                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | UTAH STATE UNIVERSITY RESEARCH FOUNDATION - CP0007653                      | \$ 302,151.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 9                                         | 6 .000                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | WESTAT - 8225-S-02                                                         | \$ 730,528.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 8                                         | 4 .133                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL INSTITUTE ON DISABILITY AND REHABILITATION RESEARCH - H133G050181 | \$ 147,294.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 8                                         | 4 .133                        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | NATIONAL INSTITUTE ON DISABILITY AND REHABILITATION RESEARCH - H133G050230 | \$ 137,253.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | U                                                | O                                                        | N/A                                                   |
| 8                                         | 4 .007                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | FEDERAL SUPPLEMENTAL EDUCATIONAL OPPORTUNITY                               | \$ 799,883.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |                                                                            |                                                                            | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                                         | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                                                            |                                                                        |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 8                                         | 4 .033                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | FEDERAL WORK STUDY PROGRAM                                             | \$ 1,314,074 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8                                         | 4 .063                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | FEDERAL PELL GRANT                                                     | \$ 1,393,640 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8                                         | 4 .376                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL SCIENCE AND MATHEMATICS ACCESS TO RETAIN TALENT GRANT (SMART) | \$ 114,663 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8                                         | 4 .375                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | ACADEMIC COMPETITIVENESS GRANT                                         | \$ 165,805 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3 .283                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | CENTER FOR DISEASE CONTROL - U50/CCU121143-04                          | \$ -98 .00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3 .283                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | CENTER FOR DISEASE CONTROL - U50/CCU121143-06                          | \$ 41,271 .00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3 .283                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | CENTER FOR DISEASE CONTROL - U50/CCU121143-05                          | \$ 116,261 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3 .779                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | CENTERS FOR MEDICAID AND MEDICARE SERVICES - HCF2                      | \$ 18,333 .00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3 .884                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D54HP00006-06-1          | \$ 158,005 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3 .918                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5H76HA00812-03-1          | \$ 878 .00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |                                                                            |                                                                        | \$ 197,358,931 .00     | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

|                                    |                                            |                                                        |                                 |
|------------------------------------|--------------------------------------------|--------------------------------------------------------|---------------------------------|
| A. Activities allowed or unallowed | E. Eligibility                             | I. Procurement and suspension and debarment            | L. Reporting                    |
| B. Allowable costs/cost principles | F. Equipment and real property management  | J. Program income                                      | M. Subrecipient monitoring      |
| C. Cash management                 | G. Matching, level of effort, earmarking   | K. Real property acquisition and relocation assistance | N. Special tests and provisions |
| D. Davis - Bacon Act               | H. Period of availability of Federal funds |                                                        | O. None                         |

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                            |                            | Research and development (c)                                               | Name of Federal program (d)                                   | Amount expended (e) | Direct award (f)                                                                                                      | Major program (g)                                                          |                                               | Type(s) of compliance requirement(s) <sup>4</sup> (a) | Audit finding reference number(s) <sup>5</sup> (b) |
|----------------------------------------|----------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|----------------------------------------------------|
| Federal Agency Prefix <sup>1</sup> (a) | Extension <sup>2</sup> (b) |                                                                            |                                                               |                     |                                                                                                                       | Major program (g)                                                          | If yes, type of audit report <sup>3</sup> (h) |                                                       |                                                    |
| 9                                      | 3 .000                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - HHS250200616199  | \$ 7,000.00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .359                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 1D64HP03109-03   | \$ 807.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .359                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D64HP03109-03-1 | \$ 125,173.00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .110                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5H93MC00081-04-1 | \$ 50,786.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .918                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 2H76HA00812-06   | \$ 94,749.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .153                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 2H12HA00007-11   | \$ 27,396.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .110                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D70MC06898-03   | \$ 20,722.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .110                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5T02MC06325-03   | \$ 136,720.00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .918                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 1P06HA06477-02   | \$ 33,141.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .884                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D54HP00006-06   | \$ 88,052.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>   |                            |                                                                            |                                                               | \$ 197,358,931.00   | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                               |                                                       |                                                    |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

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<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
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- E. Eligibility
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- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE



FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

| 9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR |                               |      |                                                                            |                                                               |                        |                                                                                                                       | 10. AUDIT FINDINGS                                                         |                                                  |                                                          |                                                       |
|-----------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|---------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
| Federal Agency Prefix <sup>1</sup><br>(a)     | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)                                | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|                                               | Extension <sup>2</sup><br>(b) |      |                                                                            |                                                               |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                             | 3                             | .127 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 6H33MC06727-02-1 | \$ 106,583.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .918 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5H76HA00812-04-1 | \$ 263,888.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .265 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 1D62HP06809-01-1 | \$ 127,132.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .110 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 1D70MC06898-01-1 | \$ 242,570.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .895 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D14HP00158-04   | \$ -17,220.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .884 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D56HP00059-07   | \$ 47,933.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .884 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D56HP00011-07   | \$ -502.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .884 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5D55HP00024-07   | \$ 56,623.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .107 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5U77HP03627-04   | \$ 180,537.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                             | 3                             | .153 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5H12HA00007-11   | \$ 306,331.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>          |                               |      |                                                                            |                                                               | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

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- E. Eligibility
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- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c) | Name of Federal program<br>(d)                              | Amount expended<br>(e)   | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|---------------------------------|-------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                 |                                                             |                          |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | .153                            | HEALTH RESOURCE AND SERVICE ADMINISTRATION - 5H12HA00007-11 | \$ -373.00               | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .242                            | NATIONAL INSTITUTES OF HEALTH - 1F31MH07583-02              | \$ 48,874.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .272                            | NATIONAL INSTITUTES OF HEALTH - 1F31AA116718-02             | \$ 13,899.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .242                            | NATIONAL INSTITUTES OF HEALTH - 1F31MH073304-01A            | \$ 34,825.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .853                            | NATIONAL INSTITUTES OF HEALTH - 1F31NS056720-02             | \$ 28,492.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000                            | NATIONAL INSTITUTES OF HEALTH - 263-MQ-61073-3              | \$ 24,444.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .279                            | NATIONAL INSTITUTES OF HEALTH - 5R25MH057541-11             | \$ 75,025.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .859                            | NATIONAL INSTITUTES OF HEALTH - 5F32GM073307-04             | \$ 7,307.00              | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .846                            | NATIONAL INSTITUTES OF HEALTH - 1F32AR054653-02             | \$ 6,063.00              | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .989                            | NATIONAL INSTITUTES OF HEALTH - 5D43TW006807-06             | \$ 26,233.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |                                 |                                                             | <b>\$ 197,358,931.00</b> | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of Instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
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- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix 1 (a) | CFDA Number Extension 2 (b) | Research and development (c)                                               | Name of Federal program (d)                                 | Amount expended (e) | Direct award (f)                                                           | Major program (g)                                                          |                                    | Type(s) of compliance requirement(s) 4 (a) | Audit finding reference number(s) 5 (b) |
|-----------------------------|-----------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------|---------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------|--------------------------------------------|-----------------------------------------|
|                             |                             |                                                                            |                                                             |                     |                                                                            | Major program                                                              | If yes, type of audit report 3 (h) |                                            |                                         |
| 9                           | 3 .879                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH - 5G08LM008110-04             | \$ 57,961 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .989                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH - 5D43TW006807-04             | \$ 38,112 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .859                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH - 5F32GMD73307-03             | \$ 41,720 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .867                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH - 5F31EY016386-03             | \$ 31,451 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .173                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH - 1F32DC008481-02             | \$ 42,084 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .989                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH - 5D43TW006807-05             | \$ 245,111 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .173                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL INSTITUTES OF HEALTH - 1F32DC008773-01A            | \$ 48,796 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .243                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES - 5U79SM57261-03 | \$ 265,781 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .243                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES - 1U79SM57261-02 | \$ 128,710 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |
| 9                           | 3 .395                      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | AMERICAN COLLEGE OF RADIOLOGY - RTOG                        | \$ 103,242 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                    | O                                          | N/A                                     |

TOTAL FEDERAL AWARDS EXPENDED

\$ 197,358,931 .00

IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS

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- A. Activities allowed or unallowed
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- E. Eligibility
- F. Equipment and real property management
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- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

5 N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)                       | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |      |                                                                            |                                                      |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | AMBULATORY PEDIATRIC ASSOCIATION - APA2              | \$ 50,250.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .399 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | ALLEGHENY-SINGER RESEARCH INSTITUTE - PFED<br>DAR-02 | \$ 1,149.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | BRAIN INJURY ASSOCIATION BIANH                       | \$ 48,501.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | BETH ISRAEL DEACONESS MEDICAL CENTER - BIMC          | \$ 1,958.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .398 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | BOSTON UNIVERSITY - MC-425535-D-JW                   | \$ 5,790.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF CHICAGO - UNIV OF CHICAGO              | \$ 178,218.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | CENTER FOR DISEASE CONTROL - 05IPA28206.02           | \$ 17,942.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | CENTER FOR DISEASE CONTROL - 99IPA06359              | \$ 5,981.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | DUKE UNIVERSITY - Z10/Z12                            | \$ 463.00              | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MOUNT SINAI SCHOOL OF MEDICINE - MSSM CT             | \$ -93.00              | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |      |                                                                            |                                                      | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |     | Research and development<br>(c)                                            | Name of Federal program<br>(d)                                      | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|-----|----------------------------------------------------------------------------|---------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |     |                                                                            |                                                                     |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | 853 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MOUNT SINAI SCHOOL OF MEDICINE - COMBIRX                            | \$ 4,994.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NEW ENGLAND INSTITUTE FOR ADDICTION STUDIES - ATEDARYMOUTH02        | \$ 17,483.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NEW ENGLAND INSTITUTE FOR ADDICTION STUDIES - NET05-2               | \$ 27,453.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 399 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL SURGICAL ADJUVANT BREAST AND BOWEL PROJECT - PINDDAR-02    | \$ 5,502.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 399 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL SURGICAL ADJUVANT BREAST AND BOWEL PROJECT - PFED22-DAR-02 | \$ 8,901.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SOCIAL & SCIENTIFIC SYSTEMS INC - BRSIMPCTQ0600145                  | \$ 209,502.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SOCIAL & SCIENTIFIC SYSTEMS INC - PRE-AWARD                         | \$ 20,257.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 958 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF MINNESOTA - A85654                                         | \$ 54,894.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 991 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 850169-06                                  | \$ 92,205.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - FY2008                                     | \$ 159,645.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |     |                                                                            |                                                                     | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)            | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|-------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |      |                                                                            |                                           |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | .283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 151155           | \$ 30,757.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 151968           | \$ 18,655.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .913 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 150685           | \$ 81,841.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 850167           | \$ 269,221.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 010-023-8240-091 | \$ 94,624.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 850167           | \$ 514.00              | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 850167           | \$ 46,234.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 711472-06        | \$ 197,242.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .667 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 150675           | \$ 92,766.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .667 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 150675           | \$ 790,692.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |      |                                                                            |                                           | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                            |                            | Research and development (c)                                               | Name of Federal program (d)        | Amount expended (e) | Direct award (f)                                                                                                      | Major program                                                              |                                               | Type(s) of compliance requirement(s) <sup>4</sup> (a) | Audit finding reference number(s) <sup>5</sup> (b) |
|----------------------------------------|----------------------------|----------------------------------------------------------------------------|------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|----------------------------------------------------|
| Federal Agency Prefix <sup>1</sup> (a) | Extension <sup>2</sup> (b) |                                                                            |                                    |                     |                                                                                                                       | Major program (g)                                                          | If yes, type of audit report <sup>3</sup> (h) |                                                       |                                                    |
| 9                                      | 3 .667                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 150675    | \$ 111,974 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .913                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 150685    | \$ 407 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .003                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 150926    | \$ 73,973 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .283                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 151155    | \$ 16,570 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .991                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 850169-06 | \$ 1,580 .00        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .667                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 150676    | \$ 35,513 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .889                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF VERMONT - 03420-4540      | \$ 91,062 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .003                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF VERMONT - 3951            | \$ -41,250 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .889                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF VERMONT - 03420-4275      | \$ 201,185 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 9                                      | 3 .994                     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF VERMONT - 03420-4196      | \$ 13,800 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> → |                            |                                                                            |                                    | \$ 197,358,931 .00  | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                               |                                                       |                                                    |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

**FEDERAL PROGRAMS - Continued**

**9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR**

**10. AUDIT FINDINGS**

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c) | Name of Federal program<br>(d)                  | Amount expended<br>(e)   | Direct award<br>(f)                                                                                                   | Major program                            |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|---------------------------------|-------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                 |                                                 |                          |                                                                                                                       | Major program<br>(g)                     | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | 283                             | STATE OF VERMONT - 03420-4211                   | \$ 19,347.00             | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 283                             | STATE OF VERMONT - (3120-4406)                  | \$ 48,470.00             | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 399                             | SOUTHWEST ONCOLOGY GROUP - PCPT                 | \$ 53.00                 | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 399                             | SOUTHWEST ONCOLOGY GROUP - CA37430              | \$ 1,294.00              | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 866                             | UNIVERSITY OF CALIFORNIA - ADNI-025             | \$ 105,011.00            | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 000                             | UNIVERSITY OF CHICAGO - 5-30554-8610            | \$ -2,700.00             | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 866                             | UNIVERSITY OF CALIFORNIA, SAN DIEGO - ADC-028   | \$ 1,500.00              | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 768                             | UNIVERSITY OF MASSACHUSETTS - 6065538/RFS70001  | \$ 9,939.00              | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 283                             | UNIVERSITY OF MASSACHUSETTS - 6068695/RFS700068 | \$ 17,916.00             | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 110                             | UNIVERSITY OF MASSACHUSETTS - 6053142/RFS20015  | \$ 10,669.00             | 2 <input checked="" type="checkbox"/> No                                                                              | 2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |                                 |                                                 | <b>\$ 197,358,931.00</b> | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                          |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE



FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |     | Research and development<br>(c)                                            | Name of Federal program<br>(d)                             | Amount expended<br>(e) | Direct award<br>(f)                                                        | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|-----|----------------------------------------------------------------------------|------------------------------------------------------------|------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |     |                                                                            |                                                            |                        |                                                                            | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | 110 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS - 6068558/RFS70058             | \$ 14,344 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 283 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS - 6058128/RES6004              | \$ 12,397 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 853 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MARYLAND - 99-706                            | \$ 18,913 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 145 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER - 6066911/0CP16 | \$ 5,998 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 145 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER - 6066911/0CP16 | \$ 66,866 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 145 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER - 6066911/0CP16 | \$ 19,667 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 145 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS MEDICAL CENTER - 6055051/0CP17 | \$ 12,938 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 632 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - 07-054                       | \$ 4,867 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 632 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - 06-003                       | \$ 59,751 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | 632 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - 06-072                       | \$ 1,053 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |

TOTAL FEDERAL AWARDS EXPENDED

\$ 197,358,931 .00

IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)                                 | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|----------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           | Extension <sup>2</sup><br>(b) |      |                                                                            |                                                                |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 9                                         | 3                             | .846 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF WASHINGTON - 994253                              | \$ 9,442.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .846 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF WASHINGTON - 215086                              | \$ 18,422.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .853 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | YALE UNIVERSITY - A06379                                       | \$ 24,705.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .853 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | YALE UNIVERSITY - A06113                                       | \$ 6,540.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9                                         | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | YALE NEW HAVEN HEALTH SYSTEM - YNHHS                           | \$ 121,843.00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 4                                         | 7                             | .076 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | EDUCATION AND HUMAN RESOURCES - DUE-0226233                    | \$ 8,614.00            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 4                                         | 7                             | .076 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | EDUCATION AND HUMAN RESOURCES - DGE-0234612                    | \$ 285,801.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 4                                         | 7                             | .070 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | COMPUTER AND INFORMATION SCIENCE AND ENGINEERING - IIS-0631821 | \$ 3,957.00            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 4                                         | 7                             | .050 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | GEOSCIENCES - ATM-0457561                                      | \$ 152,166.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 4                                         | 7                             | .049 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MATHEMATICAL AND PHYSICAL SCIENCE - CHE-0443614                | \$ -827.00             | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |      |                                                                            |                                                                | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                          |                        | Research and development                                                   | Name of Federal program                                                 | Amount expended    | Direct award                                                                                                          | Major program                                                              |                                           | Type(s) of compliance requirement(s) <sup>4</sup> | Audit finding reference number(s) <sup>5</sup> |
|--------------------------------------|------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------|------------------------------------------------|
| Federal Agency Prefix <sup>1</sup>   | Extension <sup>2</sup> |                                                                            |                                                                         |                    |                                                                                                                       | Major program                                                              | If yes, type of audit report <sup>3</sup> |                                                   |                                                |
| (a)                                  | (b)                    | (c)                                                                        | (d)                                                                     | (e)                | (f)                                                                                                                   | (g)                                                                        | (h)                                       | (a)                                               | (b)                                            |
| 4                                    | 7 .049                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MATHEMATICAL AND PHYSICAL SCIENCE - DMS-0026425                         | \$ 58,142 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 7 .049                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MATHEMATICAL AND PHYSICAL SCIENCE - DMS-0602970                         | \$ 14,832 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .001                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | AEROSPACE EDUCATION SERVICES PROGRAM - NNX06A31G                        | \$ 29,290 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .001                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | AEROSPACE EDUCATION SERVICES PROGRAM - NNX06A126H                       | \$ 15,078 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .001                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | AEROSPACE EDUCATION SERVICES PROGRAM - PRE-AWARD                        | \$ 42,262 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .000                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | INTEGRATED SYSTEMS SOLUTION, DISASTER AND WATER MANAGEMENT - NNS06AAI8G | \$ 48,645 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .001                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | INSTITUTE FOR THE APPLICATION OF GEOSPATIAL TECHNOLOGY - IAGT           | \$ 1,432 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .001                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL SPACE BIOMEDICAL RESEARCH INSTITUTE - TD00402                  | \$ 45,861 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .002                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - PZ05007                                   | \$ 38,528 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 3 .002                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - PZ05007                                   | \$ 59,972 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> |                        |                                                                            |                                                                         | \$ 197,358,931 .00 | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                           |                                                   |                                                |

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- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

| 9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR |                               |      |                                                                            |                                                                        |                        |                                                                                                                       | 10. AUDIT FINDINGS                                                         |                                                  |                                                          |                                                       |
|-----------------------------------------------|-------------------------------|------|----------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
| Federal Agency Prefix <sup>1</sup><br>(a)     | CFDA Number                   |      | Research and development<br>(c)                                            | Name of Federal program<br>(d)                                         | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|                                               | Extension <sup>2</sup><br>(b) |      |                                                                            |                                                                        |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 4                                             | 3                             | .002 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - PZ05007                                  | \$ 25,291.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 4                                             | 3                             | .002 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF NEW HAMPSHIRE - PZ05007                                  | \$ 2,027.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 4                                             | 3                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITIES SPACE RESEARCH ASSOCIATION - 03491-42                     | \$ 24,899.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 6                                             | 4                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | VETERAN S AFFAIRS ADMINISTRATION - IPA-NORRIS                          | \$ 79,674.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 6                                             | 4                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | VETERAN S AFFAIRS ADMINISTRATION - IPA-SLONE                           | \$ -2,630.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 6                                             | 4                             | .000 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | VETERAN S AFFAIRS ADMINISTRATION - V00241P-00440                       | \$ 57,604.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                             | 7                             | .011 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | INTERGOVERNMENTAL PERSONNEL ACT (IPA MOBILITY PROGRAM) - PRE-AWARD     | \$ 1,766.00            | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                             | 7                             | .011 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | INTERGOVERNMENTAL PERSONNEL ACT (IPA MOBILITY PROGRAM) - V405P-3642    | \$ 19,165.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                             | 7                             | .011 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | INTERGOVERNMENTAL PERSONNEL ACT (IPA MOBILITY PROGRAM) - V00241P-00710 | \$ 21,744.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                             | 7                             | .011 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | INTERGOVERNMENTAL PERSONNEL ACT (IPA MOBILITY PROGRAM) - V00241P-00100 | \$ 233,256.00          | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>          |                               |      |                                                                            |                                                                        | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| CFDA Number                            |                            | Research and development (c)                                               | Name of Federal program (d)                                               | Amount expended (e) | Direct award (f)                                                                                                      | Major program                                                              |                                               | Type(s) of compliance requirement(s) <sup>4</sup> (a) | Audit finding reference number(s) <sup>5</sup> (b) |
|----------------------------------------|----------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------------------|----------------------------------------------------|
| Federal Agency Prefix <sup>1</sup> (a) | Extension <sup>2</sup> (b) |                                                                            |                                                                           |                     |                                                                                                                       | Major program (g)                                                          | If yes, type of audit report <sup>3</sup> (h) |                                                       |                                                    |
| 1 2                                    | .910                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | RESEARCH AND TECHNOLOGY DEVELOPMENT - HR0011-06-1-0033                    | \$ 148,639 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .630                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | BASIC APPLIED AND ADVANCED RESEARCH IN SCIENCE AND ENGINEERING - W813E5-0 | \$ 1,261 .00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .431                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | BASIC SCIENTIFIC RESEARCH - W911NF-05-1-0471                              | \$ 6,608 .00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .431                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | BASIC SCIENTIFIC RESEARCH - W911NF-05-1-0530                              | \$ 31,143 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .431                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | BASIC SCIENTIFIC RESEARCH - W911NF-07-1-0196                              | \$ 66,725 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .420                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MILITARY MEDICAL RESEARCH AND DEVELOPMENT - W81XWH0510350                 | \$ 158,537 .00      | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .420                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MILITARY MEDICAL RESEARCH AND DEVELOPMENT - W81XWH0710104                 | \$ 26,564 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .420                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MILITARY MEDICAL RESEARCH AND DEVELOPMENT - W81XWH-0610328                | \$ 26,801 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .420                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | MILITARY MEDICAL RESEARCH AND DEVELOPMENT - W81XWH-0610367                | \$ 24,338 .00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| 1 2                                    | .901                       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL SECURITY AGENCY - H98230-06-1-0091                               | \$ 14,879 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                               | O                                                     | N/A                                                |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>   |                            |                                                                            |                                                                           | \$ 197,358,931 .00  | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                               |                                                       |                                                    |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

| 9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR |                               |  |                                                                            |                                                                            |                        |                                                                                                                       |                                                                            | 10. AUDIT FINDINGS                               |                                                          |                                                       |
|-----------------------------------------------|-------------------------------|--|----------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
| Federal Agency Prefix <sup>1</sup><br>(a)     | CFDA Number                   |  | Research and development<br>(c)                                            | Name of Federal program<br>(d)                                             | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|                                               | Extension <sup>2</sup><br>(b) |  |                                                                            |                                                                            |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 1 2                                           | 910                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - NNEMMRS                                           | \$ 158,866 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 1 6                                           | 560                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NIJ RESEARCH, EVALUATION, AND DEVELOPMENT PROJECT GRANTS - 2004-TJ-CX-1041 | \$ 664,444 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                           | 200                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED - P200A040046-06             | \$ 230,834 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                           | 200                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED - P200A040191-06             | \$ 171,297 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                           | 200                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED - P200A040045-06             | \$ 314,787 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                           | 200                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED - P200A060188                | \$ 299,311 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                           | 200                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | GRADUATE ASSISTANCE IN AREAS OF NATIONAL NEED - P200A060114                | \$ 249,834 .00         | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                           | 133                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | WRIGHT STATE UNIVERSITY - H133B040013                                      | \$ 14,585 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9 8                                           | 001                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | AMERICAN INTERNATIONAL HEALTH ALLIANCE - 04-PPTRHAGA-01                    | \$ 1,823 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9 7                                           | 071                           |  | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | US DEPARTMENT OF HOMELAND SECURITY - EMW-2004-GR-0691                      | \$ 910 .00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →        |                               |  |                                                                            |                                                                            | \$ 197,358,931 .00     | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.  
<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)  
<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.  
<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

|                                    |                                            |                                                        |                                 |
|------------------------------------|--------------------------------------------|--------------------------------------------------------|---------------------------------|
| A. Activities allowed or unallowed | E. Eligibility                             | I. Procurement and suspension and debarment            | L. Reporting                    |
| B. Allowable costs/cost principles | F. Equipment and real property management  | J. Program income                                      | M. Subrecipient monitoring      |
| C. Cash management                 | G. Matching, level of effort, earmarking   | K. Real property acquisition and relocation assistance | N. Special tests and provisions |
| D. Davis - Bacon Act               | H. Period of availability of Federal funds |                                                        | O. None                         |
| <sup>5</sup> N/A for NONE          |                                            |                                                        | P. Other                        |

FORM SF-SAC (5-2004)

**FEDERAL PROGRAMS - Continued**

**9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR**

**10. AUDIT FINDINGS**

| CFDA Number                          |                        | Research and development                                                   | Name of Federal program                             | Amount expended    | Direct award                                                                                                          | Major program                                                              |                                           | Type(s) of compliance requirement(s) <sup>4</sup> | Audit finding reference number(s) <sup>5</sup> |
|--------------------------------------|------------------------|----------------------------------------------------------------------------|-----------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------|------------------------------------------------|
| Federal Agency Prefix <sup>1</sup>   | Extension <sup>2</sup> |                                                                            |                                                     |                    |                                                                                                                       | Major program                                                              | If yes, type of audit report <sup>3</sup> |                                                   |                                                |
| (a)                                  | (b)                    | (c)                                                                        | (d)                                                 | (e)                | (f)                                                                                                                   | (g)                                                                        | (h)                                       | (a)                                               | (b)                                            |
| 9                                    | 7 .000                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | US DEPARTMENT OF HOMELAND SECURITY -<br>233-03-0107 | \$ 126,604 .00     | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 8                                    | 1 .000                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | DEPARTMENT OF ENERGY - DE-EG02-06ER6423             | \$ 939 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 6                                    | 6 .514                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | ENVIRONMENTAL PROTECTION AGENCY - FP-91651101-2     | \$ 21,671 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 6                                    | 6 .514                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | ENVIRONMENTAL PROTECTION AGENCY - FP-91668701-1     | \$ 15,308 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 6                                    | 6 .514                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | ENVIRONMENTAL PROTECTION AGENCY - FP-91677101-1     | \$ 17,866 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 6                                    | 6 .514                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | ENVIRONMENTAL PROTECTION AGENCY - FP-91651101-1     | \$ 4,477 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 9                                    | 0 .300                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | JAPAN-US FRIENDSHIP COMMISSION - 17-MAY             | \$ -7,452 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 5 .024                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL ENDOWMENT FOR THE ARTS - 05-4400-7019      | \$ 1,060 .00       | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 5 .024                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL ENDOWMENT FOR THE ARTS - 07-5400-7015      | \$ 13,000 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| 4                                    | 5 .024                 | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NATIONAL ENDOWMENT FOR THE ARTS - 06-5400-7004      | \$ 25,069 .00      | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                           | O                                                 | N/A                                            |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> |                        |                                                                            |                                                     | \$ 197,358,931 .00 | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                           |                                                   |                                                |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>1</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                   | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                                                            |                                                  |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 4                                         | 5 .025                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | NEW ENGLAND FOUNDATION FOR THE ARTS - 2007-11608 | \$ 7,500 .00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 5                                         | 9 .007                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SMALL BUSINESS ADMINISTRATION - SBAHQ-04-0066    | \$ 435,530 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 5                                         | 9 .000                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SMALL BUSINESS ADMINISTRATION - SBAHQ-03-10430   | \$ 805 .00             | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 5                                         | 9 .000                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SMALL BUSINESS ADMINISTRATION - SBAHQ-06-1-0168  | \$ 624,045 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 5                                         | 9 .000                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | SMALL BUSINESS ADMINISTRATION - SBAHQ-05-1-0075  | \$ 165,459 .00         | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8                                         | 4 .336                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 74631                   | \$ 27,819 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                         | 0 .600                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 304-07S-002             | \$ 12,384 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                         | 0 .600                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 304-07S-004             | \$ 98,490 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                         | 0 .600                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 304-07S-003             | \$ 31,664 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 2                                         | 0 .600                        | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | STATE OF NEW HAMPSHIRE - 304-06S-002             | \$ 29,683 .00          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b> →    |                               |                                                                            |                                                  | \$ 197,358,931 .00     | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § .510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act

- E. Eligibility
- F. Equipment and real property management
- G. Matching, level of effort, earmarking
- H. Period of availability of Federal funds

- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance

- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE



FORM SF-SAC (5-2004)

FEDERAL PROGRAMS - Continued

9. FEDERAL AWARDS EXPENDED DURING FISCAL YEAR

10. AUDIT FINDINGS

| Federal Agency Prefix <sup>f</sup><br>(a) | Extension <sup>2</sup><br>(b) | Research and development<br>(c)                                            | Name of Federal program<br>(d)                             | Amount expended<br>(e) | Direct award<br>(f)                                                                                                   | Major program                                                              |                                                  | Type(s) of compliance requirement(s) <sup>4</sup><br>(a) | Audit finding reference number(s) <sup>5</sup><br>(b) |
|-------------------------------------------|-------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|
|                                           |                               |                                                                            |                                                            |                        |                                                                                                                       | Major program<br>(g)                                                       | If yes, type of audit report <sup>3</sup><br>(h) |                                                          |                                                       |
| 8 4                                       | .264                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS - 050626-DC                    | \$ 7,238.00            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                       | .264                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | UNIVERSITY OF MASSACHUSETTS - 050626-DC                    | \$ 22,526.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 1 0                                       | .206                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | US DEPARTMENT OF AGRICULTURE - NH10703-B17                 | \$ 42,036.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 1 5                                       | .000                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | US DEPARTMENT OF THE INTERIOR - H2490060028                | \$ 14,283.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 1 0                                       | .206                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | WEEKS MEDICAL CENTER - NH0703-B17                          | \$ 42,036.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9 8                                       | .000                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | WORLD LEARNING - GSM-023                                   | \$ 63,402.00           | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                       | .038                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | U.S. DEPARTMENT OF EDUCATION- PERKINS LOANS<br>O/S 6/30/07 | \$ 21,661,710.00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 8 4                                       | .032                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | U.S. DEPARTMENT OF EDUCATION- FFEL LOANS<br>ISSUED 6/30/07 | \$ 23,154,402.00       | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9 3                                       | .342                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH PROFESSIONAL STUDENT LOANS O/S AT<br>6/30/07        | \$ 67,338.00           | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| 9 3                                       | .108                          | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No | HEALTH EDUCATION ASSISTANT LOANS O/S AT 6/30/07            | \$ 1,535,757.00        | 1 <input checked="" type="checkbox"/> Yes<br>2 <input type="checkbox"/> No                                            | 1 <input type="checkbox"/> Yes<br>2 <input checked="" type="checkbox"/> No |                                                  | O                                                        | N/A                                                   |
| <b>TOTAL FEDERAL AWARDS EXPENDED</b>      |                               |                                                                            |                                                            | \$ 197,358,931.00      | IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS |                                                                            |                                                  |                                                          |                                                       |

<sup>1</sup> See Appendix 1 of instructions for valid Federal Agency two-digit prefixes.

<sup>2</sup> Or other identifying number when the Catalog of Federal Domestic Assistance (CFDA) number is not available. (See Instructions)

<sup>3</sup> If major program is marked "Yes," enter only one letter (U = Unqualified opinion, Q = Qualified opinion, A = Adverse opinion, D = Disclaimer of opinion) corresponding to the type of audit report in the adjacent box. If major program is marked "No," leave the type of audit report box blank.

<sup>4</sup> Enter the letter(s) of all type(s) of compliance requirement(s) that apply to audit findings (i.e., noncompliance, reportable conditions (including material weaknesses), questioned costs, fraud, and other items reported under § 510(a)) reported for each Federal program.

- A. Activities allowed or unallowed
- B. Allowable costs/cost principles
- C. Cash management
- D. Davis - Bacon Act
- E. Eligibility
- F. Equipment and real property management
- G. Matching; level of effort, earmarking
- H. Period of availability of Federal funds
- I. Procurement and suspension and debarment
- J. Program income
- K. Real property acquisition and relocation assistance
- L. Reporting
- M. Subrecipient monitoring
- N. Special tests and provisions
- O. None
- P. Other

<sup>5</sup> N/A for NONE

**Item 5 Continuation Sheet**

**c. List the multiple Employer Identification Numbers (EINs) covered in this report.**

**f. List the multiple DUNS covered in the report.**

|    |   |   |   |  |    |   |  |    |   |  |
|----|---|---|---|--|----|---|--|----|---|--|
| 1  | N | L | A |  | 21 | - |  | 41 | - |  |
| 2  |   |   |   |  | 22 | - |  | 42 | - |  |
| 3  |   |   |   |  | 23 | - |  | 43 | - |  |
| 4  |   |   |   |  | 24 | - |  | 44 | - |  |
| 5  |   |   |   |  | 25 | - |  | 45 | - |  |
| 6  |   |   |   |  | 26 | - |  | 46 | - |  |
| 7  |   |   |   |  | 27 | - |  | 47 | - |  |
| 8  |   |   |   |  | 28 | - |  | 48 | - |  |
| 9  |   |   |   |  | 29 | - |  | 49 | - |  |
| 10 |   |   |   |  | 30 | - |  | 50 | - |  |
| 11 |   |   |   |  | 31 | - |  | 51 | - |  |
| 12 |   |   |   |  | 32 | - |  | 52 | - |  |
| 13 |   |   |   |  | 33 | - |  | 53 | - |  |
| 14 |   |   |   |  | 34 | - |  | 54 | - |  |
| 15 |   |   |   |  | 35 | - |  | 55 | - |  |
| 16 |   |   |   |  | 36 | - |  | 56 | - |  |
| 17 |   |   |   |  | 37 | - |  | 57 | - |  |
| 18 |   |   |   |  | 38 | - |  | 58 | - |  |
| 19 |   |   |   |  | 39 | - |  | 59 | - |  |
| 20 |   |   |   |  | 40 | - |  | 60 | - |  |

|    |   |   |   |  |    |   |  |  |  |
|----|---|---|---|--|----|---|--|--|--|
| 1  | N | L | A |  | 21 | - |  |  |  |
| 2  |   |   |   |  | 22 | - |  |  |  |
| 3  |   |   |   |  | 23 | - |  |  |  |
| 4  |   |   |   |  | 24 | - |  |  |  |
| 5  |   |   |   |  | 25 | - |  |  |  |
| 6  |   |   |   |  | 26 | - |  |  |  |
| 7  |   |   |   |  | 27 | - |  |  |  |
| 8  |   |   |   |  | 28 | - |  |  |  |
| 9  |   |   |   |  | 29 | - |  |  |  |
| 10 |   |   |   |  | 30 | - |  |  |  |
| 11 |   |   |   |  | 31 | - |  |  |  |
| 12 |   |   |   |  | 32 | - |  |  |  |
| 13 |   |   |   |  | 33 | - |  |  |  |
| 14 |   |   |   |  | 34 | - |  |  |  |
| 15 |   |   |   |  | 35 | - |  |  |  |
| 16 |   |   |   |  | 36 | - |  |  |  |
| 17 |   |   |   |  | 37 | - |  |  |  |
| 18 |   |   |   |  | 38 | - |  |  |  |
| 19 |   |   |   |  | 39 | - |  |  |  |
| 20 |   |   |   |  | 40 | - |  |  |  |

SUBMITTED DATA

IF ADDITIONAL LINES ARE NEEDED, PLEASE PHOTOCOPY THIS PAGE, ATTACH ADDITIONAL PAGES TO THE FORM, AND SEE INSTRUCTIONS.



## FAC DETERMINED DATA

- \* FAC DETERMINED TYPE OF ENTITY: **Non-Profit Institution for Higher Education**
- \* FAC DETERMINED CURRENT YEAR DIRECT FINDINGS: **YES**
- \* FAC DETERMINED COGNIZANT (C) OR OVERSIGHT (O) AGENCY\*: **C**  
(Please refer to the FAQ's for definitions)
- \* FAC DETERMINED COGNIZANT OR OVERSIGHT AGENCY FEDERAL AGENCY PREFIX: **93**
- \* FAC DETERMINED TYPE OF AUDIT REPORT ON MAJOR PROGRAM COMPLIANCE  
BASED ON 1997 – 2003 SF-SAC FORM INSTRUCTIONS: **U**
- \* The items above are not reported on the Form SF-SAC, but are determined by the FAC

CllgNH Dartmouth College 1020222111A3 03/12/09!0477

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN #: 1020222111A3

DATE: March 12, 2009

INSTITUTION:  
 Dartmouth College  
 Office of Sponsored Projects  
 11 Rope Ferry Road #6210  
 Hanover

FILING REF.: The preceding  
 Agreement was dated  
 December 9, 2008

NH 03755-1404

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section II

SECTION I: FACILITIES AND ADMINISTRATIVE COST RATES\*

RATE TYPES: FIXED FINAL PROV.(PROVISIONAL) PRED.(PREDETERMINED)

EFFECTIVE PERIOD

| TYPE  | FROM     | TO            | RATE(%) | LOCATIONS  | APPLICABLE TO     |
|-------|----------|---------------|---------|------------|-------------------|
| PRED. | 07/01/08 | 06/30/09      | 59.9    | On-Campus  | Research          |
| PRED. | 07/01/09 | 06/30/11      | 58.0    | On-Campus  | Research          |
| PRED. | 07/01/08 | 06/30/11      | 35.0    | On-Campus  | Other Spon. Prog. |
| PRED. | 07/01/08 | 06/30/11      | 61.0    | On-Campus  | Instr. & Training |
| PRED. | 07/01/08 | 06/30/11      | 26.0    | Off-Campus | All Programs      |
| PROV. | 07/01/11 | UNTIL AMENDED |         |            |                   |

Use same rates and conditions as those cited for fiscal year ending June 30, 2011.

\*BASE:

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first \$25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital

expenditures, charges for patient care, student tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of \$25,000.

INSTITUTION:  
 Dartmouth College  
 Office of Sponsored Projects

AGREEMENT DATE: March 12, 2009

SECTION I: FRINGE BENEFITS RATES\*\*

RATE TYPES: FIXED      FINAL      PROV. (PROVISIONAL)      PRED. (PREDETERMINED)

| EFFECTIVE PERIOD |          |               |          |           |                      |
|------------------|----------|---------------|----------|-----------|----------------------|
| TYPE             | FROM     | TO            | RATE (%) | LOCATIONS | APPLICABLE TO        |
| FIXED            | 07/01/08 | 06/30/09      | 38.0     | All       | Fac&Off & Staff&Ser  |
| FIXED            | 07/01/08 | 06/30/09      | 24.5     | All       | Research Associate B |
| FIXED            | 07/01/08 | 06/30/09      | 9.0      | All       | Temporary            |
| FIXED            | 07/01/09 | 06/30/10      | 38.0     | All       | Fac&Off & Staff&Ser  |
| FIXED            | 07/01/09 | 06/30/10      | 24.5     | All       | Research Associate B |
| FIXED            | 07/01/09 | 06/30/10      | 9.0      | All       | Temporary            |
| PROV.            | 07/01/10 | UNTIL AMENDED | 38.0     | All       | Fac&Off & Staff&Ser  |
| PROV.            | 07/01/10 | UNTIL AMENDED | 24.5     | All       | Research Associate B |
| PROV.            | 07/01/10 | UNTIL AMENDED | 9.0      | All       | Temporary            |

## \*\*DESCRIPTION OF FRINGE BENEFITS RATE BASE:

Salaries and wages.

## INSTITUTION:

Dartmouth College  
Office of Sponsored Projects

AGREEMENT DATE: March 12, 2009

## SECTION II: SPECIAL REMARKS

## TREATMENT OF FRINGE BENEFITS:

The fringe benefits are charged using the rate(s) listed in the Fringe Benefits Section of this Agreement. The fringe benefits included in the rate(s) are listed below.

## TREATMENT OF PAID ABSENCES:

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made.

(1) Off-Campus Definition: With the exception of the VA Hospital in White River Junction, Vermont, the off-site rate will apply to all activities performed in facilities not owned by the College and to which rent is directly allocated. Actual costs will be apportioned between on-site and off-site components. Each portion will bear the appropriate rate.

(2) Special Off-Campus Rate: The following rates will apply to activities performed at the VA Hospital in White River Junction, Vermont:

| TYPE  | FROM   | TO      | RATE  | BASE          |
|-------|--------|---------|-------|---------------|
| Final | 7/1/05 | 6/30/08 | 29.8% | See Section I |
| Pred. | 7/1/08 | 6/30/09 | 29.8% | See Section I |
| Pred. | 7/1/09 | 6/30/11 | 29.7% | See Section I |
| Prov. | 7/1/11 | U/A     | 29.7% | See Section I |

(3) The fringe benefits rate consists of pension, FICA, health insurance, life insurance, worker's compensation, unemployment compensation insurance, disability insurance, employee tuition assistance, employee advising program, severance pay-out plans and TIAA/CREF.

(4) Equipment means an article of nonexpendable, tangible personal property having a useful life of more than one year, and an acquisition cost of \$5,000 or more per unit.

\* THIS RATE AGREEMENT UPDATES FRINGE BENEFIT RATES ONLY.

INSTITUTION:  
Dartmouth College  
Office of Sponsored Projects

AGREEMENT DATE: March 12, 2009

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions:

(1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted: such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21 Circular, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:  
Dartmouth College  
Office of Sponsored Projects

ON BEHALF OF THE FEDER  
DEPARTMENT OF HEALTH

(INSTITUTION)

(AGENCY)

(SIGNATURE)

(SIGNATURE)

(NAME)

Robert I. Aaronson  
(NAME)

(TITLE)

DIRECTOR, DIVISION OF COST  
(TITLE)

(DATE)

March 12, 2009  
(DATE) 0477

HHS REPRESENTATIVE: Ryan  
Telephone:  
(212) 264-2069





(b)(6)

July 28, 2009

Ronald Ford  
Program Officer  
Attn: National Cyber Security Division/Preparedness Directorate  
Department of Homeland Security  
Washington, DC 20528

Dear Mr. Ford:

On behalf of the Institute for Information Infrastructure Protection (I3P) and the Institute for Security Technology Studies (ISTS), we are pleased to submit this Cyber Security and Information Sharing Progress Report, providing detailed information on the research and development efforts funded under award number 2006-CS-001-000001. This report covers ISTS and I3P activities between April 1, 2009 and June 30, 2009.

We trust this report illustrates the progress the two institutes have made to address the approved project(s) objectives. We look forward to working closely with you as we move the I3P and ISTS forward. If you require any further information please contact me at either (b)(6) or

(b)(6) Thank you for your continued support.

Sincerely yours,

(b)(6)

Principal Investigator

cc: Marilyn Morgan, Grants Officer

**Institute for Information Infrastructure Protection and  
Institute for Security, Technology, and Society**

**Quarterly Progress Report  
For the period April 1 – June 30, 2009**

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**I3P Report**

## Overview

The objective of this 2.5 year project is to apply the collective, diverse expertise of Dartmouth College's Institute for Information Infrastructure Protection (I3P) and Institute for Security, Technology, and Society (ISTS) to topics emphasized as critical priorities for securing cyberspace. The work will be accomplished through research, education and outreach programs including communities of researchers nationwide. This tenth progress report reflects I3P activities and progress made in addressing goals outlined in the February 2007 proposal. The following six initiatives will be discussed in greater detail:

- **Initiative 1: I3P Fellowship Program**
- **Initiative 2: Human Behavior, Insider Threat, and Awareness**
- **Initiative 3: Cyber Security Workshops**
- **Initiative 4: Survivability and Recovery of Process Control Systems:**
- **Initiative 5: Business Rationale for Cyber Security**
- **Initiative 6: Assessable Identity and Privacy Protection**

## Activities

### Initiative 1: I3P Fellowship Program

#### 1. Project title and lead

Project title: I3P Fellowship Program

Project lead: Martha Austin, I3P Administrative office

#### 2. Description

A portion of NCSF funding supports the continuation of the I3P Fellowship program begun in 2005.

The sixth annual call for I3P postdoctoral fellowship resulted in 21 applications, the highest number to date. The fellowship committee met in April to select the best candidates from the application pool to participate in the 2009/2010 I3P fellowship program. The top two candidates were offered fellowships, and both accepted. The two I3P fellows for the 2009/2010 program are:

- (b)(6) at the University of California, Davis, researching obfuscation engines under the direction of (b)(6)
- (b)(6) at Georgia Tech, researching Domain Name System (DNS) security under the direction of (b)(6)

I3P Scholar (b)(6) is finishing his period of work at the University of Massachusetts Amherst under the direction of Dr. (b)(6). A new call for applications to the I3P Scholar program was published in April, 2009, but due to the low number of applicants, the program has been suspended and is under review.

## **Initiative 2: Human Behavior, Insider Threats, and Awareness**

### **1. Project title and leads**

Project title: Human Behavior, Insider Threats, and Awareness

Project lead (b)(6) RAND

### **2. Description**

The I3P research team is addressing the problem of insider threat. Two primary objectives serve to focus and integrate the research activities: technology exploration and environmental constraints.

The technology exploration objective addresses the need for base technologies to monitor insider behavior, coupled with behavioral descriptions of suspicious, inappropriate or illegitimate events or activities. In combination, the technology and behavioral descriptions will provide a lightweight, robust, and scalable event processing infrastructure that can be deployed in a range of at-risk enterprises such as the U.S. military, financial institutions, chemical plants, refineries, and border and port security systems.

The second objective addresses the need for a methodological framework for handling incipient and actual insider behavior once it is recognized. Here, research efforts aim to characterize behaviors, determine risks, and understand the ethical, legal and policy choices available to technologists and policy-makers. Policy choices might include modifying institutional behavior, establishing clear policies, providing incentives for good behavior, and implementing training programs so that employees will better understand the risks and consequences of their actions.

All this information will inform decisions about preventing and dealing with insider threats. The research will be integrated with three workshops, intended to engage the stakeholders most affected by this work.

### **3. Participating institutions**

- RAND Corporation (Team leader)
- Center for Education and Research in Information Assurance and Security, Purdue University
- Columbia University

- Cornell University
- Institute for Security, Technology, and Society, Dartmouth College
- MITRE Corporation
- School of Informatics, Indiana University

#### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

#### **5. Relationships with academia, industry, or government**

Members of the team continue to utilize their relationships with government and industry stakeholders. Computer Associates continues to share some of their real-world experience with access control issues with Dartmouth, and also offered to continue funding work on SHOES after this project ends. MITRE has shared information with host-based monitoring software vendor Verdasys; MITRE continued with training and professional services related to MITRE's no-cost licensing of their host-based software.

#### **6. Activities and progress**

##### **a. Recent activities and progress**

###### *Underlying infrastructure*

The Columbia University and Cornell teams integrated Cayuga with the Columbia Decoy Document Distributor (DDD); they demonstrated the joint system at the final Insider Threat workshop in May. Cornell completed their experimental evaluation of the distributed version of Cayuga; a paper on this work appeared in the Proceedings of the Third ACM International Conference on Distributed Event-Based Systems. Cornell also completed the new version of NightWatch (described in a previous quarterly report), implementing:

- A more robust counting scheme (based on Flajolet-Martin counting)
- A web interface that supports visualization of the cumulative distributions of sensor values
- The ability to add new sensor values and specify the time during which those should be monitored.

Another version under development further increases the usability of the tool by increasing scalability and by adding automatic code updating for bug fixes and protocol improvements, contributing to robustness. Cornell is also adding a history maintenance function to be used for anomaly detection, allowing users to look for attacks signals.

###### *Capture the flag exercises*

The MITRE team conducted further data analysis, including independent review of participant data resulting in the removal of 7 additional participants, leaving 23

participants in each condition, then re-ran existing statistics on the remaining participants. The team also continued to code open-ended responses into categories for SME evaluation and post-experiment survey data. In addition, they began constructing a short experiment designed to determine whether their information flow graphs can be used by analysts to quickly assess whether observed user behavior is malicious or benign. They expect to complete this experiment by the end of the period-of-performance.

*Investigate and characterize anomalous behavior*

Columbia's RUU dataset consisting of normal computer user data and simulated masquerade attacker data was cleansed and published on a dedicated website (<http://www.cs.columbia.edu/ids/RUUdata/>). The dataset is available for researchers to download and use to evaluate their masquerade attack techniques after signing a license agreement. Columbia continued to work on modeling user intent, specifically using the RUU dataset to evaluate the accuracy of a masquerade attack detection technique that aims at capturing user intent by modeling user search behavior. The modeling approach was applied to data segments in epochs of 10 seconds. The classification technique used (one-class support vector machines) achieved a perfect detection rate (100%) with a very low false positive rate of 1.4% when compared to prior results. Columbia integrated the modeling approach into the host-based sensor. The latest sensor will be available for download at: <http://sneakers.cs.columbia.edu/ids/RUU/software/windows/>. Columbia also completed development of the wireless traffic generation and monitoring system.

*Investigate human factors for security.*

As described in previous reports, Dartmouth's goals were to develop and evaluate a specific SSF SHOES model of a partner healthcare institution. While the IRB process caused some unexpected delays, IRB approval was received and user interviews were conducted during this reporting period.

Also, a Dartmouth undergraduate senior thesis project related to the topic of misentitlement is complete. Continuing field work with Computer Associates is being planned.

*Ethical issues in insider threat*

Team members have devoted resources to their work on the influence of ethics and organizational culture on the insider threat. Of four papers accepted for the Insider Threat special issue of *IEEE Security and Privacy*, two were from project partners MITRE and Columbia University. The team leader from RAND, along with a team member from Columbia, is writing the introduction to the special issue of *IEEE Security and Privacy* on Insider Threat. The introduction includes a discussion of the response space. RAND researchers also wrote a working paper on behavioral decision theory and insider threat. It has been published as a RAND working paper and is available on the RAND website at: [http://www.rand.org/pubs/working\\_papers/WR688/](http://www.rand.org/pubs/working_papers/WR688/). It will eventually be published in a journal.

The paper, "Insiders Behaving Badly: A Taxonomy of Bad Actors and Their Actions," by Jeffrey Hunker, Joel Predd, Shari Lawrence Pfleeger and Carla Bulford was submitted to



the *Journal of Computer Security*. It is also being submitted to the *Journal of Electronic Security and Digital Forensics*, which welcomes longer papers.

#### *Exploring incentives*

Indiana University submitted their work on using incentive-based access control to mitigate insider threat to ACSAC'09, and is preparing a final report on their work under this project.

#### *Risk Analysis*

The Purdue team completed their survey to investigate the risk taking behavior of average users in online environments; 372 participants (student volunteers in North America) provided responses for this task. Preliminary data has already yielded evidence that the perceived benefit influences the perceived risk, causing a misalignment of the perception with the objective reality. The results of this survey will be used to compare the risk taking behavior of *average users* with *insiders*. Purdue presented some of the results of this survey in a paper to the 2009 International Conference of Information Systems. Their paper on "Insider Behavior: An Analysis of Decision under Risk", was accepted for presentation and publication by the First International Workshop on Managing Insider Security Threats, MIST 2009. This paper was presented on June 15, 2009 and was judged one of the best of those presented at the event, and the authors were invited to submit an extended version of this paper for publication to the Information Systems Frontiers Special Issue on Security management and Technologies for Protecting Against Internal Data Leakages.

Purdue also developed a survey instrument to quantify perceptions of information security risks and presented this instrument in their paper on "Risk Perceptions of Information Security: A Measurement Study". The paper was accepted for presentation and publication by the First IEEE International Workshop on Software Security Process.

#### **b. Where we stand**

Work has generally caught up with project plans despite initial delays. Some work was transferred back to RAND to ensure its completion. Most deliverables are on or close to schedule and the research team is documenting and publishing its results.

#### **c. Plans**

The team will finalize work on the various aspects of its research under this project and prepare a final report.

The final Insider Threat team workshop was held in Washington, DC on May 5, with a poster session in the Rayburn House Office Building on May 4<sup>th</sup>.

Team members from Columbia and RAND will be guest editors of a special issue of *IEEE Security and Privacy* on insider threat to be published near the end of 2009.

#### **d. Obstacles**

There are no significant project obstacles to report at this time.

#### **7. Meetings attended**

The final Insider Threat team workshop was held in Washington, DC on May 5, with a poster session in the Rayburn House Office Building on May 4<sup>th</sup>.

Team members have presented parts of their work at conferences and industry forums, including the First International Workshop on Managing Insider Security Threats, First IEEE International Workshop on Software Security Process, SIGMOD 2009, G020 Information Assurance Days Conference (22 June, 2009), European Research Council Symposium, the Google Android Workshop, Security and Human Behaviors, MIT Cambridge MA (June 2009), the Security Economics Workshop, London, UK, (June 2009), the American Registry for Internet Numbers (ARIN XXIII), San Antonio, TX, (April 2009), the International Conference on Trust Management, West Lafayette, IN (June 2009), as well as an individual meeting with the chairman of the Institute for Advanced Science & Engineering and a presentation at the National Security Agency.

#### **8. Publications:**

Joel Predd and Andrew Parker, "Toward a Cognitive Analysis of Insider Threats", [http://www.rand.org/pubs/working\\_papers/WR688/](http://www.rand.org/pubs/working_papers/WR688/)

Fariborz Farahmand and Eugene H. Spafford, "Insider Behavior: An Analysis of Decision under Risk", First International Workshop on Managing Insider Security Threats (MIST 2009), June 2009.

Fariborz Farahmand, Melissa Dark, Sydney Liles, Brandon Sorge, "Risk Perceptions of Information Security: A measurement Study", First IEEE International Workshop on Software Security Process.

Deanna Caputo, Mark Maloof, Greg Stephens, "Detecting the Theft of Trade Secrets by Insiders: A Summary of MITRE Insider Threat Research", to be published in the Oct/Nov 2009 Issue of IEEE Security & Privacy Magazine.

Stephanie Trudeau, Honors thesis: "The Effects of Introspection on Computer Security Policies."

K. Birman, G. Chockler, and R. van Renesse, "Towards a cloud computing research agenda.", SIGACT News, 40(2), June 2009

Brian Bowen, Malek Ben Salem, Shlomo Hershkop, Angelos D. Keromytis, and Salvatore J. Stolfo, “Web of Detectors to Mitigate Insider Threat”, IEEE Security & Privacy Magazine, Special Issue on Insider Threat, November 2009.

Malek Ben Salem and Salvatore J. Stolfo, “Masquerade Attack Detection using a Search-Behavior Modeling Approach”, Columbia University Department of Computer Science Technical Report, CUCS027-09, 2009. (Under review)

Brian Bowen, Shlomo Hershkop, Angelos D. Keromytis, and Salvatore J. Stolfo, “Baiting Inside Attackers using Decoy Documents”, Columbia University Department of Computer Science Technical Report, CUCS-016-09, 2009 (Under review)

## 9. Technology transfer

A patent request is under submission by Indiana University for Privacy-Aware Portal Monitor, 2008 and a provisional patent for “Pharming Detection Using Personal Histories (Net Trust)” is in negotiation for licensing.

### Initiative 3: Cyber Security Workshops

#### 1. Project title and lead

Initiative title: Cyber Security Workshops

Initiative lead: (b)(6) I3P Administrative office

#### 2. Description

The I3P will host a series of workshops that focus on process control systems security, examining the economics of protecting the information infrastructure, understanding and developing solutions to protect against the insider threat and raising awareness among government and industry leaders about critical infrastructure protection vulnerabilities, threats, challenges and research solutions. The current state of knowledge about cyber security challenges and available solutions is inadequate. Pockets of expertise exist in the security community, but there is an acute need to further inform and educate decision makers and leaders from industry, government and academia about cyber vulnerabilities and existing and emerging remediation options.

This initiative mirrors the priorities outlined in both the *National Strategy for Homeland Security* and the *National Strategy to Secure Cyberspace* by focusing on developing a better understanding of vulnerabilities and threats against critical national infrastructures, including PCS/SCADA systems, as well as raising awareness and improving public-private information sharing in these areas. Moreover, I3P workshops are strongly aligned with the goals and objectives outlined in the *National Infrastructure Protection Plan*

(NIPP) in terms of supporting critical infrastructure and key resources research, development, testing, evaluation and deployment, and disseminating research results, guidelines, and best practices to the user community. The proposed workshop initiative will be a vehicle to provide timely and accurate information and details of solutions to the relevant stakeholders.

These workshops and sessions have the following objectives:

- To provide a trusted forum for a diverse network of researchers, government, and industry representatives to exchange ideas and develop interdisciplinary solutions to critical problems.
- To demonstrate high-impact tools and technologies developed through I3P research.
- To increase awareness of cyber security issues and solutions, and assemble the right coalition of experts to address the most pressing technical and policy challenges.
- To create new understanding and knowledge that will be reported in the form of workshop proceedings, books and other publications.

The I3P has a well-established ability to organize high-impact workshops of interest to industry, government and academia, and has used these workshops to gain knowledge about cyber security problems and to demonstrate solutions. The Consortium has previously demonstrated its ability to bring together important stakeholders from a variety of disciplines to discuss security challenges and advance solutions. The I3P has the unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue.

### **3. Participating institutions**

This initiative is run by the I3P administrative office, working in partnership with I3P consortium members and others as needed on specific events.

### **4. Subcontractors**

The original award was made to Dartmouth College.

### **5. Relationships with academia, industry, or government**

The I3P administrative office works closely with its industry, government and academic partners and stakeholders to plan and organize workshops and conferences that add significant value to the field, and provide attendees with useful knowledge or tools. The I3P regularly recruits high-level speakers and attendees from all the major stakeholder groups for I3P events.

## **6. Activities and progress**

### **a. Recent activities and progress**

The 5th Annual I3P PCS Security Workshop took place in Houston, TX April 27.

The I3P Workshop on Insider Threats: Strategies for Staying Secure was held in Washington, DC May 4-5.

The Tuck School of Business at Dartmouth (part of the Business Rationale team) helped organized WEIS 2009: the Eighth Workshop on the Economics of Information Security, held June 24-25 in London.

The I3P coordinated with Dartmouth College's Tuck School of Business in planning the latest installment of the CISO Workshop Series. Titled "Assessing Risk in Turbulent Times: A Workshop for Information Security Executives. The event took place July 13-14, 2009 in Hanover, NH.

### **b. Where we stand**

In the past quarter, the I3P successfully organized several workshops and meetings, all were well attended and considered successful.

### **c. Plans**

The I3P is in the planning stages for several workshops scheduled for the fall and winter of 2009/10.

### **d. Obstacles**

There are no significant project obstacles to report at this time.

## **7. Meetings attended**

The I3P has participated in numerous teleconferences with planning partners from the consortium and industry to plan workshops and conferences.

## **8. Publications**

No publications were released during the reporting time.

## **9. Technology transfer**

No technology was transferred during the reporting period.

## **Initiative 4: Survivability and Recovery of Process Control Systems**

### **1. Project title and leads**

Project title: Survivability and Recovery of Process Control Systems

Project lead: (b)(6) MIT Lincoln Laboratory

### **2. Description**

Process control systems (PCSs) are instrumental in the safe, reliable, and efficient operation of many physical processes in our critical infrastructures. However, the growing dependence of PCSs on conventional information technology (IT) elements and their increasing connectedness to the Internet results in their inheritance of known and emerging cyberspace risks and threats, including cyber attacks from adversaries with a range of skills. A successful cyber attack on a PCS could adversely affect not only the safe and reliable operation of the directly controlled infrastructure, but also other interconnected and interdependent critical infrastructures, resulting in adverse impact on human safety and the economy.

This project seeks to reduce the opportunity for an attack to be mounted against critical components, to increase the likelihood of detection if such an attack is made, and, if successful, operators can rapidly recover.

Team members will accomplish this by methodically identifying critical components, ensuring software is secure against attacks by design, by hosting, and by network configuration, and if the attacker is still successful, by ensuring recovery happens easily. Members will follow other related research, build and transition tools to industry, and participate in yearly workshops.

The research effort will be by coordinated by MIT/LL and is organized into seven thrusts, using I3P member organizations as follows:

Thrust 1, USMA: Track and leverage R&D efforts for government and industry. Share results, connect stakeholders and identify gaps.

Thrust 2, MITRE: Identify critical assets to better plan for PCS survivability. Spotlight cases where mission critical nodes are at risk so operators can prioritize security efforts.

Thrust 3, PNNL & MIT/LL: Ensure survivability of legacy and future platforms. Enable automated security testing of future PCS product software and develop a secure operating system base.

Thrust 4, UIUC: Specify, implement and enforce policy that results in survivable operations. Demonstrate tool that efficiently accomplishes this and provides human-interpretable feedback.

Thrust 5, Tulsa: Establish situational awareness in MODBUS networks. Develop tools to passively and actively map networks and components without affecting operations.

Thrust 6, SNL: Ensure system-level survivability and recovery. Work with industry groups to define best practices and demonstrate in a realistic setting.

Thrust 7, SRI: Work with industry to ensure research is on proper path and that technical transition is happening smoothly. Present results to community members via workshop.

### **3. Participating institutions**

- MIT Lincoln Laboratory (Team leader)
- Center for Information Security, University of Tulsa
- Information Technology and Operations Center, United States Military Academy
- Information Trust Institute, University of Illinois at Urbana-Champaign
- MITRE Corporation
- Pacific Northwest National Laboratory
- Sandia National Laboratories
- SRI International

### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

### **5. Relationships with academia, industry, or government**

The research team continues to interact with its project advisory board, made up of experts from owner/operator companies and vendors, as well as their individual industry partners. UIUC has been validating some new capabilities of their APT tool with their partners Alyeska and Ameren and expects to complete those efforts in July. The MIT team continues to leverage other non-I3P projects at Lincoln Labs to test their new port of DEADBOLT. Sandia's leadership role in the redefinition of the API 1164 standard was rewarded with its adoption and published this quarter.

### **6. Activities and progress**

#### **a. Recent activities and progress**

A few of the research activities were slightly behind schedule due to project start-up delays (funding, staffing, etc.). However, most of those team members are catching up to their planned activities.

*Thrust 1. Track and leverage R&D efforts for government and industry. Share results, connect stakeholders and identify gaps.*

The United States Military Academy (USMA) completed its gap analysis report that built upon its report from year one. This report, which tracks relevant, ongoing research, development, and application efforts in the survivability and recovery of process control systems, has provided overall guidance to the project team and highlights research gaps

identified by the USMA team as well as by stakeholders in industry and government. Specifically, the report provides a summary of related research, development, and application efforts and includes an assessment of DHS Rule 6, CFR Part 27. The draft report was provided in April 2009 and was reviewed by the I3P PCS team.

*Thrust 2. Identify critical assets to better plan for PCS survivability. Spotlight cases where mission critical nodes are at risk so operators can prioritize security efforts.*

During the previous reporting period, MITRE completed the implementation of the new architecture of their RiskMAP tool which enabled the completion of the confidentiality, integrity, and/or availability extensions to the tool. During this quarter the team completed the documentation for the tool and provided a demo at the April PCS workshop in Houston. One workshop attendee reported that he traveled from Japan specifically to see the RiskMap presentation and demonstration.

*Thrust 3. Ensure survivability of legacy and future platforms. Enable automated security testing of future PCS product software and develop a secure operating system base.*

The Pacific Northwest National Laboratory (PNNL) team completed its work on the NACIO tool and demonstrated it at the PCS workshop in April. As reported previously, the NACIO tool authenticates operators by monitoring network traffic in the control system and then taking pictures at the workstation when certain critical commands are issued. The team expects their final deliverables of documentation for deployment procedures and best practices to be completed by 31 July 2009.

MIT's Lincoln Laboratory completed the prototype of their resource exhaustion discovery system for one class of denial of service vulnerabilities. Their work was demonstrated at the April workshop. They also found some very recent work showing improvements in input-generation to discover security vulnerabilities that caused them to focus on detecting memory corruption errors within objects and data structures. This topic remains unaddressed in the literature and presents a real problem for C and C++ software. The team is extending DEADBOLT to accommodate this focus.

*Thrust 4. Specify, implement and enforce policy that results in survivable operations. Demonstrate tool that efficiently accomplishes this and provides human-interpretable feedback.*

During the previous reporting period, the University of Illinois Urbana-Champaign (UIUC) finished validating the implementation of the topology inference functionality with their stakeholder partner Ameren. Since then they developed a script to check the inferred topology against the rule-set files to identify missing nodes, networks or potential misinterpretations (i.e. duplicate IP addresses or nodes). Through close collaboration with Ameren, they confirmed that the topologies generated by the tool are representative of Ameren's actual network configurations. The team moved on to specify basic global policies for Ameren using the policy templates written during the previous



quarter in accordance to the latest NIST recommendations. As Ameren's full topology is very large, they chose to start performing the security analysis on a subset of nodes (i.e. a sub-topology constituted of around 150 hosts and several firewalls). The team had to update the engine to be able to run analysis using a rule-set file referring to nodes not present in the provided topology. They are currently in the process of generating a connectivity map for this particular sub-topology. To wrap up their efforts they will complete a similar set of work for their Alyeska partner.

*Thrust 5. Establish situational awareness in MODBUS networks. Develop tools to passively and actively map networks and components without affecting operations.*

The University of Tulsa previously reported the completion of its deliverables for this project. During this reporting period the team built and provided a demo for the PCS workshop. In addition, the team worked on the editing activities associated with the third installment of the Critical Infrastructure Protection book series to be published by Springer by the end of the year.

*Thrust 6. Ensure system-level survivability and recovery. Work with industry groups to define best practices and demonstrate in a realistic setting.*

Sandia National Labs completed its Operator Response Training Simulator (OPSIM) during the previous reporting period. During this reporting period they completed an on-site visit to a participating refinery to obtain more input to their creation of additional cyber scenarios for OPSIM. They tested those scenarios using their virtual representation of a refinery and their attack graph tool (GAME). The team demonstrated their OPSIM tool at the PCS workshop in April. The team wrote a paper for the July DHS Cyber-Physical Systems Security Conference that was accepted. The API 1164 standard effort, which the Sandia team co-led, was completed with the adoption and publication of the new standard. The final version was submitted on April 16<sup>th</sup> and was presented at the API and ENTELLEC conferences.

*Thrust 7. Work with industry to ensure research is on proper path and that technical transition is happening smoothly. Present results to community members via workshop.*

During this reporting period, SRI worked on the final preparations for the April 28, 2009 workshop. This included preparation of the agenda, development of afternoon discussion sessions, review of team presentations, outreach to potential attendees from industry and government, and other activities. SRI also worked with some of the presenters to ensure the effectiveness of their presentations. The workshop went extremely well, was very well-attended during the challenging economic climate, and received glowing reviews.

#### **b. Where we stand**

Work has generally caught up with project plans despite initial delays, and all final deliverables are expected to be completed.

**c. Plans**

In the remaining thirty days, the team will be wrapping up and documenting their final deliverables as well as participating in the DHS Cyber-Physical Systems Security Conference in July.

**d. Obstacles**

There are no significant project obstacles to report at this time.

**7. Meetings attended**

The research team has held regular teleconferences to coordinate its efforts. Team members have presented parts of their work at conferences and industry forums, most notably at the Fifth I3P PCS Security Workshop in April in Houston. The UIUC team presented their APT work at the IDGA Cyber-security for National Defense Conference in May.

**8. Publications**

McIntyre, Annie, “Organizational Communication for Security Risk Reduction and Survivability”, ENTELEC conference.

Richardson, Bryan, et.al., “Modeling and Simulation for Process Control System Cyber Security Research, Development and Applications”, DHS Cyber-Physical Systems Security Conference.

**9. Technology transfer**

There was no technology transfer activity during this reporting period.

**Initiative 5: Business Rationale for Cyber Security**

**1. Project title and leads**

Project title: Business Rationale for Cyber Security  
Project lead: (b)(6) University of Virginia

**2. Description**

Organizations of all types are facing risks resulting from their ever-increasing reliance on the information infrastructure. Decision and policy makers managing these risks are challenged by a lack of information concerning the risks and consequences of cyber events and would benefit from an increased understanding of the implications of cyber security risks and solutions. The project supports risk management efforts by studying essential components of risk management investment decisions: (1) what processes

support a rational approach to cyber risk management?, (2) what data are needed to support rational decisions, and (3) what are the impacts to individual businesses and business sectors resulting from various investment alternatives? Sound, rational decisions require an understanding of IT risks and their impact on business events; this project supports these efforts via the development and refinement of decision support tools. To be of maximum utility, these tools require credible data of current and past situations, likely trends, and the impacts of current and past actions. Similarly, an understanding of the dynamics of cyber security is needed to help business decision makers understand the likely effects of cyber security choices.

The project will employ several techniques to explore and extend current options, including: (1) analytical risk-based decision models, (2) computer-based collaborative decision aids, (3) field studies of industry practices, (4) case studies, and (5) identification and analysis of credible data sources to apply to decision support. Building on their past research of the economics of cyber security investment, team members will develop new understanding and new capabilities for more rational decisions for investments in information infrastructure security. The results of the project will be support tools, models and data useful to support information security investment decision-making across all organizational levels. The methodology, body of data, and tools and techniques produced by the project will comprise a widely applicable set of cyber security practices and tools that are informed by an empirical understanding of business processes, constraints, government policy, and cyber security risks.

### **3. Participating institutions**

- University of Virginia (Team leader)
- RAND Corporation
- School of Law, University of California at Berkeley
- Tuck School of Business, Dartmouth College

### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

### **5. Relationships with academia, industry, or government**

Business rationale team members continue to use industry and stakeholder relationships as necessary for their work. The Tuck School of Business has concluded interviews with field study partners and their suppliers in the retail grocery, dairy and health care sectors. Tuck is also working with researchers from the I3P's Process Control Systems Security project to use the RiskMAP risk analysis tool in one of their case studies at a hospital unit. RAND continues to work closely with its case study partner to document the company's decision-making process in the face of a sustained cyber attack. UVa is working with various industry and government stakeholders, including presenting their

collaboration tool to Booz Allen Hamilton, and UC Berkeley has conducted interviews with CSOs as part of its study into cyber security decision making.

## **6. Activities and progress**

### **a. Recent activities and progress**

A few of the research activities continue to be slightly behind schedule due to project start-up delays (funding, staffing, etc.). However, most of the team members have now caught up to their planned activities. Team members from Tuck helped plan the Workshop on the Economics of Information Security in London, June 24-25, as well as a CISO workshop July 14<sup>th</sup> in Hanover, NH.

#### *Task 1.1. Identify Possible Decision Support Models and Their Required Data Input*

RAND has continued to develop its decision support model evaluation framework, and continues to publish its findings in peer-reviewed journals. The paper “Anatomy of an Intrusion” was submitted to IEEE IT Professional. The team leader from RAND hosted a panel discussion at the Workshop on the Economics of Information Security in London, June 24-25. The panel discussed the need for a multidisciplinary model of security investments to support good decision-making.

The Business Rationale team continues with their major effort to perform agent-based modeling. All the team members are involved and are modeling different things, with UVa coordinating the effort.

#### *Task 1.2. Survey of Business Cyber Security Investment Decision Processes*

Tuck continues development of an application of the RiskMAP decision support tool, however this effort was delayed as the use of the process at the field study hospital has taken much longer than originally planned. In particular, the part of the process transferring the recommendations resulting from risk mapping to stakeholders in the hospital only started in early July (after the conclusion of this reporting period); this process is at the heart of improving the resiliency of the hospital from a practical point of view. The principal researcher will continue developing the tool.

#### *Task 1.3. Describing Interdependencies Arising From Business' Information and Physical Supply Chains*

UVa has been working with Tuck to construct a supply chain model that builds on Tuck's field study work. UVa identified the utilization of information technologies in the daily operations of dairy supply chain, and refocused their research from dairy supply chains to general grocery supply chains, including integrating a supply chain model from two different perspectives: the logistic operations and information security. UVa also developed different information disruption scenarios and management options as inputs to the simulation model and proposed measurement indexes for the performance of a supply chain. UVa coded the simulation model in the C language and the simulation can now be used on desktops, statistical data analysis can be performed on the simulation

results, and sensitivity analysis on the model parameters. UVa identified the best information management options to achieve supply chain optimization based on model assumptions. UVa is working on two papers related to the work, one on the information asymmetry and the other on agent-based modeling of information flows in supply chains.

*Task 1.4. Creation of Collaborative Computing Decision Support Tool*

No further updates were reported this quarter.

*Task 2.1. Analyzing the Emergent Nature of Cyber Security*

UVa has had a paper, “Empirical Analysis of the Effects of Cyber Security Incidents” accepted by the journal “Risk Analysis”, while the paper “Network Effects and Cybersecurity” is still under review at Management Science. UVa has started analyzing the performance of reputation-based schemes for cyber security, the main idea being that on-line interactions can benefit by relying on a reputation updating scheme through which malicious agents can be correctly labeled as such. However, UVa’s work has shown that the ability of the scheme to correctly identify malicious agents is highly dependent on the structure of interactions among agents.

*Task 2.2. Collecting and Mining Publicly Available Data for Factors Affecting Security Deployment*

This task fell under the scope of work for MIT Lincoln Laboratory, which withdrew from the project for staffing reasons.

*Task 2.3. Modeling Firm Decisions in the Marketplace*

Indiana completed their paper and gave a presentation about their IPv6 work at the 2008 Workshop on the Economics of Information Security (WEIS). As decided following the mid-term project review, Indiana University has officially ended their activities on the project.

*Task 2.4. Case Study of an Actual Cyber Attack on Cyber Related Business Practices*

No further developments reported this quarter.

*Task 2.5. Chief Security Officers*

UC Berkeley continues to share its findings from its expansive literature review related to the study of how data breach laws affect chief security officers’ cyber security decisions at conferences and with government and industry representatives. Berkeley continues to be slightly delayed in this work, but has mostly completed its analysis of interviews with the CSOs of major software, telecommunication, healthcare, finance and retail sector companies, and is continuing to draft their report in a parallel effort. Berkeley is arranging a few final interviews, and a PhD student is analyzing the CSO data as part of his dissertation work. He is continuing to examine the threats identified through regulatory security standard efforts against the threats revealed by organizational breach data that is available in publicly available databases. Berkeley’s goal of preparing smaller issue briefs for use with policy makers is currently delayed. Berkeley is working

with the Computer Security Institute to use data from prior CSI/FBI surveys and has submitted questions for inclusion in the survey. Berkeley has signed a memorandum of understanding that will provide them access to raw data from the entire survey. This will allow Berkeley to work toward validating their qualitative findings. Data collection by CSI is underway, and Berkeley expects to receive data in late summer.

*Task 2.6. Cyber Risks to U.S. Intellectual Property*

Berkeley's paper, "Trade Secrecy as an Instrument of National Security? Rethinking the Foundations of Economic Espionage," has been accepted for publication by the Arizona State Law Journal. The paper will be presented at the Intellectual Property Scholars Conference at Cardozo Law School, New York, NY. It will also provide a partial foundation for Berkeley's participation in Phase II of the ISA-ANSI Workshop on the Financial Impacts of Cyber Risk (beginning July 31, 2009), as well as an upcoming workshop on future states of the Internet, to be held at Sandia National Labs (July 27, 2009) under the auspices of the CNCI.

**b. Where we stand**

Work has generally caught up with project plans despite initial delays. Most deliverables are on schedule and the research team continues to document and publish its results. The Business Rationale team has changed its focus a little from the initial research plan by embarking on a major effort to do agent-based modeling. All the team members are involved in this effort.

**c. Plans**

The team will finish its various research and modeling efforts in close collaboration with stakeholders. The team will continue to refine its analysis of available decision support models, and their data needs. They will also finish work on their case studies in various sectors. Several papers on these efforts have already been published, with more publications planned for the future.

**d. Obstacles**

There are no significant project obstacles to report at this time.

**7. Meetings attended**

The research team has held regular teleconferences to coordinate its efforts. The Tuck School of Business, RAND and UC Berkeley have been meeting with their industry partners as part of their field studies/case study/interviews. Team members have presented parts of their work at conferences and industry forums, including the Workshop on Security and Human Behavior, in Boston June 11-12 and the Privacy Law Scholars Conference June 4-5, and will attend the Young Engineering Scientists Symposium (jointly sponsored by NSF and the French Embassy) in July.

## 8. Publications

Johnson, M. Eric, Eric Goetz and Shari Lawrence Pfleeger “Security through Information Risk Management,” IEEE Security and Privacy, Vol. 7, No. 3, 45-52.

Davis, Ginger, Alfredo Garcia and Weide Zhang “Empirical Analysis of the Effects of Cyber Security Incidents,” Risk Analysis, Vol. 29 No. 9 (published online June 24, 2009)

Burstein, Aaron J. “Trade Secrecy as an Instrument of National Security? Rethinking the Foundations of Economic Espionage” Arizona State Law Journal, volume 41, to be published December 2009.

## 9. Technology transfer

No technology was transferred during this reporting period.

## Initiative 6: Assessable Identity and Privacy Protection

### 1. Project title and leads

Project title: Assessable Identity and Privacy Protection  
(also called “Safeguarding Digital Identity”)

Project lead: (b)(6) MITRE

### 2. Description

Identity theft has become a national problem due to the ease with which digital identities are compromised and to the ever-increasing demand for electronic access to information, goods, and services. Capabilities to protect identity and privacy are critical to the various sectors of our national infrastructure, such as the financial sector and the health care sector. This national issue is a multi-faceted problem; broad, holistic solutions that address and strategically balance technical requirements and business processes as well as policy, social, legal, and economic constraints are necessary for a successful approach to identity and privacy protection. Failing to address this national problem threatens the nation’s economic well-being and individuals’ security and privacy.

The closely aligned problem domains of identity management (which includes defining and managing identity credentials) and privacy protection are large, and considerable effort is being applied to specific problems in those domains. Our objective is to enable enterprises in the critical infrastructure sectors of finance and healthcare to state requirements, implement solutions, and assess the relative benefits of alternative solutions for handling digital credentials in service oriented architectures.

To achieve our objectives, we will engage stakeholders and seek collaborative relationships with other research efforts to define a framework for describing digital credential requirements, comparing solutions, and identifying gaps. We will also develop a proof-of-concept demonstration of the credentialing framework that demonstrates the ability to identify critical and relevant problems in this domain and solve them. A safe and acceptable way of exchanging credentials will solve a large piece of the national identity and privacy protection problem.

### **3. Participating institutions**

- MITRE Corporation (Team leader)
- Center for Education and Research in Information Assurance and Security, Purdue University
- Cornell University
- Georgia Tech Information Security Center
- Information Trust Institute, University of Illinois at Urbana-Champaign
- SRI International

### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

### **5. Relationships with academia, industry, or government**

This project has a very strong dependence upon collaboration with industry and other ongoing identity management projects. Team members are working with numerous partners in the healthcare and finance sectors, as well as several government agencies and other research organizations, to help establish their requirements and develop an effective solution framework. For example, the Georgia Tech team continued their work with a healthcare partner on challenges in identity management and privacy protection in federated healthcare environments, and with another on identity and health record challenges faced by emergency responders. They are exploring synergies between centralized identity-related data collection and user-centric identity services with a credit reporting agency. Through interactions with stakeholders, Cornell identified a potential real-world application for their work in a medical research effort that link Cornell's team in NYC with a Harvard group based in Boston. The Cornell team has continued to work with them to push the idea forward and build a deployable prototype system. The SRI team is working closely with other researchers at Stanford, UCSD, Columbia, UCLA, and MIT.

Stakeholders have been involved throughout the project, helping clarify stakeholder requirements, reviewing the SPICI Analytical Framework for Sharing Protected Identity, and driving new innovations such as the new Oblivious Commitment-based Envelope (OBCE) protocols that Purdue added to their VeryIDX prototype.



## 6. Activities and progress

### a. Recent activities and progress

#### *Task 1. Identify Stakeholder Requirements*

The research teams completed their interviews and exchanges with various stakeholders to identify and refine the real-world requirements. MITRE, as the team leader, continues to maintain a list of stakeholder interactions, and uses those interactions to ensure continuity and continued relevance of their research.

#### *Task 2. Leverage and Influence Other Identity Management Efforts*

The project team continues to work with a number of identity management efforts to inform and leverage their work. These include Project Higgins, Liberty Alliance, OASIS, FiXS, Microsoft Metasystem, IBM Tivoli, TrustGenix, and the National Electronic Commerce Coordinating Council (EC3).

#### *Task 3. Establish Credentialing Framework*

The MITRE team presented their credential framework at IDTrust2009 and was published in the ACM International Conference Proceeding Series.

The University of Illinois at Urbana-Champaign (UIUC) presented their paper on assessing trust when selecting certificate chains in a PKI at IDTrust2009. Since then, they have extended their work in two ways. First, they analyzed the gap between their research and typical practice of PKI's and discovered hidden trust assumptions in the real-world PKI. Second, they constructed a modal logic system for modeling real-world PKI. The team also began writing two archival journal articles; one is addressed to formal models of trust and semantics, while the other fleshes out the work reported previously on "real" PKI's.

#### *Task 4. Develop Proof-of-Concept Demonstration*

*All of the teams are working towards coordinated demonstrations of their work.*

After completing their prototypic set of enabling web service components—the Physician Trust Hub—during the previous reporting period, the team has now completed their demonstration. They succeeded in dovetailing their demonstration with the Office of the National Coordinator for Health Information Technology, Emergency Responder Electronic Health Record, Detailed Use Case. The team presented the demonstration at the I3P Consortium meeting in April.

#### *Provide a Trust Negotiation Service*

As reported in the previous report, the Purdue team completed development of a demo of their VeryIDX tool in the context of healthcare – the demo consists of an e-prescription example and includes four different parties (a hospital, a test lab, a doctor and a patient). It was also previously reported that the Purdue team completed its integration of Trust-X and the Minimal Credential Disclosure Technique. This close collaboration between

Purdue and the Georgia Tech team was quite valuable. As a result of this work, two papers were accepted and presented at IDTrust2009 and another was accepted to the journal *Computer*.

The Cornell team is developing techniques and tools for managing identity without ever exposing identity-related data to attackers. These research efforts have progressed far, but Cornell expects techniques and ideas from this research (which in particular focus on studying multi-party security and zero-knowledge authentication and its applications to identity management solutions) to be leveraged to create practical ways of measuring information flow into and out of IDM systems. The team has also continued to pursue its work on developing a new general security framework that can be used to guarantee that protocols remain provably secure under concurrent executions, without assuming any trusted infrastructure. The paper describing this work was presented at STOC 2009 (June) and may very well form the basis of new metrics for assessment of the security of identity management systems. Two other papers were also accepted for publication in CRYPTO 2009 and the IEEE International Symposium on Network Computing and Applications.

#### *Enable User Control of Personal Information in Credential Systems*

Georgia Tech is collaborating with a local healthcare provider on the incorporation of their minimum information disclosure (MID) credential technology as the basis for a “Personal Health Record” (PHR) service. During the previous reporting period they completed a prototype PHR service that includes verifiable sourcing, auditability, and selective disclosure. The team is also investigating technologies for attribute aggregation that can be used in a scenario covering emergency responder access to health records. The team completed an integrated demo of these two technologies on a scenario covering emergency responder access to health records. The team also wrote, and submitted for publication, a paper describing the “source-verifiable patient-centric PHR repository” prototype.

#### *Enhance Privacy with Queries on Encrypted Data*

SRI has completed its contributions to joint work with UIUC. UIUC has developed an Attribute-Based Messaging (ABM) system that uses SRI's Attribute-Based Encryption (ABE), now generalized into Functional Encryption. See the previous quarterly reports for further background on ABE and its relationship with ABM. In addition, numerous papers relating to ABM can be found on the uiuc.edu Website:  
<http://weclab.uiuc.edu/web/projects/61-attribute-based-messaging-and-security.html>

Peter Neumann presented an invited keynote talk at the IDtrust conference at NIST, April 14-16 2009. That talk, *Identity Trust in Context*, considered identity management in relation to overall trustworthiness needs, and also the roles of ABE and ABM. The slides are online: <http://www.csl.sri.com/neumann/idtrust09+x4.pdf> .

SRI continues to pursue its long-term research independently with UIUC on applications of SRI's Attribute Based Encryption (now generalized as Functional Encryption) and with other institutions as well.

**b. Where we stand**

The work on this project has been successfully completed, despite the initial delays. Most deliverables were on schedule and the research team has been documenting and publishing its results.

**c. Plans**

Some of the teams will be finalizing their results and will continue to collaborate on integrating them into papers and cohesive demonstrations.

**d. Obstacles**

There are no significant project obstacles to report at this time.

**7. Meetings attended**

The research team has held regular teleconferences to discuss progress of the various efforts and coordinate related tasks. All the research partners have had extensive meetings and discussions with industry stakeholders, such as: Health Information Management Systems Society; Liberty Alliance: Health Care Special Interest Group; OASIS; eCitizen Identity and Online Civic Engagement Workshop. Team members have presented their work at conferences, workshops and industry forums, including TCC, PKC, STACS, Eurocrypt, and ARES 2009. During this reporting period the entire team attended the IDTrust2009 conference held at NIST in April.

**8. Publications.**

Bodeau, D. *Safeguarding Digital Identity: The SPICI Approach to Negotiating Identity Federation and Sharing Agreements*. Accepted and presented at IDTrust2009.

Huand, J. and Nicol, D. *A Calculus of Trust and its Application to PKI and Identity Management*. Accepted and presented at IDTrust2009.

Lin, H, et.al. *A Unified Framework for Concurrent Security*. Symposium on Theory of Computing.

Mashima, D., et.al. *User-Centric Handling of Identity Agent Compromise*. To appear European Symposium on Research in Computer Security 2009.

Paci, F., et.al. *Privacy-Preserving management of Transactions' Receipts for Mobile Environments*. Accepted and presented at IDTrust2009.

Paci, F., et.al. *VeryIDX – a Privacy Preserving Digital Identity Management System for Mobile Devices*. Accepted and presented at IDTrust2009.

Paci, F., et.al. *An Interoperable Approach to Multifactor Identity Management*. Computer, Vol. 42, No. 5, pp.50-57, May 2009.

Pass, R., et.al. *On the Composition of Public-Coin Zero-Knowledge*. To appear in CRYPTO 2009.

Siegenthaler, M. and Birman, K. *Sharing Private Information Across Distributed Databases*. IEEE International Symposium on Network Computing and Applications. Boston.

### **9. Technology transfer.**

No technology was transferred during this reporting period.

## **ISTS Report**

## Overview

The Institute for Security, Technology, and Society (ISTS) is a community of researchers, students and educators working together with a common focus on technology critical for cyber security, privacy and trust. Our research, education and outreach programs contribute to the nation's security by providing knowledge discovery, science and engineering workforce development, and technology transfer. ISTS also nurtures leaders and scholars, educates students and the community, and collaborates with its partners to develop and deploy IT, and to better understand how IT relates to socio-economic forces, cultural values and political influences.

In this document, we describe the activity of the Institute focusing on those projects supported by Grant number 2006-CS-001-000001 awarded by the National Cyber Security Division (NCSA) of the Department of Homeland Security (DHS). During this period, the grant supported eight research projects. In this overview, we provide a few highlights; in the appended reports we detail the progress in each funded project. The Interoperability and Usability for PKI Management (PKI) project ended this past quarter. This project's final report is included herein.

In following our usual cycle for preparing these reports, this quarter we have asked each project lead to produce a full, detailed report to summarize their last three months of work. In our next quarterly report, we will have our project leads provide a shorter update on their efforts.

## ISTS Highlights: April – June 2009

While not all of these highlights are included in the following reports, they all have direct or indirect relevance to the NCSA-funded projects (or NCSA efforts) and/or the people involved in the projects.

### Two Dartmouth Students Named IASP Scholars

In its first year of eligibility, Dartmouth College will be the host to two Information Assurance Scholarship Program (IASP) scholars. This year Ryan Speers, Class of 2011, and Loren Sands-Ramshaw, Class of 2010, have been awarded scholarships; they were two of only 32 selected from an applicant pool of 246. ISTS manages the IASP program at Dartmouth, overseeing the application process, connecting the scholars with on-campus faculty mentors, and coordinating other administrative details. ISTS Research Director Denise Anthony acts as the program's Principal Investigator.

The scholarships fully fund the student's tuition and provide a very generous stipend. After completion of their studies the students owe back the amount of time they receive in funding (e.g., a one year scholarship requires one year of employment in a Department of Defense organization).

### ISTS Awarded "Capacity Building" Funds Through IASP Program

On a related note, in late June, ISTS was notified that it would be awarded "capacity building" funds as a result of another proposal it made to the IASP program. This award

will support two educational initiatives in cyber security at Dartmouth College. The first will provide hardware and software to bolster the Secure Information Systems Mentoring and Training (SISMAT) program. The second (proposed in collaboration with Dartmouth College's Peter Kiewit Computing Services) will similarly provide hardware and software to Dartmouth Cyber Security Initiative<sup>1</sup> (CSI) as well as funding for internships tied to the CSI's work.

### **ISTS Graduate Student Affiliate Named 2009 Google Anita Borg Scholar<sup>2</sup>**

(b)(6) a member of the Information Risk in Data-Oriented Enterprises (IRIDOE) research team, recently was awarded the Google Anita Borg Scholarship. The scholarship awards \$10,000 to women studying computer science on the basis of academic strength and demonstrated leadership. In addition to her work on IRIDOE, (b)(6) research focuses on the intersection of human organizations and secure systems. (b)(6) joined other Google scholarship recipients in June at the 2009 Google Scholars Retreat in Mountain View, California for three days of networking and professional development.

### **PKI Press Release**

The Interoperability and Usability for PKI Management (PKI) team's research was recently recognized through a press release from Dartmouth College that has generated a good deal of press in a number of other venues. Though occurring after the project's period of performance, on July 7<sup>th</sup> the Dartmouth College Public Affairs Office wrote about the team's efforts to make computer security easier to implement.

The press release, which is available through the ISTS homepage and at <http://www.dartmouth.edu/~news/releases/2009/07/07.html>, was picked up by several other sources and resulted in a follow-on interview and article on the *Smarter Technology* website<sup>3</sup>. It also has already generated interest with at least one Fortune 500 company that will be looking into the possibility of collaborating with the PKI research team.

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<sup>1</sup> "The Cyber Security Initiative is an ongoing collaboration between Peter Kiewit Computing Services and faculty, staff, and students from the Department of Computer Science, Thayer School of Engineering, and ISTS. The CSI is focused on projects aimed at improving the security of the College's information systems. By coordinating research interests with practical concerns, the initiative has resulted in a number of innovative tools and procedures currently in use on production systems." Quoted from the CSI website: <http://www.dartmouth.edu/comp/support/library/safecomputing/initiatives/education/csi.html>

<sup>2</sup> <http://www.google.com/anitaborg/>

<sup>3</sup> <http://www.smartertechnology.com/c/a/Technology-For-Change/Dartmouth-Scientists-Hard-at-Work-on-PKI-Fix/>

### Specific Project Highlights

Each report in the following sections outlines recent efforts by the project teams. The bullets below reference the papers published and submitted, and presentations given during this reporting period.

#### Foundations for Autonomic Computing (AC)

- Team members presented their results at BAE Systems, DARPA, and the University of California at Berkeley.

#### Dartmouth Internet Security Testbed (DIST)

- The “wired” project team published two reports and have one accepted that will be published during the next quarter:
  - Dave Twardowski and George Cybenko, “Process Learning of Network Interactions in Market Microstructures”, in *Proceedings of IEEE SSCI 2009* - Nashville, Tennessee, USA, March 2009.
  - N. Sandell, R. Savell, D. Twardowski, G. Cybenko, “HBML: A Representation Language for Quantitative Behavioral Modeling in the Human Terrain,” *Proceedings of SBP09*, Phoenix, AZ, March 2009.
  - Alexy Khrabrov and George Cybenko, “A Language of Life: Characterizing People from Cell Phone Tracks” to appear in *Proceedings of IEEE SocialCom '09*, Vancouver BC, August 2009.
- The “wireless” team described the architecture and experiences of DIST in a paper accepted at the USENIX’s 2<sup>nd</sup> Workshop on Cyber Security Experimentation and Test (CSET ‘09), to be delivered in August in Montreal (<http://www.usenix.org/event/cset09/>).

#### Digital Video Forensics (DVF)

- The team produced two publications during the reporting period:
  - W. Wang, “Digital Video Forensics”. *Ph.D. Dissertation*, Dartmouth College, 2009
  - W. Wang and H. Farid. “Exposing Digital Forgeries in Video by Detecting Double Quantization”. *ACM Multimedia Security Workshop*, Princeton, NJ, 2009.

#### Hardware-Based Security (HBS)

- A. Ramaswamy, *Autoscopy: Detecting Pattern-Searching Rootkits via Control Flow Tracing*. <http://www.cs.dartmouth.edu/reports/abstracts/TR2009-644/>.

#### Information Risk in Data-Oriented Enterprises (IRIDOE)

- The IRIDOE team gave two presentations of their work and published two papers.
  - Presentations:
    - Zach Zhou and Eric Johnson, “Information Risk Rating and Competition in the Business Services Market,” *INFORMS International*, Toronto, Ontario, June 14-17, 2009.



- Zach Z. Zhou and Eric Johnson, “The Impact of Information Security Ratings on Vendor Competition”. *The Third China Summer Workshop on Information Management (CSWIM 2009)*, Guangzhou, China, June 27-28, 2009.
- Papers
  - Appari, Ajit, Denise Anthony and M. Eric Johnson (2009), “HIPAA Compliance: An Examination of Institutional and Market Forces,” *Proceedings of the Eighth Workshop on the Economics of Information Security*, University College London, England, June 24-25.
  - Zhou, Zach and M. Eric Johnson (2009), “The Impact of Information Security Ratings on Vendor Competition,” *Proceedings of the Eighth Workshop on the Economics of Information Security*, University College London, England, June 24-25.

### MetroSense

- The MetroSense team had a very busy quarter attending and presenting at several conferences and publishing numerous reports.
  - Conferences Attendance/Presentations:
    - Andrew Campbell and Nic Lane attended *ACM MobiSys* in Poland in June.
    - Andrew Campbell gave a talk on the MetroSense project at UTUC
    - Andrew Campbell attended *IEEE Percomm* in March in Galveston, TX.
    - Alexy Khrabrov presented a poster at the first *AAAI Spring Symposium* on Human Behavior Modeling held in Stanford, March 26-30.
    - Alexy Khrabrov and George Cybenko presented the Language of Life work at a Machine Learning Group seminar at the University of Pennsylvania on April 30.
    - George Cybenko presented this work at the Dartmouth Computer Science Colloquium, April 2009.
    - David Twardowski presented a paper at *IEEE SSCI 2009* - Nashville, Tennessee, March 2009.
    - Nils Sandell presented a paper at *SBP09*, Phoenix, AZ, March 2009.
  - Publications:
    - Hong Lu, Wei Pan, Nicholas D. Lane, Tanzeem Choudhury, Andrew T. Campbell, “SoundSense: Scalable Sound Sensing for People-Centric Sensing Applications on Mobile Phones”, to appear in *Proc. of 7th ACM Conference on Mobile Systems, Applications, and Services (MobiSys '09)*, Krakov, Poland, June 22-25, 2009.
    - Alexy Khrabrov and George Cybenko, “A Language of Life: Characterizing People from Cell Phone Tracks” to appear in

*Proceedings of IEEE SocialCom '09*, Vancouver BC, August 2009.

- Dave Twardowski and George Cybenko, “Process Learning of Network Interactions in Market Microstructures”, in *Proceedings of IEEE SSCI 2009* - Nashville, Tennessee, USA, March 2009.
- N. Sandell, R. Savell, D. Twardowski, G. Cybenko, “HBML: A Representation Language for Quantitative Behavioral Modeling in the Human Terrain,” *Proceedings of SBP09*, Phoenix, AZ, March 2009.

#### Interoperability and Usability for PKI Management (PKI)

- The PKI team is submitting its final report this quarter. Papers either published this quarter, or accepted for publication include:
  - Massimiliano Pala, Scott Rea, Shreyas Cholia and Sean Smith, “Interoperable PKI Data Distribution in Computational Grids”, *International Journal of Grid and High Performance Computing (IJGHPC)*, IGI Publishing, Volume 1, Issue 2, 2009.
  - Massimiliano Pala and Scott Rea, “Usable Trust Anchor Management”, Accepted for publication (in January) at 8th Symposium on Identity and Trust on the Internet (IDtrust 2009), Apr 14-16, 2009, NIST, Gaithersburg, MD.
  - Yifei Wang and Massimiliano Pala, “On The Usability of Browsers Interfaces”, 6th European PKI Workshop: Theory and Practice, EuroPKI 2009 (Accepted for publication)
  - Gabe Weaver, Scott Rea and Sean Smith, “A Computational Framework for Certificate Policy Operations,” 6th European PKI Workshop: Theory and Practice, EuroPKI 2009 (Accepted for publication)
- In addition, Scott Rea will lead a break-out session on PKI, HEBCA and the Four Bridges Forum at our *Securing the eCampus* conference in July.

#### Secure Information Systems Mentoring and Training (SISMAT)

- The SISMAT team completed the two-week intensive course portion of the program and have placed their students in internships that are ongoing and will conclude sometime in mid-August.
- At the Colloquium for Information Systems Security Education (CISSE) 2009 in Seattle this June, SISMAT project leaders Michael Locasto and Sergey Bratus organized and led a panel on “Hacker Curriculum” and its uses in teaching. Their goal was to facilitate the “meeting of minds” between the educator community and the ethical hacker community, to provide the former with perspectives on the methods of the latter, and let representatives of the latter address the former.

## **Communication and Outreach Efforts**

In addition to our newsletter<sup>4</sup>, distributed to over 1,000 people, we regularly provide updates via email to our many mailing lists. Our website details upcoming programs, recent publications, news items, and a great deal more.

Beyond print and media, our staff and affiliates have personal communication with corporate research leaders and with program managers at government agencies. Associate Director Tom Candon traveled to Seattle, Washington in early June to attend the Colloquium for Information Systems Security Education (CISSE). Research Director Anthony is planning to travel to California in July to attend a conference sponsored by the Army Research Office.

As part of our on-campus outreach efforts we host a speaker series. This spring we presented a full schedule. On April 29<sup>th</sup>, Timothy Thomas, LTC (Ret.) from the Foreign Military Studies Office gave a presentation on Chinese information warfare.<sup>5</sup> On May 4<sup>th</sup>, Professor Jonathan Zittrain of Harvard Law and Co-Founder of the Berkman Center for Internet & Society gave a very well received talk on “Civic Technologies and the Future of the Internet”.<sup>6</sup>

This spring we also continued our “Brown Bag” Discussion Series with attorney Billie Audia presenting a discussion on managing risk associated with open source software in early April.<sup>7</sup> We also kicked off a *Technology & You* series with a panel discussion on Facebook and how different members of our campus community utilize it.<sup>8</sup>

The Institute, our faculty, and postdoctoral affiliates also continued to receive a great deal of attention in the press. For links to stories on our faculty, staff and students<sup>9</sup> and for a complete listing of ISTS publications, please see our website.<sup>10</sup>

## **Conferences, Courses, and Scholarships**

The following efforts have been mentioned in previous updates and are still in the planning phase. An update on the *Securing the eCampus 2009* conference will be provided in the next quarterly report, along with a link to available presentations and other materials.

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<sup>4</sup> Our most recent newsletter was published during the last quarter and is available at: <http://www.ists.dartmouth.edu/docs/WinterSpringNewsletter2009.pdf>.

<sup>5</sup> See <http://www.ists.dartmouth.edu/events/abstract-TimThomas.html> for a bio, talk abstract, and Mr. Thomas's slides from the discussion. For coverage by the campus newspaper, please see <http://thedartmouth.com/2009/04/30/news/cyberwarfare/>

<sup>6</sup> See <http://www.ists.dartmouth.edu/events/abstract-zittrain.html> for a bio, talk abstract, slides and a video of Professor Zittrain's lecture and an abstract of the discussion. For an article in the campus newspaper on the talk, please see <http://thedartmouth.com/2009/05/05/news/civictech>

<sup>7</sup> For more information please see <http://www.ists.dartmouth.edu/events/BillieAudia.html>

<sup>8</sup> For more information, please see <http://www.ists.dartmouth.edu/events/specialevents2009.html>. The panel discussion was covered by the campus newspaper. The article is located at <http://thedartmouth.com/2009/05/20/news/facebook/>

<sup>9</sup> See a listing of ISTS press online at <http://www.ists.dartmouth.edu/news/index.html>

<sup>10</sup> ISTS papers: <http://info.ists.dartmouth.edu/library/>

### Securing the eCampus 2009

We are in the process of planning our Third Annual *Securing the eCampus* Conference. The *eCampus* conference is focused on information security on college campuses and the unique challenges higher education administrators face. The agenda is geared toward academic CIOs, CISOs, and other campus IT leaders. This year the conference will be held July 27-28 on the Dartmouth campus. Government and government-related presentations will include NCSA's Brenda Oldfield presenting on "Government-related Activities in Education and Workforce Training for Information Security", Rodney Petersen of the EDUCAUSE Computer and Network Security Task Force who will provide and update on "Legal and Regulatory Developments for Security and Privacy" and Scott McGaunn an FBI agent on Boston's Computer Crime Squad discussing "Hacker Motivations". Full information on the conference is available at: <http://www.dartmouth.edu/comp/about/conferences/security/>.

### Business Engagement for the Information Security Professional (BESP)

The Center for Digital Strategies at the Tuck School of Business will be following up on the highly successful course, "Business Essentials for the Information Security Professional", they presented with large support from NCSA last year. This year they will be offering BESP (with a slight change in name) with all funding through tuition, but focused on the same challenge of enhancing the leadership, financial, and communication skills of IT leaders. The course is being offered November 9-12, 2009. More information is available at:

[http://www.tuck.dartmouth.edu/exec/targeted\\_audiences/besp.html](http://www.tuck.dartmouth.edu/exec/targeted_audiences/besp.html)

ISTS will continue to advance its efforts in information security and continue its mission through research, education and outreach.

## ISTS Affiliated Faculty, Fellows, and Postdoctoral Researchers

| ISTS Faculty Affiliates                                                                                                                                                                    |                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Director, Institute for Security, Technology, and Society; Associate Professor of Sociology and Chair of Sociology; Adjunct Associate Professor of Community and Family Medicine. | Adjunct Associate Professor of Business Administration; Executive Director, Center for Digital Strategies, Tuck School of Business. |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Associate Professor of Computer Science.                                                                                                                                                   | Assistant Professor of Computer Science, University of Massachusetts Lowell.                                                        |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Assistant Professor of Computer Science.                                                                                                                                                   | Dorothy and Walter Gramm Professor of Engineering, Thayer School of Engineering; Adjunct Professor of Computer Science.             |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| David J. McLaughlin Distinguished Professor of Computer Science and Associate Chair of Computer Science.                                                                                   | Adjunct Professor of Computer Science.                                                                                              |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Assistant Professor of Computer Science.                                                                                                                                          | Professor of Operations Management; Director, Glassmeyer/McNamee Center for Digital Strategies, Tuck School of Business.            |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Professor of Computer Science; Director of Center for Mobile Computing.                                                                                                                    | Professor and Department Chair, Computer Science and Engineering (CSE), University of Texas at Arlington                            |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Adjunct Professor of Computer Science.                                                                                                                                                     | Assistant Professor of Engineering, Thayer School of Engineering.                                                                   |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Assistant Professor of Computer Science.                                                                                                                                                   | Professor of Engineering, Thayer School of Engineering.                                                                             |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Associate Professor of Computer Science.                                                                                                                                                   | Professor of Engineering, Thayer School of Engineering.                                                                             |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Associate Professor, Computer Science.                                                                                                                                            |                                                                                                                                     |
| ISTS Fellows and Postdocs                                                                                                                                                                  |                                                                                                                                     |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Strategies, Tuck School of Business.                                                                                                                                                       | school of Engineering.                                                                                                              |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Assistant Professor of Computer Science.                                                                                                                                          | Senior Research Fellow, Glassmeyer/McNamee Center for Digital Strategies, Tuck School of Business.                                  |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| ISTS Research Fellow, Computer Science                                                                                                                                                     | Research Assistant Professor of Computer Science.                                                                                   |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| ISTS Research Fellow, Computer Science                                                                                                                                                     | Research Fellow, Glassmeyer/McNamee Center for Digital Strategies, Tuck School of Business.                                         |

**Laboratory for Hardware-Based Security (HBS)**

### 1. Project title and leads.

Project title: Laboratory for Hardware-Based Security (HBS)

Project lead: (b)(6), Computer Science Department

### 2. Description.

As the title suggests, the goal of this project is to establish a laboratory. Rather than piecemeal exploration via paper designs and occasional hardware, we want to establish a foundation to systematically explore the security implications of this next wave of architecture. This work will broach several fronts: vulnerabilities in current trusted computing architectures; designs and prototypes to fix these vulnerabilities; designs and prototypes of new architectures; and prototypes of applications of current and new architectures – including exploring how (in the spirit of minimizing the TCB) the requirements for “trusted” hardware in distributed security applications can be minimized.

The purpose of this project is to stand up the lab, and use this as a catalyst, leveraging external funding for student support where possible.

### 3. Personnel.

Working on this project within the reporting period:

- (b)(6) h scientist
- (b)(6) e student
- (b)(6) graduate student
- (b)(6) graduate student
- (b)(6)

(Note, however, that not all of these researchers receive funding from the project. Many split time between others, where they are exposed to research problems, and this, where they apply hardware expertise to these problems.)

### 4. Subcontractors.

None during the reporting period.

### 5. Relationships with academia, industry, or government.

(b)(6) George Mason University

## 6. Activities and progress.

### a. Recent activities and progress.

(b)(6) finished his MS thesis and graduated.

(b)(6) is almost finished with the Faerieplay FPGA prototype, and is preparing to teach the undergraduate architecture class in Summer 2009.

(b)(6) drafted a chapter on “Hardware Security Modules” for the forthcoming *Handbook of Financial Cryptography*, and was also invited to be an Associate Editor (covering hardware security, among other things) for Springer’s *Encyclopedia of Cryptography and Security*.

(b)(6) explored further improvements to our YASIR hardware-accelerated crypto for SCADA.

In the previous reporting period, we published several papers outlining our vision of “a better mousetrap”, an extended system of hardware-supported memory traps and logic to process these traps. Our design was informed by a growing instrumentation trend in operating systems, exemplified by DTrace, Pin, Kprobes/SystemTap, and other similar projects.

Such radical hardware changes, however desirable, are far in the future. In order to make them happen, we must demonstrate that user-level and OS-level programming primitives to be enabled by them are indeed accessible to the majority of programmers, usable and effective.

For this reason, we concentrated on several more limited and tractable designs implementing aspects of the “better mousetrap” but within the possibility of efficient emulation on existing x86 platforms.

1. “VertIso” is a design that extends the familiar x86 (first) segmentation step of memory translation. In particular, x86 segmentation underlies the four privilege rings that form the basis of OS kernel – user level hardware-supported separation on the x86 platform.

We proposed a simple extension of this segmentation mechanism, which we call “vertical segments” (as opposed to the fully ordered, “horizontal” use of segments to create the partitioning into the four rings). Vertical segments will not necessarily impose a complete ordering, but rather support isolation between related groups of code and data segments that form separate contexts (e.g., belong to different security contexts of Linux Vservers or similar).



Vertical segmentation supported by the kernel executable loader will be very efficient at ensuring that data that is only expected to be accessed by certain code, executing under certain conditions, will in fact be accessible only by this code – even when both are located in the user space.

2. “Data access lattice” is a design to emulate a lattice-based access control logic and process behavior checks with the existing x86 segmentation. Trustworthiness – critical data that has specific access expectations (such as key material, module linkage tables, etc. – in other words, user-level data structures that cannot be easily moved into the kernel to protect their integrity, for lack of appropriate kernel APIs, and are nevertheless clearly more important from the developer point of view than the rest of user-level data) is placed in “ring 2”, accesses to it cause segmentation traps and get processed by the handler supplying the lattice-checking logic. To ensure efficiency, code segments allowed to access the special data structures without trapping are created on the fly.

This design, currently under development, will enable secure programming protection primitives for critical user-level data, which have been conspicuously absent from the programmer’s toolbox on commodity platforms (as opposed to e.g., tagged architectures).

**b. Where we stand.**

We are on track.

**c. Plans.**

We plan to continue investigating the VertIso and Data Access Lattice approaches above.

(b)(6) is developing thesis research plans based on our “hardware-based privacy” ideas (basically, incorporating “tiny trusted third parties” into CPUs) and on exploring moving hypervisor functionality into hardware (thus reducing the TCB and simplifying necessary interfaces.)

**d. Obstacles.**

Over the course of the project, probably the biggest obstacle has been the difficulty of doing long-term work with short-term students (e.g., seniors and MS students, and new PhD students).

**7. Meetings attended.**

(b)(6) gave the keynote at *TRUST2009* in Oxford.

**8. Publications.**

Technical report:

A. Ramaswamy, *Autoscopy: Detecting Pattern-Searching Rootkits via Control Flow Tracing*. <http://www.cs.dartmouth.edu/reports/abstracts/TR2009-644/>.

**9. Technology transfer.**

N/A.

## **Digital Video Forensics (DVF)**

### 1. Project title and leads.

Project title: Digital Video Forensics (DVF)

Project lead: (b)(6) Computer Science Department

### 2. Description.

Our goal is the development of computational techniques for detecting traces of tampering in digital video, and computational techniques for camera ballistics. These techniques work in the absence of digital watermarks or signatures.

### 3. Personnel.

- (b)(6)
- (b)(6) (student)
- (b)(6) (emer)

### 4. Subcontractors.

None.

### 5. Relationships with academia, industry, or government.

We receive funding in the form of unrestricted gifts from Adobe and Microsoft. We are collaborating with the National Center for Missing and Exploited Children.

### 6. Activities and progress.

#### a. Recent activities and progress.

We completed a new video forensic tool for detecting blue-screening in video. This technique works by quantifying, modeling, and measuring statistical artifacts that are introduced by double quantization that itself is the result of combining two videos of different qualities. We also have been working to extend this technique to be applicable to single JPEG images. Much of our efforts these past few months have gone to putting the final touches on Weihong Wang's dissertation (Weihong is the primary graduate student who developed all of the video forensic tools.).

#### b. Where we stand.

We are on target to meeting our stated project goals and objectives.

#### c. Plans.

We plan to extend the technique for detecting double quantization in video to single JPEG images. We also are developing new algorithms for analyzing audio tracks associated with video. The first technique which we are developing explicitly models the reverberation in an audio signal which depends on the geometry of the room in which the

audio/video was recorded. Differences in reverberation across an audio track can be used to detect tampering, and the amount of reverberation can be used to determine if the recorded audio is consistent with the video.

**d. Obstacles.**

No major obstacles.

**7. Meetings attended.**

None.

**8. Publications.**

W. Wang. "Digital Video Forensics". *Ph.D. Dissertation*, Dartmouth College, 2009

W. Wang and H. Farid. "Exposing Digital Forgeries in Video by Detecting Double Quantization". *ACM Multimedia Security Workshop*, Princeton, NJ, 2009.

**9. Technology transfer.**

We plan to incorporate our video forensic tools into our image forensic software that has already been delivered to the FBI's digital forensic laboratory.

## **Foundations for Practical Autonomic Computing (AC)**

### 1. Project title and leads.

Project title: Foundations for Practical Autonomic Computing (AC)

Project lead: (b)(6) (Thayer School of Engineering)

Investigators: (b)(6) (Thayer School of Engineering)

### 2. Description.

Autonomic systems research is offering a seductive vision. Systems that can automatically diagnose, repair, defend and improve themselves would revolutionize information technology as we now know it. Current estimates of network maintenance costs, software complexity, and labor force trends paint a grim picture of the future for networked computer systems in terms of functionality, security and affordability. New directions and approaches are needed.

This project is investigating technical, and to a lesser extent the economic, business and social, aspects of autonomic computing systems from the point of view of security and robustness. We first focus on critical government and business systems that are typically more managed and better defined in terms of functionality. Later in this project, we investigate the possible impact that our findings can have on consumer technologies that “real people” are more likely to use. Consumer autonomic systems are in some ways more challenging because of their dynamic nature and the lower degree of management found in consumer information processing systems.

### 3. Personnel.

- Faculty: (b)(6) Engineering
- Staff: (b)(6) Thayer School of Engineering
- Student: (b)(6) Working for Process Query Systems, LLC, Lebanon, NH

### 4. Subcontractors.

None.

### 5. Relationships with academia, industry, or government.

We have continued to collaborate with the Air Force Research Laboratory, Wright Patterson AFB, Dayton, OH, California State University at Los Angeles, University of California at Berkeley, BAE Systems, and DARPA.

## 6. Activities and progress.

### a. Recent activities and progress.

One advancement was the development of a Markovian algorithm for system modeling. The most efficient implementation is derived from hardware branch predictors, which are capable of quickly learning common behavioral patterns in practically any metric available in an operating system. The technique is straightforward in its basic concept; by recording a short history of one metric, we select a ‘predictor’ of future behavior for that same metric, which we then train over time. This is a continuous process, and does not require bootstrapping, or a cumbersome training period.

We implemented this algorithm, and developed a new sensor (based on the publicly available CIGAR framework). This was necessary, as our results at a host-level were disappointing, forcing us to abandon our Gkrellm-based host-level sensor. During recent months, we have been able to implement our algorithm and sensing infrastructure to compare application performance, which shows much more promising results.

Our research plan for this year called for five distinct research objectives, summarized as follows:

- We plan to quantify program stability as the number of unique predictor changes per hour. This can then be compared to other hosts running the same application, finding deviant processes, or possibly processes operating under a different name, trying to hide their true, malicious identity.
- Run this experiment in a clean testbed environment, such that performance benchmarks may be set. The importance here is on measuring the accuracy of our predictions, rather than predicting them from first principals.
- Run this experiment on all private users’ computers in our group.
- Perform system maintenance tasks, such as updating software.
- Publish our results.

We have completed the monitoring infrastructure and sensors (task 4), and implemented the first several experiments on a limited number of systems (task 1).

A major obstacle the team faced was the realization that our performance metrics must be more comprehensive than on the system-level alone. We therefore have shifted some of our focus to application behavior.

In accordance with our objectives stated in the previous report, we performed experiments to test the performance of our algorithm. We worked on compiling the results from our experiments. For completed experiments, we saw promising results in characterizing different activities on a host using our metric (see appendix).

During the course of our experiments, we uncovered a few inconsistencies in how our algorithm ran on batch/collected data. We had to rewrite portions of the code originally written for a live environment to accommodate batch data.



We had to postpone a few experiments while waiting for backordered UPS.

Below are some results plots from experiments to determine how our algorithm scores different host activities. Activities we explored included web browsing, playing video games, word processing and watching movies.

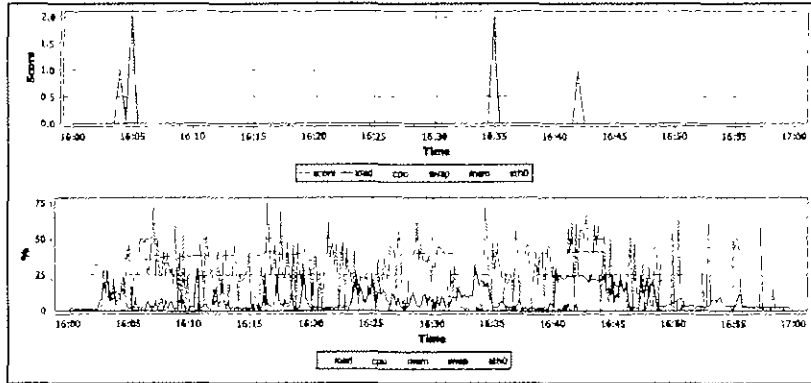


Figure 1. System stability score while web browsing (~6.0 per hour)

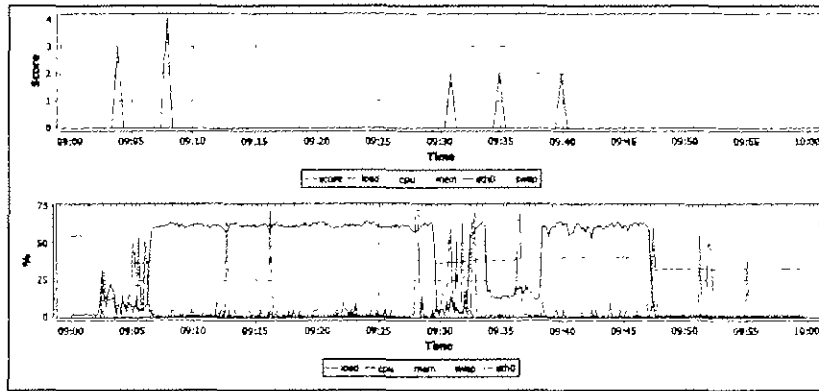


Figure 2. System stability score while watching a movie (~13.0 per hour)

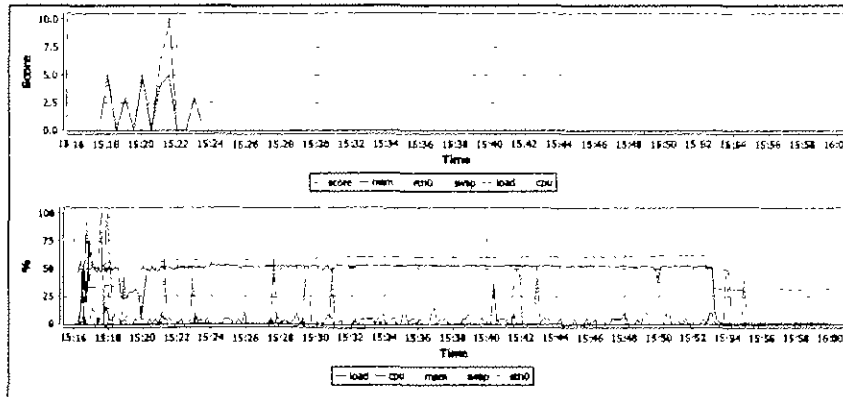


Figure 3. System stability score while playing video game (~29.0 per hour)

**b. Where we stand.**

The project is on schedule.

**c. Plans.**

We plan to finish up our experiments and the planned publication of methodology and results.

We intend to also investigate the effects of changing:

- a. the history length
- b. the number of discrete tokens

used in our predictors to determine if an optimal history length and/or number of discrete tokens exist for our given environment.

**d. Obstacles.**

None.

**7. Meetings attended.**

Our autonomic monitoring ideas were presented as part of poster session at the *Association for the Advancement of Artificial Intelligence (AAAI '09) Spring Symposium*, March 23-25, 2009 at Stanford University.

Results were presented at BAE Systems, DARPA, Dartmouth College Computer Science Department and the University of California at Berkeley.

**8. Publications.**

None to report at this time, but one is in preparation.

**9. Technology transfer.**

None at this time.

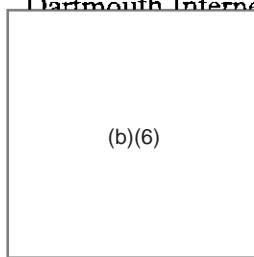
## **Dartmouth Internet Security Testbed (DIST)**

## 1. Project title and leads.

Project title:

Dartmouth Internet Security Testbed (DIST).

Project leads (Wireless):



sentia, on Fulbright Scholarship in India;  
puter Science Department; Sergey Bratus,  
Department  
niversity of Massachusetts Lowell

Project lead (Wired):

Thayer School of Engineering

## 2. Description.

Since the inception of the Institute for Security, Technology, and Society, its researchers have recognized the need for real world, large-scale network security data. This has, over the years, driven the development of various testbeds and network simulation environments. Although all of these technologies were valuable in their own right, their general applicability and usefulness outside of their immediate development context has been limited. This project develops the idea that Dartmouth possesses one of the most versatile and multi-faceted sources of network and computer security data in the world so that developing the Dartmouth computing infrastructure as a testbed serves multiple purposes including:

- access to complex, dynamic real world security for the evaluation of advanced security technologies;
- building a unique, exemplary security capability at Dartmouth which can serve as a model for other universities;
- improving the overall computing security posture of Dartmouth, thereby benefiting all of he Dartmouth community;
- addressing the privacy and confidentiality issues that will arise in a highly heterogeneous, decentralized computing environment that strives to improve its security.

The DIST project consists of two components, **wired** and **wireless**, as indicated above. Their progress is described separately, because the DIST wired component has been repurposed to address non-Dartmouth publicly available datasets, while the DIST wireless effort continues working with Dartmouth's wireless network data.

In particular, the wireless component of DIST is operated in cooperation with **Peter Kiewit Computing Services (PKCS)**, Dartmouth's central IT organization. It concerns itself with studying campus network usage patterns and with developing systems for automatically detecting malicious attempts to disrupt or degrade the network. DIST will operate wireless network monitors located throughout the campus and provide operational data to PKCS and, after suitable anonymization to ensure user privacy, to ISTS researchers.

### 3. Personnel.

#### *DIST Wireless*

- [redacted] (absentia, on Fulbright Scholarship in India)
- [redacted] faculty
- [redacted] faculty
- [redacted] post-doctoral fellow
- (b)(6) [redacted] Candidate (currently on internship at Los Alamos)
- [redacted] staff
- [redacted] staff
- [redacted], visiting faculty (U. of Western Australia, Australia)
- [redacted], undergraduate student at the University of Colorado (formerly summer 2008 intern, continued to work on GUI tools; under supervision of Sergey Bratus)
- Ron Peterson, staff

#### *DIST Wired<sup>11</sup>*

- [redacted]
- [redacted]
- [redacted] staff
- [redacted]
- (b)(6) [redacted] graduate student
- [redacted] student
- [redacted] staff
- [redacted] student

### 4. Subcontractors.

[redacted] University of Massachusetts Lowell. Dr. Chen's subcontract on the DIST project ended March 31, 2009.

### 5. Relationships with academia, industry, or government.

#### *DIST Wireless*

We have an informal but strong relationship with Aruba Networks regarding the wireless portion of this project. Recently, data collected from DIST was used on a project sponsored by the Army Research Labs on an STTR award for developing network monitoring sensors.

<sup>11</sup> Though not all of those listed have charged to the project during this past quarter, their research in other areas have contributed to this effort as well.

### *DIST Wired*

We are having discussions with Computer Associates (CA), Cisco, Raytheon and other companies about the wired portions of this work. We have ongoing discussions with the Air Force Research Labs (AFRL), Air Force Office of Scientific Research (AFOSR), DARPA, and other government agencies about the goals of this work.

Since Q3-08 we have been working hard to obtain a large variety of data sources for the DIST project. Due to the sensitive nature of network traffic captures we have obtained two sources of data that are fully anonymous, and fit the research of the DIST objectives very well. Several years ago we performed on a DOD sponsored network security research project that focused on advanced intrusion detection by stepping stones and other inconspicuous techniques. For this project many gigabytes of network traffic was generated and captured. We have secured permission to use these datasets for our current research (although not publish the actual traffic data), and have since then obtained a new copy of the data (it was originally destroyed after completion of this research project, in accordance with customer guidelines.) These datasets are very rich in user behavioral data.

- MIT Lincoln Labs – We have installed and deployed the Lariat traffic generator system.
- AFRL – We are currently studying a full network traffic capture obtained by AFRL in a fully monitored sub-network.

Since the nature of our research focus has shifted significantly to behavioral analysis of hosts, it has become increasingly important to measure realistic base-line behavior profiles. The testbed that we are currently constructing lends itself ultimately very well to this. Observing systems in a clean and controlled environment allows us to compare real-world active hosts with pristine ones, giving us a much better idea of how well our behavior signatures differentiate between them.

## **6. Activities and progress.**

### *DIST Wireless*

#### **a. Recent activities and progress.**

We have achieved deployment of over 50% of planned Air Monitors, and expect the remaining part to be deployed on schedule, by the end of July 2009. At this time, we have achieved planned deployment in 8 of 11 buildings. As of this writing, 119 AMs are installed, configured, and reporting.

(b)(6) integrated updated anonymization code provided by (b)(6) to archive more efficient anonymization (b)(6) (b)(6) reviewed these updates to ensure that they conform to the DIST security guidelines as documented in the DIST Security Guide.

(b)(6) worked to update the software on previously deployed AMs and bring them online (which included complete re-flashing the firmware on the AMs in the Collis Student Center).

Data collected by DIST AMs was used in anomaly detection experiments to test streaming entropy estimation detection features. These experiments are described in the Dartmouth Technical Report TR2009-653, to be released shortly.

(b)(6) added a number of data analysis features to the DIST GUI, following planning meetings with PKCS personnel.

We described the architecture and experiences of DIST in a paper accepted at the USENIX's 2<sup>nd</sup> Workshop on Cyber Security Experimentation and Test (CSET '09), to be delivered in August in Montreal (<http://www.usenix.org/event/cset09/>).

(b)(6) continued tuning the performance of the encryption and transmission AM components; his progress is described in the CSET paper (b)(6) revised configuration scripts for consistency with (b)(6) new, more robust sniffer initialization procedure.

We restructured and added to deployment documentation (moving information from CVS to SVN, with appropriate revisions, and updating scripts for AM configuration, etc.)

#### **b. Where we stand.**

Deployment of DIST proceeds according to the schedule in the updated Statement of Work, and is expected to reach completion by the end of July 2009.

#### **c. Plans.**

Planned DIST activities include:

- data collection for (b)(6) doctoral thesis on aspects of data anonymization in research corpora
- data collection to understand usage patterns of the WPA-2 Enterprise “Dartmouth Secure” and the open “Dartmouth Public” networks, and the reasons for apparent authentication failures in “Dartmouth Secure”
- data collection to estimate the locality and sparseness of 802.11 sessions and the relative information content of simple L2 statistics for identifying frequent users.

#### **d. Obstacles.**

Currently, we are facing two challenges:

- The deployed fleet of Air Monitors requires observation and management. Some AMs occasionally go offline and need to be examined and sometimes re-flashed. We are looking into automating management of the AMs and have some tasks already scripted.
- As the Dartmouth production network -- on which the AMs depend for connectivity -- continues to evolve to match the needs of the College, its subnet

configurations change. Although we work closely with its administrators, the Peter Kiewit Computing Services (PKCS), sometimes network changes affect installed AMs without warning, making their static network configurations (such as gateway and subnet mask) invalid for their new environment. We are exploring a “recovery” mode for AMs that would activate when an AM finds itself in a changed network environment.

### ***DIST Wired***

#### **a. Recent activities and progress.**

Previously (Q1-09), we outlined four steps for this year’s research plan:

1. Define a comprehensive network profile signature, including any useful metrics.
2. Obtain more realistic data sources for testing.
3. Develop a robust methodology for comparing network profile signatures.
4. Collect the results and publish.

Task 3 has been the major focus of our work this quarter. We have created an infrastructure for data collection and for automated profile signature generation. The automated profiles are generated through a set of programs that operate with data from the sources obtained for task 2 to update baseline profiles on a weekly basis, and to create and store snapshot profiles once per hour. Profile signatures have been created using multiple metrics previously identified as being of interest, in this case unique destinations and unique ports, ranked by number of connections. As noted earlier, the components of a profile signature will ultimately depend on the detecting and profiling task. We are continuing to evaluate individual metrics for usefulness as we proceed, and expect our work on task 3 to contribute to determining which metrics are most useful for comprehensive network profile signatures.

Several methods have been explored for comparing profile signatures, including statistical methods that treat the profile as a probability distributions, and heuristic methods that score a pair of profiles according to an element-by-element comparison and relative ranking of shared elements. Network profile comparison will continue to be the main focus of work going into the next quarter.

We have additionally included in our monitored testbed several machines in active use by researchers on this project, representing further progress on task 2. Using the network data collected, and matched with sensors installed on those machines, we have developed a system for producing automated profiles of user behavior.

Since the nature of our work puts the focus on behavior analysis of hosts in a computer network, we have been able to diversify the actual research objectives, enabling us to work on a variety of different problem sets, while applying the same underlying theory to all problems.

- The CRAWDAD work. This data is a collection of sanitized MAC addresses accessing IEEE 802.11b wireless access points throughout the Dartmouth campus



over a period of 4 years. Most interestingly, the data includes the roaming steps, meaning, a user disassociating from one access point, and associating with the next. This allowed us to form traces of user motion (even though the access points do not necessarily have to be spatially close together – for instance, a user might close their laptop, walk to the next class on campus, and open it up to continue on the network), which turn out to be good signatures for at least 50% of the users, for periods of three months or more. Care must be taken not to account for occasional users, like visitors, which can significantly skew the results.

- Our recent work on host behavioral profiling has focused on defining the most effective metrics for capturing host network signatures, and the relationship between these metrics. For instance, we have learned that not only the relative frequency of protocol use is a nice indicator of a host's unique behavior, but also destinations, volumes, and time of day. We have had some difficulty defining how this relationship should be structured, as we have too many metrics right now to include them all in the same profile (a dimensional reduction must be performed first).

**b. Where we stand.**

This quarter, a student working with this project, (b)(6) successfully defended his MS thesis, “Network Characterization for Botnet Detection Using Statistical-Behavioral Methods” using network data collected from this testbed. Related to this work, Alex used network traffic to produce a baseline profile for individual hosts in the testbed. These baseline profiles were then compared against short-time snapshot profiles generated at intervals afterward for the purposes of detecting and measuring change over time. He selected one network metric, the proportion of traffic sent to the server, to that sent to the client, and his profiles treated this metric as a probability distribution. He then compared profiles using Kullback-Liebler (K-L) divergence, a metric indicating the degree to which a pair of probability distributions differ. When this metric crossed a selected threshold, the host was considered to have exhibited a significant degree of change, and was flagged. He found that keeping a moving average of the K-L distance from the snapshots to the baseline could be treated as a baseline variance.

**c. Plans.**

Our plans for future quarters follow:

1. Define the relationships between different parts of a signature, which includes, for each host: protocols used, traffic destinations, traffic volumes, and time-of-day/time-of-week usage. Theoretically, this is a very high-dimensional space, which must be projected onto a more manageable plane, such that signatures can more quickly be generated and compared.
2. Obtain more realistic data sources for testing and learning host behavioral signatures. At this point we are limited to the ARDA/SKAION data, which is

synthetically generated, and our small-scale testbed, which will be very clean, and might not be a good indicator of expected real-world behavior. In our group there are only a small number of people that use fixed network hosts, that have agreed to be monitored, anonymously, which is complicating this work. Therefore, in the next quarter we aim to improve the datasets that we have access to, such that we may obtain more meaningful results.

3. A method for comparing host behavioral signatures will be the majority of the research focus for the next quarter. Before we can determine what we would consider a “benign”, versus a “malicious” behavior pattern, we must first be certain that we are able to compare these signatures in a meaningful and repeatable manner. Directly related to this is the research question regarding changes in signatures, meaning how much may a host’s behavior change before it ought to raise a red flag. Extended access to network data will certainly help our researchers obtain better insight into these two, much related research questions.
4. Collect and categorize signatures, and publish the results.

**d. Obstacles.**

The major stumbling block has been the access to realistic and useful network data. The privacy concerns, which are very understandable, have been a barrier to obtaining good workable datasets.

**7. Meetings attended.**

None during this quarter.

**8. Publications.**

***DIST Wireless***

No Dartmouth publications this period, one accepted at *CSET 2009* and will be described in the next quarterly report.

***DIST Wired***

Dave Twardowski and George Cybenko, “Process Learning of Network Interactions in Market Microstructures”, in *Proceedings of IEEE SSCI 2009* - Nashville, Tennessee, USA, March 2009.

N. Sandell, R. Savell, D. Twardowski, G. Cybenko, “HBML: A Representation Language for Quantitative Behavioral Modeling in the Human Terrain,” *Proceedings of SBP09*, Phoenix, AZ, March 2009.

Alexy Khrabrov and George Cybenko, “A Language of Life: Characterizing People from Cell Phone Tracks” to appear in *Proceedings of IEEE SocialCom '09*, Vancouver BC, to appear in August 2009.

#### **9. Technology transfer.**

We have been in contact with PKCS about hand-off of the AM’s monitoring capabilities for debugging network authentication and locating missing laptops by MAC addresses. Several features have been added to the GUI to support such activities.

**Interoperability and Usability for PKI Management (PKI)--  
FINAL**

### 1. Project title and leads.

Project title: Interoperability and Usability for PKI Management

Project lead: [redacted] Computer Science Department

Project Investigators: [redacted] (b)(6) ISTS Postdoctoral Fellow and [redacted] (b)(6) Computing Services

### 2. Description.

In this project we focused on three different but related topics: making PKI technology usable, integrating it with the rest of enterprise infrastructure, and making it interoperate with other public key infrastructures external to the enterprise. On the development side, we designed, implemented, and released *LibPKI*, an easy-to-use high-level open-source PKI library and API specification. The purpose of this library is to provide an easy-to-use tool to ease the development of PKI enabled applications.

We also focused on developing and prototyping the *PKI Resource Query Protocol (PRQP)* and promoting it in the real world via an RFC. The new PRQP protocol addresses the unavailability of PKI resource locators (such as certificate repository URLs) by providing an efficient and easy method for a client to request the needed data.

On the outreach portion of the project, we developed and promoted this technology within the communities whose applications require them, and provided educational and support forums for the engineers integrating them.

### 3. Personnel.

During the whole project, the following people participated in the project's activities:

- [redacted] (Staff)
- [redacted]
- [redacted] (student)
- [redacted] (undergraduate)
- [redacted] (undergraduate)
- [redacted] (graduate)
- [redacted] (graduate)
- [redacted] (student)

### 4. Subcontractors.

There were no subcontractors on this project.

## 5. Relationships with academia, industry, or government.

The outreach portion of this project provided support and educational services, particularly to academia, to promote the use and integration of PKI-based services. As such, there were a number of forums and conferences across multiple communities of interest that the researchers participated in to raise the awareness of the benefits of using this technology and particularly the outputs from the research and development portions of this project.

This project also leveraged the collaboration between Dartmouth College and OpenCA Labs to integrate the results of this project into OpenCA's PKI framework. In particular the developed ideas and PKI library will serve as the basis for the new OpenCA-NG PKI software that will be released by OpenCA.

The OpenCA community counts thousands of users and many deployed Certification Authorities from different environments (commercial, academic, government, etc.) use the OpenCA PKI packages. The integration of the results in the next generation PKI from OpenCA will provide a wide adoption of the research, development results of this project.

## 6. Activities and progress.

### a. Recent activities and progress.

This success of this project and its rich outcomes are the result of the combination of the three different parts of this project: development, research and outreach. All of the sub-projects have been important and the results coming from each of them have helped the other sub-projects by providing valuable feedback.

We hereby provide a comprehensive description of the activities (in chronological order) that have been carried out throughout the whole project. We present each sub-project separately.

### *Development*

One of the first activities we accomplished is the evaluation of the development environment to be used. This activity is of critical importance as this impacted on the portability on different Operating Systems of the development and research activities of this project. In order to provide the availability of the results of this project to a large number of different operating systems, we established a development environment that makes use of the following tools and configuration, and the building of a base package that will provide the support for all the next releases of the package:

- *Automake* and *Autoconf*. We wrote configuration scripts that enable automatic software building configuration, in particular currently tested platforms are Solaris 9, Solaris 10, OpenSolaris, Linux, and FreeBSD
- *CVS*. For software development we choose to use a CVS repository on our servers. This enables multiple developers to work at the same time on the project.

- **Binary Packages Tools.** We have developed a series of scripts to enable automatic binary package building on different platforms. In particular available scripts enable the building of binary distributable packages for Linux (RPM format) and Solaris (PKG format).

Because the project sought to leverage the Open Source community behind the OpenCA project, we decided to release work-in-progress code to attract interest in the project development and, therefore, attract users and contributors. We set up a web environment where news and code about both LibPKI and PRQP were posted for the public.

The collaboration with the OpenCA Labs provided us with the possibility of using a generic binary installer provided by BitRock for every OpenCA's released software for free.

After setting up the development environment based on open source tools, we started to design and develop LibPKI. We focused our efforts on four cryptographic basic aspects:

- key pair generation
- certificate request generation
- certificate management
- certificate extensions

For the key pair generation aspect, we designed an API that enables developers to generate and manage key pairs. We support different key pair formats, i.e., RSA, DSA and ECDSA. The OpenSSL module---which provides the core software plug-in for managing key generation---is capable of supporting all the key formats. The other developed modules, as described later, do not fully support all algorithms because of limitation of the testing hardware, e.g. the PKCS#11 module has been tested with Aladdin eToken devices which are capable of performing RSA operations only.

Low-Level Key Pair Generation. The key functionalities handle the key generation details. An example of the API usage follows:

```
#include<libpki/pki.h>

int main (intargc, char *argv[] ) {

int bits = 2048;
char * file = "outfile.pem";

printf("\n\nlibpki Test\n");
printf("Generating DSA Key:\n");
printf(" * %d bits ... ", bits);
```

```
p = PKI_PKEY_new(PKI_SCHEME_RSA, bits, NULL, NULL );
if( !p ) {
    printf("ERROR!\n");
    return (0);
}

r = PKI_X509_REQ_new ( p, NULL );
if( !r ) {
    if (p) PKI_PKEY_free(p);
    printf("ERROR!\n");
    return (0);
}

if(!PKI_X509_REQ_write_file( r, PKI_FORMAT_PEM, file
)) {
    printf("<file write error> ");
}

PKI_X509_REQ_free ( r );
PKI_PKEY_free( p );

printf("Done.\n\n");

return 1;
}
```

The certificates and requests management interfaces provide functionalities to generate, store and retrieve that data. All the I/O functionalities use the URL interface (described later) to specify the target of the operation. Several protocols have been defined in the API.

**XML-based Certificate Templates.** To allow the library to be easily extensible as long as new PKIX extensions are defined by new standards (and to support private extensions as well), we decided to support an OID configuration file and XML based certificate profiles. The first file is needed to provide a mapping between names and OIDs. An example is hereby reported:

```
<?xml version="1.0" ?>
<!-- PKI Object Identifiers Extension File -->
<pki:objectIdentifiers
```



```
xmlns:pki="http://www.openca.org/openca/pki/1/0/0">  
<pki:oid name="testSig" description="Test Sig Example">  
    0.1.2.3.4.5.6.7.8  
</pki:oid>  
<pki:oid name="OpenCA" description="OpenCA's Private OID">  
    0.1.2.3.4.5.6.7.8.9  
</pki:oid>  
<pki:oid name="msLogin" description="MS Login">  
    1.32.33.43.11.1.23.2.1.1.1  
</pki:oid>  
</pki:objectIdentifiers>
```

We identified a very simple format that makes use of the `oid` tag whose value is the OID value. The `name` attribute is used to identify the OID and can be used in all LibPKI operations, e.g. in certificate profiles. The `description` attribute provides a long description that might be used when printing the OID value in a human readable form.

The certificate profiles can be used by developers to specify the contents and format of a certificate. By allowing the developers to provide the library with a set of profiles, i.e., by storing them in a directory, the library is capable of generating the requests/certificates detail without the need for the developer to provide specific code for different data structures. A certificate profile example follows:

```
<?xml version="1.0" ?>  
<!-- PKI X509 PROFILE -->  
<pki:profilexmlns:pki="http://www.openca.org/openca/pki/1/  
0/0">  
<!-- Name of the Service -->  
<pki:name>test</pki:name>  
<pki:subject>  
    <pki:e required="yes">libPKI@Dartmouth.EDU</pki:e>  
<pki:cn required="yes" max="1" min="1" />  
<pki:ou required="no" max="5" />  
<pki:o required="yes" max="1" min="1">OpenCA</pki:o>  
<pki:c required="yes" max="1" min="1">US</pki:c>  
<pki:dn required="yes">dartmouth</pki:dn>  
<pki:dn required="yes">edu</pki:dn>  
</pki:subject>  
<pki:validity years="1" days="1" hours="0" minutes="0" />  
<pki:extensions>
```

```
<!-- Basic Constrains (CA or not CA)
      Required by some Software -->
<pki:extension name="extendedKeyUsage" critical="yes">
<pki:value type="OID">msCodeInd</pki:value>
<pki:valueoid="0.2.3.333.2.2.222.1.1.11"></pki:value>
<pki:value type="OID">OpenCA</pki:value>
</pki:extension>
<pki:extension name="basicConstraints" critical="yes">
<pki:value type="CA">FALSE</pki:value>
<pki:value type="pathlen">0</pki:value>
</pki:extension>
<pki:extension name="OpenCA" critical="yes">
<pki:value type="ASN1:UTF8String">Pippo</pki:value>
<pki:value type="DER">01:02:03:04:AA:F8</pki:value>
</pki:extension>
<pki:extension name="crlDistributionPoints" critical="no">
<pki:value type="URI">
http://www.somewhere.com/my.crl
</pki:value>
<pki:value type="IP">10.5.122.233</pki:value>
</pki:extension>
<pki:extension name="issuingDistributionPoint"
critical="yes">
<pki:value type="URI">
http://www.fullname.uri/crl.crl
</pki:value>
</pki:extension>
<pki:extension name="authorityInfoAccess" critical="no">
<pki:value type="URI" tag="OCSP">
http://www.somewhere.com/ocsp
</pki:value>
<pki:extension name="nameConstraints" critical="no">
<pki:value tag="permitted" type="IP">
192.168.0.0/255.255.0.0
</pki:value>
<pki:value tag="excluded" type="email">
.hackmasters.net
</pki:value>
</pki:extension>
<pki:extension name="certificatePolicies" critical="no">
<pki:value type="OID">1.3.6.1.4.1.65.1.1.1.1</pki:value>
</pki:extension>
</pki:extensions>
```

```
</pki:profile>
```

**The PKI\_TOKEN Interface.** In addition to the basic functionalities, we have added the PKI\_TOKEN interface to the library. This API acts as the high-level gateway interface to easily make use of lower-level APIs. Its purpose is to ease the process for developers regarding details about data structure and memory management. After the definition of the lower level of the key pair generation functionalities of the library, we primarily worked at the *Automatic loading* of PKI\_TOKEN configuration and integration with OpenSSL ENGINE subsystem.

The *automatic loading and initialization* of PKI\_TOKEN allows the developer to transparently load and initialize tokens based on simple XML configuration files. The library takes care of initialization procedures needed to load and use the configured token, i.e., loading of keys and certificates and HSM initialization. This has traditionally been a barrier to new developers seeking to implement PKI applications.

We then proceeded to work on two major enhancements for LibPKI:

- Simple logging system that allows the developer to store logging information in different formats
- Integration of the PKI Resource Query Protocol into LibPKI

**The Logging Subsystem.** As described in the project's proposal we proceeded to add a simple logging subsystem to LibPKI. The *logging subsystem API* has been engineered to be as simple as possible. We implemented four simple function calls:

`PKI_log_init()`, `PKI_log()`, `PKI_log_debug()`, and `PKI_log_close()`.

The API allows for logging onto different resources (e.g., syslog or a file) and in different formats (e.g., plain text or XML). We are still studying the best way to implement signed log files that will guarantee tampering detection while limiting the impact over the system performances, i.e. a tradeoff is needed between the provided level of security and the usability of the log system.

**Integration of PRQP into LibPKI.** In order to leverage the possibilities offered by the PRQP protocol, we decided to include a PRQP API into LibPKI. In particular we integrated and extended the work done for the development of the PRQP into the common distribution of LibPKI. We have seen the following effects of adopting LibPKI during the development of the PRQP server:

- A reduction in the codebase for the PRQP server
- Easier support for keypair and X.509 certificate management
- Easier integration with existing certificates storages (e.g., LDAP server, etc.)

Although still in its alpha development stage, we presented the results of our work at The Americas Grid Policy Management Authority (TAGPMA) conference at the beginning of November 2007. The PRQP implementation follows an updated version of the protocol specification that we made available through IETF as an Internet Draft (I-D).

The next efforts in the development of the LibPKI package were mainly focused on three different directions:

- Re-engineering of the URL interface
- Integration of Trusted Platform Module (TPM)
- Providing signature capabilities for the log subsystem

**The new URL API.** On the URL interface re-engineering aspect, in accordance with feedback received from the OpenCA's community and the experience acquired while building tools and applications by using LibPKI, we decided that a more consistent interface would better support developers in retrieving data from different protocols. In particular, we decided to remove the LDAP separate subsystem and include it into the URL one.

The core of the new interface are two functions, the `URL_get_data()` and the `URL_put_data()` functions. The first one allows the developer to retrieve data from multiple sources. The returned data is presented in a `PKI_MEM_STACK` data structure. The actual function signatures are:

```
PKI_MEM_STACK *URL_get_data( char *url_s, ssize_t size )  
  
int URL_put_data ( char *url_s, PKI_MEM *data, char  
*contType )
```

To operate with the `PKI_MEM_STACK` data structure, LibPKI provides many useful functions that helps the developer to create, free, add elements or take off elements from the data structure.

An example of the usage of this function:

```
#include<libpki/pki.h>  
  
int main (int argc, char *argv[] ) {  
  
    PKI_TOKEN *tk = NULL;  
    PKI_X509_PROFILE *prof= NULL;  
    PKI_OID *oid = NULL;  
    PKI_MEM * mem_data = NULL;
```

```
PKI_MEM_STACK
if((data = URL_get_data( "file://example.txt", 0 )) !=
NULL ) {
printf("Ok (got %d objects)\n",
PKI_STACK_MEM_elements( data ));

PKI_STACK_MEM_free_all( data );
} else {
printf("ERROR, can not get FILE data!\n\n");
exit(1);
}
}
```

In the example above, the `URL_get_data()` function returns a stack of data objects. These objects can contain any type of data. It was decided to provide such an interface because different protocols may return multiple objects. The change in the `URL_get_data()` behavior has been introduced to allow the integration of the LDAP subsystem into the URL interface. Indeed to enhance usability of the library for the developers it was decided that a uniform URL API would allow for more simplicity in library usage.

Similarly, the same code can be used with different type of URLs. Because of the heterogeneous set of supported protocols, different parsers have been implemented to handle each one separately. Currently supported protocols are:

- `file://` - Retrieves data from the local filesystem
- `http://` - Retrieves data from a web server via the HTTP protocol
- `https://` - Retrieves data from a secured web server via HTTP over SSL/TLS
- `ldap://` - Retrieves data from an LDAP server
- `mysql://` - Retrieves data from a MYSQL database server
- `pg://` - Retrieves data from a PostgreSQL database server
- `pkcs11://` - Retrieves data from a PKCS#11 device

For example, in order to retrieve the CA certificate from the Dartmouth College LDAP server, the developer has just to provide the right URL string to the `URL_data_get()` function, for example:

```
ldap://ldap.dartmouth.edu:389/cn=Dartmouth CertAuth1,
o=Dartmouth College, C=US, dc=dartmouth,
dc=edu?cACertificate;binary
```

We expended effort especially in order to support PKCS#11 devices. Originally we planned to support hardware devices by leveraging existing open source libraries. In particular we decided to integrate support for both OpenSSL's ENGINE interface and the

libp11 open source PKCS#11 library. Unfortunately, the current version of libp11, which is used by many open source projects (e.g. OpenSC), has several serious bugs. In fact, after testing the framework, we figured that this library is not as reliable as initially envisioned.

For this reason we began evaluating the impact on the project of writing support for PKCS#11 devices from scratch. Although the required work is non trivial, the benefit of directly support PKCS#11 devices was of primary concern for the project. After carefully considering the possibility of fixing libp11 and distributing the fixed library along with LibPKI, we decided to develop our own PKCS#11 interface to overcome the limitation of the existing libp11 library.

**LibPKI support TPM hardware.** Another important feature that we worked on was the integration of Trusted Platform Module (TPM) usage in LibPKI. This small device is a cryptographic chip that is capable of performing basic crypto operations, tied to system configuration. The integration of the TPM into LibPKI has proven to be quite a challenging task. After fixing some bugs in LibPKI's core signature code, we were able to perform simple operations with the TPM. However, we encountered difficulties, as the reliability of the supporting code for TPM is not at the same level of maturity depending on the host operating system and, in case of Linux, on the distribution. We achieved the best results on Linux RedHat by using the OpenSSL's ENGINE interface to TPM.

**Support for SHA2.** We then proceeded to update LibPKI in order to support the full SHA2 algorithm family (RSA-SHA224, RSA-SHA256, RSA-SHA384, RSA-SHA512, ECDSA-SHA224, ECDSA-SHA256, ECDSA-SHA384, ECDSA-SHA512, DSA-SHA224, DSA-SHA256) and fixed some bugs in EC key generation. Moreover, to reflect the changes in the new specifications of the PRQP protocol, we updated the PRQP API in LibPKI.

We also enhanced the usability of the library by focusing on two main aspects: we updated the Certificate Revocation List (CRL) module by providing functionalities to manage CRL entries and CRL extensions and we implemented the native PKCS#11 module in order to overcome bugs found in some open source software (libp11) and to make the integration of cryptographic hardware even easier. Last but not least, we ported LibPKI to the new iPhoneOS2.0 (leveraging funding from Intel) to make it possible to develop LibPKI enabled applications on mobile devices that support such an Operating System. At this stage, we also worked on the re-factoring of part of the PKI\_TOKEN interface to accommodate the requirements for the new PKCS#11 native module.

**CRL Generation.** We provide code within LibPKI to manage CRL generation. Since version 0.2.0 of the API, we have provided a set of functionalities to build the list of revoked entries, and a single function to generate the CRL object and sign it. Here is an example:

```
#include<libpki/pki.h>

int main (int argc, char *argv[] ) {

    PKI_TOKEN *tk = NULL;
    PKI_X509_PROFILE *prof= NULL;
    PKI_OID *oid = NULL;

    PKI_X509_CRL *crl = NULL;
    PKI_X509_CRL_ENTRY *entry = NULL;
    PKI_X509_CRL_ENTRY_STACK *sk = NULL;

    /* Initialize the Log subsystem */
    if(( PKI_log_init (PKI_LOG_TYPE_SYSLOG, PKI_LOG_NOTICE,
NULL,
                PKI_LOG_FLAGS_ENABLE_DEBUG, NULL )) == PKI_ERR )
    {
        exit(1);
    }

    /* Generate a new Token */
    if((tk = PKI_TOKEN_new_null()) == NULL ) {
        printf("ERROR, can not allocate token!\n\n");
        exit(1);
    }

    /* Initialize the Token */
    if(( PKI_TOKEN_init( tk, "etc" , "Default" )) == PKI_ERR)
    {
        printf("ERROR, can not configure token!\n\n");
        exit(1);
    }

    /* Set the Token Algorithm */
    if((PKI_TOKEN_set_algor ( tk,
PKI_ALGOR_RSA_SHA256 )) == PKI_ERR ) {
    printf("ERROR, can not set the RSA crypto scheme!\n");
    return (0);
    }
}
```

```
    /* Generate a new keypair */
    if((PKI_TOKEN_new_keypair ( tk, 1024, NULL )) == PKI_ERR) {
    printf("ERROR, can not generate new keypair!\n");
    return (0);
    }

    /* Generate a self-signed certificate to be used to sign
the
    CRL */
    printf("* Self Signing certificate .... ");
    if((PKI_TOKEN_self_sign( tk, NULL, "23429",
                                "User" )) ==
    PKI_ERR ) {
    printf("ERROR, can not self sign certificate!\n");
    return(0);
    }

    printf("Generating a new CRL ENTRY ... ");
    if((entry = PKI_X509_CRL_ENTRY_new_serial ( "12345678",
    NULL ))
                                == NULL ) {
        printf("ERROR!\n");
        exit(1);
    }
    printf("Ok\n");

    sk = PKI_STACK_X509_CRL_ENTRY_new();
    PKI_STACK_X509_CRL_ENTRY_push( sk, entry );

    printf("Generating new CRL ... ");
    if((crl = PKI_X509_CRL_new_tk ( tk, "3", 10, 10, 10,
    sk, "crl" )) == NULL ) {
        printf("ERROR, can not generate new CRL!\n");
        exit(1);
    }

    printf("Ok\n");
```



```
if( tk ) PKI_TOKEN_free ( tk );  
if( prof ) PKI_X509_PROFILE_free ( prof );  
PKI_log_end();  
  
return (0);  
}
```

In this example we load and initialize a PKI\_TOKEN object with which we generate and sign a CRL. We used boldface red to emphasize the core functions for PKI\_CRL and PKI\_CRL\_ENTRY management:

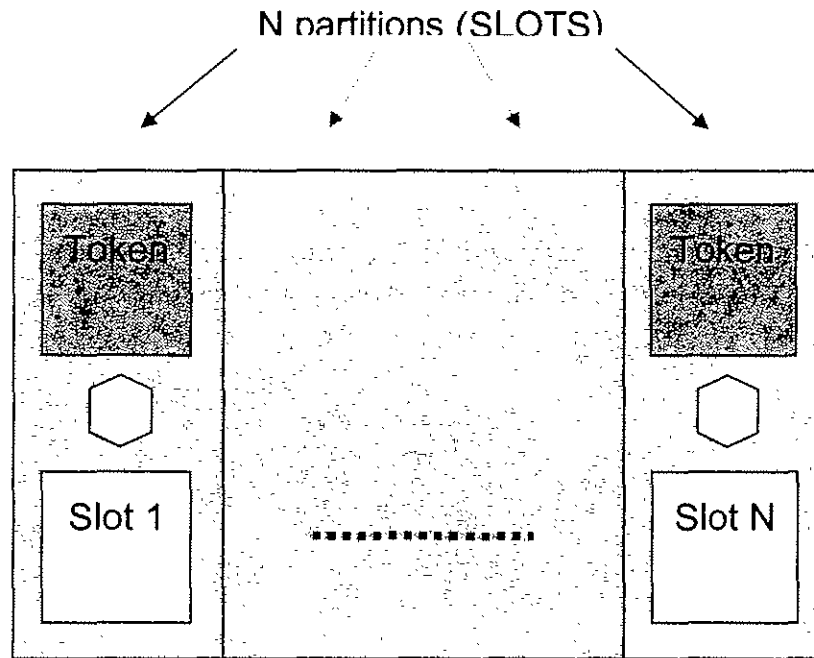
- PKI\_X509\_CRL\_ENTRY\_new\_serial() generates a new CRL entry from a serial number. The serial number is passed as a char \* instead of a number to allow the usage of very large serial numbers.
- PKI\_X509\_CRL\_new\_tk() generates the CRL object and signs it with the private key provided by the PKI\_TOKEN object. The function lets the developer define:
  1. the CRL serial number
  2. the validity period with a granularity of 1 second
  3. the profile to be used for CRL generation defining the extensions that have to be added to the CRL before signing
- PKI\_STACK\_X509\_CRL functions provide the developer with the needed tools to operate on stacks of CRL\_ENTRY objects (e.g., push, pop, insert, del).

In addition to PKI\_X509\_CRL\_ENTRY\_new\_serial(), we added another function to ease the generation of CRL entries that will generate a CRL\_ENTRY object from a PKI\_X509\_CERT object. Here's the function prototype:

```
PKI_X509_CRL_ENTRY * PKI_X509_CRL_ENTRY_new (PKI_X509_CERT  
*cert,  
PKI_X509_PROFILE  
*profile );
```

**PKI\_TOKEN Interface Refactoring.** Because of the new features introduced with the integration of the PKCS#11 module, we decided to refactor the PKI\_TOKEN interface.

The PKCS#11 standard allows for flexible hardware design. In particular it allows the usage of multiple slots and tokens that can be inserted into a slot. Figure 1 depicts the basic architecture:



PKCS#11 Device

Because of all the possibilities offered by the PKCS#11 architecture, coding for these devices is usually quite complex – many checks have to be performed all the time and different devices have different capabilities. Moreover, different from the original design of our `PKI_TOKEN` interface, PKCS#11 tokens allow storage of multiple objects, (e.g. Private Keys, Public Keys, Certificates, etc.). To ease the effort needed to use such devices, we added the notion of *identity* information (`PKI_ID_INFO`) to LibPKI. The `PKI_ID_INFO` data structure is used to retrieve the list of provided identities (private keys plus the corresponding certificate) from an HSM token.

In order to make use of the new `PKI_ID_INFO` interface we added the possibility to query a `PKI_TOKEN` in order to retrieve the list of identities it provides. In particular:

- `PKI_TOKEN_ID_set()` selects a specific identity to be used by the `PKI_TOKEN` interface
- `PKI_TOKEN_ID_num()` retrieves the number of identities available within the token
- `PKI_TOKEN_ID_INFO_list()` returns a `PKI_TOKEN_ID_STACK` object (a list) of `PKI_ID_INFO` objects that contain information about all the identities available within a specific token

- `PKI_TOKEN_ID_INFO_get()` returns a `PKI_ID_STACK` object that contains information about a specific identity within a token

To implement this functionality in a uniform fashion (and also in software-based `PKI_TOKENS`), we re-factored parts of the HSM interface. This allows the use of all the types of supported tokens (software and hardware) in exactly the same manner.

**Supporting PKCS#11 device.** As mentioned earlier, we put a lot of effort into providing usable support for PKCS#11 devices. In particular, we added direct support of PKCS#11 devices by developing the needed functionalities without relying on any 3rd party library. The PKCS#11 driver behaves exactly as the software one. The main difference is the possibility to define some parameters at token initialization time by providing an XML configuration file.

An example configuration file for the Aladdin eToken PKCS#11 driver is as follows:

```
<?xml version="1.0" ?>
<!-- Hardware Module Configuration -->
<pki:hsm xmlns:pki="http://www.openca.org/openca/pki/1/0/0">
  <!-- HSM Name -->
  <pki:name>etoken-pkcs11</pki:name>
  <!-- Token Type (kmf, engine) -->
  <pki:type>pkcs11</pki:type>
  <!-- HSM ID that pilots the HSM. Depending on the type of HSM
  it can be:
  * id:// - for kmf (name of the hw token)
  * id:// - for ENGINE openssl extensions
  * file:// - library file for PKCS11 tokens (not
supported now)
  -->
  <pki:id>file:///usr/lib/libeTPkcs11.so</pki:id>
  <!-- Private key identifier (URI - file:// id:// etc.. ) and
certificate details should be specified in the token
config
  file -->
  <!-- Here is where the Token Password - or SO password (if
any) - should
  go -->
  <pki:passin>env:etoken-pkcs11</pki:passin>
  <!-- ... or simply specify the password here -->
  <!-- <pki:passwd></pki:passwd> -->
</pki:hsm>
```

The library supports:

- Calls to load a PKCS#11 driver and initialize the device (we are currently using the latest definition of the standard available from RSA Security<sup>12</sup>).
- Calls to generate, retrieve, and delete PKI objects on the device (eg., key pair generation)
- Calls to import PKI objects into the device (e.g., user certificates)

We also included into the URL interface the functions to retrieve objects (keys and certificates) from PKCS#11 enabled devices. In particular we successfully tested our code against Aladdin's eToken devices which are FIPS140 level 3 rated.

**Porting of LibPKI to iPhoneOS 2.0.** In order to extend the range of platforms supported by LibPKI, we were able to leverage Intel funding to port LibPKI to the iPhoneOS 2.0. By leveraging the participation of Dartmouth College in the Apple Developers program, we have had access to the iPhone development environment. The availability of LibPKI for the iPhoneOS 2.0 allows developers to make use of LibPKI also on devices that supports this operating system (i.e., iPhone and iPod). Along with patching the configuration and installation code to cross-compile LibPKI for the iPhone architecture, we also worked at the distribution of a development package for Xcode (Apple's development environment). By installing the provided development package, developers are able to use LibPKI functionalities from within their applications both on iPhone devices and on the iPhone simulator which is distributed directly by Apple.

At this point in the project, we received positive feedback from multiple sources about PRQP. As part of the research and development activities, researcher Pala has also been working on the deployment and testing of the PKI Resource Query Protocol for the Certification Authorities that are part of the TACAR Project<sup>13</sup>.

In order to be able to deploy the experimental service, we enhanced the PRQP server software to support multiple Certification Authorities on a single server. This feature allowed Dartmouth College to start an experimental PRQP service for multiple CAs. The number of supported CAs in our experimental service has been growing since the start. At the moment we support more than one thousand different CAs from varying sources, including:

- TAGPMA
- TACAR
- Federal Bridge
- Firefox Store
- Internet Explorer Store

---

<sup>12</sup> Available from <ftp://ftp.rsasecurity.com/pub/pkcs/pkcs-11/201final/headers/pkcs11t.h>

<sup>13</sup> Terena Academic CA Repository, [online] <http://www.terena.org>

We presented the testbed at one TAGPMA meeting where researchers Pala and Rea discussed the latest project activities.

At this point, after testing the new features of LibPKI, we decided to release the new official version of the software. The new release (v0.2.0) contained a significant number of changes and new features over the last public release (v0.1.9). As the research part of the project on PRQP progressed again, we updated the PRQP module according to our new protocol specifications<sup>14</sup> that were published at IETF. We then focused our attention on:

- Fixing support for multi-threaded applications in LibPKI
- Updating the PRQP module in LibPKI
- Developing and testing the PRQP daemon software
- Developing web interfaces for PRQP daemon configuration
- Integrating PRQP support in PKIF (Google Summer of Code event)
- Support for Proxy Certificates
- Designing and Developing the PKI\_MSG interface of LibPKI

**Support for multi-threaded apps in LibPKI.** An important part of the development activities has been spent on debugging the library for multi-threaded applications. Indeed, while developing the PRQP server for the TERENA Academic Certification Authorities Repository (TACAR) collaboration project, we discovered a strange behavior when a specific type of cryptographic hardware was used. In particular when using the nCipher HSM, our LibPKI-enhanced PRQP server crashed (apparently randomly) when stress-tests were performed by querying the server with multiple clients from different machines. Ultimately, we have been able to locate the bug in the initialization code for OpenSSL. In particular, OpenSSL requires the application (in this case our LibPKI) to provide two different classes of functionalities in order to manage both static and dynamic thread synchronization. In order to correctly handle dynamic allocation of mutexes for some HSMs (nCipher is the only one known today that uses the dynamic callbacks) we added a family of functions that are registered with OpenSSL during LibPKI initialization. In particular we support the Posix Threads (pthread) library, which is available on every modern operating system. Indeed, during the LibPKI library initialization process the `OpenSSL_pthread_init()` function is called. This function takes care of two tasks. First it allocates the mutexes (`pthread_mutex_t`) data structures needed by OpenSSL to protect access to critical code snips and registers the functions to handle them within OpenSSL (`pthread_create_callback()` and `pthread_locking_callback()`). Secondly, the function registers the dynamic callbacks as well (`_dyn_create_callback()`, `_dyn_lock_callback()`, and `_dyn_destroy_callback()`). All the changes have been constrained within the library initialization function to preserve backward compatibility with the previous version of LibPKI.

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<sup>14</sup> Current version of the specifications are available from IETF PKIX WG page (draft-ietf-pkix-prqp-02.txt)

The new initialization code has the benefit of hiding the difficulties in initializing the needed thread-locking subsystem of OpenSSL from the developer completely.

**Updating the PRQP module.** At this stage of the project, the PKI Resource Query Protocol (PRQP) had just been approved as a PKIX working group item at the IETF. Thanks to the feedback received at the meetings attended and from the IETF, we decided to update the specification of the protocol. Then, we updated the version of the LibPKI PRQP module to reflect the changes and be aligned with the first official Internet Draft (I-D) which has been made available as <draft-ietf-pkix-prqp-00.txt> from the IETF PKIX website.

The changes in the protocol were related to the format of the PRQP response message, the definition of the *CertificateIdentifier* specification, and the definition of useful object identifiers to describe PKI-related resources. In particular, we aligned the definition of the CertificateIdentifier specification to other IETF PKIX protocols and added the Certificate Identifier field also in the response to ease the verification of responses by clients. More details are provided in the Research section of this report.

**PRQP Daemon.** Because of the update of the PRQP module of the library, we also needed to update the PRQP daemon. We released the new version of the software before the end of January 2009. The currently tested version is capable to act as a Resource Query Authority for different Certification Authorities at the same time. In this configuration, the server will run as a PRQP Trusted Authority (PTA) as described in the PRQP Internet Draft. We designed the configuration of the server to be easy and efficient. In particular we separated the network configuration of the server from the configuration of the different CAs and their supported services. In fact, to add information about a new Certification Authority, the server administrator is required to only add a single XML configuration file for the CA in the ca.d/ directory and restart the server. At startup time, the server reads all the configuration files present in the ca.d/ directory and updates its internal database with the new information.

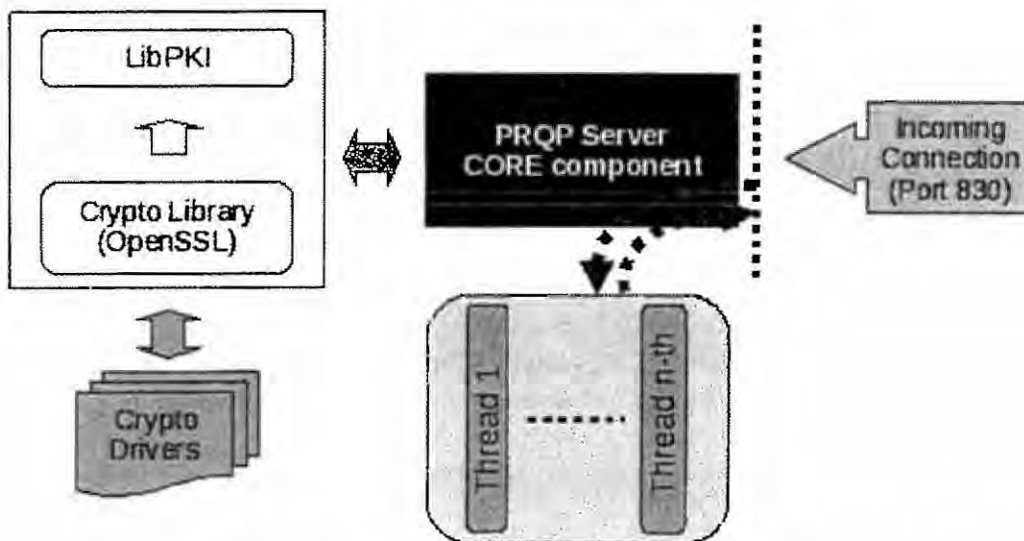
An example configuration file for a CA is as follows:

```
<?xml version="1.0" ?>
<!-- PRQP Daemon configuration -->
<pki:caConfig xmlns:pki="http://www.openca.org/openca/pki/1/0/0">
<pki:name>HellasGrid</pki:name>
<pki:caCertUrl>etc/prqpd/certs/hellasgrid-cacert.pem</pki:caCertUrl>
<pki:services>
  <pki:serviceEntry>
    <pki:name>crlDistribution</pki:name>
    <pki:url>http://pki[...]grid-v2.crl</pki:url>
    <pki:version>1</pki:version>
  </pki:serviceEntry>
</pki:services>
</pki:caConfig>
```

Each configuration file has the following elements:

- <**pki:name** /> the name of the CA that will be used for logging purposes
- <**caCertUrl** /> the URL where the server can download the CA certificate. By leveraging the URL interface from LibPKI, the PRQP server is capable of accessing the CA certificate by using all the LibPKI's supported protocols (e.g., LDAP, HTTP, etc.)
- <**pki:services**> this section contains a list of one or more resource locators (service Entry) that provide the type, location and version of each resource associated with the CA
- <**pki:serviceEntry**> this subsection provides the description of a resource and its pointer. In particular the name is the service name (e.g., crlDistribution, ocspsServer, etc.)

The daemon architecture is depicted in the following schema:



At startup, a master process reads the configuration files and sets up the network port. Moreover it spawns a configurable number of threads that compete on a single mutex. When a new connection is received by the daemon, the next available thread in the queue of the ready ones will take over the connection and handle the session with the client.

**PRQP client.** Together with the daemon, we also distribute a PRQP command-line client tool. The tool leverages the advanced features of the library in order to query the PRQP server (RQA). In particular, the client is capable of building the PRQP request, sending it to the server, retrieving the PRQP reply and printing out the results in a human readable format. The address of the RQA can be specified via an option on the command line or it can be retrieved from the /etc/pki.conf configuration file. This configuration file can be updated via a DHCP extension (as described in the Research Activities section) or can be edited via a simple text editor. In this configuration file, each line specifies the

address of an RQA server. Our PRQP client (pclient) queries all of the specified servers until a valid PRQP server is contacted and a response is retrieved. The command line tool accepts the list of options:

- *-casubject<dn>* - Issuer's of the CA certificate DN
- *-serial<num>* - Serial Number of the CA certificate (optional)
- *-cacert<file>* - Certificate to find CA services for (optional)
- *-cacertissuer<file>* - CA certificate to find serviced of (optional)
- *-clientcert<file>* - A certificate issued by the CA
- *-service<id>* - Service which URL is to be asked (optional)

For the service option, the client accepts the following options to identify the PKI resources:

- **General Services:**rqa, ocspServer, issuerCert, timestamping, scvp, crlDistribution
- **Repositories:**certRepository, crlRepository, crossCertRepository
- **PKI Service Gateways:**cmsGateway, scepGateway, htmlGateway, xkmsGateway
- **Policy Pointers:**certPolicy, certPracticesStatement, endorsedTAMcertLOALevel
- **HTML (Browsers) Services:**htmlRequestCertificate, htmlRevokeCertificate, htmlRenewCertificate, htmlSuspendCertificate
- **Extended Services:**tampUpdate

**Google Summer of Code** (b)(6) the IETF sponsor of TAMP) to talk about the possible interactions between PRQP and the Trust Anchor Management Protocol (TAMP) - a new IETF protocol currently on standard track within the PKIX working group. From a first analysis, the authors of TAMP wanted to leverage PRQP for the distribution of URLs related to specific TAMP messages: APEXTrustAnchorUpdate and trustAnchorUpdate. From the interaction with Wallace, we got two important results:

- Changes to the PRQP specifications in order to support TAMP. These changes were actually discussed during a meeting at IDTrust 2009.
- Integration of PRQP into another open source project for ease of validation of digital certificates: the PKIF library

These collaboration efforts led to the proposal of the integration of PRQP into the PKIF project as part of the **Google's Summer of Code** event<sup>15</sup>. We submitted the application for participating to the event. An undergraduate researcher with the PKI team (b)(6) (b)(6) was successful in earning a spot in the Google event. He will use the opportunity to integrate PRQP into the PKIF library<sup>16</sup>. This is a great opportunity to provide an

<sup>15</sup> <http://code.google.com/soc/>

<sup>16</sup> <http://socghop.appspot.com/org/home/google/gsoc2009/pkiframework>.



independent implementation of the PRQP protocol. This will also help the PRQP to move forward in the standardization process.

**The PKI Message Interface.** During the last few months of the project, we developed a powerful API, integrated into LibPKI, which provides the required functionalities for an application to communicate with a CA. In particular we designed the `PKI_MSG_REQ` and `PKI_MSG_RESP` structures in such a way that they do not depend on the specific message format used to communicate with the CA. Therefore this interface can be easily extended to support many different message formats like CMS or XKMS.

Currently, because of the availability of deployed CAs that support it, we implemented the required encoding/decoding functionalities to use the Simple Certificate Enrollment Protocol (SCEP) to communicate with a CA. The synergies coming from the usage of this new interface with the flexibility of PRQP enables the user (or, more specifically, the application) to easily request a certificate from a CA.

**Proxy Certificates Support.** Proxy certificates as defined in RFC 3232 are extensively used in Computing Grids to authenticate job submission to Grid infrastructures. The ability to easily issue proxy certificates is vital for scientists that make extensive use of computing grids. For this reason we concentrated our last development efforts to support Proxy Certificate generation within the `PKI_TOKEN` interface of LibPKI. Because of the lack of software capable of supporting Proxy Certificates, most of Computing Grids users are still stuck with using software credentials instead of hardware tokens: we believe that by supporting Proxy Certificates we will enable scientists to use hardware devices (e.g., USB tokens, SmartCards, etc.) for submitting their calculations to Grids, thus enhancing the overall security and authentication for the whole scientific community.

### ***Research***

At the beginning of the project, we published a paper that promotes the idea behind the proposed PRQP and outlines the possibilities that would open if it were widely adopted in PKIs. The paper was presented at the EuroPKI 2007 conference and feedback from the audience was positive. The presented results and the envisaged usage scenarios also were positively commented on by IETF members that were present at the conference.

During the initial phase of the project, we worked on a proof-of-concept implementation that was intended to be used to test the PRQP protocol. We provided two different packages. The first one is LibPRQP that implements the PRQP protocol and provides the developers with easy-to-use PRQP enabling library. The second package was the RQA server software which was capable of providing a working RQA responder both in normal mode and as a PRQP Trusted Authority (PTA). Although the first version of the distributed package was quite stable, updates were needed to provide a more versatile version (especially for the RQA server).

The paper that we published at EuroPKI 2007 also was selected for an extended publication in a journal. We leveraged this opportunity and published the latest changes and considerations about PRQP usage. The updated version of the protocol contained optimizations to permit a better usage of the resources (caching of responses). We also planned to publish the new specifications of the protocol as a PKIX Experimental Internet Draft. Our participation in IETF meetings proved to be very important for the promotion of the standardization of PRQP. We had confirmation from the PKIX WG Chairs that our proposal could be moved to an Experimental stage (PKIX WG working item) if the ongoing poll within the IETF supported such a move.

Thanks to our active participation to conferences and dissemination of results through OpenCA Labs, we were able to demonstrate the practical impact and raise interest in the protocol. This helped in the adoption of PRQP as a PKIX working Item. For this purpose our outreach activities were of primary importance: we have been able to stimulate PKI communities to participate and provide feedback about the applicability of PRQP to different realities.

In addition to these activities, we also started to study the extension of PRQP in order to support the distribution of PRQP data over a Peer-2-Peer (P2P) network. The basic idea was to leverage the OpenDHT network to publish RQAs addresses to provide a P2P approach to solving the PKI Resource Availability problem. The OpenDHT network is based on the Chord protocol and does not require authentication in order to publish or retrieve information from it.

The problem of how to distribute the retrieved information from the P2P network to the client has been studied for a long time. In particular we evaluated if the local RQA should act as an “active proxy” (Trusted Query Authority) or if the RQA should just discover the URL of the RQA, forward the client’s request to the official RQA and then send the response back to the client. The second approach could simplify the

implementation of the protocol for the RQA because no special trust settings are required – it would just act as a gateway to the authoritative RQA. This solution could require the presence of more trust anchors on the PRQP client as the received response would be signed by an “alien” RQA, not the local one.

In order to provide a demonstration of the capabilities of PRQP (it was used as part of the presentation at the IETF meeting in Vancouver) we set up a web demo service that lets the user test the PRQP protocol through a simple web interface. The interface lets the user upload a CA certificate. If the demo RQA has knowledge regarding the requested CA, it prints out the PRQP request and response.

The PRQP proposal moved forward much faster than we expected. We were able to publish the PRQP idea on a major PKI conference last summer. At IETF we were able to push for the proposal to be voted to be adopted as an Experimental working item.

In respect of the original proposal, the publication of the first I-D on PRQP (originally expected by April 2008) already happened. This speed up in the research portion of the project also pushed us to develop a PRQP server and client ahead of schedule (originally expected by April 2008). One unexpected effect of our early results is the interest demonstrated by the Computing Grid community.

We continued to study the available options on how to extend PRQP in order to provide a reliable discovery system that leverages existing P2P networks. By combining PRQP together with Peer-to-Peer (P2P) technology, we planned on providing a distributed solution to the PKI resource discovery problem.

To improve the usability and interoperability between PKIs, we also worked on the extension of the PRQP to the Peer-to-peer paradigm. In fact, one open problem in PRQP is how to find information about CAs without prior knowledge of the associated RQA. To solve this problem, we are studying how to provide a distributed discovery system for PKI resources. We published our research efforts at EuroPKI 2008. In particular our work describes the *PKI Easy Auto-discovery Collaborative Hash-table* (PEACH) protocol. This protocol specifies how to find the location of a specific RQA, how RQAs join the system, and how to update the system in case a node leaves.

We obtained our research results by adapting the Chord protocol for the PKI environment. In particular, we designed PEACH in order to leverage unique features of PRQP to provide support for a P2P overlay network specifically for RQAs. We presented our initial results at the *Fifth EuroPKI* held in Trondheim, Norway.

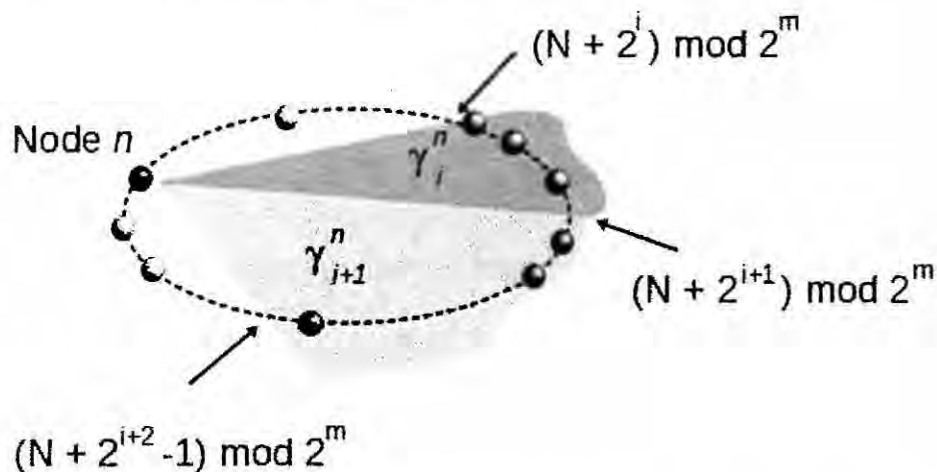
Similarly to Chord, PEACH uses a standard hash function to assign node identifiers. Differently from Chord, we use a PKI-specific method instead of network addresses to assign node identifiers.

In our protocol, the participating peers are RQAs. We assume that each RQA has a (cryptographic) key pair that has already been certified by its CA. Specific certificate contents i.e. the `extendedKeyUsage` field-allow the RQA to provide responses about resources related to that particular CA.

The basic idea is to leverage the direct link between a CA and its RA by building the node identifiers by using the CA's certificate fingerprint<sup>17</sup>. Since the CA's fingerprint is often used as part of a PRQP request, it is a perfect candidate for a node identifier. Moreover, this choice allows a node to provide authentication information that may be used by the *successor* node to verify that the joining RQA is authoritative for a specific CA.

This method of building node identifiers frees us from the requirement of having to store any value on the participating peers. Therefore, when a peer joins or leaves the network no data need be moved (or copied) among nodes and there is no need to implement operations for data storing/retrieving to/from the network (e.g., `insert()` and `get()`). This increases the network reliability and lowers the number and load of operations needed in order to manage `join()` and `leave()` operations.

In order to guarantee that the lookup of nodes takes place within  $O(\log N)$  steps, a list of  $m$  pointers is maintained at each node. This list of pointers is the equivalent of the fingers table in Chord and has the same purpose. Error! Reference source not found. shows two consecutive slices on the PEACH network for node  $n$ .



**Figure 4** - PEACH network example where  $m$  is the number of bits for the node identifiers.

Following the publication of the P2P idea, we continued our work on the core data

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<sup>17</sup> The fingerprint of a certificate is calculated by computing a cryptographic hash over the DER-encoded certificate.

structures in PRQP by:

- updating the definition of the `CertificateIdentifier`
- updating the list of object identifiers to describe PKI-related resources.

The new data `CertificateIdentifier` data structure has been simplified as follows:

```
BasicCertIdentifier ::= SEQUENCE {
    issuerNameHash          OCTET STRING,
    serialNumberCertificateSerialNumber }

ExtenderCertInfo ::= SEQUENCE {
    certificateHash          OCTET STRING,
    subjectKeyHash          OCTET STRING,
    subjectKeyIdentifier    [0] KeyIdentifier      OPTIONAL,
    issuerKeyIdentifier     [1] KeyIdentifier      OPTIONAL
}

CertIdentifier ::= SEQUENCE {
    hashAlgorithmAlgorithmIdentifier,
    basicCertIdentifierBasicCertIdentifier,
    extInfo                 [0] ExtendedCertInfo
OPTIONAL,
    caCertificate           [1] Certificate
OPTIONAL,
    issuedCertificate       [2] Certificate
OPTIONAL }
```

In the description above, the `BasicCertIdentifier` reflects the classic PKIX identifier for a certificate by using the Issuers' identifier plus the certificate serial number.

The second important update in the PRQP specification is the list of object identifiers that identify the different type of data and services related to a CA. The updated list now includes pointers for:

- PKIX services (e.g., OCSP, TimeStamping, SCVP)
- Service Gateways (e.g., SCEP, CMC)
- Level Of Assurance support
- Grid Specific Services

The new OIDs allow RQAs to provide pointers for a large set of environments and Virtual Organizations.

We continued to study the extension of PRQP in order to support the distribution of PRQP data over a Peer-2-Peer (P2P) network. The publication of our refereed paper “**PEACHES and Peers**” at EuroPKI 2007 has raised interest in our approach to provide a distributed PKI discovery system by leveraging a simple architecture based on Distributed Hash Tables.

Although we were denied support for the travel under this grant to present the paper, we were able to find support for the travel elsewhere. During that conference and at the subsequent OGF (held in Barcelona) we contacted people from the TERENA’s EMC2<sup>18</sup> work group. This WG, among other activities, manages the TACAR project that provides a trusted repository of CA certificates and Certificate Practice Statements.

By leveraging the new contacts, we were given the possibility to participate in several video conferences with the members of the WG and to propose a project about the deployment of a Trusted Query Authority (Trusted RQA) for all of the CAs present in TACAR<sup>19</sup>. According to those plans we (at Dartmouth) set up and still run a Trusted Query Authority. This additional work demonstrated the feasibility of the deployment of the PRQP in a real environment. Moreover, because many of the participating CAs are operating to provide authentication mainly for Computing Grid authentication purposes, Grid application developers are now able to provide real support for PRQP in their applications.

As the research on PRQP was progressing, we added new sections to the PRQP RFC that have been presented, together with the initial feedback for the PRQP experimental deployment, at the IETF meetings.

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<sup>18</sup> The TF-EMC2 work group is focused on providing a forum to discuss middleware issues and foster collaboration in the middleware arena. The workgroup is part of the Trans-European Research and Education Networking Association (TERENA). This organization “offers a forum to collaborate, innovate and share knowledge in order to foster the development of Internet technology, infrastructure and services to be used by the research and education community” (from TERENA website – <http://www.terena.nl>)

<sup>19</sup> The TACAR (Terena Academic CA Repository) project is aimed at providing a trusted repository for root-CA certificates. The collected certificates are from PKIs related to National Research Networks, National Academic PKIs or PKIs managed by institutions to support non-profit research projects for academia.

During the first quarter of 2008, the project activities have been mainly focused on research and outreach. In particular for the research part of the project, we successfully manage to have the PKI Resource Query Protocol accepted as an experimental PKIX working group item on Experimental Track. This result was very important as it allowed PKI managers and developers to have an official IETF reference to implement PRQP based solutions.

Our work in the Computing Grid communities led to several publications. In particular we publish a paper on how to improve the interoperability among CAs in Computing Grids. The publication was presented at the *First Workshop on Security, Trust and Privacy in Grid Environments (STPG2008)* held by the *8th IEEE International Symposium on Cluster Computing and the Grid (CCGRID2008)*.

We also worked on a revised and extended version of this paper that has been published in the *International Journal of Grid and High Performance Computing*.

A derived research topic that stemmed from the dynamic approach to PKI management provided by PRQP is the usability of security features in browsers. To understand user awareness about the security features related to secure connections to websites, we designed a survey-based usability study. The study required participants to complete simple browsing tasks such as logging into their webmail account or recognizing if a website was malicious or legitimate. Each of these activities was followed by a brief online questionnaire that asked participants about the performed actions.

The participants were seated in front of a computer in a University laboratory. Each participant was asked to come to the laboratory at a set time and perform the tasks during individually supervised sessions. We provided participants with the choice of different computers that offered a range of different Operating Systems (OS) and Browsers. In particular, participants were able to choose their preferred OS and Browser in order to maximize the proficiency of the user and to understand the participant's normal browsing behavior.

The study was divided into two different parts. The participants were asked to use their preferred web browser and follow the indications provided to them via the study website (which was preloaded as the initial page in the provided browsers). The average completion time for both parts of the study was approximately 20 minutes.

In the first part of this study we asked the subjects to respond to a series of questions in the form of a web-based survey about their general knowledge on security, how they rated themselves in terms of computer usage, and their general understanding of security.

In the second part we asked the participants to perform some simple browsing tasks (e.g., logging into personal email accounts) and then respond to some questions related to the performed activities. Participation was voluntary and no money was offered as remuneration.

This study provided us with valuable information about the real browsing behaviors of participants:

- The information about the security of the connection and the address bar itself is often ignored because the attention of the user is drawn to the page itself. The lack of active messaging about the security of the website (or the lack thereof) allowed us to successfully fool most of our population nevertheless the used service was well known by the participants.
- The presence of more noticeable notifications about the successful validation of the identity of the website would provide the users with more confidence when using authenticated services. Moreover, this could lead users to notice the complete lack of authentication, for example when using HTTP, thus increasing the user awareness about the security status of browsing sessions.

From the results of our study, it is clear that although some users look for website authentication indicators, many do not actively check for the authenticity of the website. Some non-invasive but still visually effective mechanism to communicate authentication information about the website is needed.

In one paper that we submitted and has been accepted at *EuroPKI 2009*, we proposed the following changes to the current Web User Interfaces in order to provide the user with a better and more useful notification system:

- Provide the information where the user attention is actually focused, that is inside the page
- Provide active messages both when the connection is securely established and when there are security-related problems
- Provide simple, non-technical and short messages to the users
- Provide easy access to additional information
- Provide the information securely

In our work we designed and implemented a prototype of an interface for browser applications that keep these requirements in mind.

By participating to IETF, we have been able to demonstrate the practical impact of PRQP over existing PKIs and to raise interest in the protocol by PKI deployers. In this respect, our outreach activities have been of primary importance in order to stimulate PKI communities to participate and provide feedback.

We continued our research activities by updating the specification of the PRQP Internet Draft and continuing the collaboration with the TACAR project.

In 2009, PhD student (b)(6) (funded elsewhere) started working with (b)(6) (b)(6) on using Weaver's experience in tools that map between human policy and



machine-actionable policy to streamline CA operation. That work also generated a paper accepted at *EuroPKI 2009*, and has received interest from the FPKIPA.

### PRQP specification updates:

On the PRQP specification updates side, we:

- Added a new section for OID description
- Provided a detailed specification for distributing the RQA address via DHCP extensions and DNS SRV records
- Continued the collaboration with the TACAR project

**The new OID section.** We added a new section to the document in which we provided an Internet profile for the Object Identifiers (OIDs) for PKI resources. In particular the 28 new subsections of section 4 (4.1 through 4.28) provide a detailed description of the OID and its intended usage. Although it is possible to define other OIDs for new services, the current document provides a profile for Internet PKIs. Other groups might want to define their own profile that consists of their own set of OIDs. The decision to add this large section came after the suggestion from the PKIX chair to clarify better what each OID would identify.

The list of the defined OIDs for Internet PKIs is as follows:

```
id-ad-prqp                OBJECT IDENTIFIER ::= { id-ad 12 }
id-ad-prqp-rqa            OBJECT IDENTIFIER ::= { id-ad-prqp 0 }
id-ad-prqp-ocsp           OBJECT IDENTIFIER ::= { id-ad-prqp 1 }
id-ad-prqp-issuerCert     OBJECT IDENTIFIER ::= { id-ad-prqp 2 }
id-ad-prqp-timestamping  OBJECT IDENTIFIER ::= { id-ad-prqp 3 }
id-ad-prqp-scvp           OBJECT IDENTIFIER ::= { id-ad-prqp 4 }
id-ad-prqp-crlDistribution OBJECT IDENTIFIER ::= { id-ad-prqp 5 }
id-ad-prqp-certRepository OBJECT IDENTIFIER ::= { id-ad-prqp 6 }
id-ad-prqp-crlRepository OBJECT IDENTIFIER ::= { id-ad-prqp 7 }
id-ad-prqp-crossCertRepository OBJECT IDENTIFIER ::= { id-ad-prqp 8 }
id-ad-prqp-cmsGateway     OBJECT IDENTIFIER ::= { id-ad-prqp 10 }
id-ad-prqp-scepGateway    OBJECT IDENTIFIER ::= { id-ad-prqp 11 }
```

|                                   |                                       |
|-----------------------------------|---------------------------------------|
| id-ad-prqp-htmlGateway            | OBJECT IDENTIFIER ::= {id-ad-prqp 12} |
| id-ad-prqp-xkmsGateway            | OBJECT IDENTIFIER ::= {id-ad-prqp 13} |
| id-ad-prqp-certPolicy             | OBJECT IDENTIFIER ::= {id-ad-prqp 20} |
| id-ad-prqp-certPracticesStatement | OBJECT IDENTIFIER ::= {id-ad-prqp 21} |
| id-ad-prqp-endorsedTA             | OBJECT IDENTIFIER ::= {id-ad-prqp 22} |
| id-ad-prqp-loaPolicy              | OBJECT IDENTIFIER ::= {id-ad-prqp 25} |
| id-ad-prqp-certLOALevel           | OBJECT IDENTIFIER ::= {id-ad-prqp 26} |
| id-ad-prqp-htmlRequestCertificate | OBJECT IDENTIFIER ::= {id-ad-prqp 30} |
| id-ad-prqp-htmlRevokeCertificate  | OBJECT IDENTIFIER ::= {id-ad-prqp 31} |
| id-ad-prqp-htmlRenewCertificate   | OBJECT IDENTIFIER ::= {id-ad-prqp 32} |
| id-ad-prqp-htmlSuspendCertificate | OBJECT IDENTIFIER ::= {id-ad-prqp 33} |
| id-ad-prqp-tampUpdate             | OBJECT IDENTIFIER ::= {id-ad-prqp 70} |

### **The DHCP and DNS SRV extensions.**

In order to distribute the address of the Resource Query Authority, we envisage using either a single extension in the CA certificate, an extension for the DHCP or DNS SRV records. Besides the usage of an extension in the CA certificate, the DHCP and DNS SRV options were underspecified. To overcome this lack of details, we decided to add, in an appendix of the document (Appendix B), a detailed description of how to use DHCP and DNS SRV records with PRQP.

*DHCP extensions.* While working on the definitions of the options for the DHCP, we collaborated with the DHCP Working Group (DHWG) at IETF. This group is in charge of defining the standards related to DHCP (both for IPv4 and IPv6). After receiving some feedback on the first draft of the section, we added two different sub-sections (B.1.1 and B.1.2) that specify the format of the new DHCP extension to be used to distribute the RQA address for both IPv4 and IPv6 type of address respectively.

Moreover, we provided a description of how to configure the popular ISC DHCP package to support PRQP. In particular we suggest adding the `prqp-servers` option as an array of `ipv6/ipv4` addresses and we describe how to modify the `dhcpd.conf` configuration file to support the option on both the server and the client. Furthermore, for the client side, we also provide a detailed description of the format for the `/etc/pki.conf` configuration file. That file format is similar to the more popular DNS configuration file (`/etc/resolv.conf`) and it is already supported by the latest version of LibPKI.

*DNS SRV configurations.* In order to provide the RQA address by using the DNS, a detailed specification of the Service (“SRV”) records in the DNS was needed. A clear definition of all the options for the RQA's SRV record is provided in section B.2.1 of the PRQP draft.

To help system administrators to correctly configure their DNS systems for PRQP support, we also added an example of a DNS zone file where a series of RQA addresses are actually configured.

### **TACAR Project Collaboration.**

During the last year of the project, we continued the collaboration with the TACAR project. In particular we pursued the possibility to deploy an RQA for all the CAs present in the TACAR repository.

After proposing a simple plan to deploy the RQA server at Dartmouth, we participated in discussions with multiple CA service providers on how to provide the possibility, for each CA administrator, to setup/change the options related to his/her own CA in a simplified manner.

Researcher Pala participated in video conference calls with people from the TACAR project in order to design a web-based configuration tool for PRQP. This tool, initially thought to be a stand-alone one, will be integrated in the general TACAR management console once completed. Unfortunately, because of delays with the development of the TACAR interface (due to funding problems within TACAR), the PRQP interface has not yet been integrated in the TACAR management at this time.

We hope that this additional effort will help the CA administrators make effective use of PRQP and provide a real-world large-impact deployment of the research and development effort carried out in this project. The design and development activities of the PRQP management console is a work in progress.

In addition to these activities, we published a refereed paper in the *International Journal of Grid and High Performance Computing (IJGHPC)*, “Interoperable PKI Data Distribution in Computational Grids”, (Accepted for publication, IGI Publishing<sup>20</sup>, First Qt. 2009). (This is a revised and extended version of an earlier refereed conference paper we published as part of this project.)

Interest in PRQP has been expressed by the Federal Bridge CAs. We provided a virtual machine with a demo installation of the PRQP server (together with some administrative tools to it) in order to be able to provide the Federal Bridge CA Operating Authority with an evaluation environment. They are interested in PRQP and at the time of writing this report, they are still evaluating to deploy it in their environment. Interest in PRQP has also been expressed by one large commercial vendor (name withheld due to NDA).

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<sup>20</sup> <http://www.igi-global.com/ijghpc>

## *Outreach*

Our participation to IETF meetings has shown to be very important for the promotion of the standardization of PRQP. In fact, the PRQP draft, which was published as an “individual contribution” until recently, has been approved for publication as a PKIX WG item. In particular, by being able to attend IETF and OGF meetings, we have been able to demonstrate the practical impact of PRQP over existing PKIs and to raise interest in the protocol by PKI deployers. In this respect, our outreach activities have been of primary importance in order to stimulate PKI communities to participate and provide feedback.

[3Q 2007] For the outreach initiatives, we have participated in key industry related Working Groups during the whole life of the project, including the following forums with related deliverables:

- The Higher Education Bridge Certificate Authority (HEBCA)
  - Participated in and provided secretarial services for the Policy Authority meetings
  - Participated in and initiated mailing list discussions for PA members
  - Maintained HEBCA Operating Authority (OA) infrastructure
  - Obtained agreements for future funding of OA infrastructure
  - Reported on HEBCA activities at conferences/workshops/meetings
  - Participated as HEBCA representative for Bridge-2-Bridge Working group
  - Initiated HEBCA cross-certification process with Australian Access Federation (AAF)
  - Began the establishment of a test laboratory infrastructure for bridge based PKIs in HE
  
- The US Higher Education Root (USHER)
  - Participated in the Policy Authority meetings
  - Participated in and initiated mailing list discussions for PA members
  - Maintained USHER Operating Authority (OA) infrastructure
  - Obtained agreements for future funding of OA infrastructure
  - Reported on USHER activities at conferences/workshops/meetings
  - Contributed to the finalization of the USHER Foundation CA Certificate Profile, by restructuring the document in RFC3647 format, and making related policy recommendations and updates
  - Produced the base Usher Foundation CA Certificate Practices Statement (CPS) in RFC 3647 format to address the policy requirements of the CP
  - Began work on a “free-to-higher-education” Certificate Authority package that can be distributed free of charge to the HE community
  
- The Americas Grid Policy management Authority (TAGPMA)

- Established the Grid Bridge Working Group
    - Mapped the IGTF Classic CA profile against the FPKI C4 CP
    - Supported the mapping operations of the FPKI C4 CP against the IGTF Classic CA profile
    - Supported the mapping operations of the FBCA CP at Basic level against the IGTF Classic CA profile
  - Reported on findings, develop a list of potential next steps
  - Participated in the Policy Management Authority meetings
  - Participated in and initiated mailing list discussions for PA and community members
  - Reviewed candidates for accreditation of CA profiles with the IGTF and report
  - Reviewed candidates for operational completeness in accordance with IGTF profiles
  - Reported on HE PKI activities at conferences/workshops/meetings
- Participated on NIST PKI R&D Workshop Program Committee
    - Refereed and reviewed PKI research and case study papers submitted to the conference
    - Shepherded two separate PKI research papers not obtaining initial approval through multiple reviews and final acceptance by the committee
    - Organized panel discussion topics and speakers on relevant PKI issues for the up coming conference
  - The Higher Education PKI Technical Advisory Group (HEPKI-TAG)
    - Participated in the TAG meetings
    - Participated in and initiated mailing list discussions for TAG and community members

[4Q 2007] For the outreach initiatives, we continued participation in key industry related Working Groups during this reporting period, including the following forums with related deliverables:

- The Higher Education Bridge Certificate Authority (HEBCA)
  - Participated in and initiated mailing list discussions for PA members
  - Maintained HEBCA Operating Authority (OA) infrastructure
  - Finalized agreements for future funding of OA infrastructure
  - Reported on HEBCA activities at conferences/workshops/meetings
  - Progressed HEBCA cross-certification process with Australian Access Federation (AAF)
  - Progressed the establishment of a test laboratory infrastructure for bridge based PKIs in HE

- The US Higher Education Root (USHER)
  - Participated in the Policy Authority meetings
  - Participated in and initiated mailing list discussions for PA members
  - Maintained USHER Operating Authority (OA) infrastructure
  - Progressed agreements for future funding of OA infrastructure
  - Reported on USHER activities at conferences/workshops/meetings
  - Progressed work on a “free-to-higher-education” Certificate Authority package that can be distributed free of charge to the HE community
  
- The Americas Grid Policy management Authority (TAGPMA)
  - Managed the Grid Bridge Working Group
  - Participated in the Policy Management Authority meetings
  - Participated in and initiated mailing list discussions for PA and community members
  - Reviewed candidates for accreditation of CA profiles with the IGTF and report
  - Reviewed candidates for operational completeness in accordance with IGTF profiles
  - Reported on HE PKI activities at conferences/workshops/meetings
  - Participated on NIST PKI R&D Workshop Program Committee
  - Participated in the NIST PKI R&D Workshop
  - Chaired a panel on relevant PKI issues at the conference
  
- The Higher Education PKI Technical Advisory Group (HEPKI-TAG)
  - Participated in the TAG meetings
  - Participated in and initiated mailing list discussions for TAG and community members
  
- The Higher Education Bridge Certificate Authority (HEBCA)
  - Participated in and initiated mailing list discussions for PA members
  - Maintained HEBCA Operating Authority (OA) infrastructure
  - Developed a proposed Business Plan for the options associated with the long term sustainability of the HEBCA project
  - Pursued agreements for future funding of OA infrastructure
  - Reported on HEBCA activities at conferences/workshops/meetings
  - Progressed HEBCA cross-certification process with Australian Access Federation (AAF)
  
- The US Higher Education Root (USHER)
  - Participated in the Policy Authority meetings
  - Participated in and initiated mailing list discussions for PA members
  - Reported on USHER activities at conferences/workshops/meetings

- Progressed work on a “free-to-higher-education” Certificate Authority package that can be distributed free of charge to the HE community
- The Americas Grid Policy management Authority (TAGPMA)
  - Participated in the Policy Management Authority meetings
  - Participated in and initiated mailing list discussions for PA and community members
  - Participated in EuroGridPMA meeting via video/conference call
  - Reviewed candidates for accreditation of CA profiles with the IGTF and report
  - Reviewed candidates for operational completeness in accordance with IGTF profiles
  - Participated in Audit assessment of operational CA for IGTF re-accreditation purposes
  - Managed the Grid Bridge Working Group
  - Reported on HE PKI activities at conferences/workshops/meetings
- Participated in IDTrust 2008 – (7<sup>th</sup> Symposium on Identity and Trust on the Internet) Program Committee (NOTE: IDTrust replaces NIST PKI R&D Workshop)
  - Reviewed several papers for potential inclusion in published proceedings and/or for presentation at the Symposium
  - Participated in the discussions surrounding content for the next Symposium
  - Assigned as shepherd for authors with papers requiring adjustments before being fully accepted by committee
- The Higher Education PKI Technical Advisory Group (HEPKI-TAG)
  - Participated in the TAG meetings
  - Participated in and initiated mailing list discussions for TAG and community members
  - Finalized PKI Survey to help understand the status of PKI in the higher education community
  - Promotion of PKI survey to community members
- General PKI community outreach and training activities
  - Created PKI training curriculum for higher education institutions looking to begin or further their use of the technology
  - Provided PKI training for 25 participants from 9 institutions in a whole day seminar in Boulder CO.
  - Presented at the EDUCAUSE sponsored Federal-Education PKI Coordination Meeting

[2Q 2008] Some of the original outreach activities planned for the beginning of the project have been delayed in order to coordinate with industry and community partners who are participating in (and sometimes control) the agendas of the targeted events. It



was always anticipated that the final phase of the project would include more outreach activities than the earlier phases in order to showcase and promote the outputs of the research and development components of the earlier phases. Due to the success of the project since its beginning, the participation in outreach activities relating to all components of the project increased during the final phase.

We then continued to focus on five main objectives:

1. Participate in PKI related working groups and industry forums and discussion lists, hold PKI training sessions for higher education institutions where appropriate, and seek to establish a PKI Usability working group in the most appropriate forum;
2. Promote PRQP and LibPKI in PKI related working groups and industry meetings and discussion lists, along with PKI Usability as mentioned above;
3. Publish research papers demonstrating the applicability and use of PRQP and LibPKI, and the importance of and issue surrounding PKI usability;
4. Seek for a viable strategy for the long term sustainability of the HEBCA project through the development of a Business Plan with the assistance of students from the Tuck School of Business at Dartmouth;
5. Continue the development of CAPSO - an easy to install and run CA platform as an interim alternative to OpenCA-NG.

[3Q 2008] As the project got closer to its end, we continued the planned participation in key industry related Working Groups during the project's lifespan, including the following forums with related deliverables:

- The Higher Education Bridge Certificate Authority (HEBCA)
  - Participated in and initiated phone discussions with PA members regarding future plans
  - Maintained HEBCA Operating Authority (OA) infrastructure
  - Finalized funding of OA infrastructure (at a rudimentary level of assurance) through December 31, 2008
  - Participated in the Forum of the Four Bridges (Higher Education, Federal PKI, Aerospace Industry, Pharmaceutical Industry), for collaboration and technical interoperability
  - Reported on HEBCA activities at conferences/workshops/meetings
  - Continued preparations for HEBCA cross-certification process with Australian Access Federation (AAF)
- The US Higher Education Root (USHER)
  - Participated in and initiated mailing list discussions for PA members
  - Reported on USHER activities at conferences/workshops/meetings
  - Progressed work on a "free-to-higher-education" Certificate Authority package that can be distributed free of charge to the HE community

- The Americas Grid Policy management Authority (TAGPMA)
  - Participated in the Policy Management Authority meetings
  - Participated in and initiated mailing list discussions for PA and community members
  - Reviewed candidates for accreditation of CA profiles with the IGTF and report
  - Reviewed candidates for operational completeness in accordance with IGTF profiles
  - Managed the Grid Bridge Working Group
  - Reported on HE PKI activities at conferences/workshops/meetings
  
- The Higher Education PKI Technical Advisory Group (HEPKI-TAG)
  - Participated in the TAG meetings
  - Participated in and initiated mailing list discussions for TAG and community members
  - Promoted PKI Survey to help understand the status of PKI in the higher education community
  
- General PKI community outreach and training activities
  - Participated in the TeraGrid '08 Conference in Las Vegas, NV – co-authored and presented the refereed paper “Level of Assurance (LoA) as a Catalyst for Identity Management Across Trust Boundaries” which was a collaborative effort with University of Texas Systems and the Texas Advanced Computing Center.
  - Participated in (and presented at) the EDUCAUSE sponsored Federal Government and Higher Education PKI Coordination Meeting #17 in Washington, DC.
  - Participated in (and presented at) the EDUCAUSE PKI Deployment Forum in Madison, WI – the following presentations were made: “PKI & Grids”, “Campus PKI Success Stories: Dartmouth - How We Did It Here”, “How to Deploy and Get the Most Out of Tokens”. Commitment was also obtained for starting a higher education PKI token user group at this forum.
  - Participated in (and gave 3 training presentations at) the Secure Information Systems Mentoring and Training (SISMAT) program operated by ISTS at Dartmouth – presented two sessions for students on “General PKI Technology” and “Advanced PKI Application & Experience”, presented one session to faculty/professors on “PKI in higher Education”.
  - Established a working group to deploy a trusted RQA (based on PRQP development work) with the Trans-European Research and Education Networking Association (TERENA) Academic CA Repository (TACAR) in the Netherlands.
  - We have also begun discussions with the three other PKI bridges who constitute the the Four Bridges Forum to deploy PRQP as part of a common PKI bridge interoperability test infrastructure that will be used by clients of

the four bridges (and the bridges themselves) to facilitate deployment and compatibility testing.

[4Q 2008] Moreover, we also started the collaboration with the Four Bridges Forum and participated in its activities. Rea worked together with the Four Bridges Forum (4BF) in preparation for the launch of the federation at an event at the National Press Club in Washington DC. The 4BF is a federation of the leading US bridge PKI communities - HEBCA (higher education), FBCA (federal government), SAFE (pharmaceutical industry), and CertiPath (aerospace and defense industry). The 4BF website has been launched (<http://www.the4BF.com>) along with invitations to the event for key program managers and application owners in the respective communities.

The collaboration with the HEBCA project was a unique opportunity that allowed us to disseminate our research to a wide audience (e.g., Federal Agencies):

- The Higher Education Bridge Certificate Authority (HEBCA)
  - Participated in and initiated phone discussions with PA members regarding future plans
  - Participated in phone based plus face-to-face discussions with Four Bridge Forum (4BF) members regarding future plans
  - Maintained HEBCA Operating Authority (OA) infrastructure
  - Reported on HEBCA activities at conferences/workshops/meetings
  - Continued preparations for HEBCA cross-certification process with Australian Access Federation (AAF)
- The US Higher Education Root (USHER)
  - Participated in and initiated mailing list discussions for PA members
  - Reported on USHER activities at conferences/workshops/meetings
  - Progressed work on a “free-to-higher-education” Certificate Authority package that can be distributed free of charge to the HE community
- The Americas Grid Policy management Authority (TAGPMA)
  - Participated in the Policy Management Authority meetings
  - Participated in and initiated mailing list discussions for PA and community members
  - Reviewed candidates for accreditation of CA profiles with the IGTF and report
  - Reviewed candidates for operational completeness in accordance with IGTF profiles
  - Contributed to the Audit Guidelines documentation for the IGTF community – part author – see: <https://forge.gridforum.org/sf/go/doc4858>
  - Managed the Grid Bridge Working Group
  - Reported on HE PKI activities at conferences/workshops/meetings

- The Higher Education PKI Technical Advisory Group (HEPKI-TAG)
  - Participated in the TAG meetings
  - Participated in and initiated mailing list discussions for TAG and community members
  - Promoted PKI Survey to help understand the status of PKI in the higher education community
  
- General PKI community outreach and training activities
  - Participated and presented at the Identity Management Workshop in Brisbane, Australia on the status of PKI in US Higher education, as well as introduced LibPKI and PRQP, and solicited support for a security usability working group
  - Met with a Steering Committee member of the Certificate Authority and Browser (CAB) Forum to discuss the need for security usability focus and working group
  - Submitted an abstract for a proposed position paper to the CAB Forum for the use of PRQP as a means to help manage trust anchors from an organizational perspective rather than relying upon the browser vendors (NOTE: this position paper is currently a WIP, and we hope to present it at the Forum in December).
  - Prepared hardware for hosting the Four Bridges Forum (4BF) web site to disseminate information and links for the 4 US industry bridges (HEBCA, FBCA = Fed govt, SAFE = pharmaceutical industry, CertiPath = aerospace industry).
  
- IETF PKIX Working Group.
  - Participated and presented at the 72nd IETF Meeting in Dublin, Ireland, on the status of PRQP draft. During the meeting we also solicited support for a security library API standard. The idea has been welcomed by the PKIX WG chairs.
  
- The Higher Education Bridge Certificate Authority (HEBCA)
  - Participated in and initiated phone discussions with PA members regarding future plans
  - Participated in phone based plus face-to-face discussions with Four Bridge Forum (4BF) members regarding future plans
  - Maintained HEBCA Operating Authority (OA) infrastructure
  - Reported on HEBCA activities at conferences/workshops/meetings
  - Began preparations for virtualization of HEBCA infrastructure so that it may more easily be relocated or transferred to a new sponsor and/or location
  - Set up infrastructure, designed profiles, and instantiated the HEBCA Administrative CA that will issue credentials to HEBCA Administrator personnel, Policy Authority members, and Sponsor staff i.e. to provide credentials for all supporting HEBCA roles

- The US Higher Education Root (USHER)
  - Participated in and initiated mailing list discussions for PA members
  - Progressed work on a “free-to-higher-education” Certificate Authority package that can be distributed free of charge to the HE community
  - Introduced better version control mechanisms for the existing library of code
  - Added authentication requirements to user request interface
  
- The Americas Grid Policy management Authority (TAGPMA)
  - Participated in the Policy Management Authority meetings
  - Participated in and initiated mailing list discussions for PA and community members regarding this PKI project and its outcomes
  - Participated and presented at the Face-To-Face meeting in La Plata, Argentina
  - Reviewed candidates for accreditation of CA profiles with the IGTF and reported on activities
  - Reviewed candidates for operational completeness in accordance with IGTF profiles
  - Managed the Grid Bridge Working Group
  - Reported on HE PKI activities at conferences/workshops/meetings
  
- The Higher Education PKI Technical Advisory Group (HEPKI-TAG)
  - Participated in the TAG meetings
  - Participated in and initiated mailing list discussions for TAG and community members
  
- General PKI community outreach and training activities
  - Participated and reported at the Postsecondary Electronic Standards Council (PESC) Fall Members Meeting, which also included the e-Authentication/e-Authorization (EA2) Task Force. Introduced LibPKI and PRQP, and solicited support for better security in inter-school communications using this technology and PKI in general
  - Participated and reported at the Internet2 Fall Members Meeting. Gave updates on research progress, HEBCA, USHER, and PKI in higher education in general.
  - Participated and reported at the EDUCAUSE sponsored Federal Government - Higher Education (FedEd) PKI Co-ordination Meeting. Gave updates on research progress, HEBCA and PKI in higher education in general
  - Wrote and submitted a technical research paper “Improving Security Usability in Browsers with the PKI Resource Query Protocol (PRQP)” to the *IDTrust Symposium on Trust in the Internet* which was held at NIST in Gaithersburg, MD, April 2009.
  - Reviewed other technical papers submitted to the *IDTrust Symposium on Trust in the Internet* and discussed the merits of submissions with other Program Committee members.

- Continued hardware setup, and interface configuration for hosting the Four Bridge Forum (4BF) web site to disseminate information and links for the 4 US industry bridges (HEBCA, FBCA = Fed govt, SAFE = pharmaceutical industry, CertiPath = aerospace industry).
- Made plans for a follow up PKI Training outreach day for the WestNet set of schools in Boulder, CO for March 2009.

By being able to participate to the works of the TAGPMA, Pala presented on the activities related to PRQP and its integration with Computing Grids. Pala and Rea have presented how to use PRQP to ease the Trust Anchor Management problems in applications (eg., Browsers or Operating Systems) by integrating PRQP with TAMP (a new draft document from IETF PKIX WG).

**b. Where we stand.**

This project completed successfully. All the primary objectives of the proposed project have been met and some of the obtained results exceeded our initial expectations.

On the development side, we focused on providing early and concrete results at each step during the project's lifespan. The development of LibPKI has been a success. Its inclusion into the new version of OpenCA will promote its deployment on a large number of different systems. Moreover we expect that the library will be included in some Linux distributions soon.

We have been primarily working with the OpenSSL library (which is finally on its way for version 1.0) as the main crypto provider because of its availability and its wide adoption. This choice allowed us to provide binary packages of LibPKI that do not have many requirements (in terms of software dependencies) and that are very easy to install and use.

One of the primary objectives of our project was to provide concrete impact to the PKI community. Because of this we focused on both boosting the development of new features and releasing them as soon as possible. The number of downloads of LibPKI has been steadily increasing since its first release to the public demonstrating the real interest in the project's activities from the PKI community.

In LibPKI we also managed to include support for the TPM in two different ways. The first one is through the OpenSSL's TPM ENGINE driver. The second one is via nTRU's TPM PKCS#11 interface.

We also received impressive feedback in terms of interest from the Computing Grid Communities with which we have been in contact. In particular during the meeting attended in Chile, representatives from many different computing grids in the Americas expressed the need for such a library and urged us to go on with its development. Moreover, they were interested in the availability of Certification Authority software based on this library.

Although LibPKI is successful in providing an easy-to-use PKI library, that can be deployed on many different platforms, its development will not stop with the end of this project. The future development activities on LibPKI will be led by the OpenCA Labs team (and, depending on the availability of funding, by Dartmouth College).

In this project, we have put a great deal of effort in engineering the cryptographic core of the library to enhance the possibility to integrate external providers. Unfortunately the support for the KMF API (instead of the OpenSSL one) never made it in the library because the collaboration with Sun Microsystems has suffered from heavy delays. Nevertheless, the general design of LibPKI allows for the development of other crypto-drivers that can be developed and included into the library.

An interesting side-effect of choosing C over other more high-level languages for the development of LibPKI was the ease of portability across POSIX systems. We successfully build a development environment for LibPKI and LibPKI-based applications that is highly portable, as demonstrated by the ability to port it for the iPhone. The current development activities of LibPKI enable easier usage of cryptographic. Currently, we are using the LibPKI in some other projects and the ease of use sped up the development of real-world PKI applications considerably.

We also provide extensive documentation together with the library in PDF or HTML formats. For this purpose we used a powerful documentation tool: Doxygen. Although the current documentation is quite extensive, we plan on integrating it with development examples. The Wiki website that we already set up (it is currently being re-structured) for the LibPKI project will act as the LibPKI information gateway for all developers.

A successful example of the usefulness of LibPKI is represented by the PRQP daemon. We have built a fully functional server application (PRQP daemon) that makes full use of the capabilities of LibPKI. The constant development activities of PRQP daemon and the work on LibPKI enabled easier usage of cryptographic hardware for the implementation of other PKI-related software. In fact, running the PRQP daemon by using a software token or a PKCS#11 device is extremely easy. During the TAGPMA meeting, we demonstrated how to setup the PRQP server, initialize a PKCS#11 device (specifically an Alladin's eToken) and edit the configurations in less than 10 minutes. Previous LibPKI, switching between software and hardware provided keys was much more complicated and prone to errors.

We also demonstrated how LibPKI and the developed command-line tools can be used to initialize a PKCS#11 device that can be easily used by other applications, e.g., Firefox or Thunderbird.

These results are very important when considering the possibility of having automated tools that make use of PRQP and CMS/SCEP/XKMS protocols to ease the interaction between the user and the Certification Authority.

On the research side, we worked very hard in order for our research ideas to be deployed in the real world. Since the beginning we tried to involve the IETF in the process. Since we presented the first draft proposal at the IETF meeting in Chicago, we received insightful comments by PKIX WG members that we integrated into our proposal. Thanks to these comments, we modified the PRQP initial specifications in the hope that the implementation by third parties to be easier, thus allowing for better interoperability.

The outcomes from the research sub-project have always exceeded our initial expectations. We have been successful in writing the proposal for PRQP to become an Internet standard.

The large number of publications in peer-reviewed international conferences on PKIs is a clear demonstration of the high quality of research that has been conducted at Dartmouth. In particular the paper on the P2P extension of PRQP demonstrated how it is possible to develop a deployable PKI resources discovery system. The introduction of peer-to-peer technology associated with PKIs is a novel approach that we think will open up a whole new set of possibility for PKI deployers, managers and the final users.

After being accepted on the Experimental track, we hope that the collaboration with the TACAR project will provide a solid ground to request the advancement of the PRQP I-D on the standard track.

On the outreach portion we have had considerable success. Despite some obstacles faced because of the travel approval process, we participated in the appropriate forums/ conferences/ meetings to raise awareness of the research and development activities of this project and PKI in general.

Our success is demonstrated by the considerable interest in utilizing LibPKI and PRQP in production PKI environments by a broad range of key players in the global PKI community.

#### **c. Plans.**

The development of LibPKI's advanced features will continue beyond the end of this project. The OpenCA community is starting to use it as well as other third parties. The need to provide full support for any PKI-related operations to the developer will continue to drive our efforts. LibPKI development will proceed in three directions:

- The integration of the new KMF cryptographic library,
- Better support of TPM within LibPKI
- Enhancement of support for PKCS#11 devices (e.g., ECDSA)

On the research side, we will continue to study the PQR in real PKI applications and we will investigate the effects of its deployment in the real world. We will also continue to support the RQA server. This software will be extended to include new capabilities as soon as the PKI community of users will demand for them.



We will also seek funding for deploying a real-world network of Resource Query Authorities by using a Peer-2-Peer network infrastructure as envisaged in one of our publications. The possibility of leveraging existing P2P network for distribution of PRQP data will be also of particular interest.

While continuing the discussions about the new version of the I-D within IETF, we will work on a new Internet Draft about the extension to the Peer-to-peer case of PRQP. We envisage publishing the draft as an individual contribution and discuss its possible adoption at the next IETF meeting.

Moreover, as soon as the OpenCA-NG project starts, we will proceed to integrate LibPKI usage into the CA software.

Ultimately, as interest from different sources within and outside IETF has been expressed about the possibility of writing an Internet-Draft for a standardized PKI library interface, we will consider (probably together with some external parties) to write a "*Profile for a standard Internet PKI API*" document.

For the outreach initiatives, we will seek funding to continue our main objectives. In particular we will continue to pursue the creation of a PKI Working Group on Usability.

#### **d. Obstacles.**

The establishment of a suitable development environment with cross-platform support has been a challenging problem, especially for the high number of different UNIX-like systems and availability of cross-platform development tools. The high numbers of parameters and specific configurations to support shared as well as static libraries have required a lot of effort during the whole project. However, all major obstacles faced during the development part of the projects were overcome, allowing development to proceed, at times, ahead of expectations.

On the research side, although we have been able to publish the PRQP I-D, though we still need to continue to participate to the PKI WG meetings in order to move our proposal on a standard track. As expected, this required quite a large amount of time and our attending to IETF meetings to build personal relationships that would help the project. We hope that our current and future projects will be able to support the standardization effort started with this project.

Outreach milestones for cross-certification with HEBCA by various educational and research networks was delayed due to prioritization at the third party entities and also due to the lack of clarity around the long-term sustainability of the HEBCA infrastructure. However the cross-certification of the HEBCA infrastructure continues to be pursued with appropriate industry and community federations. The level of funding for the HEBCA infrastructure limited the level of assurance at which it can be cross-certified and

hence limited the operational effectiveness of the cross-certification, and the resulting benefits to the parties involved.

The inclusion of HEBCA in the 4BF is an indication of the importance that the Federal government, pharmaceutical industry, and aerospace industry see in the role it performs for higher education.

The establishment of a solid Business Plan for HEBCA remains a priority; however, the opportunity to involve Dartmouth Tuck School of Business students in that process suffered a setback when none of the existing student groups chose the HEBCA opportunity as their term project. Although this project is already over, plans are being developed to attract a group of students from the incoming MBA class to tackle the HEBCA opportunity as their group project.

### 7. Meetings attended.

The initial project kick off meeting was held on January 17, 2007. Attendees were project lead (b)(6). Work items and individual assignments were discussed and made. Follow-up correspondence has been managed via email.

Besides all the activities and meetings listed in the Outreach section of this project, the following meetings have been attended (listed in Chronological order):

- (b)(6) all attended and participated in the NIST PKI R&D 2007
- (b)(6) served on the PKI07 PC and both chaired panels
- (b)(6) served on the EuroPKI 07 PC
- (b)(6) attended the EuroPKI meeting where he presented the **PKI Resource** and related paper (first publication related to the project)
- (b)(6) attended the I3P TF Meetings
- (b)(6) attended the TAGPMA F2F Meeting in Santiago, Chile
- (b)(6) attended the Fed-Ed PKI Coordination Meeting in Washington, DC
- (b)(6) attended the WestNet PKI Workshop in Boulder, CO
- (b)(6) attended the TAGPMA F2F #7 meeting in Oakland, California
- (b)(6) attended the 23<sup>rd</sup> OGF Meeting in Barcelona, Spain
- (b)(6) attended the 1st STPG Workshop in Lion, France (Note (b)(6) was Grant sources)
- (b)(6) attended the 5<sup>th</sup> EuroPKI Workshop in Trondheim, Norway
- (b)(6) attended the EDUCAUSE PKI Deployment Forum in Madison, Wisconsin
- (b)(6) attended the Federal Government – Higher Education PKI Coordination Meeting in Washington, DC
- (b)(6) attended the Forum of the Four Bridges in Linthicum, Maryland
- (b)(6) attended the TeraGrid '08 meeting in Las Vegas, Nevada

- [redacted] participated in the SISMAT program at Dartmouth College in
  - [redacted] ended the TAGPMA F2F #8 meeting in La Plata, Argentina
  - [redacted] e 73<sup>rd</sup> IETF Meeting in Minneapolis, Minnesota
  - [redacted] PESC Fall Members Meeting and the EA2 Task Force in  
nia
  - [redacted] Internet2 Fall Members Meeting in New Orleans, Louisiana
- Virtua [redacted] o conference or teleconference):
- [redacted] Policy Authority calls (scheduled bi-weekly)
  - [redacted] AG conference calls (scheduled bi-weekly)
  - (b)(6) [redacted] IDTrust 2008 Program Committee calls
  - [redacted] PMA F2F in Amsterdam, Netherlands
  - [redacted] ENA EMC2 WG Meeting (Sweden)
  - [redacted] weekly TAGPMA meetings
  - [redacted] hoc HEPKI-TAG meetings
  - [redacted] hoc Forum of the Four Bridges meetings
  - [redacted] hoc USHER policy and administration meetings
  - [redacted] bi-weekly TAGPMA meetings
  - [redacted] bi-weekly HEPKI-TAG meetings
  - [redacted] FedEd PKI Co-ordination Meeting held in Washington, DC
  - [redacted] eral 4BF collaboration meetings

## 8. Publications.

The following publications, related to this project, have appeared:

- Massimiliano Pala and Sean W. Smith, “AutoPKI: a PKI Resource Discovery System”, *4th European PKI Workshop: Theory and Practice, LLNCS* (Springer), pp. 154-169, Vol. 4582, June, 2007, ISSN: 0302-9743, ISBN: 978-3-540-73407-9
- Massimiliano Pala and Sean W. Smith, “PEACHES and Peers”, *5th European PKI Workshop: Theory and Practice, EuroPKI 2008*, Trondheim, Norway, June 16-17, 2008 (Published)
- Massimiliano Pala, Scott Rea, Shreyas Cholia and Sean Smith, “Extending PKI Interoperability in Computational Grids”, *The First Workshop on Security, Trust and Privacy in Grid Environments*, Lyon, France, May 22, 2008 (Published)
- Massimiliano Pala, Scott Rea, Shreyas Cholia and Sean Smith, “Interoperable PKI Data Distribution in Computational Grids”, *International Journal of Grid and High Performance Computing*
- Scott Rea, Margaret Murray, Evan Turner, Paul Caskey, “Level of Assurance (LoA) as a Catalyst for Identity Management Across Trust Boundaries”, *TeraGrid '08 Online Papers Archive* (web publication only), <http://teragrid.org/events/teragrid08/Papers/papers/15.pdf>

- Massimiliano Pala, Scott Rea, Shreyas Cholia and Sean Smith, “Interoperable PKI Data Distribution in Computational Grids”, *International Journal of Grid and High Performance Computing* (IJGHPC), IGI Publishing, Volume 1, Issue 2, 2009.
- Massimiliano Pala and Scott Rea, “Usable Trust Anchor Management”, Accepted for publication (in January) at *8th Symposium on Identity and Trust on the Internet* (IDtrust 2009), Apr 14-16, 2009, NIST, Gaithersburg, MD.
- Yifei Wang and Massimiliano Pala, “On The Usability of Browsers Interfaces”, 6th European PKI Workshop: Theory and Practice, EuroPKI 2009 (Accepted for publication)
- Gabe Weaver, Scott Rea and Sean Smith, “A Computational Framework for Certificate Policy Operations,” *6th European PKI Workshop: Theory and Practice*, EuroPKI 2009 (Accepted for publication)

## 9. Technology transfer.

The project aimed to stimulate interest in the proposed solution by providing early stage software to the open source community. Therefore, we have a publicly available repository and website where all the software and documentation is uploaded. Many results in the area of the technology transfer have been achieved: the PRPQ protocol is looked at by the academic community as well as by commercial vendors, the LibPKI packages are available for many different platforms and they are being integrated with new and existing applications. Here we list the packages that have been directly developed during this project. All of these packages are available in their source form and their license is aligned with the OpenCA's. Proper acknowledgment is given in each package about the source of funding for developing the code.

### a. Package: LibPKI

This package provides the LibPKI library itself together with some tests. As long as the API for the library is updated, we also provide additional tests and examples.

The package is available at <http://www.openca.org/projects/libpki>

We set up a Wiki page where developers and users can contribute with comments, code examples and technical views about the library.

The LibPKI WiKi pages are available at  
<http://mm.cs.dartmouth.edu/wiki/index.php/LibPKI>

### b. Package: PRPQ Server

The package provides the PRPQ server. The released software reflects the current status of the PRPQ proposal.

The package is available at <http://www.openca.org/projects/prqpd/>

**c. Demo: PRQP**

In order to provide a demo of the capabilities of PRQP (it was used as part of the presentation at the IETF meeting in Vancouver) we set up a web demo service.

The PRQP demo website is available at <https://prqp.openca.org/prqp/>

**d. Internet-Draft: draft-ietf-pkix-prqp-03.txt**

The draft provides a description of the PKI Resource Discovery Protocol. It is available from the IETF main repository at:

Internet Draft Database at <http://www.ietf.org/id/draft-ietf-pkix-prqp-03.txt>

**e. Package: LibPKI iPhone SDK**

In order to provide LibPKI support for iPhoneOS developers, we packaged a pre-compiled version of the library for both x86 and arm6 architecture. This package can be downloaded and installed in order to make use of the library within applications developed for iPhone.

The package is available at <http://ftp.openca.org/libpki/iPhone/>

**Secure Information Systems Mentoring and Training  
(SISMAT)**

### 1. Project title and leads.

Project title: Secure Information Systems Mentoring and Training (SISMAT).

Project leads: (b)(6) Computer Science Department (PI) and (b)(6)  
George Mason University, Computer Science Department (Director)

### 2. Description.

Business, government, and non-profit institutions have expressed difficulty finding personnel with appropriate training in cyber security tools. Such training requires hands-on experience with secure systems work, yet many institutions of higher learning lack the resources to provide that experience. This initiative aims to meet regional and national needs by implementing a pilot program in mentoring and training that will bring the extensive expertise of researchers and teachers at Dartmouth College in the areas of PKI and trusted systems together with students and faculty from other New England colleges, as well as interested corporate and non-profit partners. We explicitly target regional colleges whose curricula will have prepared upper-level undergraduates for this hands-on work but cannot offer it themselves; we target cyber security focus areas in which we have leadership and expertise; and we target external partners that have communicated a need for training in these areas. The training program will provide undergraduates with the knowledge and support needed to participate in internships, provide opportunities for secure systems research and development to traditionally underrepresented student populations, and facilitate the development of secure systems curricula at other academic institutions.

### 3. Personnel.

- (b)(6) Research Assistant Professor, Computer Science Department
- (b)(6) Dartmouth Senior PKI Architect
- (b)(6) Program Administrator, ISTS
- (b)(6) Dartmouth College CISO (guest lecture)
- (b)(6) Class of 2011, student member of the Cyber Security Initiative, (during professional development weekend)
- (b)(6) Class of 2009, student member of the Cyber Security Initiative, (during professional development weekend)

### 4. Subcontractors.

- (b)(6) Research Assistant Professor in Computer Science, George Mason University

## **5. Relationships with academia, industry, or government.**

Planned collaboration with:

- The College of New Jersey (TCNJ)
- Amherst College
- Wellesley College
- Evergreen State College

to write a SIGCSE paper and explore the feasibility of setting up an organization or consortium for academic student red teams modeled after Dartmouth's CSI.

## **6. Activities and progress.**

### **a. Recent activities and progress.**

This year's SISMAT student training and mentors' visit will conclude on July 2nd; student internships are ongoing. We:

- recruited students
- ran the workshop/seminar
- matched students and internships (Boston College, Dartmouth-Hitchcock Medical Center (DHMC), Dartmouth's Peter Kiewit Computing Services (PKCS), George Mason University (GMU), and a digital forensics company in NJ)
- discussed ways to incorporate lessons from the hacker curriculum into the standard CS undergraduate curriculum. Our faculty mentors from the participating institutions are taking the lead on this effort using our SISMAT wiki.
- solicited feedback and updates from students in previous year on their research projects. Research projects included:
  1. a study of rootkit analysis methods
  2. a research project focusing on the design of a better MLS/MAC security policy language to wrap SELinux policies
  3. a class project on intrusion incident analysis

### **b. Where we stand.**

With regard to the program goals, we have been able to assemble a community of interest around this topic both within academia and with our industry partners. Despite the difficult economic climate, we were able to place all our interns this year, even when some organizations had to pull back due to fiscal concerns. We believe that this strong community provides the basis for expanding the role and scope of SISMAT across multiple institutions and more students in the coming years.

### **c. Plans.**

The following summarizes curricular developments in SISMAT this year. We plan to cover them in a paper continuing our series of "Hacker Curriculum" publications.



1. For the networking part of the curriculum, besides the usual spoofing and deception components such as Ethernet ARP poisoning, we introduced exploration of the different network protocol failure modes. This approach proved useful, since it (1) allowed us to both introduce the underpinnings of popular advanced network scanning tools such as nmap and firewalk as growing naturally out of analysis of connection failures, and (2) lent depth to our discussions of bridging and routing through observation of their failures.
2. For the systems part of the curriculum, we added the discussion of the binary formats, linking and loading. This introduced the students to the concept of ABI, which, despite being a centerpiece of systems engineering, is not typically covered in standard undergraduate curricula. We provided the students and their mentors with a reading list of representative hacker publications on the subject.

#### **d. Obstacles.**

Our further curriculum development and refinement has reached a point where we need resources to publically share the exercises, labs, lessons, and lectures with the wider public.

#### **7. Meetings attended.**

This year we organized and led a panel on “Hacker Curriculum” and its uses in teaching at the Colloquium for Information Systems Security Education (CISSE) 2009 in Seattle. Our goal was to facilitate the “meeting of minds” between the educator community and the ethical hacker community, to provide the former with perspectives on the methods of the latter, and let representatives of the latter address the former.

For this panel we invited (b)(6) a professor from the US Military Academy at West Point who developed contacts with the ethical hacker community, the organizer of the popular Toorcon security conference in San Diego, and a well-known independent computer security researcher with a hacking background.

To help the attendees and other fellow academic researchers navigate the online hacker publications regarding basic of various computer technologies, we set up the site [www.hackercurriculum.org](http://www.hackercurriculum.org).

#### **8. Publications.**

[www.hackercurriculum.org](http://www.hackercurriculum.org)

#### **9. Technology transfer.**

N/A.

## **Information Risk in Data-Oriented Enterprises (IRIDOE)**

**1. Project title and leads.**

Project title: Information Risk in Data-Oriented Enterprises (IRIDOE)

Project leads: (b)(6) Tuck School of Business (b)(6) Department of  
Computer Science

**2. Description.**

Many modern industries share and operate on information. As with the rest of society, these industries are moving their operations into electronic settings. In some fields (such as the financial sector), operating on data electronically offers a vital competitive edge; in other fields (such as in health care), operating on data electronically can be a very desirable cost-cutting measure. In both cases, firms are faced with the challenge of channeling the right information to employees, while ensuring that these information systems don't provide data entitlements that inappropriately enable misuse or violate customer privacy.

With a research team from computer science and business, we are investigating how information risk can be articulated and monetized with the goal of developing lifecycle management approaches to information provisioning. We are developing models of both the organizational and system application structure to allow us to simulate the effectiveness of potential technical and access policy changes. For example, a model of an organization that allows the simulation of employee hiring, termination, promotion, and supervisory relationship changes enables us to predict how auto-provisioning users with a certain role at a certain lifecycle event would affect the overall system. We are also examining the role of incentives within organizations to reduce over-access to information. Using game theory, we will examine how policy changes could reduce risk. This interdisciplinary project will benefit data-oriented enterprises by both analyzing many current best-practices for provisioning and developing new approaches that reduce information risk.

We see this project as building on our IRIPS project, and feeding ideas and tools into our I3P Insider project. We note that the development of the SSF SHOES modeling tool is joint to both this and the Insider project. As in previous reports, we distinguish the deliverables associated with each by noting that SHOES models for Insider will focus on the negative impact a small number of users (malicious or well-intentioned) can have on the data security of a large organization; SHOES models for IRIDOE will focus more on the larger impact that inappropriate access control technology can have on the larger business, and how the business goals of efficiency and cost reduction impact the effectiveness of access control technology in turn.

### 3. Personnel

- Computer Science: (b)(6) (graduate student), (b)(6) faculty), Gabe Weaver (graduate student).
- Tuck School: (b)(6) (faculty), (b)(6) (research fellow), (b)(6) (b)(6) research fellow).

### 4. Subcontractors.

None.

### 5. Relationships with academia, industry, or government.

External Partners: (b)(6) s (Goldman-Sachs), (b)(6) (Jorgan Stanley and now of Goo (b)(6) (Dartmouth-Hitchcock Medical Center).

### 6. Activities and progress

#### a. Recent activities and progress

- Jan-June 2008: Developed preliminary agent-based simulation models using SSF SHOES.
- March-May 2008: Developed a pilot simulation model of privilege accumulation using Arena simulation software (with two MEM students).
- May-June 2008: Revised and presented paper on a model of escalation using game theory. Presented on June 26 at WEIS.
- March-May 2008: Developed new paper examining discrete event simulation. Submitted to ICIS.
- March-June 2008: Entered discussions with Computer Associates on a possible collaboration. Made tentative plans for graduate student Sinclair to do a site visit at the end of the summer.
- July-August 2008: Revised WEIS paper for publication in forthcoming book *Managing Information Risk and the Economics of Security*.
- August-September 2008: Developed new model of access governance with limited IT capacity. Submitted and accepted for presentation at INFORMS in October.

- September-December 2008: Developed new economic model of access governance that incorporates variable audit costs.
- October 2008: Presented new model of access governance with limited IT at INFORMS (Washington DC).
- November-December 2008: Successfully proposed work pattern study to healthcare partner for development of SSF SHOES model.
- December 2008: Presented new model with audit cost at WISE (Paris).
- December 2008: Self-funded graduate student (b)(6) began discussions on using natural language processing techniques to extract and analyze information policy from a corporate text corpus. (This work may prove relevant to both this project and our I3P Insider project)
- March 2009: InformationWeek WebCast, “Risk & Surviving in a Downturn”, March 24.
- January - March 2009: Worked on revising our research survey of Information Security in Healthcare. Paper accepted for publication:

Appari, Ajit and M. Eric Johnson (2009), “Information Security and Privacy in Healthcare: Current State of Research,” forthcoming in *International Journal of Internet and Enterprise Management*.
- January – March 2009: (b)(6) was in continuing discussions with DHMC IT staff about their access control hygiene challenges (which also feed into her I3P project work). Computer Associates, impressed by our work in these two projects, is providing additional real-world access (and supplemental funds). Sinclair presented her work at a seminar at Harvard. New student Weaver (funded via a teaching assistantship) began learning about this space.
- April – June 2009: Revised and presented final paper (WEIS) on HIPAA compliance in Healthcare.
- April – June 2009: Revised and presented final paper (WEIS) on “Vendor Risk Rating”. Presented related talks at INFORMS and CSWIM.
- April – June 2009: (b)(6) efforts have been threefold: 1) developing tools for working with enterprise-level information policies, 2) exploring how information policies are used in actual practice, and 3) acquiring skills to facilitate the creation, modification, and evaluation of information policy. A paper on an application in PKI is under review. Weaver plans to develop more tools based on real-world needs and is actively exploring how information policies are actually developed as a member of Dartmouth’s Information Security Council (DISC) policy group. By understanding traditional approaches to information

policy, Weaver hopes to glean use cases and develop techniques to develop effective policies more rapidly

- April – June 2009: (b)(6) has been coordinating her fieldwork (scheduled for August) with Computer Associates. She has also been undergoing “new employee training” for her DHMC fieldwork; supported by the I3P project, she will be spending a few weeks working with Dr (b)(6) at Royal Holloway tuning her fieldwork methodology.

**b. Where we stand.**

Fully ramped up and on target.

**c. Plans.**

As outlined in our earlier report, we are moving our focus towards healthcare and vendor risk as outlined in the second phase of our proposal. We completed two papers related to this and are continuing to work on extending our models to understand drivers of HIPAA compliance.

In the financial sector, we are developing new game theoretic models to understand how risk rating of vendors impact competition and security. We presented a related paper at WEIS and are now getting that paper revised for journal submission. We also are continuing our work on escalation and privilege policy development.

We are expanding the work done earlier to develop a pilot simulation of privilege accumulation using Arena simulation software (widely used in the study of supply chains). Further work with this simulation in the fall will help us validate results from both the game-theoretic models and the first organizational simulation models developed with SSF SHOES.

Development of the first set of SSF SHOES models continues. In addition to the already-established set of problems regarding role engineering and management, we have also identified a number of questions surrounding access control infrastructure deployment and maintenance that we hope to explore with the tool. In particular, we have heard from a number of partners that the deployment of a PKI is always more expensive and difficult than one estimates; we hope to determine whether some of the same factors in RBAC’s surprising failure are also playing a role in this problem, too.

As always, we plan to keep in touch with our partners over the spring/summer. We hope to use the new relationship with Computer Associates to better understand the development, refinement, and tailoring of access control solutions by vendors, as well as the relationship between a vendor’s claims of their products and their customers’ actual experiences with those products.

**d. Obstacles.**

None.

## 7. Meetings attended/Presentations

(b)(6) Information Risk Rating and Competition in the Business Services Market,” INFORMS International, Toronto, Ontario, June 14-17, 2009.

(b)(6) “The Impact of Information Security Ratings on Vendor Competition”. *The Third China Summer Workshop on Information Management (CSWIM 2009)*, Guangzhou, China, June 27-28, 2009.

## 8. Publications.

Appari, Ajit, Denise Anthony and M. Eric Johnson (2009), “HIPAA Compliance: An Examination of Institutional and Market Forces,” *Proceedings of the Eighth Workshop on the Economics of Information Security*, University College London, England, June 24-25.

Zhou, Zach and M. Eric Johnson (2009), “The Impact of Information Security Ratings on Vendor Competition,” *Proceedings of the Eighth Workshop on the Economics of Information Security*, University College London, England, June 24-25.

## 9. Technology transfer.

We envision much of the technology transfer to occur through workshops, articles, and collaboration with industry partners. Also possible are transfer of models and simulation programs placed in the public domain. We have had feedback from industry partners that these tools could be very useful to them in managing their entitlement systems.

## **MetroSense: Scalable Secure Sensor Systems**



### 1. Project title and leads.

Project title: MetroSense: Scalable Secure Sensor Systems

Project leads:

|        |
|--------|
| (b)(6) |
|--------|

 Computer Science Department (MetroSense)  
Thayer School of Engineering (MetroFuse)  
Computer Science Department (MetroSec)<sup>21</sup>

### 2. Description.

Sensor networks will provide a foundation to protect and monitor our national infrastructure, including economically important businesses with global reach (e.g., stock markets), critical transport and industrial facilities, the enterprise, and the border. These tiny, low-cost wireless devices embed on-board sensing, are fully programmable, and can spontaneously form large sensor webs with thousands of distributed sensor devices. In this project, we will study, analyze, propose, deploy, and evaluate MetroSense, a radically different scalable secure sensor architecture and system capable of reliable real-time monitoring and data fusion for large-scale critical infrastructure, resources, and assets. MetroSense opportunistically leverages mobile sensors (e.g., sensor enabled mobile phones) when available to deal with sparse coverage and communications when sensing. We are developing a scalable mobile sensor network based on mobile phones and embedded sensors that supports sensing and communications, sensor security, and sensor fusion. Results from this project will serve as a foundation for building secure sensor networks capable of monitoring large-scale critical infrastructure.

### 3. Personnel.

#### *MetroSense*<sup>22</sup>

- |        |
|--------|
| (b)(6) |
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 Faculty
- |        |
|--------|
| (b)(6) |
|--------|

 Programmer
- |        |
|--------|
| (b)(6) |
|--------|

 Graduate Student
- |        |
|--------|
| (b)(6) |
|--------|

 Graduate Student
- |        |
|--------|
| (b)(6) |
|--------|

 Student

#### *MetroFuse*

- |        |
|--------|
| (b)(6) |
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 Faculty
- |        |
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| (b)(6) |
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 Arch Staff
- |        |
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| (b)(6) |
|--------|

 Research Staff
- |        |
|--------|
| (b)(6) |
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 Student
- |        |
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| (b)(6) |
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 Graduate Student

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<sup>21</sup> The MetroSec portion of the research concluded during the last reporting period.

<sup>22</sup> The MetroSense project is conducted primarily under NCSD funding with some contributions from National Science Foundation (NSF) funding. Others research on related work also contributed to these efforts. The progress reported herein represents the progress of the collaborative effort.

#### 4. Subcontractors.

None.

#### 5. Relationships with academia, industry, or government.

Nokia funded (b)(6) on an urban-sensing related project in the last quarter.

#### 6. Activities and progress.

##### *MetroSense*

##### **a. Recent activities and progress**

The focus of the quarter is the development of the SoundSense system for people-centric sensing. The vision behind the project is as follows: Top-end mobile phones include a number of specialized (e.g., accelerometer, compass, GPS) and general-purpose sensors (e.g., microphone, camera) that enable new people-centric sensing applications. Perhaps the most ubiquitous and unexploited sensor on mobile phones is the microphone – a powerful sensor that is capable of making sophisticated inferences about human activity, location, and social events from sound. In our paper presented at the 7<sup>th</sup> *ACM Conference on Mobile Systems, Applications, and Services (MobiSys 2009)*, we exploit this untapped sensor not in the context of human communications but as an enabler of new sensing applications. We propose SoundSense, a scalable framework for modeling sound events on mobile phones. SoundSense is implemented on the Apple iPhone and represents the first general purpose sound sensing system specifically designed to work on resource limited phones. The architecture and algorithms are designed for scalability and SoundSense uses a combination of supervised and unsupervised learning techniques to classify both general sound types (e.g., music, voice) and discover novel sound events specific to individual users. The system runs solely on the mobile phone with no back-end interactions. Through implementation and evaluation of two proof of concept people centric sensing applications, we demonstrate that SoundSense is capable of recognizing meaningful sound events that occur in users' everyday lives.

(b)(6) attended *ACM MobiSys* in Krakov, Poland, June 22-25, 2009. *MobiSys* is widely considered the top mobile systems conference. SoundSense also received attention in the *Technology Review*

<http://www.technologyreview.com/communications/22907/>

and in *Slashdot*

<http://mobile.slashdot.org/story/09/07/10/1835252/Cell-Phones-That-Learn-the-Sounds-of-Your-Life?from=rss>

The group also completed the development of CenceMe 2.0 and are testing the system on

the iPhone for release later in the summer on the AppStore.

Other highlights during this quarter include a keynote by (b)(6) at *IEEE PerCom 2009*), Galveston, TX, March 2009, on the MetroSense project. (b)(6)

(b)(6) also gave an invited talk on the project at UIUC.

**b. Where we stand.**

(b)(6) are working at Nokia Research and Microsoft Research in the summer. All the students are working on transferring ideas on people-centric sensing to industrial partners. Once the students return from their internships we will proceed with the plans below.

**c. Plans.**

We have a number of important tasks to complete:

- 1) The work on duty cycling the phones for sensing application is still to start. However, we have developed some early thinking on how to address this problem.
- 2) CenceMe is being analyzed to understand the relationship between location and activity.
- 3) Open sourcing the MetroSense software has still to start.
- 4) Developing scalable inference algorithm on the phone.

***MetroFuse***

**a. Recent activities and progress**

A number of important advances in MetroFuse have been made. MetroFuse has been experimenting with variable length n-gram analysis of sensor reports to answer questions such as: What is an individual's baseline behavior?; How unique are individual user behavior patterns?; How well can an individual's behavior be anticipated/predicted?

The analysis is based on building a probabilistic suffix automata using a trie data structure. Sensor reports are the symbols used in the n-gram analysis.

We have results concerning what fraction of users from a cell phone dataset are identifiable, predictable and stable. Metrics for these properties are still being investigated and evaluated against each other.

Work planned for the next time period includes finalizing the experimental results, producing a library of routines for performing the analysis on different kinds of datasets and documenting results in publications.

One publication related to this work was accepted to the *Second International Workshop on Social Computing, Behavioral Modeling and Prediction* held in Phoenix in April 2009.

The paper "A Language of Life: Characterizing People from Cell Phone Tracks" has been accepted to the *SocialCom '09* conference (August 29-31 in Vancouver, British

Columbia), the top venue on modeling individual and group behavior in computer systems. For the final submission, the system was run for more n-gram orders, generating a full matrix of sample length vs n-gram order, showing how much data is needed in each case to achieve higher identification accuracy. We consulted Andreas Stolcke, the author of the leading SRILM n-gram language modeling toolkit and an authority in speech and language modeling, on the paper and incorporated his thorough feedback. He also confirmed the novelty of the approach and suggested further methods to improve accuracy.

**b. Where we stand.**

(b)(6) are working at a summer internship with ISA/CCS in Bowie, MD.

**c. Plans.**

We are exploring extending our work to Twitter as follows. Twitter is an emerging system which is in fact a sensor of interest, activity, and location. It allows users to declare their location, or update it from GPS from an appropriate client. Short and frequent status updates allow tracking people in real time, and millions of users adopt Twitter monthly. Twitter information is all public and there are no privacy issues in using it.

We have connected to the new Twitter Streaming API, pushing several kinds of streams -- gardenhose, a sample of all tweets, providing about 2 million status updates a day from about a million users, and a focused shadow stream allowing us to follow up to 50,000 users completely. With the top conversationalists determined from the gardenhose, our shadow selection also brings about 2 million statuses a day, and the total amount of data is already 5 GB/day and growing.

In order to store and index these data efficiently, we started developing Tfitter -- a data mining system with pluggable storage back-end with a focus on conversations between two or more users, tracking replies. We also have a Lucene back-end allowing searching for de facto communities using certain words. Currently, we can identify top pairs of users exchanging hundreds of replies.

The Tfitter system is under active development and stores about 30 million tweets already. We use Lucene to find groups and compare individuals to groups, and use replies to overlay a social graph on those word-based groups. We also plan to track difference on behavior in time, e.g. of an individual role in a group.

**7. Meetings attended.**

- (b)(6) attended *ACM MobiSys* in Poland in June.
- (b)(6) gave a talk on the MetroSense project at UIUC
- (b)(6) attended *IEEE Percomm* in March in Galveston, TX.
- (b)(6) presented a poster at the first *AAAI Spring Symposium* on Human Behavior Modeling held in Stanford, March 26-30.

- [redacted] (b)(6) presented the Language of Life work at a Machine Learning Group seminar at the University of Pennsylvania on April 30.
- [redacted] (b)(6) presented this work at the Dartmouth Computer Science Colloquium, April 2009.
- [redacted] (b)(6) presented a paper at *IEEE SSCI 2009* - Nashville, Tennessee, March 2009.
- [redacted] (b)(6) presented a paper at *SBP09*, Phoenix, AZ, March 2009.

## **8. Publications**

Hong Lu, Wei Pan, Nicholas D. Lane, Tanzeem Choudhury, Andrew T. Campbell, "SoundSense: Scalable Sound Sensing for People-Centric Sensing Applications on Mobile Phones", to appear in *Proc. of 7th ACM Conference on Mobile Systems, Applications, and Services (MobiSys '09)*, Krakov, Poland, June 22-25, 2009.

Alexy Khrabrov and George Cybenko, "A Language of Life: Characterizing People from Cell Phone Tracks" to appear in *Proceedings of IEEE SocialCom '09*, Vancouver BC, August 2009.

Dave Twardowski and George Cybenko, "Process Learning of Network Interactions in Market Microstructures", in *Proceedings of IEEE SSCI 2009* - Nashville, Tennessee, USA, March 2009.

N. Sandell, R. Savell, D. Twardowski, G. Cybenko, "HBML: A Representation Language for Quantitative Behavioral Modeling in the Human Terrain," *Proceedings of SBP09*, Phoenix, AZ, March 2009.

## **9. Technology transfer.**

None during this reporting period.



(b)(6)

April 27, 2009

Ronald Ford  
Program Officer  
Attn: National Cyber Security Division/Preparedness Directorate  
Department of Homeland Security  
Washington, DC 20528

Dear Mr. Ford:

On behalf of the Institute for Information Infrastructure Protection (I3P) and the Institute for Security Technology Studies (ISTS), we are pleased to submit this Cyber Security and Information Sharing Progress Report, providing detailed information on the research and development efforts funded under award number 2006-CS-001-000001. This report covers ISTS and I3P activities between January 1, 2009 and March 31, 2009.

We trust this report illustrates the progress the two institutes have made to address the approved project(s) objectives. We look forward to working closely with you as we move the I3P and ISTS forward. If you require any further information please contact me at either (b)(6) or

(b)(6) Thank you for your continued support.

Sincerely yours

(b)(6)

Principal Investigator

*Did he send one to MSM too?*

Officer

**Institute for Information Infrastructure Protection and  
Institute for Security, Technology, and Society**

**Quarterly Progress Report  
For the period January 1 – March 31, 2009**





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## **I3P Report**

## Overview

The objective of this 2.5 year project is to apply the collective, diverse expertise of Dartmouth College's Institute for Information Infrastructure Protection (I3P) and Institute for Security, Technology, and Society (ISTS) to topics emphasized as critical priorities for securing cyberspace. The work will be accomplished through research, education and outreach programs including communities of researchers nationwide. This tenth progress report reflects I3P activities and progress made in addressing goals outlined in the February 2007 proposal. The following six initiatives will be discussed in greater detail:

- **Initiative 1: I3P Fellowship Program**
- **Initiative 2: Human Behavior, Insider Threat, and Awareness**
- **Initiative 3: Cyber Security Workshops**
- **Initiative 4: Survivability and Recovery of Process Control Systems:**
- **Initiative 5: Business Rationale for Cyber Security**
- **Initiative 6: Assessable Identity and Privacy Protection**

## Activities

### Initiative 1: I3P Fellowship Program

#### 1. Project title and lead

Project title: I3P Fellowship Program

Project lead: (b)(6) I3P Administrative office

#### 2. Description

A portion of NCSF funding supports the continuation of the I3P Fellowship program begun in 2005. The two I3P fellows for the 2008/2009 program are:

- (b)(6) asto at George Mason University under the direction of Dr. (b)(6) began his fellowship in August.
- (b)(6) at the Information Trust Institute, University of Illinois at Urbana-Champaign under the direction of Dr. (b)(6) began his fellowship in November.

The sixth annual call for I3P postdoctoral fellowship proposals was announced in November 2008. Applications for the fellowship program were due February 20, 2009, and the I3P received 21 applications, the highest number to date. The fellowship committee will meet in April to select the best candidates from the application pool to participate in the 2009/2010 I3P fellowship program. The fellowship program runs on an

annual basis, with fellows usually starting their research in summer.

I3P Fellow (b)(6) completed his fellowship at UC Davis last fall, he reports that he has one paper currently in submission and at least four in preparation that have resulted from his work while funded by I3P.

I3P Scholar (b)(6) is working at the University of Massachusetts Amherst under the direction of Dr. (b)(6). A new call for applications to the I3P Scholar program will be published in April, 2009.

## **Initiative 2: Human Behavior, Insider Threats, and Awareness**

### **1. Project title and leads**

Project title: Human Behavior, Insider Threats, and Awareness  
Project lead: (b)(6) RAND

### **2. Description**

The research team will address the problem of insider threat by forming a collaboration of I3P member organizations with diverse, complementary capabilities. Two primary objectives serve to focus and integrate the research activities: technology exploration and environmental constraints.

The first objective addresses the need for base technologies to monitor insider behavior, coupled with behavioral descriptions of suspicious inappropriate or illegitimate events or activities. In combination, the technology and monitoring will provide a lightweight, robust, and scalable event processing infrastructure that can be deployed in a range of at risk enterprises, such as the U.S. military, financial institutions, chemical plants, refineries, and border and port security systems.

The second objective addresses the need for a methodological framework for handling incipient and actual insider behavior once it is recognized. Here, research efforts aim to characterize behaviors, determine risks, and understand the ethical, legal and policy choices available to technologists and policy-makers. Policy choices might include modifying institutional behavior, establishing clear policies, providing incentives for good behavior, and implementing training programs so that employees will better understand the risks and consequences of their actions.

All this information will inform decisions about preventing and dealing with insider threats. The research will be integrated with three workshops, intended to engage the stakeholders most affected by this work.

### **3. Participating institutions**

- RAND Corporation (Team leader)
- Center for Education and Research in Information Assurance and Security, Purdue University
- Columbia University
- Cornell University
- Institute for Security, Technology, and Society, Dartmouth College
- MITRE Corporation
- School of Informatics, Indiana University

### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

### **5. Relationships with academia, industry, or government**

Members of the team continue to develop their relationships with government and industry stakeholders. The Dartmouth team is evaluating a specific SSF SHOES model of a partner healthcare institution. A group at Technion in Israel and also at the Free University of Amsterdam is currently experimenting with Cornell's original version of NightWatch and reported the shortcomings that are fixed in the new version. Computer Associates has offered to share with Dartmouth some of their real-world experience with access control issues, and also offered to continue funding work on SHOES after this project ends. MITRE has shared information with host-based software vendor Verdasys to convey bugs identified during MITRE's experiment and provide product feedback to the Verdasys development team to improve product effectiveness. The Insider Threat team will be presenting its work to stakeholders on May 4<sup>th</sup> and 5<sup>th</sup> at a poster session and workshop in Washington, DC.

### **6. Activities and progress**

#### **a. Recent activities and progress**

A few of the research activities are slightly behind schedule due to year two funding delays.

#### *Underlying infrastructure*

Cornell has continued working on the evaluation of a distributed version of Cayuga that scales across a cluster, and plans to submit a paper with of the results in April of this year. Cornell has integrated Columbia's Decoy Document Distributor (DDD) as a source of documents for the Cayuga System and will be able to demonstrate the joint system at the stakeholder workshop in May.

Cornell has been developing a new version of NightWatch. NightWatch is a peer-to-peer system that generates, at each peer, a histogram synopsis of the distribution of data across all peers. For example, consider a monitoring system that is looking for suspicious activity. This system will generate a certain load on all machines. NightWatch can generate a synopsis of the distribution of this load across all machines. If an insider tries to disable the monitoring for one or more machines, then this will show up in the histogram. As such, NightWatch can be a valuable tool to strengthen the robustness of insider threat monitoring systems. The first version of NightWatch, however, had some weaknesses. In particular, it could not deal with duplicates in the data (two nodes with exactly the same load) and with outliers in the data distribution. The new version of NightWatch is significantly more robust in that it counts duplicates correctly and can very effectively detect various kinds of outliers. As before, NightWatch is based on an epidemic protocol, with nodes gossiping the synopsis. The synopsis is an equi-depth histogram, meaning that the range is subdivided into a fixed number of intervals so that in each interval there are approximately the same number of peers with a value in that interval. Cornell has demonstrated that NightWatch generates accurate histograms for a wide variety of distributions, including multi-modal ones and heavy-tailed distributions. The new version can also find, for example, that a disproportionate number of nodes report the load 0.

NightWatch has been getting traction in the research community. A group at Technion in Israel has begun looking into clustering data distributions as an alternate approach. Another group at the Free University of Amsterdam is currently experimenting with the old version of NightWatch and reported the shortcomings that are fixed in the new version. Cornell is currently finishing the implementation of the new version, which will have a web interface and visualization tools built in, and hope to distribute the new version within one or two months.

#### *Capture the flag exercises*

MITRE has completed some of the planned analysis of the capture-the-flag exercises. The experiment data includes host and network-based events recorded by the sensors, pre- and post-experiment participant surveys, and evaluations by subject matter experts of the material delivered by participants. The transfer of funding from Dartmouth will allow MITRE to complete analysis for reporting. With the additional funding, MITRE will complete the data analysis, participate in the I3P workshop scheduled for May, produce a project summary suitable for publishing on the I3P web site, and submit the completed MITRE research to a conference.

MITRE has evaluated ELICIT detectors against participant behavior and performed a statistical analysis by condition of the event types for the host-based events. Using the host-based and network-based sensor data, MITRE developed an additional 10 behavioral measures and then evaluated the measures for statistically meaningful differences between experiment conditions. In addition, MITRE conceptualized an additional 20 measures to be investigated.

MITRE has completed a comparison of participant responses and subject matter expert evaluation of the data delivered across conditions. Using all available experiment data, MITRE evaluated for additional participant drops. Several participants were identified based on what appears to be a failure to perform the assigned task. Final decisions regarding these participants have not been yet made.

In support of the data analysis task, MITRE also conducted several teleconferences with the host-based software vendor, Verdasys. The purpose of these teleconferences was to convey bugs identified during the experiment, provide product feedback to the Verdasys development team to improve product effectiveness, provide a list of system behavioral patterns that should be considered for future filtering, and share at a high-level their preliminary findings.

*Investigate and characterize anomalous behavior*

The capture-the-flag exercises for intent modeling have been conducted, where subjects were provided with a realistic scenario where they had to perform as masqueraders while having access to somebody else's computer. The computer had a realistic file system where files which included financial information were placed in various directories (including decoy files). 14 volunteers participated in the user study in which they were asked to find as many of the above files as possible during a time slot of 15 minutes where they had unlimited access to the file system. The data collected was uploaded to a central data server and is being sanitized and anonymized for public release to the research community

Columbia has integrated DCubed with Cornell's Cayuga project. The DCubed system supports embedding HMACs calculated over a file's contents and hiding it in the file (PDFs and Word docs). The DCubed system was modified so that when Cayuga detects an HMAC, it can notify DCubed by sending the detected HMAC. DCubed will then identify the document user and send an e-mail to the owner notifying her that her decoy document was ex-filtrated. DCubed can now support roughly 6000 users, and around a million strings per user. This means that a million documents per user can be in the system, that such strings can be generated and verified in a very efficient manner within DCubed, and would be very hard for an attacker to learn even from a large number of documents.

*Investigate human factors for security.*

Dartmouth has identified an application for SSF SHOES (Scalable Simulation Framework for the Simulation of Human-Oriented Enterprise Environments) with a partner healthcare organization. Dartmouth received approval from the IRB, and has begun the user interviews necessary to develop and evaluate a specific SSF SHOES model to help them and the healthcare technologists gain insight into a current challenge at that institution. The model will test the deployment of a variety of laptop protection mechanisms across the organization. Dartmouth had previously moved the usability testing into the end phases of the work, instead of the beginning phases as originally



planned. The interviews that the IRB now allows are a component of that testing. Computer Associates will share opinion and data with Dartmouth regarding access control issues, and has also offered to continue funding work on SHOES after the I3P project completes. At the completion of this research effort, Dartmouth plans to provide the source code of SSF SHOES to the public free of charge.

As Dartmouth was under spending, primarily due to insufficient staffing, some of their surplus funds will be returned to the I3, to be re-allocated to MITRE for additional analysis on their part.

A Dartmouth undergraduate has begun a senior thesis project related to the topic of misentitlement. She has planned out her user study, discussed it with a team member from MITRE, and obtained IRB approval. During the next reporting period, Dartmouth plans to carry out her study.

#### *Ethical issues in insider threat*

RAND has devoted all of their resources to their work on the influence of ethics and organizational culture on the insider threat. The Insider Threat team leader has returned to full time status. The ethics guidelines document was completed and submitted to *IEEE Security and Privacy* for its special issue on Insider Threat. (b)(6) Associates (consultant worked begun under the auspices of the Heinz School at Carnegie Mellon) delivered its products to RAND at the end of February, completing its contract. RAND has begun work on the response space. "Insiders Behaving Badly: A Taxonomy of Bad Actors and Their Actions," was submitted to the *Journal of Computer Security*, but was rejected as not being technical enough. It will be resubmitted it to *Computers & Security* in mid-April. The team leader, along with a team member from Columbia, will be guest editors of a special issue of *IEEE Security and Privacy* on Insider Threat. Seventeen submissions are in review and decisions about which papers will be published will take place in early May. A first draft of a paper on behavioral decision theory and insider threat had been prepared by RAND, and is undergoing further revision.

#### *Exploring incentives*

Indiana University completed design of a risk-budget model to provide incentives to the inadvertent insider to behave responsibly, and produced a game-theoretic analysis that demonstrates its effectiveness. The model also communicates risk to the user, which was evaluated through human-subject experiments. Indiana continues working on incentive-based access control mechanism to further regulate insiders' behavior, research that will be completed by the end of July.

#### *Risk analysis*

The Purdue team conducted a survey to investigate the risk taking behavior of normal users in online environments, and expect the results of this survey will help them in comparing perceived risk, benefit, and their tradeoff by insiders versus normal users in online environments. So, far, 220 participants have participated in this survey. Purdue is currently analyzing preliminary results of this survey and expects to submit a paper to the

2009 International Conference of Information Systems based these results. Purdue has submitted two papers; one to the Special issue of IEEE Security and Privacy on Insider Threats, and one to the First International Workshop on Managing Insider Security Threats, MIST 2009. The papers discuss the results of validating the risk perception model, how the model may be used to identify characteristics of insiders' perceptions of risk and benefit, their risk-taking behavior, and offers suggestions for how this knowledge may be used to reduce the chances of insider misbehavior.

#### **b. Where we stand**

Work has generally caught up with project plans despite initial delays. Some work was transferred back to RAND to ensure its completion. Most deliverables are on or close to schedule and the research team is documenting and publishing its results.

#### **c. Plans**

In the next quarter the team will finalize work on the various aspects of its research in the two main areas of the research effort: technology exploration and analyzing environmental constraints. In the area of technology exploration, team members are refining their monitoring and modeling tools, continuing to validate those tools with industrial partners, and will complete the analysis of the results from the capture-the-flag exercises which were designed to test different aspects of insider attacks. In the area of environmental constraints the team will continue to validate the insider threat taxonomy using material on insider threats and activities, and leverage the taxonomy to distinguish insider behavior from legitimate behavior. There will also be continued analysis of databases of legal information to determine how laws relevant to insider threats are applied in practice, and a framework for making ethical decisions with regard to insider threats will be completed.

The final Insider Threat team workshop will be held in Washington, DC on May 5, with a poster session in the Rayburn House Office Building on May 4<sup>th</sup>.

Team members from Columbia and RAND will be guest editors of a special issue of *IEEE Security and Privacy* on insider threat. The submissions were due to the magazine in mid-March, and the issue should be published near the end of 2009.

#### **d. Obstacles**

There are no significant project obstacles to report at this time.

### **7. Meetings attended**

The project team has held regular teleconferences to discuss progress of the various efforts and coordinate related tasks.

In addition, the individual research partners have had meetings and discussions with industry stakeholders as needed. Team members have presented parts of their work at

conferences and industry forums, including the Harvard Center for Research on Computation and Society; February 11, 2009 and the First International Workshop on Managing Insider Security Threats, MIST 2009, as well as at various Distinguished Lecture Series and Colloquia at UC Irvine, Carnegie Mellon, RPI, and UT Austin.

## 8. Publications

Robbert van Renesse, "Programming Models: Client-Server, Process Groups and Peer-to-Peer" *Wiley Encyclopedia of Computer Science and Engineering* Benjamin W. Wah (ed.). Wiley. January 2009

## 9. Technology transfer

No technology was transferred during this reporting period.

### Initiative 3: Cyber Security Workshops

#### 1. Project title and lead

Initiative title: *Cyber Security Workshops*

Initiative lead: (b)(6) I3P Administrative office

#### 2. Description

The I3P will host a series of workshops that focus on process control systems security, examining the economics of protecting the information infrastructure, understanding and developing solutions to protect against the insider threat and raising awareness among government and industry leaders about critical infrastructure protection vulnerabilities, threats, challenges and research solutions. The current state of knowledge about cyber security challenges and available or burgeoning solutions is inadequate. Pockets of expertise exist in the security community, but there is an acute need to further inform and educate decision makers and leaders from industry, government and academia about cyber vulnerabilities and existing and emerging remediation options.

This initiative mirrors the priorities outlined in both the *National Strategy for Homeland Security* and the *National Strategy to Secure Cyberspace* by focusing on developing a better understanding of vulnerabilities and threats against critical national infrastructures, including PCS and SCADA systems, as well as raising awareness and improving public-private information sharing in these areas. Moreover, I3P workshops are strongly aligned with the goals and objectives outlined in the *National Infrastructure Protection Plan* (NIPP) in terms of supporting critical infrastructure and key resources research, development, testing, evaluation and deployment, and disseminating research results, guidelines, and best practices to the user community. The proposed workshop initiative

will be a vehicle to provide timely and accurate information and details of solutions to the relevant stakeholders.

These workshops and sessions have the following objectives:

- To provide a trusted forum for a diverse network of researchers, government, and industry representatives to exchange ideas and develop interdisciplinary solutions to critical problems.
- To demonstrate high-impact tools and technologies developed through I3P research.
- To increase awareness of cyber security issues and solutions, and assemble the right coalition of experts to address the most pressing technical and policy challenges.
- To create new understanding and knowledge that will be reported in the form of workshop proceedings, books and other publications.

The I3P has a well established ability to organize high-impact workshops of interest to industry, government and academia, and has used these workshops to gain knowledge about cyber security problems and to demonstrate solutions. The Consortium has previously demonstrated its ability to bring together important stakeholders from a variety of disciplines to discuss security challenges and advance solutions. The I3P has the unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue.

### **3. Participating institutions**

This initiative is run by the I3P administrative office, working in partnership with I3P consortium members and others as needed on specific events.

### **4. Subcontractors**

The original award was made to Dartmouth College.

### **5. Relationships with academia, industry, or government**

The I3P administrative office works closely with its industry, government and academic partners and stakeholders to plan and organize workshops and conferences that add significant value to the field, and provide attendees with useful knowledge or tools. The I3P regularly recruits high-level speakers and attendees from all the major stakeholder groups for I3P events.

## **6. Activities and progress**

### **a. Recent activities and progress**

The I3P coordinated with UC Berkeley in planning *WESII 2* (Workshop on the Economics of Securing the Information Infrastructure) on March 5<sup>th</sup> in Berkeley, CA.

The *Third Annual IFIP WG 11.10 International Conference on CIP*, led by the University of Tulsa, took place March 22-25 in Hanover, NH.

In addition, the I3P released a report on the recommendations made during last fall's Senate forums. It is available at [http://www.thei3p.org/news/senate\\_report.html](http://www.thei3p.org/news/senate_report.html).

### **b. Where we stand**

In the past quarter, the I3P successfully organized several workshops and meetings, and additional events are in various stages of planning.

### **c. Plans**

The I3P has scheduled several workshops for the spring and summer of 2009.

On April 28<sup>th</sup>, the I3P will hold its 5<sup>th</sup> annual process control systems security workshop in Houston, Texas. The workshop attracts attendees who wish to learn best practices to improve PCS security and provides an opportunity for industry stakeholders to meet with I3P team members to ensure that emerging solutions meet their needs.

The I3P's Insider Threat team will hold their project workshop May 5<sup>th</sup> in Washington, DC, with a poster session May 4<sup>th</sup> in the Rayburn House Office Building.

The Tuck School of Business at Dartmouth (part of the Business Rationale team) is organizing WEIS 2009 Eighth Workshop on the Economics of Information Security, to be held June 24-25 in London.

The I3P and the Tuck School at Dartmouth are in the planning stages for the *CISO Workshop on Measuring Risk*, scheduled for July 14<sup>th</sup> in Hanover, NH.

### **d. Obstacles**

There are no significant project obstacles to report at this time.

## **7. Meetings attended**

The I3P has participated in numerous teleconferences with planning partners from the consortium and industry to plan future workshops and conferences.

## 8. Publications

No publications were released during the reporting time.

## 9. Technology transfer

No technology was transferred during the reporting period.

### Initiative 4: Survivability and Recovery of Process Control Systems

#### 1. Project title and leads

Project title: Survivability and Recovery of Process Control Systems

Project lead: (b)(6) MIT Lincoln Laboratory

#### 2. Description

Process control systems (PCSs) are instrumental in the safe, reliable, and efficient operation of many physical processes in our critical infrastructures. However, the growing dependence of PCSs on conventional information technology (IT) elements and their increasing connectedness to the Internet results in their inheritance of known and emerging cyberspace risks and threats, including cyber attacks from adversaries with a range of skills. A successful cyber attack on a PCS could adversely affect not only the safe and reliable operation of the directly controlled infrastructure, but also other interconnected and interdependent critical infrastructures, resulting in adverse impact on human safety and the economy.

This project seeks to reduce the opportunity for an attack to be mounted against critical components, to increase the likelihood of detection if such an attack is made, and, if successful, operators can rapidly recover.

Team members will accomplish this by methodically identifying critical components, ensuring software is secure against attacks by design, by hosting, and by network configuration, and if the attacker is still successful, by ensuring recovery happens easily. Members will follow other related research, build and transition tools to industry, and participate in yearly workshops.

The research effort will be by coordinated by MIT/LL and is organized into seven thrusts, using I3P member organizations as follows:

Thrust 1, USMA: Track and leverage R&D efforts for government and industry. Share results, connect stakeholders and identify gaps.

Thrust 2, MITRE: Identify critical assets to better plan for PCS survivability. Spotlight

cases where mission critical nodes are at risk so operators can prioritize security efforts. Thrust 3, PNNL & MIT/LL: Ensure survivability of legacy and future platforms. Enable automated security testing of future PCS product software and develop a secure operating system base.

Thrust 4, UIUC: Specify, implement and enforce policy that results in survivable operations. Demonstrate tool that efficiently accomplishes this and provides human-interpretable feedback.

Thrust 5, Tulsa: Establish situational awareness in MODBUS networks. Develop tools to passively and actively map networks and components without affecting operations.

Thrust 6, SNL: Ensure system-level survivability and recovery. Work with industry groups to define best practices and demonstrate in a realistic setting.

Thrust 7, SRI: Work with industry to ensure research is on proper path and that technical transition is happening smoothly. Present results to community members via workshop.

### **3. Participating institutions**

- MIT Lincoln Laboratory (Team leader)
- Center for Information Security, University of Tulsa
- Information Technology and Operations Center, United States Military Academy
- Information Trust Institute, University of Illinois at Urbana-Champaign
- MITRE Corporation
- Pacific Northwest National Laboratory
- Sandia National Laboratories
- SRI International

### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

### **5. Relationships with academia, industry, or government**

The research team continues to interact with its project advisory board, made up of experts from owner/operator companies and vendors, as well as their individual industry partners. UIUC has been validating some new capabilities of their APT tool with their partners Alyeska and Ameren. The MIT team continues to leverage other non-I3P projects at Lincoln Labs to test their new port of DEADBOLT. The MIT team also continued talking with Emerson Process Management. The new version of the controller product for QNX operating system has been delayed due to staffing issues (one of the lead developers left the company), but they hope to have a subset of the code ready in the coming month and still interested in testing it using DEADBOLT. Sandia's leadership role in the redefinition of the API 1164 standard was rewarded by a near-unanimous vote for its adoption.

## 6. Activities and progress

### a. Recent activities and progress

A few of the research activities were slightly behind schedule due to project start-up delays (funding, staffing, etc.). However, most of those team members are catching up to their planned activities. Two teams were impacted by lengthy NDA negotiations with their industry collaborators, one of which was ultimately abandoned and the team redeployed to other efforts on this project. Another team was impacted by a personnel change and a refinement to their project plan.

*Thrust 1. Track and leverage R&D efforts for government and industry. Share results, connect stakeholders and identify gaps.*

The United States Military Academy (USMA) is completing its gap analysis that is based, in part, on the report from year one. This report, which tracks relevant, ongoing research, development, and application efforts in the survivability and recovery of process control systems, has provided overall guidance to the project team and highlights research gaps identified by the USMA team as well as by stakeholders in industry and government. The report will also include an assessment of DHS Rule 6, CFR Part 27. The report will be released before the PCS workshop in late April.

*Thrust 2. Identify critical assets to better plan for PCS survivability. Spotlight cases where mission critical nodes are at risk so operators can prioritize security efforts.*

MITRE completed the implementation of the new architecture of their RiskMAP tool which enabled the completion of the confidentiality, integrity, and/or availability extensions to the RiskMAP tool. Previously, they had been able to track mission dependencies on tasks; task dependencies on information; and information dependencies on IT assets. Now, the RiskMAP tool can keep separate track of these dependencies with respect to issues of confidentiality, integrity and availability. This enables one to evaluate the mission impact of network risks with respect to data exfiltration, data corruption or denial of service.

*Thrust 3. Ensure survivability of legacy and future platforms. Enable automated security testing of future PCS product software and develop a secure operating system base.*

As previously reported, the Pacific Northwest National Laboratory (PNNL) team working on the SHARP (Security-Hardened Attack Resistant Platform) software was refocused to work on an operator authentication mechanism that was given favorable reviews from the same industry advisors and vendors (See previous quarterly report for background on this change). The new focus, called NACIO, authenticates operators by monitoring network traffic in the control system and then taking pictures at the workstation when certain critical commands are issued. The team procured and tested Wifi active tags and rfid passive tags with their system. For simplicity and ease of demonstration they incorporated the passive tags into their demo for the upcoming



workshop. They also developed and tested the software to tie all the components relating to NACIO into one cohesive whole.

MIT's Lincoln Laboratory modified their taint-tracking system for C programs to work with C++ applications. They successfully compiled standard C++ library with taint-tracking to enable tracing of input taint in and out of commonly-used library functions. When complete, the taint-tracking system will identify allocations of limited resources that could be controlled by an attacker. They also investigated and implemented several different strategies for automatically understanding program input ("protocol learning"). This functionality is necessary to identify which parts of input should be changed and what mutations are appropriate. They developed a system that uses information from taint-tracking with some heuristics to break up input into tokens that can be modified by the testcase generating module. The MIT team continued to evaluate the performance of their resource exhaustion discovery system and introduce refinements to the system. The MIT team was also focused on the demos and presentations for the upcoming PCS workshop in April. For example, they will demonstrate a prototype of their resource exhaustion discovery system that identified memory allocation failures due to lack of input validation.

*Thrust 4. Specify, implement and enforce policy that results in survivable operations. Demonstrate tool that efficiently accomplishes this and provides human-interpretable feedback.*

The University of Illinois Urbana-Champaign (UIUC) continued to refine and extend their APT tool. They enhanced the topology inference functionality, enabling the tool to identify layer 2 or layer 3 devices (gateway, switches or routers) from firewall configuration files and include them as new kind of nodes in the generated topologies. They are now able to produce more detailed and complete topologies. They are currently validating this new capability with their partners Alyeska and Ameren, making sure that the topologies they generate are representative of their partners' actual configurations. The UIUC team also upgraded the tool's front-end application to appropriately parse and display these new nodes on the GUI. They also updated the engine to take into account the additional traffic flows going through these nodes when performing the analysis. In parallel, using the experience gathered from interactions with their industry partners and the various published guidelines for configuration of firewalls in PCS, they began developing a set of machine-checkable global policy templates that can be easily customized by the PCS network administrators for their particular network installations. These policies can be loaded, visualized and edited via APT's GUI.

*Thrust 5. Establish situational awareness in MODBUS networks. Develop tools to passively and actively map networks and components without affecting operations.*

The University of Tulsa's real-time scanner for situational awareness about SCADA devices and control operations was successfully ported to the low-cost Gumstix platform. Enhanced by a GUI and supported by a SQL database, it is currently capable of showing

visual representations of the process control network and events of interest to operators. It will be demonstrated at the upcoming PCS workshop.

*Thrust 6. Ensure system-level survivability and recovery. Work with industry groups to define best practices and demonstrate in a realistic setting.*

Sandia National Labs completed its Operator Response Training Simulator (OPSIM). After completing an on-site visit to a participating refinery, cyber scenarios for attacking an oil and gas process control system were developed and used to test using Sandia's virtual representation of a refinery and our attack graph tool (GAME). Still in progress is the documentation of these tests. During that same refinery visit, the team demonstrated OPSIM to the employees of the refinery and feedback was gathered. Using this feedback, the physics-based process models being represented within OPSIM were vastly improved upon, and were subsequently tested using cyber attack scenarios also developed and enhanced using feedback from the on-site visit.

The Sandia team also oversaw the completion of the final draft of API 1164 in February 2009, and its submission to API. The standard was overwhelmingly approved, with the API rewrite team now incorporating suggested refinements. The final version was submitted on April 16<sup>th</sup> and will be presented at the API and ENTELLEC conferences.

*Thrust 7. Work with industry to ensure research is on proper path and that technical transition is happening smoothly. Present results to community members via workshop.*

SRI continues to coordinate industry outreach and maintain the event participation plan. Because the PCS project workshop is scheduled for April 28, 2009, SRI requested and received an extension of the period of performance to 5/31/2009, which should be considered an extension of Y2Q4. SRI also submitted a revised Scope of Work (SOW) for tasks related to Y2Q4 on March 20, 2009. In this updated SOW the deliverables relating to technology evaluation and transition were removed. During this reporting period, SRI has been working on the detailed preparations for the April 28, 2009 workshop. This has included preparation of the agenda, development of afternoon discussion sessions, review of team presentations, outreach to potential attendees from industry and government, and other activities. SRI has also worked with some of the presenters to ensure the effectiveness of their presentations.

#### **b. Where we stand**

Work has generally caught up with project plans despite initial delays. The refining of the project plans and NDA negotiations with industry partners have caused some delay, but this is not expected to substantially impact the project. The renewal of the team at PNNL and its decision to refocus their efforts has also caused some delay.

#### **c. Plans**

In the next quarter the team will continue to work on its various research and development efforts in close collaboration with stakeholders. The MIT team intends to

resume collection of a resource exhaustion vulnerability corpus that was put on hold during their push to port DEADBOLT to the Windows platform. This corpus will be used to evaluate the prototype resource exhaustion detection system after the workshop. The UIUC team expects to have specified policy constraints for their two industry partners and used the APT tool to report any violations to these constraints by the firewall configurations. They also plan to work on implementing conflict detection and resolution among the rules in the global policy specification.

#### **d. Obstacles**

There are no significant project obstacles to report at this time.

### **7. Meetings attended**

The research team has held regular teleconferences to coordinate its efforts. Team members have presented parts of their work at conferences and industry forums. The UIUC team presented their APT work at the SANS SCADA Security Conference in January, and the UIUC team with SRI and the I3P staff provided a booth at that conference. The USMA team presented their work at the NPRA Cyber Security Workshop.

### **8. Publications**

Michael Zhivich, "DEADBOLT: Improving Software Security and Robustness Using Automated Testing" (Presentation to Rapid7 and Bain Capital)

Robert K. Cunningham, "Process Control System Protection, Misuse Detection and Incident Response", 2009 Homeland Protection/Bio-Chem Defense Systems Workshop

Shenoi and Papa, "Implementing Situational Awareness for Pipeline Control Operations", Third annual IFIP WG 11.10 International Conference on Critical Infrastructure Protection (Hanover, NH)

S. East, J. Butts, M. Papa and S. Shenoi, "A Taxonomy of Attacks on the DNP3 Protocol", Third annual IFIP WG 11.10 International Conference on Critical Infrastructure Protection (Hanover, NH)

Michael Zhivich, Robert K. Cunningham, "The Real Cost of Software Errors", IEEE Security & Privacy, 7(2), March/April 2009

### **9. Technology transfer**

There was no technology transfer activity during this reporting period.

## **Initiative 5: Business Rationale for Cyber Security**

### **1. Project title and leads**

Project title: Business Rationale for Cyber Security

Project lead: (b)(6) University of Virginia

### **2. Description**

Organizations of all types are facing risks resulting from their ever-increasing reliance on the information infrastructure. Decision and policy makers managing these risks are challenged by a lack of information concerning the risks and consequences of cyber events and would benefit from an increased understanding of the implications of cyber security risks and solutions. The project supports risk management efforts by studying essential components of risk management investment decisions: (1) what processes support a rational approach to cyber risk management?, (2) what data are needed to support rational decisions, and (3) what are the impacts to individual businesses and business sectors resulting from various investment alternatives? Sound, rational decisions require an understanding of IT risks and their impact on business events; this project supports these efforts via the development and refinement of decision support tools. To be of maximum utility, these tools require credible data of current and past situations, likely trends, and the impacts of current and past actions. Similarly, an understanding of the dynamics of cyber security is needed to help business decision makers understand the likely effects of cyber security choices.

The project will employ several techniques to explore and extend current options, including: (1) analytical risk-based decision models, (2) computer-based collaborative decision aids, (3) field studies of industry practices, (4) case studies, and (5) identification and analysis of credible data sources to apply to decision support. Building on their past research of the economics of cyber security investment, team members will develop new understanding and new capabilities for more rational decisions for investments in information infrastructure security. The results of the project will be support tools, models and data useful to support information security investment decision-making across all organizational levels. The methodology, body of data, and tools and techniques produced by the project will comprise a widely applicable set of cyber security practices and tools that are informed by an empirical understanding of business processes, constraints, government policy, and cyber security risks.

### **3. Participating institutions**

- University of Virginia (Team leader)
- RAND Corporation
- School of Law, University of California at Berkeley
- Tuck School of Business, Dartmouth College

#### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

#### **5. Relationships with academia, industry, or government**

Business rationale team members continue to use industry and stakeholder relationships as necessary for their work. The Tuck School of Business has concluded interviews with field study partners and their suppliers in the retail grocery, dairy and health care sectors. Tuck is also working with researchers from the I3P's Process Control Systems Security project to use the RiskMAP risk analysis tool in one of their case studies at a hospital unit. RAND continues to work closely with its case study partner to document the company's decision-making process in the face of a sustained cyber attack. UVa is working with various industry and government stakeholders, including presenting their collaboration tool to Booz Allen Hamilton, and UC Berkeley has conducted interviews with CSOs as part of its study into cyber security decision making.

#### **6. Activities and progress**

##### **a. Recent activities and progress**

A few of the research activities continue to be slightly behind schedule due to project start-up delays (funding, staffing, etc.). However, most of the team members have now caught up to their planned activities. A workshop hosted by UC Berkeley, Workshop on the Economics of Securing the Information Infrastructure (WESII), was held March 5<sup>th</sup>.

*Task 1.1. Identify Possible Decision Support Models and Their Required Data Input*  
RAND has continued to develop its decision support model evaluation framework, and continues to publish its findings in peer-reviewed journals. "Useful Security Metrics" by will appear in the May/June 2009 issue of *IEEE IT Professional*. An article describing the (anonymous) industrial case study has been written and is being reviewed by the industrial participant. Once the content is approved by the industrial partner, the article will be submitted to *IEEE Security and Privacy*. RAND is working on a paper that applies the model evaluation framework to the data available in the recent cybersecurity survey by the Bureau of Justice Statistics. The paper will describe what kinds of models might use the data in the survey. "What Makes Measuring Security Hard?" was revised and will be submitted to *IEEE Security and Privacy* as a jointly-authored publication with MIT Lincoln Labs. The team leader from RAND will host a panel discussion at the Workshop on the Economics of Information Security in London, June 24-25. The panel will discuss the need for a multidisciplinary model of security investments to support good decision-making.

The Business Rationale team continues with their major effort to perform agent-based modeling. All the team members are involved and are modeling different things, with UVa coordinating the effort.

*Task 1.2. Survey of Business Cyber Security Investment Decision Processes*

The Tuck Business School at Dartmouth College has completed 40+ interviews with its field study partners and their suppliers in the retail grocery, dairy, pharmaceutical sectors. Data from these field studies is currently being analyzed. The additional field study interviews in support of a grocery sector supply chain network study are largely completed. Tuck and UVa are working on an agent-based model to help simulate/estimate consequences of potential disruptions in a supply chain based on input from the field studies. Tuck has completed testing and verifying the RiskMAP decision support tool in cooperation with its hospital partner and is continuing documenting the process for use by other hospital organizations and development of application supporting tool. Tuck is also observing the deployment of business continuity plans by hospital units. Tuck is editing its draft of a “how-to” document aimed at assisting hospital information risk officers through all stages of running a risk mapping process at their institutions. Tuck has published a paper on policy recommendations for critical information infrastructure protection in developing countries.

*Task 1.3. Describing Interdependencies Arising From Business' Information and Physical Supply Chains*

UVa has been working with Tuck to construct a supply chain model that builds on Tuck's field study work. UVa investigated the dairy supply chain structure and operations, acquired annual data on production, supply, use of milk and manufactured dairy products (1970-2004), as well as on wholesale and retail price indexes, prices received by farmers, milk production costs, and regional shares of U.S. milk production during the same time period. Understanding the logistics and inventory policy of liquid milk products in two local grocery chains through Tuck's field study, UVa reviewed the dependency of dairy farms, processors and headquarters on information infrastructures and built a simple agent-based model to represent the operation among dairy farm, dairy processor, dairy headquarter, grocery and consumer. UVa is working on two papers related to the work, one on the information asymmetry and the other on agent-based modeling of information in supply chains.

*Task 1.4. Creation of Collaborative Computing Decision Support Tool*

UVa continued working on its collaborative computing decision support tool. The tool provides interdependency analysis to support security and investment decisions throughout a distributed organization. UVa continues to modify and incorporate the separate pieces of the decision support tool into one tool that flows inputs and outputs from the separate tools to the other pieces of the tool, and continues efforts to package the software into a deliverable form. While UVa has had discussions with Wachovia, the IT ISAC, SAIC, Booz Allen and Hamilton, Lockheed Martin, and Bank of America, and has done demonstrations for several, none were able to commit to trying out the entire tool.

Task 2.1. Analyzing the Emergent Nature of Cyber Security  
UVa has had a paper, “Empirical Analysis of the Effects of Cyber Security Incidents” accepted by the journal “Risk Analysis”, while the paper “Network Effects and Cybersecurity” is still under review at Management Science.

*Task 2.2. Collecting and Mining Publicly Available Data for Factors Affecting Security Deployment*

This task fell under the scope of work for MIT Lincoln Laboratory, which withdrew from the project for staffing reasons.

*Task 2.3. Modeling Firm Decisions in the Marketplace*

Indiana completed their paper and gave a presentation about their IPv6 work at the 2008 Workshop on the Economics of Information Security (WEIS). As decided following the mid-term project review, Indiana University has officially ended their activities on the project.

*Task 2.4. Case Study of an Actual Cyber Attack on Cyber Related Business Practices*

RAND’s drafts of two case studies of a firm’s business practices and decision making processes in the face of an ongoing cyber attack remain under development; when the team lead returns to full time work they will be completed.

*Task 2.5. Chief Security Officers*

UC Berkeley is sharing its findings from its expansive literature review related to the study of how data breach laws affect chief security officers’ cyber security decisions at conferences and with government and industry representatives. Berkeley continues to be slightly delayed in this work, but is completing its analysis of interviews with the CSOs of major software, telecommunication, healthcare and retail sector companies, has a new lead for a partner in the financial sector, and has begun drafting their report in a parallel effort. Berkeley is working with the Computer Security Institute to use data from prior CSI/FBI surveys and will incorporate questions into the 2009 survey for use in exploring and validating the findings of their qualitative work. If all the organizational issues are worked through, data collection for the survey will occur early this summer and be available for use in late summer.

**Area 2: Cyber Security Risks to US IP**

*Task 2.6. Cyber Risks to U.S. Intellectual Property*

Berkeley’s paper, “Trade Secrecy as an Instrument of National Security? Rethinking the Foundations of Economic Espionage,” has been accepted for publication by the Arizona State Law Journal. The paper has also been submitted for presentation at the Intellectual Property Scholars Conference and TPRC, and may be presented at the Princeton Center for Information Technology Policy. Acceptances for these presentations are due in the next month.

#### **b. Where we stand**

Work has generally caught up with project plans despite initial delays. Most deliverables are on schedule and the research team is continues to document and publish its results. The Business Rationale team has changed its focus a little from the initial research plan by embarking on a major effort to do agent-based modeling. All the team members are involved in this effort.

#### **c. Plans**

In the next quarter the team will continue to work on its various research and modeling efforts in close collaboration with stakeholders. The team will continue to refine its analysis of available decision support models, and their data needs. They will also finish work on their case studies in various sectors. Several papers on these efforts have already been published, with more publications planned for the next quarter. Team members are planning the Workshop on the Economics of Information Security in London, June 24-25, as well as a CISO workshop to be held July 14<sup>th</sup> in Hanover, NH.

#### **d. Obstacles**

There are no significant project obstacles to report at this time.

### **7. Meetings attended**

The research team has held regular teleconferences to coordinate its efforts. The Tuck School of Business, RAND and UC Berkeley have been meeting with their industry partners as part of their field studies/case study/interviews. Team members have presented parts of their work at conferences and industry forums, including the Financial Cryptography and Data Security February 22-26, the Security Breach Notification Symposium, and the Workshop on the Economics of Securing the Information Infrastructure (WESII), both on March 5, the Symposium on Security Breach Notification Laws, March 6, and the 3rd Annual IFIP Work Group 11.10 Critical Infrastructure Protection March 22-25.

### **8. Publications**

Shari Lawrence Pfleeger and Thomas Ciszek, "Choosing Among Security Options: Using the InfoSecure Methodology," *IEEE IT Professional*.

S. Dynes, "Information Risk Management in Tightly and Loosely Coupled Organizations" 3rd Annual IFIP Work Group 11.10 Critical Infrastructure Protection, March 22-25, 2009

H. Brechbuhl, R. Bruce, S. Dynes, M.E. Johnson, "Protecting Critical Information Infrastructure: Developing Cybersecurity Policy" *Journal of Information Technology for Development* (in press)



S. Dynes "Information Security and Critical Infrastructure Resiliency: Results From Field Studies" Center for Research on Computation and Society Seminar, Harvard (March 11)

E. Johnson "Data Hemorrhages in the Health- Care Sector" *Proceedings of Financial Cryptography and Data Security*, February 22

E. Johnson "Why File Sharing Networks Are Dangerous?" *Communications of the ACM*, February 2009, 134-38.

## 9. Technology transfer

No technology was transferred during this reporting period.

## Initiative 6: Assessable Identity and Privacy Protection

### 1. Project title and leads

Project title: Assessable Identity and Privacy Protection  
(also called "Safeguarding Digital Identity")

Project lead: (b)(6) MITRE

### 2. Description

Identity theft has become a national problem due to the ease with which digital identities are compromised and to the ever-increasing demand for electronic access to information, goods, and services. Capabilities to protect identity and privacy are critical to the various sectors of our national infrastructure, such as the financial sector and the health care sector. This national issue is a multi-faceted problem; broad, holistic solutions that address and strategically balance technical requirements and business processes as well as policy, social, legal, and economic constraints are necessary for a successful approach to identity and privacy protection. Failing to address this national problem threatens the nation's economic well-being and individuals' security and privacy.

The closely aligned problem domains of identity management (which includes defining and managing identity credentials) and privacy protection are large, and considerable effort is being applied to specific problems in those domains. Our objective is to enable enterprises in the critical infrastructure sectors of finance and healthcare to state requirements, implement solutions, and assess the relative benefits of alternative solutions for handling digital credentials in service oriented architectures.

To achieve our objectives, we will engage stakeholders and seek collaborative relationships with other research efforts to define a framework for describing digital credential requirements, comparing solutions, and identifying gaps. We will also develop

a proof-of-concept demonstration of the credentialing framework that demonstrates the ability to identify critical and relevant problems in this domain and solve them. A safe and acceptable way of exchanging credentials will solve a large piece of the national identity and privacy protection problem.

### **3. Participating institutions**

- MITRE Corporation (Team leader)
- Center for Education and Research in Information Assurance and Security, Purdue University
- Cornell University
- Georgia Tech Information Security Center
- Information Trust Institute, University of Illinois at Urbana-Champaign
- SRI International

### **4. Subcontractors**

The original award was made to Dartmouth College. Sub-awards were issued to each of the participating institutions (section #3).

### **5. Relationships with academia, industry, or government**

This project has a very strong dependence upon collaboration with industry and other ongoing identity management projects. Team members are working with numerous partners in the healthcare and finance sectors, as well as several government agencies and other research organizations, to help establish their requirements and develop an effective solution framework. For example, the MITRE team met with the Director, Identity, Policy and Management of the GSA and with the FTC & Office of the National Coordinator for Health Information Technology. The Georgia Tech team continued their work with a healthcare partner on challenges in identity management and privacy protection in federated healthcare environments, and with another on identity and health record challenges faced by emergency responders, and they are exploring synergies between centralized identity-related data collection and user-centric identity services with a credit reporting agency. The Purdue team worked with the Cornell-Weihl medical center to explore options for experimenting with a new technique in medical research collaboration applications developed as part of this effort. In a nutshell, Cornell identified a potential real-world application for their work, arising from medical research efforts that link Cornell's team in NYC with a Harvard group based in Boston. The Cornell team is now working with them to push the idea forward and build a deployable prototype system. The SRI team is working closely with other researchers at Stanford, UCSD, Columbia, UCLA, and MIT.

Stakeholders have been involved throughout the project from helping clarify stakeholder requirements to reviewing the SPICI Analytical Framework for Sharing Protected

Identity to driving new innovations such as the new Oblivious Commitment-based Envelope (OBCE) protocols that Purdue added to their VeryIDX prototype.

## 6. Activities and progress

### a. Recent activities and progress

A few of the research activities continue to be slightly behind schedule due to project start-up delays (funding, staffing, etc.).

#### *Task 1. Identify Stakeholder Requirements*

The research teams continue their interviews and exchanges with various stakeholders to identify and refine the real-world requirements. MITRE, as the team leader, continues to maintain a list of stakeholder interactions, and once again those interactions included numerous national and federal IdM standards bodies. As their work progresses, the teams' results often lead to new guidance from previously contacted stakeholders and prompts new interactions with additional stakeholders. Georgia Tech continued to leverage its relationship with a local healthcare provider as well as Nortel and Equifax. Over this reporting period, the MITRE team has been again very active. They held several collaborative work sessions with the office of the Chief Information Officer at Sun Microsystems on the implementation of their IdM web services components. They also held a technical exchange with MITRE's subject matter experts in Service-Oriented Architectures. Additionally, they collaborated with the Director, Identity, Policy and Management of the General Services Administration (GSA) on digital IdM standards implementation. The MITRE team participated in numerous national and federal IdM standards bodies meetings throughout this reporting period. The IdM standards-related organizations that MITRE interacted with included: Liberty Alliance, Health Information Management Systems Society (HIMSS), and the Organization for the Advancement of Structured Information Standards (OASIS). Each member of the team has continued to work with its specific stakeholders to identify use cases and deepen partnerships.

#### *Task 2. Leverage and Influence Other Identity Management Efforts*

The project team continues to work with a number of identity management efforts to inform and leverage their work. These include Project Higgins, Liberty Alliance, OASIS, FiXS, Microsoft Metasystem, IBM Tivoli, TrustGenix, and the National Electronic Commerce Coordinating Council (EC3).

#### *Task 3. Establish Credentialing Framework*

The MITRE team continues to present SPICI to stakeholders and will continue to revise it as needed based upon their input. They will present and demonstrate it at NIST's IDTrust2009 conference in April and this is expected to drive additional stakeholder interest in this unique approach.

The University of Illinois at Urbana-Champaign (UIUC) continues to improve the performance and reliability of its method of compiling a transaction datalog into SQL. Existing performance benchmarks for SQL compilers are insufficient to characterize the

unique capabilities of the UIUC compiler, so the team is working on making extensions to those benchmarks so that the team can further improve their compiler. The team has also made significant progress on the problem of assessing trust when selecting certificate chains in a Public Key Infrastructure (PKI). They completed a formal model of trust propagation that encompasses the combination of trusted partners' assessment of trust. The resulting paper was accepted for the Trust2009 conference and the team spent time finalizing the paper for presentation at the conference and began writing an extended journal version of the paper which will become the definitive reference on the topic.

#### *Task 4. Develop Proof-of-Concept Demonstration*

All of the teams are working towards coordinated demonstrations of their work. For example, MITRE completed our prototypic set of enabling web service components—the Physician Trust Hub—for IdM. More specifically, the team developed, integrated and tested an additional web service, PatientRecord, to service requests for patient records and developed a prototypic user interface to a healthcare portal for use in their demonstration.

#### *Provide a Trust Negotiation Service*

The Purdue team completed development of a demo of their VeryIDX tool in the context of Health-care – the demo consists of an e-prescription example and includes four different parties (a hospital, a test lab, a doctor and a patient). The demo shows the interactions among the parties and the proofs that are generated. It uses a NFC cellular phone and a server implemented on a conventional PC.

The Purdue team has also completed the initial integration of Trust-X and the Minimal Credential Disclosure Technique – an implementation has been developed in collaboration with the team from Georgia Tech to integrate the Trust-X system, developed by the Purdue Team, and the Minimal Disclosure Credential System developed by Georgia Tech. Some initial performance analysis has been carried out.

The Cornell team is developing techniques and tools for managing identity without ever revealing identity-related data to attackers. These efforts are currently in the research stage but Cornell expects techniques and ideas from this research (which in particular focus on studying multi-party security and zero-knowledge authentication and its applications to identity management solutions) to be leveraged to create practical ways of measuring information flow into and out of IDM systems. The team has also continued to pursue its work on developing a new general security framework that can be used to guarantee that protocols remain provably secure under concurrent executions, without assuming any trusted infra-structure. The paper describing this work was just accepted for STOC 2009 (June) and may very well form the basis of new metrics for assessment of the security of identity management systems.

#### *Enable User Control of Personal Information in Credential Systems*

Georgia Tech is collaborating with a local healthcare provider on the incorporation of their minimum information disclosure (MID) credential technology as the basis for a

“Personal Health Record” (PHR) service. They completed a prototype PHR service that includes verifiable sourcing, auditability, and selective disclosure. The team is also investigating technologies for attribute aggregation that can be used in a scenario covering emergency responder access to health records. The team completed an integrated demo of these two technologies on a scenario covering emergency responder access to health records. Over the course of their work, the team discovered that different parts of a medical record might have release dependencies between them, thereby complicating their use. As a result of this insight, the team completed an extension of the minimum disclosure credential technology to include release dependencies between claims. This extended claim dependency technology will be integrated into the demo during the no-cost extension period of the project. The team also wrote, and submitted for publication, a paper on redactable signatures with dependencies, documenting the research extending their minimum disclosure technology to deal with claim dependencies.

#### *Enhance Privacy with Queries on Encrypted Data*

SRI continues to pursue new research independently with UIUC on applications of SRI’s Attribute Based Encryption (now generalized as Functional Encryption) and with other institutions as well. Specifically, SRI continues to work with UIUC on its incorporation of ABE into their Attribute-Based Messaging (ABM) effort in support of this initiative. SRI also continues to focus its research efforts on characterizing ABE’s broad resistance to attack via rigorous mathematical treatment, and broadening and clarifying the necessary technical foundations that must be in place for its safe use. The research contributions coming from this effort continued to be impressive (see papers below), including the solution of a long-standing open problem on designing public-key cryptosystems. ABE has become a well-known cryptosystem that has gained the attention of stakeholders and researchers alike as evidenced by its growing acceptance at the key cryptography conferences. As SRI pushes forward to complete its work on multi-authority ABE, policy-hiding ABE, and more advanced encrypted access control, this impact will undoubtedly expand further as its popularity and dependability grows. SRI’s collaboration with PhD students and faculty at Stanford, UCLA, CMU, and UCSD has been very productive, resulting in papers and a key part of one PhD thesis. The work has also supported a strong multi-institutional submission to the NIST SHA-3 hash function competition which was selected as an official first-round contender, and it still in contention. (Several of the other candidates’ proposed hash functions have already been broken by others)

#### **b. Where we stand**

Work has generally caught up with project plans despite initial delays. Most deliverables are on schedule and the research team is documenting and publishing its results.

#### **c. Plans**

In the next quarter the team will continue to work on the various aspects of its research and deliverables. While interactions with existing stakeholders will continue, it is expected that the team’s highly visible presentations at the key IDTrust2009 conference

will lead to additional opportunities in various disciplines. The teams will be finalizing many of their results and will continue to collaborate on integrating them into cohesive demonstrations.

**d. Obstacles**

There are no significant project obstacles to report at this time.

**7. Meetings attended**

The research team has held regular teleconferences to discuss progress of the various efforts and coordinate related tasks. All the research partners have had extensive meetings and discussions with industry stakeholders, such as: Health Information Management Systems Society; Liberty Alliance: Health Care Special Interest Group; OASIS; eCitizen Identity and Online Civic Engagement Workshop. Team members have presented their work at conferences, workshops and industry forums, including TCC, PKC, STACS, Eurocrypt, and ARES 2009.

**8. Publications.**

Bertino, E. Digital Identity Protection – Concepts and Issues. Keynote talk, ARES 2009.

**9. Technology transfer.**

No technology was transferred during this reporting period.

## **ISTS Report**

## Overview

The Institute for Security, Technology, and Society (ISTS) is a community of researchers, students and educators working together with a common focus on technology critical for cyber security, privacy and trust. Our research, education and outreach programs contribute to the nation's security by providing knowledge discovery, science and engineering workforce development, and technology transfer.

In this document, we describe the activity of the Institute focusing on those projects supported by Grant number 2006-CS-001-000001 awarded by the National Cyber Security Division (NCSA) of the Department of Homeland Security (DHS). During this period, the grant supported eight continuing research projects. In this overview, we provide a few highlights; in the appended reports we detail the progress in each funded project.

In following our usual cycle for preparing these reports, this quarter we have asked each project lead to produce a short update to summarize their last three months of work. In our next quarterly report we will have our project leads provide a more detailed report on their efforts.

## ISTS Highlights: January – March 2009

While not all of these highlights are included in the following reports, they all specifically pertain to NCSA-funded projects and people.

### Best Paper Award

Secure Information Systems Mentoring and Training (SISMAT) program coordinators [redacted] (b)(6) traveled to Ames, Iowa in February to present "An Experience Report on Undergraduate Cyber-Security Education and Outreach", their paper describing the first year of SISMAT. They delivered the talk at the second *Annual Conference on Education in Information Security (ACEIS)*, which was hosted at the Iowa State University Information Assurance Center by Professor [redacted] (b)(6), and co-sponsored by the NSF.

The conference, which took place February 19-20, drew together information security researchers and educators from across North America, as well as a number of participants from overseas. The ISTS team's paper was particularly well-received: it garnered the first Best Paper Award to be presented by an ACEIS program committee and also inspired queries from many attendees interested in creating programs similar to SISMAT. Their award-winning paper can be found on ISTS' website in the Library database at <http://www.ists.dartmouth.edu/library/420.pdf>.

### HEBCA Joins Four Bridges Forum (4BF)

The Interoperability and Usability for PKI Management (PKI) team has been promoting the interoperability of PKI through federation agreements. The Higher Education Bridge



Certification Authority (HEBCA) is an initiative to facilitate trust between US higher education PKIs based on policy equivalence. HEBCA, created and hosted at Dartmouth, was originally sponsored by EDUCAUSE, and was utilized by the successful federal bridge program (FBCA) to demonstrate the feasibility of inter-bridge trust relationships. As a result of that project, other industries created their own PKI federations using bridging technology – the pharmaceutical industry bridge (SAFE) and the aerospace and defense industry bridge (CertiPath) are now also cross-certified with FBCA and provide efficient trust services between their communities. Support for the operations of HEBCA transitioned from EDUCAUSE to ISTS in January, and ISTS Researcher Scott Rea is actively investigating the potential for a permanent home for HEBCA with a commercial PKI vendor so that the increased interest expressed in the initiative can continue to develop with a greater assurance for the longevity and viability of the project.

Recently, the four US bridge PKI federations (HEBCA, FBCA, SAFE, and CertiPath), joined forces to create the Four Bridges Forum (4BF). The 4BF is a federation of the nation's leading PKI based identity trust hubs. The 4BF was created to facilitate trusted electronic business transactions across major federal agencies, US-based pharmaceutical companies, aerospace and defense contractors and colleges and universities. The 4BF will be officially launched at an event at the National Press Club in Washington, DC on April 28<sup>th</sup>. Rea, as HEBCA's representative, has been preparing for the launch of the initiative in collaboration with representatives from the other three bridges. The 4BF website has just been launched and can be found at <http://www.the4BF.com>.

### **PKI/Trust Lab Participant a Semifinalist in Intel Science Talent Competition**

(b)(6) a student at Hanover (NH) High School, and participant in ISTS projects in Dartmouth's PKI/Trust Lab was named a semifinalist in the prestigious Intel Science Talent Search in January.

(b)(6) has been working with (b)(6) a Research Assistant Professor in Computer Science and an affiliate of ISTS, on a variety of security-related topics.

(b)(6) worked as an intern on several programming projects, but chose to concentrate on network security, and specifically on packet-level manipulations that are the basis for many state-of-the-art penetration testing and attack techniques.

(b)(6) eventually submitted his work on development of a prototype tool for a novel visualization technique in the paper "Visualizing Network Anomalies for Intrusion Detection with Information Theoretic Metrics," to the Intel Science Talent Search Competition. He was one of 300 semifinalists among 1600+ entrants. In addition to the honor of being named a semifinalist, (b)(6) received a \$1,000 award with an additional \$1,000 going to his school. More information on the Intel Science Talent Search can be found at <http://sciserv.org/sts/about/index.asp>.

### **Cisco Equipment Donation**

Though ISTS/Dartmouth was notified in November, we forgot to include notice of a recent equipment award from Cisco Systems in our last quarterly report. Cisco donated

more than \$200,000 of network equipment to be used in Dartmouth's efforts in network security-related research and scholarship. The equipment will be used by faculty, students, and staff working with ISTS; Peter Kiewit Computing Services; and the Department of Computer Science. Some of the equipment will specifically benefit the SISMAT program.

### Welcoming [redacted] (b)(6)

In January [redacted] (b)(6) joined the Information Risk in Data-Oriented Enterprises (IRIDOE) project. His research focuses on the economics of information systems, information security ratings, open source software, B2B supply chain management, and applied game theory. [redacted] (b)(6) work has been presented at leading conferences such as ICIS, WISE and INFORMS. His recent working paper entitled "The Impact of Information Security Ratings on Vendor Competition" (co-authored with Professor Eric Johnson) has been accepted for presentation at the International INFORMS Conference 2009 in Toronto and AMCIS 2009 in San Francisco.

### Specific Project Highlights

Each report in the following sections outlines recent efforts by the project teams. The bullets below reference the papers published and submitted, and presentations given during this reporting period.

#### Foundations for Autonomic Computing (AC)

- Team members presented their ideas on autonomic monitoring in a poster session at the *Association for the Advancement of Artificial Intelligence (AAAI '09) Spring Symposium*.

#### Dartmouth Internet Security Testbed (DIST)

- Submitted a paper to the *Sixth Annual International Conference on Mobile and Ubiquitous Systems: Computing, Networking and Services (MobiQuitous)*.
- The team's network behavioral profiling ideas were presented as part of poster session at the *Association for the Advancement of Artificial Intelligence (AAAI '09) Spring Symposium*.

#### Digital Video Forensics (DVF)

- The team will submit a paper to the upcoming *ACM Workshop on Multimedia and Forensics*.

#### Hardware-Based Security (HBS)

- P. Tsang, R. Solomakhin, S.W. Smith. "ASOE: Authenticated Streamwise Online Encryption". *Computer Science Technical Report TR2009-640*. Dartmouth College. March 2009.

### Information Risk in Data-Oriented Enterprises (IRIDOE)

- Appari, Ajit and M. Eric Johnson (2009), “Information Security and Privacy in Healthcare: Current State of Research,” forthcoming in *International Journal of Internet and Enterprise Management*.

### MetroSense

- The project team developed “SoundSense”, a scalable sound sensing framework for mobile phones. It represents the first general purpose sound sensing system specifically designed to work on resource limited mobile phones. The SoundSense architecture and algorithms realize a scalable classification process that uses a combination of supervised and unsupervised learning techniques to classify both general sound types (e.g., music, voice) and sound types particular to each individual user. A paper on SoundSense was accepted to be presented at *ACM MobiSys* in June 2009.
- Professor Campbell presented results from the MetroSense project at two keynote addresses.
  - “The Rise of People-Centric Sensing”, *7th IEEE International Conference on Pervasive Computing and Communications (PerCom)*, Galveston, Texas, March 9-13, 2009.
  - “The Rise of People-Centric Sensing”, *10th International Conference of Distributed Computing and Networking (ICDCN)*, Hyderabad, India, January 3-6, 2009.
- The MetroFuse team:
  - Presented a poster at *AAAI Spring Symposium 2009, Human Behavior Modeling Workshop*, Palo Alto CA.
  - Presented a paper at *SBP09: Second Workshop on Social Computing, Behavioral Modeling and Prediction*, Phoenix AZ.
- The MetroSec team submitted a paper about energy-efficient sensor monitoring that was accepted at the *IEEE SECON* conference. They are preparing another paper that focuses on security and privacy properties of opportunistic sensing systems that use outboard sensors, sensors shared by other users, or sensors embedded in the surrounding environment. They also plan to finish and submit the journal-quality version of their AnonySense paper on ‘location blurring’, based on our paper in *Pervasive 2008*.

### Interoperability and Usability for PKI Management (PKI)

- In addition to helping launch the Four Bridges Forum (4BF), the team gave presentations on their work at the Open Grid Forum (OGF) in early March and the Internet Engineering Task Force (IETF) in late March in San Francisco.
- Revised and extended versions of earlier refereed conference papers have been accepted for journal publication.

- M. Pala, S.W. Smith. “PRQP: Finding the PKI Needles in the Internet Haystack.” *Journal of Computer Security*. To appear.
- M. Pala, S. Cholia, S. Rea, S.W. Smith. “Extending PKI Interoperability in Computational Grids.” *International Journal of Grid and High Performance Computing*. To appear.

#### Secure Information Systems Mentoring and Training (SISMAT)

- As noted above, (b)(6) published (and presented) a refereed paper on SISMAT – and earned “Best Paper” award.
- (b)(6) submitted a Working Group Proposal on undergrad cybersecurity education to the Colloquium for Information Systems Security Education (CISSE) 2009. The Colloquium will be held in Seattle in June (<http://www.cisse.info/>).

#### **Communication and Outreach Efforts**

In addition to our newsletter, distributed to over 1,000 people, we regularly provide updates via email to our many mailing lists. Our website details upcoming programs, recent publications, news items, and a great deal more. Beyond print and media, our staff and affiliates have personal communication with corporate research leaders and with program managers at government agencies. Research Director (b)(6) and Associate Director (b)(6) traveled to Washington, DC in early March to meet with several current and past government client including representatives from the National Institute of Standards and Technology (NIST), the National Science Foundation (NSF), and Mr. Ronald Ford and Ms. Brenda Oldfield of DHS/NCSD. (b)(6) provided an update on ongoing projects and a preview of future initiatives.

As part of our on-campus outreach efforts we host a speaker series. This spring we developed a full schedule. On March 5<sup>th</sup> we welcomed Steve Hanna, Distinguished Engineer at Juniper Networks, to talk about “Cloud Computing”.<sup>1</sup> The rest of the spring schedule follows:

- April 29<sup>th</sup> (b)(6), from the Foreign Military Studies Office of the Joint Reserve Intelligence Center at Fort Leavenworth, KS. His talk, entitled “Decoding the Virtual Dragon”, will discuss Chinese information warfare capabilities.<sup>2</sup>
- May 4<sup>th</sup> (b)(6), Professor, Harvard Law School and Co-Founder of the Berkman Center for Internet & Society and author of the recently published *The Future of the Internet and How to Stop It*. His talk will focus on prospects for a new generation of civic technologies to maintain the productive chaos of the

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<sup>1</sup> See <http://www.ists.dartmouth.edu/events/abstract-hanna.html> for Mr. Hanna’s bio, an abstract of the talk, the presentation slides, and the video as posted to YouTube.

<sup>2</sup> See <http://www.ists.dartmouth.edu/events/abstract-TimThomas.html> for a bio of Mr. Thomas and an abstract of the discussion.

Internet; it is entitled “Civic Technologies and the Future of the Internet”.<sup>3</sup>

The Institute, our faculty, and postdoctoral affiliates also continue to receive a great deal of attention in the press. For links to stories on our faculty, staff and students<sup>4</sup> and for a complete listing of ISTS publications, please see our website.<sup>5</sup>

### **Conferences, Courses, and Scholarships**

#### Securing the eCampus 2009

We are in the process of planning for our Third Annual *Securing the eCampus* Conference. The *eCampus* conference is focused on information security on college campuses and the unique challenges higher education administrators face. The agenda is geared toward academic CIOs, CISOs, and other campus IT leaders. This year the conference will be held July 27-28 on the Dartmouth campus. We will forward invitations to NCSD as we progress with the planning. Information will be made available at <http://www.dartmouth.edu/comp/about/conferences/security/>.

#### Business Engagement for the Information Security Professional (BESP)

The Center for Digital Strategies at the Tuck School of Business will be following up on the highly successful course, “Business Essentials for the Information Security Professional”, they presented with large support from DHS/NCSD last year. This year they will be offering BESP (with a slight change in name) with all funding through tuition, but focused on the same challenge of enhancing the leadership, financial, and communication skills of IT leaders. The course is being offered November 9-12, 2009.

#### Information Assurance Scholarship Program (IASP)

In June 2008, Dartmouth was designated a Center of Academic Excellence in Information Assurance – Research (CAE-R) by the Department of Homeland Security and the National Security Agency. As a result, this year was the first we were able to offer the opportunity for our students to apply to the Information Assurance Scholarship Program (IASP). We were pleased to submit four strong applications and look forward to hearing back from the IASP program office in May.

ISTS will continue to advance its efforts in information security and continue its mission through research, education and outreach.

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<sup>3</sup> See <http://www.ists.dartmouth.edu/events/abstract-zittrain.html> for a bio of Professor Zittrain and an abstract of the discussion.

<sup>4</sup> See a listing of ISTS press online at <http://www.ists.dartmouth.edu/news/index.html>

<sup>5</sup> ISTS papers: <http://info.ists.dartmouth.edu/library/>

## ISTS Affiliated Faculty, Fellows, and Postdoctoral Researchers

| ISTS Faculty Affiliates                                                                                                                                                                    |                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Director, Institute for Security, Technology, and Society; Associate Professor of Sociology and Chair of Sociology; Adjunct Associate Professor of Community and Family Medicine. | Adjunct Associate Professor of Business Administration; Executive Director, Center for Digital Strategies, Tuck School of Business. |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Associate Professor of Computer Science.                                                                                                                                                   | Assistant Professor of Computer Science. University of Massachusetts Lowell.                                                        |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Assistant Professor of Computer Science.                                                                                                                                                   | Dorothy and Walter Gramm Professor of Engineering, Thayer School of Engineering; Adjunct Professor of Computer Science.             |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| David T. McLaughlin Distinguished Professor of Computer Science and Associate Chair of Computer Science.                                                                                   | Adjunct Professor of Computer Science.                                                                                              |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Assistant Professor of Computer Science.                                                                                                                                          | Professor of Operations Management; Director, Glassmeyer/McNamee Center for Digital Strategies, Tuck School of Business.            |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Professor of Computer Science; Director of Center for Mobile Computing.                                                                                                                    | Professor and Department Chair, Computer Science and Engineering (CSE). University of Texas at Arlington                            |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Adjunct Professor of Computer Science.                                                                                                                                                     | Assistant Professor of Engineering, Thayer School of Engineering.                                                                   |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Assistant Professor of Computer Science.                                                                                                                                                   | Professor of Engineering, Thayer School of Engineering.                                                                             |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Associate Professor of Computer Science.                                                                                                                                                   | Professor of Engineering, Thayer School of Engineering.                                                                             |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Associate Professor, Computer Science.                                                                                                                                            |                                                                                                                                     |
| ISTS Fellows and Postdocs                                                                                                                                                                  |                                                                                                                                     |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Fellow, Glassmeyer/McNamee Center for Digital Strategies, Tuck School of Business.                                                                                                | Lecturer/Researcher, Thayer School of Engineering.                                                                                  |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| Research Assistant Professor of Computer Science.                                                                                                                                          | Senior Research Fellow, Glassmeyer/McNamee Center for Digital Strategies, Tuck School of Business.                                  |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| ISTS Research Fellow, Computer Science                                                                                                                                                     | Research Assistant Professor of Computer Science.                                                                                   |
| (b)(6)                                                                                                                                                                                     |                                                                                                                                     |
| ISTS Research Fellow, Computer Science                                                                                                                                                     | Research Fellow, Glassmeyer/McNamee Center for Digital Strategies, Tuck School of Business.                                         |

## **Laboratory for Hardware-Based Security (HBS)**

## 1. Project title and leads.

Project title: Laboratory for Hardware-Based Security (HBS).

Project lead: (b)(6) (Department of Computer Science)

## 2. Summary of Project Progress: 1 January – 31 March 2009.

### *Brief description*

As the title suggests, the goal of this project is to establish a laboratory. Rather than piecemeal exploration via paper designs and occasional hardware, the research team wants to establish a foundation to systematically explore the security implications of this next wave of architecture. This work will broach several fronts: vulnerabilities in current trusted computing architectures; designs and prototypes to fix these vulnerabilities; designs and prototypes of new architectures; and prototypes of applications of current and new architectures – including exploring how (in the spirit of minimizing the TCB) the requirements for “trusted” hardware in distributed security applications can be minimized.

The purpose of this project is to stand up the lab, and use this as a catalyst, leveraging external funding for student support where possible.

### *During this reporting period*

As noted above, this project was intended to stand up a lab for hardware-based security: to build up tools and expertise so that rather than depending on hardware produced by others, we could do hands-on experimental research and development ourselves. Throughout, we have pursued a portfolio of efforts: free-standing HBS projects, as well leveraging the grant to bring HBS skills to other research efforts.

(b)(6) (along with former postdoc (b)(6)) have been continuing to pursue ideas for novel CPU modifications that will make it easier to produce secure systems. This work has generated several paper drafts (hopefully to be published soon). We hope to be able to build upon these ideas using tools and expertise accumulated through HBS—and leveraging follow-on funds we hope to obtain from the Army Research Office (ARO). Last quarter, we reported that (b)(6) was looking at host-based intrusion detection; he has made great progress, although he has gravitated toward low-level OS techniques (for now), with CPU tricks as a follow-on.

(b)(6) has been working on prototyping the YASIR bump-in-the-wire SCADA crypto box (that came out of the NSF TCIP project) and the Faerieplay TTTP box (that came out of an earlier ISTS project) in FPGAs, in order to generate real artifacts—as well as to develop the toolset and skillset to do this sort of thing. (b)(6) is just about done with YASIR; in the next reporting period, it is hoped that he will finish Faerieplay—and then, equipped with this skillset, move on to his own research work in privacy-enhancing modifications to CPUs (“Hardware-based Privacy,” essentially).

(b)(6) and new MS student (b)(6) have been looking at ways to speed up the hardware-based encryption of YASIR, for legacy SCADA systems. They



have some theoretical results (including a formalism for a new kind of encryption model); however, their work is taking them toward analysis of higher-level communication patterns, and in the long run, it might better fit under the NSF TCIP umbrella than the HBS umbrella.

The following report was completed this quarter:

P. Tsang, R. Solomakhin, S.W. Smith. "ASOE: Authenticated Streamwise On-line Encryption". *Computer Science Technical Report TR2009-640*. Dartmouth College. March 2009.

## **Digital Video Forensics (DVF)**

### 1. Project title and leads.

Project title: Digital Video Forensics (DVF)  
Project lead: (b)(6) Department of Computer Science)

### 2. Summary of Project Progress: 1 January – 31 March 2009.

#### *Brief Description*

We are living in a world where seeing and hearing are no longer believing. The technology that allows for digital media to be manipulated and distorted is developing at break-neck speeds. These advances in digital technology are affecting nearly every corner of our lives: law enforcement, the courts, the media, scientific journals, medicine, business and more. At the same time our understanding of the technological, ethical, and legal implications is lagging behind. To this end, there is a significant need for mathematical and computational algorithms to detect traces of tampering in digital video. Our goal is the development of these algorithms. These techniques work in the absence of digital watermarks or signatures.

#### *During this reporting period*

We completed the latest new video forensic tool. This technique detects just video editing effects as green-screening. This approach works by quantifying, modeling, and measuring statistical artifacts that are introduced by double quantization that itself is the result of combining two videos of different qualities.

### 3. Future Plans.

We will submit a paper to the upcoming *ACM Workshop on Multimedia and Forensics*.

We believe that this approach may be applicable to the analysis of JPEG images. Currently, we are investigating this extension.

## **Foundations for Practical Autonomic Computing (AC)**

## 1. Project title and leads.

Project title: Foundations for Practical Autonomic Computing (AC)  
Project lead: (b)(6) (Thayer School of Engineering)  
Investigators: (b)(6) (Thayer School of Engineering)

## 2. Summary of Project Progress: 1 January – 31 March 2009.

### *Brief description*

Autonomic systems research is offering a seductive vision. Systems that can automatically diagnose, repair, defend and improve themselves would revolutionize information technology as we now know it. Current estimates of network maintenance costs, software complexity, and labor force trends paint a grim picture of the future for networked computer systems in terms of functionality, security and affordability. New directions and approaches are needed.

This project is investigating technical, and to a lesser extent the economic, business and social, aspects of autonomic computing systems from the point of view of security and robustness. We first focus on critical government and business systems that are typically more managed and better defined in terms of functionality. Later in this project, we investigate the possible impact that our findings can have on consumer technologies that “real people” are more likely to use. Consumer autonomic systems are in some ways more challenging because of their dynamic nature and the lower degree of management found in consumer information processing systems.

### *During this reporting period*

In the previous quarter, our most significant advancement was the development of a Markovian algorithm. The most efficient implementation is derived from hardware branch predictors, which are capable of quickly learning common behavioral patterns in practically any metric available in an operating system. The technique is straightforward in its basic concept; by recording a short history of one metric, we select a ‘predictor’ of future behavior for that same metric, which we then train over time. This is a continuous process, and does not require bootstrapping, or a cumbersome training period.

In the last performance period, we implemented this algorithm, and developed a new sensor (based on the publicly available CIGAR framework). This was necessary, as our results at a host-level were disappointing, forcing us to abandon our Gkrellm-based host-level sensor. During recent months, we have been able to implement our algorithm and sensing infrastructure to compare application performance, which shows much more promising results.

Our research plan for this year calls for five distinct research objectives, summarized as follows:

- We plan to quantify program stability as the number of unique predictor changes per hour. This can then be compared to other hosts running the same application,

finding deviant processes, or possibly processes operating under a different name, trying to hide their true, malicious identity.

- Run this experiment in a clean testbed environment, such that performance benchmarks may be set. The importance here is on measuring the accuracy of our predictions, rather than predicting them from first principals.
- Run this experiment on all private users' computers in our group.
- Perform system maintenance tasks, such as updating software.
- Publish our results.

At this time, we have completed the monitoring infrastructure and sensors (task 4), and implemented the first several experiments on a limited number of systems (task 1).

A major obstacle the team faced was the realization that our performance metrics must be more comprehensive than on the system-level alone. We therefore have shifted some of our focus to application behavior.

Our autonomic monitoring ideas were presented as part of poster session at *Association for the Advancement of Artificial Intelligence (AAAI '09) Spring Symposium*.

### **3. Future Plans.**

Over the course of the next three months, we will finish the article currently being written (task 5) while producing additional experiments, as needed (tasks 2 and 3).

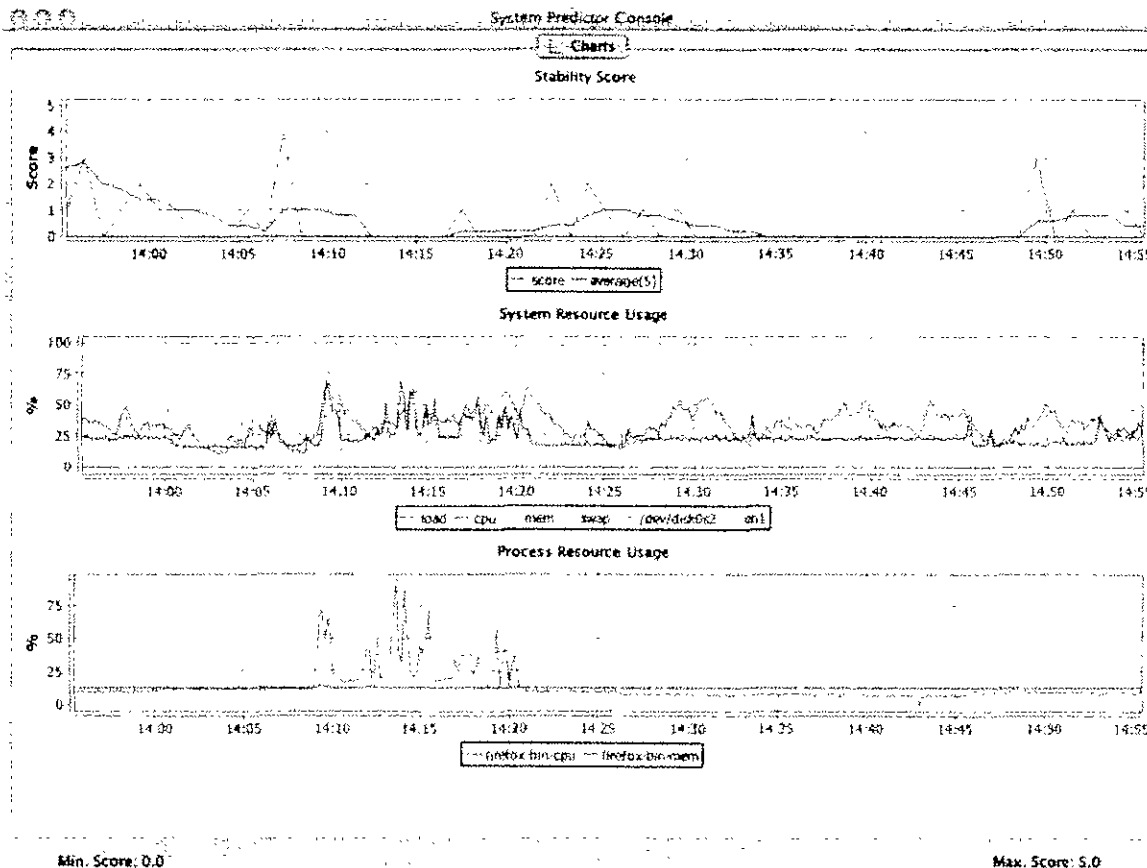
Our plan is to finish experimentation in both a cleanroom environment (for baselining), as well as on additional user systems. What we want to determine for this case is how much a given set of predictors for application performance is actually a signature for user behavior. Meaning, we all tend to browse to different websites, and we all tend to use applications in our own personal way, at our own pace. This means we ought to see differences in performance prediction changes that could be quite unique to each user.

Additionally, we intend to complete the research article summarizing our results. Hopefully the new measurements will offer sufficient verification of our methodology.

Finally, we are aware of N-gram approaches, used by linguists for machine natural language processing, which offer similar change predictors using a much smaller memory footprint. We are optimistic that this approach might hold some value for us, although we are aware that the N-gram approach requires a priori learning using a training dataset. Our current approach does online learning from the moment the system is turned on. We hope to have sufficient time next quarter to also explore the N-gram approach.

## Appendix – Measuring Single-Application Performance

Below is a screenshot of the monitoring software we wrote to measure single-application performance. The two lower strip charts speak for themselves, while the top strip chart shows the relative stability of a system as a sum of the monitored programs. This overall score turns out to be quite unique for different users, as well as different programs.



## **Dartmouth Internet Security Testbed (DIST)**



## 1. Project title and leads.

Project title: Dartmouth Internet Security Testbed (DIST)

Project leads (Wireless portion): (b)(6) in absentia (Department of Computer Science), (b)(6) Department of Computer Science), (b)(6) (Department of Computer Science)

Project lead (Wired portion): (b)(6) (Thayer School of Engineering)

## 2. Summary of Project Progress: 1 January – 31 March 2009.

### *Brief description*

Since the inception of the Institute for Security, Technology, and Society, its researchers have recognized the need for real world, large-scale network security data. This has, over the years, driven the development of various testbeds and network simulation environments. Although all of these technologies were valuable in their own right, their general applicability and usefulness outside of their immediate development context has been limited. This project develops the idea that Dartmouth possesses one of the most versatile and multi-faceted sources of network and computer security data in the world so that developing Dartmouth computing infrastructure as a testbed serves multiple purposes including:

- access to complex, dynamic real world security for the evaluation of advanced security technologies;
- building a unique, exemplary security capability at Dartmouth which can serve as a model for other universities;
- improving the overall computing security posture of Dartmouth, thereby benefiting all of the Dartmouth community;
- addressing the privacy and confidentiality issues that will arise in a highly heterogeneous, decentralized computing environment that strives to improve its security.

The DIST project consists of two components, **wired** and **wireless**, as indicated above. Their progress is described separately, because the DIST wired component has been re-purposed to address non-Dartmouth publicly available datasets, while the DIST wireless effort continues working with Dartmouth's wireless network data.

In particular, the wireless component of DIST is operated in cooperation with Peter Kiewit Computing Services (PKCS) that concerns itself with studying campus network usage patterns and with developing systems for automatically detecting malicious attempts to disrupt or degrade the network. DIST will operate wireless network monitors located throughout the campus and provide operational data to PKCS and, after suitable anonymization to ensure user privacy, to ISTS researchers.

### *DIST Wired Progress*

Access to realistic and useful network data has been the major stumbling block in the DIST Wired research. The privacy concerns, which are very understandable, have been a barrier to obtaining good workable datasets.

Since Q3-08, we have been working hard to obtain a large variety of data sources. So far, we have been able to obtain traffic captures produced for the AFRL/ARDA research project, and data collected on our own instrumented network testbed. In addition to these two sources, we are actively working with BAE systems to obtain sanitized network traffic from one of their locations. Also, another research group at the Thayer School of Engineering is in possession of the Lariat traffic generator, produced by Lincoln Labs. We are pursuing a working relationship, which could result in our ability to access traffic generated by the Lariat generator.

#### Where we stand.

Since the nature of our work puts the focus on behavior analysis of hosts in a computer network, which is mostly a direct result of user actions, we have spent the majority of our time exploring the various dimensions of data available in our network traffic datasets. We have developed a robust methodology for comparing different metrics, which will ultimately allow us to accurately compare traffic behavior signatures.

This year's research plan calls for the following steps to be completed (in summary):

- Define a comprehensive network profile signature, including any useful metrics.
- Obtain more realistic data sources for testing.
- Develop a robust methodology for comparing network profile signatures.
- Collect the results and publish.

At this point we are close to finalizing the components of network profile signatures (task 1), although we are of the opinion that these signatures will contain different parts depending on the detection and profiling task. We have actively recruited additional data sources, and are becoming more comfortable with the data sources that we have gathered so far. This is concrete progress on task 2.

We are able to compare the various subparts of network profiles, but have no theoretical foundation to combine the comparisons into a comprehensive comparison, yet. This will be a major focus of the next quarter (task 3).

Our network behavioral profiling ideas were presented as part of poster session at the *Association for the Advancement of Artificial Intelligence (AAAI '09) Spring Symposium*.

### *DIST Wireless Progress*

In this quarter, we worked to certify the DIST wireless infrastructure for operation, having addressed the many security and privacy related tasks stipulated by the external

auditor and the internal security assessment of the DIST software architecture (it will be certified in early April 2009). The resulting infrastructure, along with the guidelines for its further development, has been summarized in the “DIST Security and Privacy” document.

The group also continued working on the application of streaming entropy estimation algorithms to intrusion detection in 802.11 networks.

(b)(6) continued working on improving the performance of the Air Monitor's (AM) sniffing software, by implementing a faster and more CPU-efficient cipher based on the Rabbit encryption algorithm.

Finally, the deployed DIST Air Monitors in two buildings have been moved to a different set of VLANs and, consequently, subnets, due to changes in the underlying Dartmouth network. This posed a challenge to our AM management and scanning/inventorying mechanisms; we plan to describe our experiences in addressing this challenge with such underlying network changes in a workshop paper.

## **Future Plans**

### *DIST Wired*

In the next quarter, we intend to further develop the behavior profile, in the hopes of finding a meaningful way of combining the comparisons on multiple probability density functions into a single score that has conceptual meaning. We cannot simply add the scores, as it seems that some metrics are more powerful for detection of botnets, while others are more useful for comparing network data sets.

Proper separation of objectives is most likely needed to define how to fit multiple metrics into a single “score”, depending on what the desired detection is. We are considering a weighting vector, as well as a conventional data mining approach: principal component analysis (PCA).

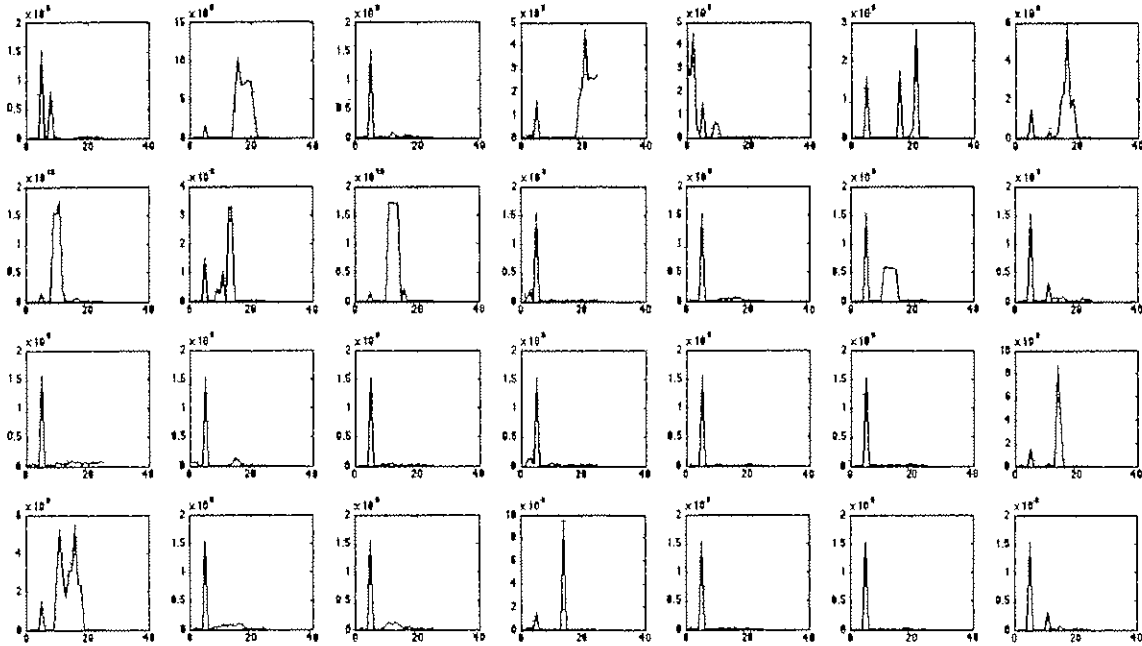
### *DIST Wireless*

The DIST Wireless team will continue installation of the AMs. Installation is expected to be complete by July 2009. The team also is planning to conduct larger tests on its MAP wireless-network intrusion detection research, specifically on methods for channel sampling. These tests will act as a foundation for other research topics.

Preliminary results on the application of streaming entropy estimation algorithms to intrusion detection in 802.11 networks will be submitted to the RAID 2009 conference in April.

### Appendix – DIST Wired Analysis

These graphs show screenshots of four weeks of user behavior for the HTTP protocol from a single computer. Left to right are Sunday to Saturday. It appears that the same spike at 6AM is always present on this system, all days of the week. The amplitude spikes, for instance, are very helpful in creating unique signatures.



## DIST Subcontractor Report

### 1. Project title and leads.

Project title: Dartmouth Internet Security Testbed (DIST): Subcontract Report

Project lead: (b)(6) (UMass Lowell subcontractor)

### 2. Summary of Project Progress: 1 January -- 31 March 2009.

We have successfully built self-diagnosis wireless APs by running a model-based fault diagnosis rule engine on the embedded wireless device. The APs are enhanced to detect both malicious security attacks and benign performance problems. This architecture allows easier deployment of sniffing infrastructure by adding an additional radio to existing APs, more accurate correlation between wired and wireless measurements, and potential self-remedy actions to be taken by APs themselves. We have evaluated the prototype system in an office testbed, and found the diagnosis engine achieved high analysis accuracy while imposing minimum overhead on APs' client-serving performance. We have also evaluated a distributed approach by running a diagnosis engine in a central server that takes inputs from APs (acting as sniffers). We have submitted a paper to the *Sixth Annual International Conference on Mobile and Ubiquitous Systems: Computing, Networking and Services* (MobiQuitous).

## **Interoperability and Usability for PKI Management (PKI)**

## 1. Project title and leads.

Project title: Interoperability and Usability for PKI Management (PKI)

Project lead: (b)(6) Department of Computer Science)

Investigators: (b)(6) (ISTS Postdoctoral Researcher) (b)(6)

(b)(6) Computing Services and ISTS Researcher)

## 2. Summary of Project Progress: 1 January – 31 March 2009.

### *Brief Description*

Enabling the people and organizations that use the real-world information infrastructure to easily make the right trust judgments about other entities is an ongoing problem. Public-key cryptography is a critical building block here because it can enable verifiable assertions between parties who do not share secrets beforehand. However, the public-key infrastructure (PKI) that effectively solves these trust problems still eludes us. The existing technology provides pieces of solutions, but still leaves us with obstacles. This project aims to overcome these obstacles by focusing on how to fit the technology to human requirements, rather than imposing upon the humans the trust structures convenient for the technology. In the spirit of Dartmouth's computing traditions and the mission of ISTS, this project aims to make PKI work in the real world; PKI is the glue that holds the IT together!

This project also supports (and ISTS is the interim host of) the Higher Education Bridge Certification Authority (HEBCA). Originally sponsored by EDUCAUSE, HEBCA was developed at Dartmouth College to facilitate trusted electronic communications within and between all institutions of higher education within the US, as well as with federal and state governments.

### *During this reporting period*

(b)(6) presented on LibPKI, PRQP and integration with OpenCA to the CA Operations (CAOPS) group within the Open Grid Forum (OGF) on March 3. The interest in the research was evidenced by the dramatic increase in attendance at the CAOPS session, where numbers swelled by 250-300% and requests for copies of the presentation were fielded by grid researchers who were unable to make the meeting.

(b)(6) also took the opportunity at OGF to continue talks with key grid researchers who have expressed interest in the use of PRQP, and presented on the current activities of The Americas Grid Policy Management Authority (TAGPMA) - a federation of PKI authentication providers and relying parties of those responsible for grids in North, Central and South America, and part of the International Grid Trust Federation (IGTF) - to foster the cross-domain trust relationships that are needed to deploy grids in the Americas and around the world. (b)(6) helped found TAGPMA and has been working with the community to identify common policies and procedures that can be utilized across the IGTF and other PKI federations within federal government and higher education in the US.

(b)(6) presented the PRQP activities update at the IETF meeting in San Francisco in late March, where PRQP was proposed to be upgraded to the standard track (from experimental) as a result of the interest in the protocol expressed by the federal government, commercial CA vendors and PKI federations like the IGTF (b)(6) began work with these communities to implement PRQP, and as a result, it is anticipated that PRQP will become an official IETF standard in the near future.

(b)(6) has been working with the Four Bridges Forum (4BF) in preparation for the launch of a federation at an event at the National Press Club in Washington, DC next month (April 28<sup>th</sup>). The 4BF is a federation of the leading US bridge PKI communities - HEBCA (higher education), FBCA (federal government), SAFE (pharmaceutical industry), and CertiPath (aerospace and defense industry). The 4BF website has been launched (<http://www.the4BF.com>) along with invitations to the event for key program managers and application owners in the respective communities.

(b)(6) began the evaluation of the National Center for Supercomputing Applications (NCSA) proposal to be accredited under the IGTF for a federation-enabled short-lived credentialing service. This service is PKI-based and will be operated in addition to NCSA's existing membership integrated credentialing service that is already accredited by the IGTF.

(b)(6) has made progress in LibPKI and PRQP implementation. The basic support for PKCS#11 (restricted to RSA algorithm for now) has been completed. Testing the software together with HSMs (Aladdin eToken) and software emulation of PKCS#11 devices (provided by Eracom) is underway.

(b)(6) joined Professor (b)(6) by a teaching assistantship, Ph.D. student (b)(6) lab. His background in building tools to transform human texts and diagrams to machine-actionable representations fits into many aspects of the lab's work. During this reporting period, he worked with (b)(6) in using his approach to eliminate some of the significant barriers that certificate policy analysis presents in CA and bridge operations. A paper may come of this.

Revised and extended versions of earlier refereed conference papers have been accepted for journal publication.

M. Pala, S.W. Smith. "PRQP: Finding the PKI Needles in the Internet Haystack." *Journal of Computer Security*. To appear.

M. Pala, S. Cholia, S. Rea, S.W. Smith. "Extending PKI Interoperability in Computational Grids." *International Journal of Grid and High Performance Computing*. To appear.



**Secure Information Systems Mentoring and Training  
(SISMAT)**

## 1. Project title and leads.

Project title: SISMAT: Secure Information Systems Mentoring and Training  
Project lead: Professor S (b)(6) PI (Department of Computer Science)  
(b)(6) ir, Ph.D. student (Department of Computer Science)  
Dr. I (b)(6), Director (now of George Mason University)

## 2. Summary of Project Progress: 1 January – 31 March 2009.

### *Brief description*

Business, government, and non-profit institutions have expressed difficulty finding personnel with appropriate training in cyber security tools. Such training requires hands-on experience with secure systems work, yet many institutions of higher learning lack the resources to provide that experience. This initiative aims to meet regional and national needs by implementing a pilot program in mentoring and training that will bring the extensive expertise of researchers and teachers at Dartmouth College in the areas of PKI and trusted systems together with students and faculty from other New England colleges, as well as interested corporate and non-profit partners. We explicitly target regional colleges whose curricula will have prepared upper-level undergraduates for this hands-on work but cannot offer it themselves; we target cyber security focus areas in which we have leadership and expertise; and we target external partners that have communicated a need for training in these areas. The training program will provide undergraduates with the knowledge and support needed to participate in internships, provide opportunities for secure systems research and development to traditionally underrepresented student populations, and facilitate the development of secure systems curricula at other academic institutions.

### *During this reporting period*

A subcontract with George Mason University (GMU) was established for (b)(6) and (b)(6) to continue on as Project Director and to carry out SISMAT 2009. (b)(6) and Sergey Bratus (Dartmouth's SISMAT course lead) have agreed on the Statement of Work.

The dates for SISMAT 2009 have been locked in. The course will take place from June 24 – July 3. We have accepted applications from SISMAT participants and are in the process of evaluating them. We are expecting 5-7 participants.

(b)(6) submitted a Working Group Proposal on undergrad cybersecurity education to the Colloquium for Information Systems Security Education (CISSE) 2009. The Colloquium will be held in Seattle in June (<http://www.cisse.info/>).

Locasto and Sara Sinclair published (and presented) a refereed paper on SISMAT – and earned “Best Paper” award. Please see our most recent ISTS newsletter for more information (<http://www.ists.dartmouth.edu/docs/WinterSpringNewsletter2009.pdf>).

Michael E. Locasto and Sara Sinclair. "An Experience Report on Undergraduate Cyber-Security Education and Outreach." The Second Annual Conference on Education in Information Security (ACEIS 2009). February 2009. Ames, IA, USA.

### **3. Future Plans.**

We are in the process of reviewing applications and preparing to notify students of the results. We are also finalizing the syllabus, ordering books and finalizing other logistics. Finally, we are gathering project reports from last year's SISMAT students and intend to provide these to NCSD in the next quarterly update.

## **Information Risk in Data-Oriented Enterprises (IRIDOE)**

## 1. Project title and leads.

Project title: Information Risk in Data-Oriented Enterprises (IRIDOE)  
Project leads: (b)(6) (Tuck School of Business)  
Department of Computer Science)

## 2. Summary of Project Progress: 1 January – 31 March 2009.

### *Brief description*

Many modern industries share and operate on information. As with the rest of society, these industries are moving their operations into electronic settings. In some fields (such as the financial sector), operating on data electronically offers a vital competitive edge; in other fields (such as in healthcare), operating on data electronically can be a very desirable cost-cutting measure. In both cases, firms are faced with the challenge of channeling the right information to employees, while ensuring that these information systems don't provide data entitlements that inappropriately enable misuse or violate customer privacy.

With a research team from computer science and business, we are investigating how information risk can be articulated and monetized with the goal of developing lifecycle management approaches to information provisioning. We are developing models of both the organizational and system application structure to allow us to simulate the effectiveness of potential technical and access policy changes. For example, a model of an organization that allows the simulation of employee hiring, termination, promotion, and supervisory relationship changes enables us to predict how auto-provisioning users with a certain role at a certain lifecycle event would affect the overall system. We are also examining the role of incentives within organizations to reduce over-access to information. Using game theory, we will examine how policy changes could reduce risk. This interdisciplinary project will benefit data-oriented enterprises by both analyzing many current best practices for provisioning and developing new approaches that reduce information risk.

We see this project as building on our NIST-funded Information Risk in the Professional Services (IRIPS) project, and feeding ideas and tools into our I3P Insider Threat project. We note that the development of the SSF SHOES (a Scalable Simulation Framework to model Security in Human-Oriented Enterprise Environments) modeling tool is joint to both this and the Insider project. As in previous reports, we distinguish the deliverables associated with each by noting that SHOES models for Insider will focus on the negative impact a small number of users (malicious or well-intentioned) can have on the data security of a large organization; SHOES models for IRIDOE will focus more on the larger impact that inappropriate access control technology can have on the larger business, and how the business goals of efficiency and cost reduction impact the effectiveness of access control technology in turn.

*During this reporting period*

- March 24, 2009: Eric Johnson participated in the *InformationWeek* WebCast, “Escaping the Rock and Hard Place: Surviving & Thriving in a Time of Turmoil and Tight Budgets”.
- January - March 2009: Johnson and Appari worked on revising their research survey of information security in healthcare. The paper was accepted for publication:
  - Appari, Ajit and M. Eric Johnson (2009), “Information Security and Privacy in Healthcare: Current State of Research,” forthcoming in *International Journal of Internet and Enterprise Management*.
- January – March 2009: Sara Sinclair continued (and is continuing) discussions with DHMC IT staff about their access control hygiene challenges (which also feeds into her I3P project work). Computer Associates, impressed by our work in these two projects, is providing additional real-world access (and supplemental funds).
  - On February 11<sup>th</sup>, Sinclair presented her work at a seminar at Harvard.
  - New Ph.D. student Gabe Weaver (funded via a teaching assistantship) has begun learning about this space.
- January 2009: Zhizhong “Zach” Zhou joined the research team. He is a Research Fellow at the Center for Digital Strategies. He received his Ph.D. in Information Systems from the University of California, Irvine. His full bio can be found at: <http://www.ists.dartmouth.edu/people/fellows/zhou.html>

## **MetroSense: Scalable Secure Sensor Systems**

## 1. Project title and leads.

Project title: MetroSense: Scalable Secure Sensor Systems  
Project lead: (b)(6) ll (Department of Computer Science)  
(Thayer School of Engineering)  
Department of Computer Science)

## 2. Summary of Project Progress: 1 January – 31 March 2009.

### *Brief description*

Sensor networks will provide a foundation to protect and monitor our national infrastructure, including economically important businesses with global reach (e.g., stock markets), critical transport and industrial facilities, the enterprise, and the border. These tiny, low-cost wireless devices embed on-board sensing, are fully programmable, and can spontaneously form large sensor webs with thousands of distributed sensor devices. In this project, we will study, analyze, propose, deploy, and evaluate MetroSense, a radically different scalable secure sensor architecture and system capable of reliable real-time monitoring and data fusion for large-scale critical infrastructure, resources, and assets. MetroSense opportunistically leverages mobile sensors (e.g., sensor enabled mobile phones) when available to deal with sparse coverage and communications when sensing. We are developing a scalable mobile sensor network based on mobile phones and embedded sensors that supports sensing and communications, sensor security, and sensor fusion. Results from this project will serve as a foundation for building secure sensor networks capable of monitoring large-scale critical infrastructure.

The project has three major components: MetroSense, MetroFuse, and MetroSec. We describe progress in each component below.

### *During this reporting period*

#### MetroSense

The major tasks worked on this reporting period include a new version of the CenceMe application and work on a scalable sound sensing system called “SoundSense”.

SoundSense is a scalable sound sensing framework for mobile phones. It represents the first general purpose sound sensing system specifically designed to work on resource limited mobile phones. The SoundSense architecture and algorithms realize a scalable classification process that uses a combination of supervised and unsupervised learning techniques to classify both general sound types (e.g., music, voice) and sound types particular to each individual user.

SoundSense’s unsupervised learning algorithms support the discovery of each user’s personalized significant sound set.



The project team designed SoundSense to solely run on the mobile phone with no back-end interactions and have implemented the initial prototype system on the Apple iPhone. A paper on SoundSense was accepted to be presented at *ACM MobiSys* in June 2009.

Professor (b)(6) presented results from the MetroSense project at two keynote addresses.

- “The Rise of People-Centric Sensing”, *7th IEEE International Conference on Pervasive Computing and Communications* (PerCom), Galveston, Texas, March 9-13, 2009
- “The Rise of People-Centric Sensing”, *10th International Conference of Distributed Computing and Networking* (ICDCN), Hyderabad, India, January 3-6, 2009

### MetroFuse

Specific tasks performed by the MetroFuse team during this reporting period included:

- Explored techniques for physical layout of a sensor network (e.g., a cell network) from adjacency as determined by inter-cell handoffs.
- Investigated state-of-the-art planarity checking algorithms for graphs and N-cliques (such as 4-cliques). Example: The layout of the MIT Reality data proved non-planar, but reduction to planarity is possible.
- Used LaNet-vi visualization system to represent the terrain.
- Developed algorithms and a system to identify co-travel among the MIT Reality participants.
- Identified several couples, and about 500 pairs of co-travelers moving for at least two hops together.
- Built representation of the cell tower graph with *ocamlgraph*, a functor-based library allowing for convenient iteration.
- Started on a model of motion times diversity across different edges, in order to identify variability in speed and build a motion model for the subjects.
- Presented a poster at *AAAI Spring Symposium 2009*, Human Behavior Modeling Workshop, Palo Alto CA.
- Presented a paper at *SBP09: Second Workshop on Social Computing, Behavioral Modeling and Prediction*, Phoenix AZ.

### MetroSec

In this quarter, we submitted a paper about energy-efficient sensor monitoring, in the context of highly secure protocols; it was accepted at the competitive IEEE SECON conference. We are preparing another paper that focuses on security and privacy properties of opportunistic sensing systems that use outboard sensors, sensors shared by other users, or sensors embedded in the surrounding environment. We also plan to finish and submit the journal-quality version of our AnonySense paper on ‘location blurring’, based on our paper in *Pervasive* 2008.



**APPLICATION FOR FEDERAL ASSISTANCE  
SF 424 (R&R)**

3. DATE RECEIVED BY STATE

State Application Identifier

1. \* TYPE OF SUBMISSION

Pre-application  Application  Changed/Corrected Application

4. a. Federal Identifier

2006-CS-001-000001

b. Agency Routing Identifier

2. DATE SUBMITTED

Applicant Identifier

5. APPLICANT INFORMATION

\* Organizational DUNS: 0410278220000

\* Legal Name: Trustees of Dartmouth College

Department: Office of Sponsored Projects

Division:

\* Street1: 11 Rope Ferry Road, #6210

Street2:

\* City: Hanover

County / Parish:

\* State: NH: New Hampshire

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: 037551404

Person to be contacted on matters involving this application

Prefix: \* First Name (b)(6)

Middle Name:

\* Last Name: (b)(6)

Suffix:

\* Phone Num (b)(6) Fax Number: 603-646-3670

Email: (b)(6)

6. \* EMPLOYER IDENTIFICATION (EIN) or (TIN): 020222111

7. \* TYPE OF APPLICANT:

0: Private Institution of Higher Education

Other (Specify):

Small Business Organization Type

Women Owned

Socially and Economically Disadvantaged

8. \* TYPE OF APPLICATION:

If Revision, mark appropriate box(es).

New  Resubmission

A. Increase Award  B. Decrease Award  C. Increase Duration  D. Decrease Duration

Renewal  Continuation  Revision

E. Other (specify):

\* Is this application being submitted to other agencies? Yes  No  What other Agencies?

9. \* NAME OF FEDERAL AGENCY:

Office of Procurement Operations - Grants Div

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:

TITLE:

11. \* DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:

Cyber Security Collaboration and Information Sharing Project

12. PROPOSED PROJECT:

\* Start Date \* Ending Date

08/01/2011

07/31/2013

\* 13. CONGRESSIONAL DISTRICT OF APPLICANT

NH-002

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: Dr. \* First Name: (b)(6)

Middle Name:

\* Last Name: (b)(6)

Suffix:

Position/Title: Vice Provost

\* Organization Name: Trustees of Dartmouth College

Department: Provost

Division:

\* Street1: Parkhurst - HB 6004

Street2:

\* City: Hanover

County / Parish:

\* State: NH: New Hampshire

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: 037553529

\* Phone (b)(6) Fax Number: 603-646-0660

\* Email: (b)(6)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>15. ESTIMATED PROJECT FUNDING</b></p> <p>a. Total Federal Funds Requested <input style="width:150px;" type="text" value="850,000.00"/></p> <p>b. Total Non-Federal Funds <input style="width:150px;" type="text" value="0.00"/></p> <p>c. Total Federal &amp; Non-Federal Funds <input style="width:150px;" type="text" value="850,000.00"/></p> <p>d. Estimated Program Income <input style="width:150px;" type="text" value="0.00"/></p> | <p><b>16. * IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?</b></p> <p>a. YES <input type="checkbox"/> THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:<br/>DATE: <input style="width:100px;" type="text"/></p> <p>b. NO <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E.O. 12372; OR<br/><input type="checkbox"/> PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

17. By signing this application, I certify (1) to the statements contained in the list of certifications\* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances \* and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

\* I agree

\* The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

**18. SFLLL or other Explanatory Documentation**

**19. Authorized Representative**

Prefix:  \* First Name:  Middle Name:

\* Last Name:  Suffix:

\* Position/Title:

\* Organization:

Department:  Division:

\* Street1:

Street2:

\* City:  County / Parish:

\* State:  Province:

\* Country:  \* ZIP / Postal Code:

\* Phone:  Fax Number:

\* Email:

**\* Signature of Authorized Representative**

Completed on submission to Grants.gov

**\* Date Signed**

Completed on submission to Grants.gov

**20. Pre-application**

## RESEARCH & RELATED Other Project Information

1. \* Are Human Subjects Involved?  Yes  No

1.a. If YES to Human Subjects

Is the Project Exempt from Federal regulations?  Yes  No

If yes, check appropriate exemption number.  1  2  3  4  5  6

If no, is the IRB review Pending?  Yes  No

IRB Approval Date:

Human Subject Assurance Number:

2. \* Are Vertebrate Animals Used?  Yes  No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending?  Yes  No

IACUC Approval Date:

Animal Welfare Assurance Number

3. \* Is proprietary/privileged information included in the application?  Yes  No

4.a. \* Does this project have an actual or potential impact on the environment?  Yes  No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed?  Yes  No

4.d. If yes, please explain:

5. \* Is the research performance site designated, or eligible to be designated, as a historic place?  Yes  No

5.a. If yes, please explain:

6. \* Does this project involve activities outside of the United States or partnerships with international collaborators?  Yes  No

6.a. If yes, identify countries:

6.b. Optional Explanation:

7. \* Project Summary/Abstract

8. \* Project Narrative

9. Bibliography & References Cited

10. Facilities & Other Resources

11. Equipment

12. Other Attachments

## **Project Summary**

This amendment covers work to be completed during the supplemental funding period (August 1, 2011 – July 31, 2013) of award number 2006-CS-001-000001 from NCSD. Dartmouth College's Institute for Information Infrastructure Protection (I3P) will focus on continuing the cyber security collaboration and information sharing activities established under this award and the previous award number 2003-TK-TX-0003. The work will be accomplished through consortium activities, to include research and outreach programs that will include communities of researchers nationwide.

Workshops and forums that include private sector, government, and academic participants will highlight I3P research as well as bring attention to significant national information infrastructure issues. Specifically, the I3P will undertake two new research projects in support of NCSD's efforts in to secure the nation's infrastructure. One project will address the problem of secure information sharing and the other will undertake, in cooperation with the National Institute of Standards and Technology the development of case studies of usable security design and implementation. These case studies will help users understand the problems and will also help teach software developers about potential solutions. These projects are more fully described in our project narrative.

The benefit of the Cyber Security Collaboration, Information Sharing and Research Project is to bring together researchers, stakeholders, and other constituencies to focus on the development of tangible means to predict, identify and remediate cyberspace vulnerabilities, as well as to heighten awareness of cyber security nationwide. Outcomes of the work will be disseminated to various constituencies, including the National Cyber Security Division, through demonstrations, workshops, publications, and site visits.

## **Cyber Security Collaboration and Information Sharing Project**

### **Supplemental Funding Request**

#### **Project Narrative**

##### **Introduction**

The overarching objective of the proposed work under this supplemental funding is to apply the collective, diverse expertise of the Institute for Information Infrastructure Protection (I3P) to critical priorities tied to the mission of the Institute. Two research topics, chosen by the National Cyber Security Division will drive the research project decisions and selection of I3P team members. The I3P will also continue its current research projects with funds previously awarded.

During the period of performance, the I3P may also hold workshops and perform outreach activities to highlight and disseminate I3P research results, design and run forums to provide a holistic view into the information infrastructure protection challenges faced by the private and public sectors,. The I3P will also continue to perform its general operations and consortium activities. These activities will be performed with currently awarded funds

##### **Project Plan**

Three areas are outlined in the project plan:

1. I3P Research
2. I3P Workshops and Outreach
3. I3P Operations

##### **I3P Research**

The proposed research will be accomplished during the performance period of August 1, 2011 through July 31, 2013. Research will consist of two new research projects, described below. The focus of the projects will be on nationally identified cyber security research priorities. Such priorities have been

established in consultation with the I3P Research Director, Executive Director, the Principal Investigator, and the Program Manager at NCSD. As with all I3P-funded research, project teams, consisting of two to five member institutions will be chosen through a collaborative and rigorous process involving consortium institutions (see Appendix A for a list of current I3P members). Teams of I3P researchers will form and provide a final proposal outlining the work to be performed, describing the desired outcome and identifying the need for such work. This collaborative process has worked well for prior funded projects.

**Project topics:**

Two research areas have been identified for this supplemental funding.

**1. Secure Information Sharing**

**Problem**

There is a need for mechanisms for permitting secure, controlled, accountable communication among virtual machines in different security domains, capable of handling high volume, and able to scale as the virtual hosting infrastructure grows. How can providers and users of virtualized machines and domains evaluate the likelihood of exploitable vulnerabilities? Typically, inputs to the risk evaluation process include historical data, trends in component functional areas, the current states of development practices, exposure to adversaries, and threat actors in operational deployment. System architects need a design and optimization process for evaluating alternative architectures with respect to these risks. This process should be able to answer questions such as:

- What types of attacks have the highest risk, and what are the best defenses against them?
- How many layers are needed to bring the risk down to an acceptable level?
- What is the role of inter-layer dependence?
- How can configurations be updated safely?

The process must also include a way to test layered security solutions to identify end-to-end vulnerabilities that contribute to the risk level. In addition, the solution must be analyzed over time to determine how risk may change. This assessment will include information about vulnerabilities and expected configuration change.



## **How I3P Would Address the Problem**

1. Provide a framework for evaluating the risks that would include:
  - Methods for expressing the virtual architecture
  - Methods for specifying the secure information sharing
  - Methods for evaluating the security risks, including compromise and disclosure
  - Methods for testing the risks inherent in a variety of candidate architectures
2. The methods developed will be applied to a set of incident response sharing architectures in a cloud computing environment, to evaluate the collective methods' ability to identify risks and suggest mitigation strategies.
3. Outcomes will include:
  - Documentation of the methods listed above
  - A framework for combining the methods into an approach for building and evaluating secure, multi-layer information sharing in a virtual environment
  - An analysis of the application of methods and framework to the incident response sharing example
  - A comparison between results of the research and commercially available products to address the problem.

## **2. Usable Security**

### **Problem**

- Developers desire usable security, prompted by experiencing lost sales, lost time, and a profusion of misuse errors.
- A July 2009 NAS workshop identified challenges to advancing research in usability, security and privacy: inconsistent terminology and definitions, limited access to data, scarcity of expertise, unfamiliarity with work at the intersection of usability, security, and privacy, and difficulty moving security usability research results into practice.

A March 2011 NIST workshop recommended the development of case studies of usable security design and implementation, for use in understanding the problems and in teaching developers about solutions.

### **How I3P Would Address the Problem**

1. Identify three organizations willing to be profiled in a case study. Each organization will provide access to:

- Documentation of its perceived need for usable security
- The steps taken to build usable security into their development process
- Data useful in evaluating the effects of using the enhanced development process

2. Analyze data to determine variables and relationships

3. Outcomes will include:

- A documented case study for each participating organization
- A description of the case study methodology, to enable others to conduct similar case studies of other organizations, thereby building a body of literature that can be compared across case study subjects
- An analysis of the initial case studies, to identify commonalities and success factors
- A comparison of the success factors to commercially available products

It is our intention to perform this work in conjunction with work we have proposed to NIST. With NIST funds we will be able to complete one case study. These supplemental DHS funds will allow the project to be fully funded with three case studies completed and at least one workshop held.

### **I3P Workshops and Outreach**

The I3P has a well established and nationally recognized ability to organize high-impact workshops of interest to industry, government and academia; the consortium has used these workshops to gain knowledge about cyber security problems, to demonstrate mitigation and resilience tools and strategies, and to initiate discussions with stakeholders that result in increased visibility, understanding, and create

the momentum necessary for progress. The consortium has shown its abilities to bring together important stakeholders from a variety of disciplines to discuss security challenges and advance solutions. The I3P has a unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue.

The workshops will focus on areas related to I3P research conducted during the performance period. These interactions will accelerate our understanding of information infrastructure vulnerabilities, promote the sharing of information and help outline strategies for moving forward, facilitating the alignment of policies and best practices. Where appropriate, workshops will also serve as demonstration sites as part of the technology transfer process.

Workshop topics will be chosen by the I3P consortium, in consultation with the Principal Investigator, the I3P Executive Committee and the I3P's Program Manager at NCSD, and will reflect current cyber security priorities of the information infrastructure community.

The discussions and other outcomes of each workshop or forum will be incorporated in documents prepared by the I3P for dissemination to a broader audience. This documentation might take one of several forms. One possibility is an overview document that captures the main points of the event; another is an expanded synthesis document which relates the main points to larger infrastructure protection issues. Some events might generate an I3P position paper that integrates the findings from the event with the opinions of consortium experts, creating an integrated, systemic work that details a particular challenge in a broad context and possible action steps towards a solution, including needed research and stakeholder coalitions. It is expected that such position papers would provide a platform for future research proposals.

The I3P operations staff will provide logistical and organizational support for the workshops and forums. Staff will work closely with researchers and leading experts from industry and government to ensure insightful, well-organized and effective events. The I3P will help produce and distribute workshop materials, develop websites promoting the workshops, invite speakers, and provide on-site administrative assistance. I3P staff will also play an active role in developing workshop content and coordinating the sessions.

I3P staff will also be responsible for all tasks related to logistics, room and equipment reservations, arranging meals and managing reservations. The post-workshop activities for which the I3P staff will be responsible include managing and archiving information produced from the workshops, and the preparation and distribution, in both electronic and hard-copy format, of publications and reports from the workshops as described above.

### **I3P Operations**

The I3P consortium is managed by a small staff made up of employees of Dartmouth College. Management responsibilities include planning and administering consortium meetings and workshops, overseeing and reporting on I3P research projects, assisting with the research proposal selection process, and managing the educational initiatives, which includes the I3P fellowship program. In addition to the above activities, the administration seeks to communicate key research findings through outreach to the media as well as the public and private sectors. The I3P encourages government and sponsor participation, becoming a key place to seek experts in cyber security areas. The staff maintains a website that highlights I3P researchers and institutions, as well as publications in relevant research areas. The administration creates a cohesive environment with institutional representatives via 3 meetings per year, maintains an elected Executive Committee to provide direction and consortium oversight, and continues to find new ways to fulfill the I3P mandate. Working closely with program managers, we feel this model has proven successful.

For this award, the I3P will continue its operations of consortium activities, award and oversee research projects, as well as provide support for workshop and outreach programs. Each research project will have an institutional leader from one of the I3P member institutions who will work closely with the I3P Principal Investigator, Executive Director, and Research Director at Dartmouth College

Dr. [REDACTED] (b)(6) Vice Provost at Dartmouth College is the Principal Investigator on external awards made to the consortium. He oversees all the business and operational management of the consortium. He derives between 10-15% of his compensation from federal funds awarded for I3P operations. Dr. [REDACTED] (b)(6) is also a member of the senior administration at Dartmouth, and reports directly to the Dartmouth College Provost.

[REDACTED] (b)(6) Executive Director of the I3P, is responsible for the day-to-day management and strategic direction of the I3P. She is also responsible for advancing the I3P mission and goals, and assisting the Executive Committee and Research Director of the I3P. This position is funded by multiple sources.

The Research Director of the I3P, Dr. [REDACTED] (b)(6), works closely with the Executive Director to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. This position is funded by multiple sources.

**Appendix A – Current I3P consortium members**

Carnegie Mellon University, H. John Heinz III School of Public Policy and Management

Carnegie Mellon University, Software Engineering Institute

Cornell University

Dartmouth College

George Mason University

Georgia Institute of Technology

Idaho National Laboratory

Indiana University

Johns Hopkins University

Lawrence Berkeley National Laboratory

MIT Lincoln Laboratory

MITRE Corporation

New York University

Pacific Northwest National Laboratory (PNNL)

Purdue University

RAND Corporation

Sandia National Laboratories

SRI International

United States Military Academy (USMA)

University of California at Berkeley

University of California at Davis

University of Idaho

University of Illinois Urbana-Champaign

University of Massachusetts Amherst

University of Tulsa

University of Virginia

### Project/Performance Site Location(s)

**Project/Performance Site Primary Location**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Trustees of Dartmouth College

DUNS Number: 0410278220000

\* Street1: 45 Lyme Rd, suite 300

Street2:

\* City: Hanover County:

\* State: NH: New Hampshire

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: 037551223 \* Project/ Performance Site Congressional District: NH-002

**Project/Performance Site Location 1**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:

DUNS Number:

\* Street1:

Street2:

\* City: County:

\* State:

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: \* Project/ Performance Site Congressional District:

Additional Location(s)

## RESEARCH & RELATED Senior/Key Person Profile

| PROFILE - Project Director/Principal Investigator |                               |                                               |                                                                                                 |
|---------------------------------------------------|-------------------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------|
| Prefix:                                           | Dr.                           | * First Name:                                 | (b)(6)                                                                                          |
|                                                   |                               | Middle Name:                                  |                                                                                                 |
| * Last Name:                                      | (b)(6)                        | Suffix:                                       |                                                                                                 |
| Position/Title:                                   | Vice Provost                  | Department:                                   | Provost                                                                                         |
| Organization Name:                                | Trustees of Dartmouth College |                                               | Division:                                                                                       |
| * Street1:                                        | Parkhurst - HB 6004           |                                               |                                                                                                 |
| Street2:                                          |                               |                                               |                                                                                                 |
| * City:                                           | Hanover                       | County:                                       |                                                                                                 |
| * State:                                          | NH: New Hampshire             | Province:                                     |                                                                                                 |
| * Country:                                        | USA: UNITED STATES            | * Zip / Postal Code:                          | 037553529                                                                                       |
| * Phone Number:                                   | (b)(6)                        | Fax Number:                                   | 603-646-0660                                                                                    |
| * E-Mail:                                         |                               |                                               |                                                                                                 |
| Credential, e.g., agency login:                   |                               |                                               |                                                                                                 |
| * Project Role:                                   | PD/PI                         | Other Project Role Category:                  |                                                                                                 |
| * Attach Biographical Sketch                      | (b)(6) Bio.pdf                | <input type="button" value="Add Attachment"/> | <input type="button" value="Delete Attachment"/> <input type="button" value="View Attachment"/> |
| Attach Current & Pending Support                  |                               | <input type="button" value="Add Attachment"/> | <input type="button" value="Delete Attachment"/> <input type="button" value="View Attachment"/> |

| PROFILE - Senior/Key Person 1    |                    |                                               |                                                                                                 |
|----------------------------------|--------------------|-----------------------------------------------|-------------------------------------------------------------------------------------------------|
| Prefix:                          | *                  | First Name:                                   | Middle Name:                                                                                    |
| * Last Name:                     |                    | Suffix:                                       |                                                                                                 |
| Position/Title:                  |                    | Department:                                   |                                                                                                 |
| Organization Name:               |                    |                                               | Division:                                                                                       |
| * Street1:                       |                    |                                               |                                                                                                 |
| Street2:                         |                    |                                               |                                                                                                 |
| * City:                          |                    | County:                                       |                                                                                                 |
| * State:                         |                    | Province:                                     |                                                                                                 |
| * Country:                       | USA: UNITED STATES | * Zip / Postal Code:                          |                                                                                                 |
| * Phone Number:                  |                    | Fax Number:                                   |                                                                                                 |
| * E-Mail:                        |                    |                                               |                                                                                                 |
| Credential, e.g., agency login:  |                    |                                               |                                                                                                 |
| * Project Role:                  |                    | Other Project Role Category:                  |                                                                                                 |
| * Attach Biographical Sketch     |                    | <input type="button" value="Add Attachment"/> | <input type="button" value="Delete Attachment"/> <input type="button" value="View Attachment"/> |
| Attach Current & Pending Support |                    | <input type="button" value="Add Attachment"/> | <input type="button" value="Delete Attachment"/> <input type="button" value="View Attachment"/> |

|                                                        |                      |                                               |                                                  |                                                |
|--------------------------------------------------------|----------------------|-----------------------------------------------|--------------------------------------------------|------------------------------------------------|
| ADDITIONAL SENIOR/KEY PERSON PROFILE(S)                | <input type="text"/> | <input type="button" value="Add Attachment"/> | <input type="button" value="Delete Attachment"/> | <input type="button" value="View Attachment"/> |
| Additional Biographical Sketch(es) (Senior/Key Person) | <input type="text"/> | <input type="button" value="Add Attachment"/> | <input type="button" value="Delete Attachment"/> | <input type="button" value="View Attachment"/> |
| Additional Current and Pending Support(s)              | <input type="text"/> | <input type="button" value="Add Attachment"/> | <input type="button" value="Delete Attachment"/> | <input type="button" value="View Attachment"/> |



Pages 15 through 16 redacted for the following reasons:

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(b)(6)



Close Form

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

\* ORGANIZATIONAL DUNS: [text box]

\* Budget Type:  Project  Subaward/Consortium

Enter name of Organization: [text box]

\* Start Date: [text box] \* End Date: [text box] Budget Period 1

C. Equipment Description

List items and dollar amount for each item exceeding \$5,000

|     | Equipment item                                                      | * Funds Requested (\$) |
|-----|---------------------------------------------------------------------|------------------------|
| 1.  | [text box]                                                          | [text box]             |
| 2.  | [text box]                                                          | [text box]             |
| 3.  | [text box]                                                          | [text box]             |
| 4.  | [text box]                                                          | [text box]             |
| 5.  | [text box]                                                          | [text box]             |
| 6.  | [text box]                                                          | [text box]             |
| 7.  | [text box]                                                          | [text box]             |
| 8.  | [text box]                                                          | [text box]             |
| 9.  | [text box]                                                          | [text box]             |
| 10. | [text box]                                                          | [text box]             |
| 11. | Total funds requested for all equipment listed in the attached file | [text box]             |
|     | Total Equipment                                                     | [text box]             |

Additional Equipment: [text box]

Add Attachment

Delete Attachment

View Attachment

D. Travel

Funds Requested (\$)

|    |                                                                    |            |
|----|--------------------------------------------------------------------|------------|
| 1. | Domestic Travel Costs ( Incl. Canada, Mexico and U.S. Possessions) | [text box] |
| 2. | Foreign Travel Costs                                               | [text box] |
|    | Total Travel Cost                                                  | [text box] |

E. Participant/Trainee Support Costs

Funds Requested (\$)

|            |                                 |                                                    |
|------------|---------------------------------|----------------------------------------------------|
| 1.         | Tuition/Fees/Health Insurance   | [text box]                                         |
| 2.         | Stipends                        | [text box]                                         |
| 3.         | Travel                          | [text box]                                         |
| 4.         | Subsistence                     | [text box]                                         |
| 5.         | Other [text box]                | [text box]                                         |
| [text box] | Number of Participants/Trainees | Total Participant/Trainee Support Costs [text box] |

RESEARCH & RELATED Budget {C-E} (Funds Requested)

Close Form

RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

\* ORGANIZATIONAL DUNS: [ ]

\* Budget Type:  Project  Subaward/Consortium

Enter name of Organization: [ ]

\* Start Date: [ ] \* End Date: [ ] Budget Period 1

| F. Other Direct Costs                     | Funds Requested (\$) |
|-------------------------------------------|----------------------|
| 1. Materials and Supplies                 | [ ]                  |
| 2. Publication Costs                      | [ ]                  |
| 3. Consultant Services                    | [ ]                  |
| 4. ADP/Computer Services                  | [ ]                  |
| 5. Subawards/Consortium/Contractual Costs | 680,000.00           |
| 6. Equipment or Facility Rental/User Fees | [ ]                  |
| 7. Alterations and Renovations            | [ ]                  |
| 8. [ ]                                    | [ ]                  |
| 9. [ ]                                    | [ ]                  |
| 10. [ ]                                   | [ ]                  |
| <b>Total Other Direct Costs</b>           | 680,000.00           |

| G. Direct Costs                      | Funds Requested (\$) |
|--------------------------------------|----------------------|
| <b>Total Direct Costs (A thru F)</b> | 720,000.00           |

| H. Indirect Costs           | Indirect Cost Rate (%) | Indirect Cost Base (\$) | * Funds Requested (\$) |
|-----------------------------|------------------------|-------------------------|------------------------|
| 1. MTDC - research rate     | 58.00                  | 200,000.00              | 116,000.00             |
| 2. MTDC - non research rate | 35.00                  | 40,000.00               | 14,000.00              |
| 3. [ ]                      | [ ]                    | [ ]                     | [ ]                    |
| 4. [ ]                      | [ ]                    | [ ]                     | [ ]                    |
| <b>Total Indirect Costs</b> |                        |                         | 130,000.00             |

Cognizant Federal Agency Dept. of Health and Human Svcs (b)(6)  
(Agency Name, POC Name, and POC Phone Number)

| I. Total Direct and Indirect Costs                           | Funds Requested (\$) |
|--------------------------------------------------------------|----------------------|
| <b>Total Direct and Indirect Institutional Costs (G + H)</b> | 850,000.00           |

J. Fee Funds Requested (\$) [ ]

K. \* Budget Justification Budget Narrative\_09-01-2011.pdf Add Attachment Delete Attachment View Attachment  
(Only attach one file.)

## RESEARCH & RELATED BUDGET - Cumulative Budget

|                                                           |            | Totals (\$) |
|-----------------------------------------------------------|------------|-------------|
| <b>Section A, Senior/Key Person</b>                       |            | 40,000.00   |
| <b>Section B, Other Personnel</b>                         |            |             |
| Total Number Other Personnel                              |            |             |
| <b>Total Salary, Wages and Fringe Benefits (A+B)</b>      |            | 40,000.00   |
| <b>Section C, Equipment</b>                               |            |             |
| <b>Section D, Travel</b>                                  |            |             |
| 1. Domestic                                               |            |             |
| 2. Foreign                                                |            |             |
| <b>Section E, Participant/Trainee Support Costs</b>       |            |             |
| 1. Tuition/Fees/Health Insurance                          |            |             |
| 2. Stipends                                               |            |             |
| 3. Travel                                                 |            |             |
| 4. Subsistence                                            |            |             |
| 5. Other                                                  |            |             |
| 6. Number of Participants/Trainees                        |            |             |
| <b>Section F, Other Direct Costs</b>                      |            | 680,000.00  |
| 1. Materials and Supplies                                 |            |             |
| 2. Publication Costs                                      |            |             |
| 3. Consultant Services                                    |            |             |
| 4. ADP/Computer Services                                  |            |             |
| 5. Subawards/Consortium/Contractual Costs                 | 680,000.00 |             |
| 6. Equipment or Facility Rental/User Fees                 |            |             |
| 7. Alterations and Renovations                            |            |             |
| 8. Other 1                                                |            |             |
| 9. Other 2                                                |            |             |
| 10. Other 3                                               |            |             |
| <b>Section G, Direct Costs (A thru F)</b>                 |            | 720,000.00  |
| <b>Section H, Indirect Costs</b>                          |            | 130,000.00  |
| <b>Section I, Total Direct and Indirect Costs (G + H)</b> |            | 850,000.00  |
| <b>Section J, Fee</b>                                     |            |             |

**BUDGET NARRATIVE**

Award Number: 2006-CS-001-000001  
Supplemental Opportunity Number: DHS-06-CS-001-001  
Dartmouth College  
September 2011  
I3P: Cyber Security Collaborations and Information Sharing Project

The following two areas are presented for the \$850,000 supplemental funding. Funding will be spent through July 31, 2013:

I3P Research  
I3P Operations

Summary breakdown by category:

| Object Class Categories: |                     | <b>TOTAL</b>      | Budget Period I thru III | Supplement May 2009 | Supplement June 2010 | <b>Proposed Supplement Sept 2011</b> |
|--------------------------|---------------------|-------------------|--------------------------|---------------------|----------------------|--------------------------------------|
| a.                       | Personnel           | <b>3,923,738</b>  | 3,372,406                | 163,913             | 358,114              | <b>29,304</b>                        |
| b.                       | Fringe Benefits     | <b>1,211,936</b>  | 1,002,534                | 62,623              | 136,083              | <b>10,696</b>                        |
| c.                       | Travel              | <b>795,500</b>    | 543,575                  | 122,875             | 129,050              | -                                    |
| d.                       | Equipment           | <b>418,082</b>    | 418,082                  | -                   | -                    | -                                    |
| e.                       | Supplies            | <b>157,556</b>    | 142,823                  | 14,733              | -                    | -                                    |
| f.                       | Contractual         | <b>17,151,575</b> | 14,045,875               | 1,375,000           | 1,050,700            | <b>680,000</b>                       |
| g.                       | Construction        | -                 | -                        | -                   | -                    | -                                    |
| h.                       | Other               | <b>1,214,690</b>  | 914,015                  | 144,375             | 156,300              | -                                    |
| i.                       | Total Direct Charge | <b>24,873,076</b> | 20,439,310               | 1,883,519           | 1,830,247            | <b>720,000</b>                       |
| j.                       | Indirect Charges    | <b>4,776,924</b>  | 3,860,690                | 366,481             | 419,753              | <b>130,000</b>                       |
| k.                       | TOTAL               | <b>29,650,000</b> | 24,300,000               | 2,250,000           | 2,250,000            | <b>850,000</b>                       |

**Personnel (\$29,304):** All personnel are Dartmouth employees. Please note that prior approved funds are currently being used to fund I3P Operations. This supplemental funding will continue to support PI, Dr. [REDACTED] through July 31, 2013.

PI: Dr. [REDACTED] (b)(6) is the Vice-Provost at Dartmouth College. He oversees all the business, research and operational management of the I3P consortium. We budget for 5% effort throughout this supplemental project period of 23 months (\$29,304).

**Fringe (\$10,696):** In accordance with our negotiated agreement (dated 4/26/2011) with the Department of Health and Human Services, Dartmouth College uses the following approved fringe rate of 36.5%.

**Sub awards/Consortium/Contractual Costs (\$680,000):**

Research sub awards: As outlined in the proposal narrative we budget for two research projects. We plan for 8 total sub awards at a cost of \$85,000 each.

**Indirects (\$130,000):** In accordance with our negotiated agreement (dated 4/26/2011) with the Department of Health and Human Services, Dartmouth College uses a 58% MTDC indirect cost rate for research and 35% for non research activities. Total direct costs exclude participant costs, capital expenditures equipment over \$5,000, and the portion of each sub award in excess of \$25,000.

**(\$40,000 x 35% = \$14,000)**

**(\$200,000 x 58% = \$116,000)** – for 8 sub awards

## ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

**PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.**

**NOTE:** Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.



9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

|                                                                                                   |                                                                      |
|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <p>* SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL</p> <p>Completed on submission to Grants.gov</p> | <p>* TITLE</p> <p>Grants Officer</p>                                 |
| <p>* APPLICANT ORGANIZATION</p> <p>Trustees of Dartmouth College</p>                              | <p>* DATE SUBMITTED</p> <p>Completed on submission to Grants.gov</p> |

### Project/Performance Site Location(s)

**Project/Performance Site Primary Location**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Trustees of Dartmouth College

DUNS Number: 0410278220000

\* Street1: 45 Lyme Rd, Suite 300

Street2:

\* City: Hanover County:

\* State: NH: New Hampshire

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: 037551223 \* Project/ Performance Site Congressional District: NH-002

**Project/Performance Site Location 1**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:

DUNS Number:

\* Street1:

Street2:

\* City: County:

\* State:

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: \* Project/ Performance Site Congressional District:

**Additional Location(s)**

APPLICATION FOR FEDERAL ASSISTANCE  
**SF 424 (R&R)**

|                                  |                                     |
|----------------------------------|-------------------------------------|
| <b>3. DATE RECEIVED BY STATE</b> | <b>State Application Identifier</b> |
|                                  |                                     |

|                                                                                                                                                                                   |                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>1. * TYPE OF SUBMISSION</b><br><input type="checkbox"/> Pre-application <input checked="" type="checkbox"/> Application <input type="checkbox"/> Changed/Corrected Application | <b>4. a. Federal Identifier</b><br>2006-CS-001-000001 |
| <b>2. DATE SUBMITTED</b><br>06/16/2010                                                                                                                                            | <b>b. Agency Routing Identifier</b>                   |
| <b>Applicant Identifier</b>                                                                                                                                                       |                                                       |

|                                             |                                         |
|---------------------------------------------|-----------------------------------------|
| <b>5. APPLICANT INFORMATION</b>             | <b>* Organizational DUNS:</b> 041027822 |
| * Legal Name: Trustees of Dartmouth College |                                         |
| Department: Office of Sponsored Projects    | Division:                               |
| * Street1: 11 Rope Ferry Road, #6210        |                                         |
| Street2:                                    |                                         |
| * City: Hanover                             | County / Parish:                        |
| * State: NH: New Hampshire                  | Province:                               |
| * Country: USA: UNITED STATES               | * ZIP / Postal Code: 037551464          |

|                                                              |                          |              |
|--------------------------------------------------------------|--------------------------|--------------|
| Person to be contacted on matters involving this application |                          |              |
| Prefix:                                                      | * First Name: (b)(6)     | Middle Name: |
| * Last Name: (b)(6)                                          | Suffix:                  |              |
| * Phone: (b)(6)                                              | Fax Number: 603-646-3670 |              |
| Email:                                                       |                          |              |

|                                                               |
|---------------------------------------------------------------|
| <b>6. * EMPLOYER IDENTIFICATION (EIN) or (TIN):</b> 020222111 |
|---------------------------------------------------------------|

|                                         |                                                                                                       |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>7. * TYPE OF APPLICANT:</b>          | O: Private Institution of Higher Education                                                            |
| Other (Specify):                        |                                                                                                       |
| <b>Small Business Organization Type</b> | <input type="checkbox"/> Women Owned <input type="checkbox"/> Socially and Economically Disadvantaged |

|                                                                                                                     |                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>8. * TYPE OF APPLICATION:</b>                                                                                    | If Revision, mark appropriate box(es).                                                                                                                                            |
| <input type="checkbox"/> New <input type="checkbox"/> Resubmission                                                  | <input type="checkbox"/> A. Increase Award <input type="checkbox"/> B. Decrease Award <input type="checkbox"/> C. Increase Duration <input type="checkbox"/> D. Decrease Duration |
| <input type="checkbox"/> Renewal <input checked="" type="checkbox"/> Continuation <input type="checkbox"/> Revision | <input type="checkbox"/> E. Other (specify):                                                                                                                                      |

|                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|
| * Is this application being submitted to other agencies? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> What other Agencies? |
|---------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                      |                                                                     |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>9. * NAME OF FEDERAL AGENCY:</b><br>Office of Procurement Operations - Grants Div | <b>10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:</b><br>TITLE: |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------|

|                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------|
| <b>11. * DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:</b><br>Cyber Security Collaboration and Information Sharing Project |
|------------------------------------------------------------------------------------------------------------------------|

|                              |                                                  |
|------------------------------|--------------------------------------------------|
| <b>12. PROPOSED PROJECT:</b> | <b>* 13. CONGRESSIONAL DISTRICT OF APPLICANT</b> |
| * Start Date: 08/01/2010     | * Ending Date: 07/31/2012                        |
|                              | NH-002                                           |

|                                                                        |                                |              |
|------------------------------------------------------------------------|--------------------------------|--------------|
| <b>14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION</b> |                                |              |
| Prefix: Dr.                                                            | * First Name: (b)(6)           | Middle Name: |
| * Last Name: (b)(6)                                                    | Suffix:                        |              |
| Position/Title: Vice Provost for Reserach                              |                                |              |
| * Organization Name: Trustees of Dartmouth College                     |                                |              |
| Department: Provost                                                    | Division:                      |              |
| * Street1: Parkhurst - HB 6004                                         |                                |              |
| Street2:                                                               |                                |              |
| * City: Hanover                                                        | County / Parish:               |              |
| * State: NH: New Hampshire                                             | Province:                      |              |
| * Country: USA: UNITED STATES                                          | * ZIP / Postal Code: 037556004 |              |
| * Phone: (b)(6)                                                        | Fax Number: 603-646-0660       |              |
| * Email:                                                               |                                |              |

|                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>15. ESTIMATED PROJECT FUNDING</b></p> <p>a. Total Federal Funds Requested <input type="text" value="2,250,000.00"/></p> <p>b. Total Non-Federal Funds <input type="text" value="0.00"/></p> <p>c. Total Federal &amp; Non-Federal Funds <input type="text" value="2,250,000.00"/></p> <p>d. Estimated Program Income <input type="text" value="0.00"/></p> | <p><b>16. * IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?</b></p> <p>a. YES <input type="checkbox"/> THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:<br/>DATE: <input type="text"/></p> <p>b. NO <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E.O. 12372; OR<br/><input type="checkbox"/> PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**17. By signing this application, I certify (1) to the statements contained in the list of certifications\* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances \* and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)**

\* I agree

\* The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

**18. SFLLL or other Explanatory Documentation**

[Add Attachment](#) [Delete Attachment](#) [View Attachment](#)

**19. Authorized Representative**

Prefix:  \* First Name:  Middle Name:

\* Last Name:  Suffix:

\* Position/Title:

\* Organization:

Department:  Division:

\* Street1:

Street2:

\* City:  County / Parish:

\* State:  Province:

\* Country:  \* ZIP / Postal Code:

\* Phone:  Fax Number:

\* Email:

**\* Signature of Authorized Representative**  **\* Date Signed**

**20. Pre-application**  [Add Attachment](#) [Delete Attachment](#) [View Attachment](#)

# RESEARCH & RELATED Senior/Key Person Profile

| PROFILE - Project Director/Principal Investigator |                                |                                |                                                                   |
|---------------------------------------------------|--------------------------------|--------------------------------|-------------------------------------------------------------------|
| Prefix: Dr.                                       | * First Name: (b)(6)           | Middle Name:                   |                                                                   |
| * Last Name: (b)(6)                               |                                | Suffix:                        |                                                                   |
| Position/Title: Vice Provost for Reserach         | Department: Provost            |                                |                                                                   |
| Organization Name: Trustees of Dartmouth College  | Division:                      |                                |                                                                   |
| * Street1: Parkhurst - HB 6004                    |                                |                                |                                                                   |
| Street2:                                          |                                |                                |                                                                   |
| * City: Hanover                                   | County:                        |                                |                                                                   |
| * State: NH: New Hampshire                        | Province:                      |                                |                                                                   |
| * Country: USA: UNITED STATES                     | * Zip / Postal Code: 037556004 |                                |                                                                   |
| * Phone Number:                                   | Fax Number: 603-646-0660       |                                |                                                                   |
| * E-Mail: (b)(6)                                  |                                |                                |                                                                   |
| Credential, e.g., agency login:                   |                                |                                |                                                                   |
| * Project Role: PD/PI                             | Other Project Role Category:   |                                |                                                                   |
| * Attach Biographical Sketch                      | (b)(6) bio.pdf                 | <a href="#">Add Attachment</a> | <a href="#">Delete Attachment</a> <a href="#">View Attachment</a> |
| Attach Current & Pending Support                  |                                | <a href="#">Add Attachment</a> | <a href="#">Delete Attachment</a> <a href="#">View Attachment</a> |

| PROFILE - Senior/Key Person 1    |                              |                                |                                                                   |
|----------------------------------|------------------------------|--------------------------------|-------------------------------------------------------------------|
| Prefix:                          | * First Name:                | Middle Name:                   |                                                                   |
| * Last Name:                     |                              | Suffix:                        |                                                                   |
| Position/Title:                  | Department:                  |                                |                                                                   |
| Organization Name:               | Division:                    |                                |                                                                   |
| * Street1:                       |                              |                                |                                                                   |
| Street2:                         |                              |                                |                                                                   |
| * City:                          | County:                      |                                |                                                                   |
| * State:                         | Province:                    |                                |                                                                   |
| * Country: USA: UNITED STATES    | * Zip / Postal Code:         |                                |                                                                   |
| * Phone Number:                  | Fax Number:                  |                                |                                                                   |
| * E-Mail:                        |                              |                                |                                                                   |
| Credential, e.g., agency login:  |                              |                                |                                                                   |
| * Project Role:                  | Other Project Role Category: |                                |                                                                   |
| * Attach Biographical Sketch     |                              | <a href="#">Add Attachment</a> | <a href="#">Delete Attachment</a> <a href="#">View Attachment</a> |
| Attach Current & Pending Support |                              | <a href="#">Add Attachment</a> | <a href="#">Delete Attachment</a> <a href="#">View Attachment</a> |

|                                                        |  |                                |                                   |                                 |
|--------------------------------------------------------|--|--------------------------------|-----------------------------------|---------------------------------|
| ADDITIONAL SENIOR/KEY PERSON PROFILE(S)                |  | <a href="#">Add Attachment</a> | <a href="#">Delete Attachment</a> | <a href="#">View Attachment</a> |
| Additional Biographical Sketch(es) (Senior/Key Person) |  | <a href="#">Add Attachment</a> | <a href="#">Delete Attachment</a> | <a href="#">View Attachment</a> |
| Additional Current and Pending Support(s)              |  | <a href="#">Add Attachment</a> | <a href="#">Delete Attachment</a> | <a href="#">View Attachment</a> |

OMB Number: 4040-0001  
Expiration Date: 04/30/2008

### Project/Performance Site Location(s)

**Project/Performance Site Primary Location**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Trustees of Dartmouth College

DUNS Number: 0410278220000

\* Street1: 45 Lyme Rd, Suite 300

Street2:

\* City: Hanover County: Grafton

\* State: NH: New Hampshire

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: 037550000 \* Project/ Performance Site Congressional District: NH-002

**Project/Performance Site Location 1**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:

DUNS Number:

\* Street1:

Street2:

\* City: County:

\* State:

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: \* Project/ Performance Site Congressional District:

**Additional Location(s)**

**RESEARCH & RELATED BUDGET - SECTION A & B, BUDGET PERIOD 1**

\* ORGANIZATIONAL DUNS:

\* Budget Type:  Project  Subaward/Consortium

Enter name of Organization:

\* Start Date:  \* End Date:  Budget Period 1

**A. Senior/Key Person**

|    | Prefix | * First Name | Middle Name | * Last Name | Suffix | * Project Role | Base Salary (\$) | Cal. Months | Acad. Months | Sum. Months | * Requested Salary (\$) | * Fringe Benefits (\$) | * Funds Requested (\$) |
|----|--------|--------------|-------------|-------------|--------|----------------|------------------|-------------|--------------|-------------|-------------------------|------------------------|------------------------|
| 1. | Dr.    | Martin       |             | Wybourne    |        | PD/PI          | 260,000.00       | 1.65        |              |             | 35,750.00               | 13,585.00              | 49,335.00              |
| 2. |        |              |             |             |        |                |                  |             |              |             |                         |                        |                        |
| 3. |        |              |             |             |        |                |                  |             |              |             |                         |                        |                        |
| 4. |        |              |             |             |        |                |                  |             |              |             |                         |                        |                        |
| 5. |        |              |             |             |        |                |                  |             |              |             |                         |                        |                        |
| 6. |        |              |             |             |        |                |                  |             |              |             |                         |                        |                        |
| 7. |        |              |             |             |        |                |                  |             |              |             |                         |                        |                        |
| 8. |        |              |             |             |        |                |                  |             |              |             |                         |                        |                        |

9. Total Funds requested for all Senior Key Persons in the attached file

Total Senior/Key Person

Additional Senior Key Persons:

**B. Other Personnel**

| * Number of Personnel | * Project Role                      | Cal. Months          | Acad. Months         | Sum. Months          | * Requested Salary (\$) | * Fringe Benefits (\$) | * Funds Requested (\$)       |
|-----------------------|-------------------------------------|----------------------|----------------------|----------------------|-------------------------|------------------------|------------------------------|
| <input type="text"/>  | Post Doctoral Associates            | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| <input type="text"/>  | Graduate Students                   | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| <input type="text"/>  | Undergraduate Students              | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| <input type="text"/>  | Secretarial/Clerical                | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| 6                     | Management staff                    | 50.60                |                      |                      | 322,364.00              | 122,498.00             | 444,862.00                   |
| <input type="text"/>  |                                     | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| <input type="text"/>  |                                     | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| <input type="text"/>  |                                     | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| <input type="text"/>  |                                     | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| <input type="text"/>  |                                     | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/>    | <input type="text"/>   | <input type="text"/>         |
| 6                     | <b>Total Number Other Personnel</b> |                      |                      |                      |                         |                        | <b>Total Other Personnel</b> |

**Total Salary, Wages and Fringe Benefits (A+B)**

**RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1**

\* ORGANIZATIONAL DUNS:

\* Budget Type:  Project  Subaward/Consortium

Enter name of Organization:

\* Start Date:  \* End Date:  Budget Period 1

**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

|     | Equipment item                                                             | * Funds Requested (\$) |
|-----|----------------------------------------------------------------------------|------------------------|
| 1.  | <input type="text"/>                                                       | <input type="text"/>   |
| 2.  | <input type="text"/>                                                       | <input type="text"/>   |
| 3.  | <input type="text"/>                                                       | <input type="text"/>   |
| 4.  | <input type="text"/>                                                       | <input type="text"/>   |
| 5.  | <input type="text"/>                                                       | <input type="text"/>   |
| 6.  | <input type="text"/>                                                       | <input type="text"/>   |
| 7.  | <input type="text"/>                                                       | <input type="text"/>   |
| 8.  | <input type="text"/>                                                       | <input type="text"/>   |
| 9.  | <input type="text"/>                                                       | <input type="text"/>   |
| 10. | <input type="text"/>                                                       | <input type="text"/>   |
| 11. | <b>Total funds requested for all equipment listed in the attached file</b> | <input type="text"/>   |
|     | <b>Total Equipment</b>                                                     | <input type="text"/>   |

Additional Equipment:

**D. Travel**

**Funds Requested (\$)**

|                                                                       |                                         |
|-----------------------------------------------------------------------|-----------------------------------------|
| 1. Domestic Travel Costs ( Incl. Canada, Mexico and U.S. Possessions) | <input type="text" value="129,050.00"/> |
| 2. Foreign Travel Costs                                               | <input type="text"/>                    |
| <b>Total Travel Cost</b>                                              | <input type="text" value="129,050.00"/> |

**E. Participant/Trainee Support Costs**

**Funds Requested (\$)**

|                                                                                                            |                      |
|------------------------------------------------------------------------------------------------------------|----------------------|
| 1. Tuition/Fees/Health Insurance                                                                           | <input type="text"/> |
| 2. Stipends                                                                                                | <input type="text"/> |
| 3. Travel                                                                                                  | <input type="text"/> |
| 4. Subsistence                                                                                             | <input type="text"/> |
| 5. Other <input type="text"/>                                                                              | <input type="text"/> |
| <input type="text"/> <b>Number of Participants/Trainees</b> <b>Total Participant/Trainee Support Costs</b> | <input type="text"/> |

RESEARCH & RELATED Budget {C-E} (Funds Requested)



RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

Next Period

\* ORGANIZATIONAL DUNS:

\* Budget Type:  Project  Subaward/Consortium

Enter name of Organization:

Start Date:  \* End Date:  Budget Period 1

| F. Other Direct Costs                       | Funds Requested (\$)                      |
|---------------------------------------------|-------------------------------------------|
| 1. Materials and Supplies                   | <input type="text" value="6,700.00"/>     |
| 2. Publication Costs                        | <input type="text" value="20,000.00"/>    |
| 3. Consultant Services                      | <input type="text"/>                      |
| 4. ADP/Computer Services                    | <input type="text"/>                      |
| 5. Subawards/Consortium/Contractual Costs   | <input type="text" value="1,050,700.00"/> |
| 6. Equipment or Facility Rental/User Fees   | <input type="text"/>                      |
| 7. Alterations and Renovations              | <input type="text"/>                      |
| 8. <input type="text" value="Event costs"/> | <input type="text" value="129,600.00"/>   |
| 9. <input type="text"/>                     | <input type="text"/>                      |
| 10. <input type="text"/>                    | <input type="text"/>                      |
| <b>Total Other Direct Costs</b>             | <input type="text" value="3,207,000.00"/> |

| G. Direct Costs                      | Funds Requested (\$)                      |
|--------------------------------------|-------------------------------------------|
| <b>Total Direct Costs (A thru F)</b> | <input type="text" value="3,830,247.00"/> |

| H. Indirect Costs           | Indirect Cost Type       | Indirect Cost Rate (%)             | Indirect Cost Base (\$)                 | * Funds Requested (\$)                  |
|-----------------------------|--------------------------|------------------------------------|-----------------------------------------|-----------------------------------------|
| 1.                          | MTDC - research rate     | <input type="text" value="58.00"/> | <input type="text" value="219,200.00"/> | <input type="text" value="127,136.00"/> |
| 2.                          | MTDC - non research rate | <input type="text" value="35.00"/> | <input type="text" value="836,047.00"/> | <input type="text" value="292,617.00"/> |
| 3.                          | <input type="text"/>     | <input type="text"/>               | <input type="text"/>                    | <input type="text"/>                    |
| 4.                          | <input type="text"/>     | <input type="text"/>               | <input type="text"/>                    | <input type="text"/>                    |
| <b>Total Indirect Costs</b> |                          |                                    |                                         | <input type="text" value="419,753.00"/> |

Cognizant Federal Agency  (b)(6)  
 (Agency Name, POC Name, and POC Phone Number)

| I. Total Direct and Indirect Costs                           | Funds Requested (\$)                      |
|--------------------------------------------------------------|-------------------------------------------|
| <b>Total Direct and Indirect Institutional Costs (G + H)</b> | <input type="text" value="2,250,000.00"/> |

| J. Fee | Funds Requested (\$) |
|--------|----------------------|
|        | <input type="text"/> |

K. \* Budget Justification      
 (Only attach one file.)

## RESEARCH & RELATED BUDGET - Cumulative Budget

|                                                           |              | Totals (\$)  |
|-----------------------------------------------------------|--------------|--------------|
| <b>Section A, Senior/Key Person</b>                       |              | 49,335.00    |
| <b>Section B, Other Personnel</b>                         |              | 444,862.00   |
| Total Number Other Personnel                              | 6            |              |
| <b>Total Salary, Wages and Fringe Benefits (A+B)</b>      |              | 494,197.00   |
| <b>Section C, Equipment</b>                               |              |              |
| <b>Section D, Travel</b>                                  |              | 129,050.00   |
| 1. Domestic                                               | 129,050.00   |              |
| 2. Foreign                                                |              |              |
| <b>Section E, Participant/Trainee Support Costs</b>       |              |              |
| 1. Tuition/Fees/Health Insurance                          |              |              |
| 2. Stipends                                               |              |              |
| 3. Travel                                                 |              |              |
| 4. Subsistence                                            |              |              |
| 5. Other                                                  |              |              |
| 6. Number of Participants/Trainees                        |              |              |
| <b>Section F, Other Direct Costs</b>                      |              | 1,207,000.00 |
| 1. Materials and Supplies                                 | 6,700.00     |              |
| 2. Publication Costs                                      | 20,000.00    |              |
| 3. Consultant Services                                    |              |              |
| 4. ADP/Computer Services                                  |              |              |
| 5. Subawards/Consortium/Contractual Costs                 | 1,050,700.00 |              |
| 6. Equipment or Facility Rental/User Fees                 |              |              |
| 7. Alterations and Renovations                            |              |              |
| 8. Other 1                                                | 129,600.00   |              |
| 9. Other 2                                                |              |              |
| 10. Other 3                                               |              |              |
| <b>Section G, Direct Costs (A thru F)</b>                 |              | 1,830,247.00 |
| <b>Section H, Indirect Costs</b>                          |              | 419,753.00   |
| <b>Section I, Total Direct and Indirect Costs (G + H)</b> |              | 2,250,000.00 |
| <b>Section J, Fee</b>                                     |              |              |

## **BUDGET NARRATIVE**

Award Number 2006-CS-001-000001

Supplemental Funding: 2006-CS-001-000001-03

Dartmouth College

June 2010

I3P: Cyber Security Collaborations and Information Sharing Project

The following three areas are presented for the \$2,250,000 supplemental funding. Funding will be spent through July 31, 2012:

I3P Research

I3P Operations

I3P Workshops and Outreach

I3P Fellowship Program

Summary breakdown by category:

| Object Class Categories: |                     | <b>TOTAL</b>      | Budget Period I thru III | Supplement May 2009 | <b>Proposed Supplement June 2010</b> |
|--------------------------|---------------------|-------------------|--------------------------|---------------------|--------------------------------------|
| a.                       | Personnel           | <b>3,894,433</b>  | 3,372,406                | 163,913             | <b>358,114</b>                       |
| b.                       | Fringe Benefits     | <b>1,201,240</b>  | 1,002,534                | 62,623              | <b>136,083</b>                       |
| c.                       | Travel              | <b>795,500</b>    | 543,575                  | 122,875             | <b>129,050</b>                       |
| d.                       | Equipment           | <b>418,082</b>    | 418,082                  | -                   | -                                    |
| e.                       | Supplies            | <b>164,256</b>    | 142,823                  | 14,733              | <b>6,700</b>                         |
| f.                       | Contractual         | <b>16,471,575</b> | 14,045,875               | 1,375,000           | <b>1,050,700</b>                     |
| g.                       | Construction        | -                 | -                        | -                   | -                                    |
| h.                       | Other               | <b>1,207,990</b>  | 914,015                  | 144,375             | <b>149,600</b>                       |
| i.                       | Total Direct Charge | <b>24,153,076</b> | 20,439,310               | 1,883,519           | <b>1,830,247</b>                     |
| j.                       | Indirect Charges    | <b>4,646,924</b>  | 3,860,690                | 366,481             | <b>419,753</b>                       |
| k.                       | TOTAL               | <b>28,800,000</b> | 24,300,000               | 2,250,000           | <b>2,250,000</b>                     |

## **Project Summary**

This amendment covers work to be completed during the supplemental funding period (August 1, 2011 – July 31, 2013) of award number 2006-CS-001-000001 from NCSID. Dartmouth College's Institute for Information Infrastructure Protection (I3P) will focus on continuing the cyber security collaboration and information sharing activities established under this award and the previous award number 2003-TK-TX-0003. The work will be accomplished through consortium activities, to include research and outreach programs that will include communities of researchers nationwide.

Workshops and forums that include private sector, government, and academic participants will highlight I3P research as well as bring attention to significant national information infrastructure issues. Specifically, the I3P will undertake two new research projects in support of NCSID's efforts in to secure the nation's infrastructure. One project will address the problem of secure information sharing and the other will undertake, in cooperation with the National Institute of Standards and Technology the development of case studies of usable security design and implementation. These case studies will help users understand the problems and will also help teach software developers about potential solutions. These projects are more fully described in our project narrative.

The benefit of the Cyber Security Collaboration, Information Sharing and Research Project is to bring together researchers, stakeholders, and other constituencies to focus on the development of tangible means to predict, identify and remediate cyberspace vulnerabilities, as well as to heighten awareness of cyber security nationwide. Outcomes of the work will be disseminated to various constituencies, including the National Cyber Security Division, through demonstrations, workshops, publications, and site visits.

## **Cyber Security Collaboration and Information Sharing Project**

### **Supplemental Funding Request**

#### **Project Narrative**

##### **Introduction**

The overarching objective of the proposed work under this supplemental funding is to apply the collective, diverse expertise of the Institute for Information Infrastructure Protection (I3P) to critical priorities tied to the mission of the Institute. Two research topics, chosen by the National Cyber Security Division will drive the research project decisions and selection of I3P team members. The I3P will also continue its current research projects with funds previously awarded.

During the period of performance, the I3P may also hold workshops and perform outreach activities to highlight and disseminate I3P research results, design and run forums to provide a holistic view into the information infrastructure protection challenges faced by the private and public sectors,. The I3P will also continue to perform its general operations and consortium activities. These activities will be performed with currently awarded funds

##### **Project Plan**

Three areas are outlined in the project plan:

1. I3P Research
2. I3P Workshops and Outreach
3. I3P Operations

##### **I3P Research**

The proposed research will be accomplished during the performance period of August 1, 2011 through July 31, 2013. Research will consist of two new research projects, described below. The focus of the projects will be on nationally identified cyber security research priorities. Such priorities have been

established in consultation with the I3P Research Director, Executive Director, the Principal Investigator, and the Program Manager at NCSA. As with all I3P-funded research, project teams, consisting of two to five member institutions will be chosen through a collaborative and rigorous process involving consortium institutions (see Appendix A for a list of current I3P members). Teams of I3P researchers will form and provide a final proposal outlining the work to be performed, describing the desired outcome and identifying the need for such work. This collaborative process has worked well for prior funded projects.

### **Project topics:**

Two research areas have been identified for this supplemental funding.

#### **1. Secure Information Sharing**

##### **Problem**

There is a need for mechanisms for permitting secure, controlled, accountable communication among virtual machines in different security domains, capable of handling high volume, and able to scale as the virtual hosting infrastructure grows. How can providers and users of virtualized machines and domains evaluate the likelihood of exploitable vulnerabilities? Typically, inputs to the risk evaluation process include historical data, trends in component functional areas, the current states of development practices, exposure to adversaries, and threat actors in operational deployment. System architects need a design and optimization process for evaluating alternative architectures with respect to these risks. This process should be able to answer questions such as:

- What types of attacks have the highest risk, and what are the best defenses against them?
- How many layers are needed to bring the risk down to an acceptable level?
- What is the role of inter-layer dependence?
- How can configurations be updated safely?

The process must also include a way to test layered security solutions to identify end-to-end vulnerabilities that contribute to the risk level. In addition, the solution must be analyzed over time to determine how risk may change. This assessment will include information about vulnerabilities and expected configuration change.

## **How I3P Would Address the Problem**

1. Provide a framework for evaluating the risks that would include:
  - Methods for expressing the virtual architecture
  - Methods for specifying the secure information sharing
  - Methods for evaluating the security risks, including compromise and disclosure
  - Methods for testing the risks inherent in a variety of candidate architectures
2. The methods developed will be applied to a set of incident response sharing architectures in a cloud computing environment, to evaluate the collective methods' ability to identify risks and suggest mitigation strategies.
3. Outcomes will include:
  - Documentation of the methods listed above
  - A framework for combining the methods into an approach for building and evaluating secure, multi-layer information sharing in a virtual environment
  - An analysis of the application of methods and framework to the incident response sharing example
  - A comparison between results of the research and commercially available products to address the problem.

## **2. Usable Security**

### **Problem**

- Developers desire usable security, prompted by experiencing lost sales, lost time, and a profusion of misuse errors.
- A July 2009 NAS workshop identified challenges to advancing research in usability, security and privacy: inconsistent terminology and definitions, limited access to data, scarcity of expertise, unfamiliarity with work at the intersection of usability, security, and privacy, and difficulty moving security usability research results into practice.

A March 2011 NIST workshop recommended the development of case studies of usable security design and implementation, for use in understanding the problems and in teaching developers about solutions.

### **How I3P Would Address the Problem**

1. Identify three organizations willing to be profiled in a case study. Each organization will provide access to:

- Documentation of its perceived need for usable security
- The steps taken to build usable security into their development process
- Data useful in evaluating the effects of using the enhanced development process

2. Analyze data to determine variables and relationships

3. Outcomes will include:

- A documented case study for each participating organization
- A description of the case study methodology, to enable others to conduct similar case studies of other organizations, thereby building a body of literature that can be compared across case study subjects
- An analysis of the initial case studies, to identify commonalities and success factors
- A comparison of the success factors to commercially available products

It is our intention to perform this work in conjunction with work we have proposed to NIST. With NIST funds we will be able to complete one case study. These supplemental DHS funds will allow the project to be fully funded with three case studies completed and at least one workshop held.

### **I3P Workshops and Outreach**

The I3P has a well established and nationally recognized ability to organize high-impact workshops of interest to industry, government and academia; the consortium has used these workshops to gain knowledge about cyber security problems, to demonstrate mitigation and resilience tools and strategies, and to initiate discussions with stakeholders that result in increased visibility, understanding, and create



the momentum necessary for progress. The consortium has shown its abilities to bring together important stakeholders from a variety of disciplines to discuss security challenges and advance solutions. The I3P has a unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue.

The workshops will focus on areas related to I3P research conducted during the performance period. These interactions will accelerate our understanding of information infrastructure vulnerabilities, promote the sharing of information and help outline strategies for moving forward, facilitating the alignment of policies and best practices. Where appropriate, workshops will also serve as demonstration sites as part of the technology transfer process.

Workshop topics will be chosen by the I3P consortium, in consultation with the Principal Investigator, the I3P Executive Committee and the I3P's Program Manager at NCSD, and will reflect current cyber security priorities of the information infrastructure community.

The discussions and other outcomes of each workshop or forum will be incorporated in documents prepared by the I3P for dissemination to a broader audience. This documentation might take one of several forms. One possibility is an overview document that captures the main points of the event; another is an expanded synthesis document which relates the main points to larger infrastructure protection issues. Some events might generate an I3P position paper that integrates the findings from the event with the opinions of consortium experts, creating an integrated, systemic work that details a particular challenge in a broad context and possible action steps towards a solution, including needed research and stakeholder coalitions. It is expected that such position papers would provide a platform for future research proposals.

The I3P operations staff will provide logistical and organizational support for the workshops and forums. Staff will work closely with researchers and leading experts from industry and government to ensure insightful, well-organized and effective events. The I3P will help produce and distribute workshop materials, develop websites promoting the workshops, invite speakers, and provide on-site administrative assistance. I3P staff will also play an active role in developing workshop content and coordinating the sessions.

I3P staff will also be responsible for all tasks related to logistics, room and equipment reservations, arranging meals and managing reservations. The post-workshop activities for which the I3P staff will be responsible include managing and archiving information produced from the workshops, and the preparation and distribution, in both electronic and hard-copy format, of publications and reports from the workshops as described above.

### I3P Operations

The I3P consortium is managed by a small staff made up of employees of Dartmouth College. Management responsibilities include planning and administering consortium meetings and workshops, overseeing and reporting on I3P research projects, assisting with the research proposal selection process, and managing the educational initiatives, which includes the I3P fellowship program. In addition to the above activities, the administration seeks to communicate key research findings through outreach to the media as well as the public and private sectors. The I3P encourages government and sponsor participation, becoming a key place to seek experts in cyber security areas. The staff maintains a website that highlights I3P researchers and institutions, as well as publications in relevant research areas. The administration creates a cohesive environment with institutional representatives via 3 meetings per year, maintains an elected Executive Committee to provide direction and consortium oversight, and continues to find new ways to fulfill the I3P mandate. Working closely with program managers, we feel this model has proven successful.

For this award, the I3P will continue its operations of consortium activities, award and oversee research projects, as well as provide support for workshop and outreach programs. Each research project will have an institutional leader from one of the I3P member institutions who will work closely with the I3P Principal Investigator, Executive Director, and Research Director at Dartmouth College

Dr. (b)(6) Vice Provost at Dartmouth College is the Principal Investigator on external awards made to the consortium. He oversees all the business and operational management of the consortium. He derives between 10-15% of his compensation from federal funds awarded for I3P operations. Dr. (b)(6) is also a member of the senior administration at Dartmouth, and reports directly to the Dartmouth College Provost.

(b)(6) Executive Director of the I3P, is responsible for the day-to-day management and strategic direction of the I3P. She is also responsible for advancing the I3P mission and goals, and assisting the Executive Committee and Research Director of the I3P. This position is funded by multiple sources.

The Research Director of the I3P, Dr. [REDACTED] (b)(6) works closely with the Executive Director to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. This position is funded by multiple sources.

|

**Appendix A – Current I3P consortium members**

Carnegie Mellon University, H. John Heinz III School of Public Policy and Management

Carnegie Mellon University, Software Engineering Institute

Cornell University

Dartmouth College

George Mason University

Georgia Institute of Technology

Idaho National Laboratory

Indiana University

Johns Hopkins University

Lawrence Berkeley National Laboratory

MIT Lincoln Laboratory

MITRE Corporation

New York University

Pacific Northwest National Laboratory (PNNL)

Purdue University

RAND Corporation

Sandia National Laboratories

SRI International

United States Military Academy (USMA)

University of California at Berkeley

University of California at Davis

University of Idaho

University of Illinois Urbana-Champaign

University of Massachusetts Amherst

University of Tulsa

University of Virginia

## **Project Summary**

This amendment covers work to be completed during the supplemental funding period (August 1, 2010 – July 31, 2012) of award number 2006-CS-001-000001 from NCSD. Dartmouth College's Institute for Information Infrastructure Protection (I3P) will focus on continuing the cyber security collaboration and information sharing activities established under this award and the previous award number 2003-TK-TX-0003. The work will be accomplished through consortium activities, to include research, fellowships, and outreach programs that will include communities of researchers nationwide.

Workshops and forums that include private sector, government, and academic participants will highlight I3P research as well as bring attention to significant national information infrastructure issues; the I3P Postdoctoral Fellowship Program will be continued and interdisciplinary teams of researchers will focus on problems in information infrastructure areas such as those identified in the I3P report "*National Cyber Security Research and Development Challenges*" published in February of 2009. This work may take the form of one larger project or up to two smaller projects.

The benefit of the Cyber Security Collaboration, Information Sharing and Research Project is to bring together researchers, stakeholders, and other constituencies to focus on the development of tangible means to predict, identify and remediate cyberspace vulnerabilities, as well as to heighten awareness of cyber security nationwide. Outcomes of the work will be disseminated to various constituencies, including the National Cyber Security Division, through demonstrations, workshops, publications, and site visits.

The operations budget supports staff salaries and costs of running the consortium and related workshops, the fellowship program and to coordinate and report on research projects. The main responsibilities are outlined in the project narrative.

**Personnel (\$358,114):** All personnel are Dartmouth employees. The Dartmouth fiscal year ends on June 30. Annual salary raises take effect on July 1 of each year. The following is a list of job descriptions found in the research and related budget worksheet. **Please note that prior approved operation dollars are currently being used to fund these positions. 11 additional months of support are budgeted from the supplemental funding (FY12, July 1, 2011 – May 31, 2012).**

PI: D (b)(6) is the Vice-Provost for Research at Dartmouth College. He oversees all the business and operational management of the consortium. We budget for 15% of effort throughout. (\$35,750)

Director of Research: The Director of Research reports to the Vice-Provost for Research, they are responsible for providing the vision and leadership for the I3P Consortium's research portfolio. The Director of Research works closely with the Executive Director, the Executive Committee, and the I3P membership to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. The Director of Research oversees the implementation of new research programs and activities, and works to secure research funding to meet the research goals. The Director of Research represents the work of the Institute internally and externally, and cultivates strong ties to government agencies, industry, and academia. This position is currently unfilled. Approximately 50% of this position is budgeted under this supplemental award. (\$57,200)

Executive Director: The Executive Director is responsible for the day-to-day management and strategic direction of the Institute. On behalf of the I3P Chair, the Executive Director works to advance the I3P mission and goals, fosters a cohesive and collaborative membership, and helps to build and sustain an effective research consortium. The Executive Director also supports and develops a close working relationship with and among the members of the I3P Executive Committee and enables the Executive Committee to conduct its work on behalf of the Consortium. Approximately 60% of this position is budgeted under this supplemental award. (\$77,334)

Associate Director for Research: The Associate Director collaborates with research teams, monitoring progress and guiding teams in organizational and substantive capacities. The Associate Director coordinates reports on I3P research to government sponsors, and initiates and implements centrally-driven I3P activities in pursuit of the institute's mission. This includes hosting workshops and events, conducting studies, and liaising with subject matter experts, as well as tracking and documenting the progress of current and new research initiatives. The Associate Director actively participates in the strategic development of the I3P and is a member of the senior management staff, and represents the I3P at conferences and meetings with industry, academia, and government. 100% of this position is budgeted under this supplemental award. (\$58,844)

Associate Director for External Affairs and New Initiatives: The Associate Director manages and cultivates I3P external relations, including those with government agencies, executives in private industry, and various aspects of the public media. The Associate Director serves as a public information and program information liaison to current and potential sponsors, and in addition

provides administrative support in relation to I3P policy (by-laws, membership, elections). The Associate Director actively participates in the strategic development of the I3P and is a member of the senior management staff, and represents the I3P at conferences and meetings. 90% of this position is budgeted under this supplemental award. (\$68,640)

Events Manager: The Event Manager plans, directs and manages coordination, administration, and execution of internal and external Institute events. The position defines the strategies, tactics, budgets and related duties relevant to the successful planning and execution of all Institute events, to include workshops and external meetings. 60% of this position is budgeted under this supplemental award. (\$27,456)

Communications Assistant: The Communications Assistant provides support to the Assistant Director for Communication and Outreach in the form of coordination and execution of internal and external information provided via the I3P website and the Institutes' hard-copy publications and communication materials. 100% of this position is budgeted under this supplemental award. (\$32,890)

**Fringe (\$136,083):** In accordance with our negotiated agreement (dated 5/25/2010) with the Department of Health and Human Services, Dartmouth College uses the following approved fringe rate. Faculty & Senior personnel: 37% in FY11, with a 1% anticipated increase each fiscal year, for a rate of 38% in FY12.

**Travel (\$129,050):** Travel estimates are based on historical data regarding travel from the Hanover, NH, area and travel required of consortium members from outside the Dartmouth area.

Operations Trips: External conferences, coordination, training, and reporting: Trips are required to participate in meetings, conferences, and seminars in the process of developing research and overall I3P development requirements, collaborating technical solutions, leveraging capabilities and opportunities, and promoting outreach and technical support. Registration fees for three trips are also budgeted.

36 trips at 3 nights - \$50,900  
Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100  
\$1,000 registration fees (5 of the trips)

36 x \$500 = \$18,000  
108 x \$175 = \$18,900  
108 x \$50 = \$5,400  
36 x \$100 = \$3,600  
5 x \$1,000 = \$5,000

I3P Consortium Meetings: Consortium members and industry and government partners will meet throughout the performance periods to work on defined tasks. Current proposed level is three meetings per year, with an estimate of 15 participants requesting travel reimbursement. In addition, speakers and guest participants may be invited from time to time. We budget for two such meeting in this supplemental request.

30 trips at 2 nights - \$31,500  
Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100

30 x \$500 = \$15,000  
60 x \$175 = \$10,500  
60 x \$50 = \$3,000  
30 x \$100 = \$3,000

Workshop Trips: This budget represents costs for **four** workshops to be held between August 1, 2010, and July 31, 2012. Additional details are included in the project narrative. Costs are based on historical workshop expenses. Registration fees collected will be used to offset additional costs as appropriate.

IBP Staff Travel to workshops (4 travelers for 3 nights to 4 workshops):

16 trips at 3 nights - \$20,400  
Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100

16 x \$500 = \$8,000  
48 x \$175 = \$8,400  
48 x \$50 = \$2,400  
16 x \$100 = \$1,600

Team and consortium member travel to workshops (5 travelers for 2 nights to 4 workshops):

20 trips at 2 nights - \$21,000  
Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100

20 x \$500 = \$10,000  
40 x \$175 = \$7,000  
40 x \$50 = \$2,000  
20 x \$100 = \$2,000

Speakers or panelist travel to workshops (1 traveler for 2 nights to 4 workshops):

4 trips at 2 nights - \$4,200  
Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100



4 x \$500 = \$2,000  
8 x \$175 = \$1,400  
8 x \$50 = \$400  
4 x \$100 = \$400

Fellowship Trips: One fellow has been budgeted as part of the fellowship program. We will require the receiver of the fellowship to attend one consortium meeting to present their research.

1 trips at 2 nights - \$1,050  
Airfare \$500  
Hotel \$175 / day  
Meals \$50 / day  
Mileage/taxi/parking (\$60+\$20+\$20) \$100

1 x \$500 = \$500  
2 x \$175 = \$350  
2 x \$50 = \$100  
1 x \$100 = \$100

**Other Direct Costs:**

**Materials and Supplies (\$6,700)**: Budgeted expenditures are for the purchase of minor expendable equipment, postage and conference calls.

**Publication Costs (\$20,000)**: I3P related communication costs (brochures, posters, photography, printing, and mailing) are anticipated.

**Sub awards/Consortium/Contractual Costs (\$1,050,700):**

Research sub awards (\$800,000): As outlined in the proposal narrative we budget for two research awards. We plan for 2 awards at \$400,000 with 6 total sub awards.

Fellowship sub awards (\$150,000): As outlined in the proposal narrative we budget for one fellowship recipient during the award period.

Executive Committee (\$31,500): Payments are made according to the I3P bylaws. One year of funding is requested in this supplement.

IBM Consultant, (b)(6) \$69,200); Dartmouth College contracts with IBM for the use of Dr. (b)(6) We budget for 10 months of this consulting contract in the supplemental budget request.

**Event Fees (\$129,600):**

Consortium meetings (\$15,000): are held three times per year. In the supplemental funding, we budget for two meetings, which include all associated costs of supplies, food, set-up, and transportation as needed.

Four workshops (\$114,600): include renting space and facilities for the workshops, food (including tax and gratuities), audio/video set up with technical support, postage for materials to and from the venue, and other costs that may vary (such as printing costs for proceedings, transcriptionist, writer, etc). Costs are estimated based on historical data, location, workshop needs, and the number of expected participants.

Costs based on an average of 50 participants for two days.

Supplies - \$10 per participant =  $\$10 \times 50 = \$500$  per meeting

Meals (\$80/ day) - two days -  $\$160 \times 50 = \$8,000$  per meeting

Set-up room fee for event and room rental – \$5,000 per meeting

A/V equipment for event - \$5,000 per meeting

Postage - \$150 per meeting

Other anticipated costs (publications, editor, design, transcription, etc) - \$10,000 per meeting

$\$28,650 \times 4$  workshops = \$114,600

Some expenses may be supplemented with registration fees, or funds from additional sources if available.

**Indirects:** In accordance with our negotiated agreement (dated 3/12/2009) with the Department of Health and Human Services, Dartmouth College uses a 58% MTDC indirect cost rate for research and 35% for non research activities. Total direct costs exclude participant costs, capital expenditures equipment over \$5,000, and the portion of each subaward in excess of \$25,000.

**(\$836,047 x 35% = \$292,617)** – includes 1 sub award

**(\$219,200 x 58% = \$127,136)** – includes 6 sub awards

## **Cyber Security Collaboration and Information Sharing Project**

### **Supplemental Funding Request**

#### **Project Narrative**

##### **Introduction**

The overarching objective of the proposed work under this supplemental funding is to apply the collective, diverse expertise of the Institute for Information Infrastructure Protection (I3P) to critical priorities tied to the mission of the Institute. A number of topics outlined in the I3P's February 2009 report "*National Cyber Security Research and Development Challenges Related to Economics, Physical Infrastructure, and Human Behavior: An Industry, Academic, and Government Perspective*," as well as other national research agenda documents will drive the selection of high quality and relevant research to be performed by I3P consortium members.

During the period of performance, the I3P may hold workshops and perform outreach activities to highlight and disseminate I3P research results, design and run forums to provide a holistic view into the information infrastructure protection challenges faced by the private and public sectors, and conduct a multidisciplinary research program. The I3P will also continue its postdoctoral fellowship program, perform its general operations and consortium activities, and initiate new research projects.

##### **Project Plan**

Four areas are outlined in the project plan:

1. I3P Workshops and Outreach
2. I3P Postdoctoral Fellowship Program
3. I3P Operations
4. I3P Research

### **I3P Workshops and Outreach**

The I3P has a well established and nationally recognized ability to organize high-impact workshops of interest to industry, government and academia; the consortium has used these workshops to gain knowledge about cyber security problems, to demonstrate mitigation and resilience tools and strategies, and to initiate discussions with stakeholders that result in increased visibility, understanding, and create the momentum necessary for progress. The consortium has shown its abilities to bring together important stakeholders from a variety of disciplines to discuss security challenges and advance solutions. The I3P has a unique ability, through its wide network of contacts and its depth and breadth of technical and policy expertise, to assemble the right coalition of experts to address a particular issue.

Following discussions with our sponsor, we are proposing to increase the number of these high-impact events. We envision at least three events, some similar in scope and scale to prior workshops, others that are patterned after the Senate forums the I3P ran in the fall of 2008. The workshops will focus on areas related to I3P research, while the forums will provide a more holistic view of key information infrastructure challenges faced by the private and public sectors.

These interactions will accelerate our understanding of information infrastructure vulnerabilities, promote the sharing of information and help outline strategies for moving forward, facilitating the alignment of policies and best practices. Where appropriate, workshops will also serve as demonstration sites as part of the technology transfer process.

Workshop topics will be chosen by the I3P consortium, in consultation with the Principal Investigator, the I3P Executive Committee and the I3P's Program Manager at NCSA, and will reflect current cyber security priorities of the information infrastructure community.

The discussions and other outcomes of each workshop or forum will be incorporated in documents prepared by the I3P for dissemination to a broader audience. This documentation might take one of several forms. One possibility is an overview document that captures the main points of the event; another is an expanded synthesis document which relates the main points to larger infrastructure protection issues. Some events might generate an I3P position paper that integrates the findings from the event with the opinions of consortium experts, creating an integrated, systemic work that details a particular challenge in a broad context and possible action steps towards a solution, including needed research and stakeholder coalitions. It is expected that such position papers would provide a platform for future research proposals.

The I3P operations staff will provide logistical and organizational support for the workshops and forums. Staff will work closely with researchers and leading experts from industry and government to ensure insightful, well-organized and effective events. The I3P will help produce and distribute workshop materials, develop websites promoting the workshops, invite speakers, and provide on-site administrative assistance. I3P staff will also play an active role in developing workshop content and coordinating the sessions.

I3P staff will also be responsible for all tasks related to logistics, room and equipment reservations, arranging meals and managing reservations. The post-workshop activities for which the I3P staff will be responsible include managing and archiving information produced from the workshops, and the preparation and distribution, in both electronic and hard-copy format, of publications and reports from the workshops as described above.

### **I3P Postdoctoral Fellowship Program**

Since 2003 the I3P has sponsored a fellowship program open to postdoctoral researchers, junior faculty, and research scientists. The fellowship program is designed to build a nationwide cadre of investigators focused on critical infrastructure research challenges. The program also advances the I3P's national research agenda and provides expanded research opportunities at I3P consortium member institutions. The I3P may appoint up to two fellows for one-year terms. Fellows spend the term of their fellowship in residence at a member institution and are expected to travel to at least one I3P consortium meeting during the fellowship to present their research.

### **I3P Operations**

The I3P consortium is managed by a small staff made up of employees of Dartmouth College. Management responsibilities include planning and administering consortium meetings and workshops, overseeing and reporting on I3P research projects, assisting with the research proposal selection process, and managing the educational initiatives, which includes the I3P fellowship program. In addition to the above activities, the administration seeks to communicate key research findings through outreach to the media as well as the public and private sectors. The I3P encourages government and sponsor participation, becoming a key place to seek experts in cyber security areas. The staff maintains a website that highlights I3P researchers and institutions, as well as publications in relevant research areas. The

administration creates a cohesive environment with institutional representatives via 3 meetings per year, maintains an elected Executive Committee to provide direction and consortium oversight, and continues to find new ways to fulfill the I3P mandate. Working closely with program managers, we feel this model has proven successful.

For this award, the I3P will continue its operations of consortium activities, award and oversee research projects, run the I3P fellowship program and expand its workshop and outreach programs. Each research project will have an institutional leader from one of the I3P member institutions who will work closely with the I3P Principal Investigator, Executive Director, and Research Director at Dartmouth College

Dr. [redacted] (b)(6) Vice Provost for Research at Dartmouth College is the Principal Investigator on external awards made to the consortium. He oversees all the business and operational management of the consortium. He derives between 10-15% of his compensation from federal funds awarded for I3P operations. Dr. [redacted] (b)(6) is also a member of the senior administration at Dartmouth, and reports directly to the Dartmouth College Provost.

[redacted] (b)(6) Executive Director of the I3P, is responsible for the day-to-day management and strategic direction of the I3P. She is also responsible for advancing the I3P mission and goals, and assisting the Executive Committee and Research Director of the I3P. This position is funded by multiple sources.

The Research Director of the I3P, works closely with the Executive Director to ensure the research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. This position is funded by multiple sources. Due to a recent departure, we are conducting a search and will fill this position soon.

### **I3P Research**

The proposed research will be accomplished during the performance period of August 1, 2010 through July 31, 2012. Research may consist of one substantial research project or up to two smaller projects. Teams would range from two to five member institutions. The focus of the projects will be on nationally identified cyber security research priorities. Such priorities will be established in consultation with the I3P consortium members, the Executive Committee, the Principal Investigator, and the Program Manager at

NCS&D. As with all I3P-funded research, projects will be chosen through a collaborative and rigorous process involving consortium institutions (see Appendix A for a list of current I3P members). Teams of I3P researchers will form and provide a final proposal outlining the work to be performed, describing the desired outcome and identifying the need for such work. This collaborative process has worked well for prior funded projects.

**Project topics:** The consortium as a whole may determine whether the topic areas are of a critical nature in the area of cyber security and should be pursued by an I3P research team. Proposed topics will reflect the considered judgment of experts and may include:

- Security, resiliency and privacy of healthcare IT
- “Smart Grid” information security technologies and adoption
- Cloud computing information security issues
- Behavioral aspects of information risk management
- Supply chain risk management
- Tailored trustworthy spaces
- Moving target
- Cyber economics

**Appendix A – Current I3P consortium members**

Carnegie Mellon University, H. John Heinz III School of Public Policy and Management  
Carnegie Mellon University, Software Engineering Institute  
Columbia University  
Cornell University  
Dartmouth College  
George Mason University  
Georgia Institute of Technology  
Idaho National Laboratory  
Indiana University  
Johns Hopkins University  
Lawrence Berkeley National Laboratory  
MIT Lincoln Laboratory  
MITRE Corporation  
New York University  
Pacific Northwest National Laboratory (PNNL)  
Purdue University  
RAND Corporation  
Sandia National Laboratories  
SRI International  
United States Military Academy (USMA)  
University of California at Berkeley  
University of California at Davis  
University of Idaho  
University of Illinois Urbana-Champaign  
University of Massachusetts Amherst  
University of Tulsa  
University of Virginia



Pages 56 through 57 redacted for the following reasons:

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(b)(6)

### ASSURANCES - NON-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

**PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.**

**NOTE:** Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

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9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

|                                               |                    |
|-----------------------------------------------|--------------------|
| * SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL | * TITLE            |
| (b)(6)                                        | Assistant Director |
| * APPLICANT ORGANIZATION                      | * DATE SUBMITTED   |
| Trustees of Dartmouth College                 | 06/16/2010         |

Standard Form 424B (Rev. 7-97) Back

### Project/Performance Site Location(s)

**Project/Performance Site Primary Location**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Trustees of Dartmouth College

DUNS Number: 0410278220000

\* Street1: 45 Lyme Rd, suite 300

Street2:

\* City: Hanover County:

\* State: NH: New Hampshire

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: 037551223 \* Project/ Performance Site Congressional District: NH-002

**Project/Performance Site Location 1**  I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:

DUNS Number:

\* Street1:

Street2:

\* City: County:

\* State:

Province:

\* Country: USA: UNITED STATES

\* ZIP / Postal Code: \* Project/ Performance Site Congressional District:

Additional Location(s)

## RESEARCH & RELATED Senior/Key Person Profile

| PROFILE - Project Director/Principal Investigator |                               |                              |              |
|---------------------------------------------------|-------------------------------|------------------------------|--------------|
| Prefix:                                           | Dr.                           | * First Name:                | (b)(6)       |
|                                                   |                               | Middle Name:                 |              |
| * Last Name:                                      | (b)(6)                        | Suffix:                      |              |
| Position/Title:                                   | Vice Provost                  | Department:                  | Provost      |
| Organization Name:                                | Trustees of Dartmouth College |                              | Division:    |
| * Street1:                                        | Parkhurst - HB 6004           |                              |              |
| Street2:                                          |                               |                              |              |
| * City:                                           | Hanover                       | County:                      |              |
| * State:                                          | NH: New Hampshire             | Province:                    |              |
| * Country:                                        | USA: UNITED STATES            | * Zip / Postal Code:         | 037553529    |
| * Phone:                                          | (b)(6)                        | Fax Number:                  | 603-646-0660 |
| * E-Mail:                                         | (b)(6)                        |                              |              |
| Credential, e.g., agency login:                   |                               |                              |              |
| * Project Role:                                   | PD/PI                         | Other Project Role Category: |              |
| * Attach Biographical Sketch                      | Wybourne Bio.pdf              | Add Attachment               |              |
| Attach Current & Pending Support                  |                               | Add Attachment               |              |

| PROFILE - Senior/Key Person 1    |                    |                              |              |
|----------------------------------|--------------------|------------------------------|--------------|
| Prefix:                          | *                  | First Name:                  | Middle Name: |
| * Last Name:                     |                    | Suffix:                      |              |
| Position/Title:                  |                    | Department:                  |              |
| Organization Name:               |                    |                              | Division:    |
| * Street1:                       |                    |                              |              |
| Street2:                         |                    |                              |              |
| * City:                          |                    | County:                      |              |
| * State:                         |                    | Province:                    |              |
| * Country:                       | USA: UNITED STATES | * Zip / Postal Code:         |              |
| * Phone Number:                  |                    | Fax Number:                  |              |
| * E-Mail:                        |                    |                              |              |
| Credential, e.g., agency login:  |                    |                              |              |
| * Project Role:                  |                    | Other Project Role Category: |              |
| * Attach Biographical Sketch     |                    | Add Attachment               |              |
| Attach Current & Pending Support |                    | Add Attachment               |              |

[Next Person](#)

|                                                        |                      |                                |                                   |                                   |
|--------------------------------------------------------|----------------------|--------------------------------|-----------------------------------|-----------------------------------|
| ADDITIONAL SENIOR/KEY PERSON PROFILE(S)                | <input type="text"/> | <a href="#">Add Attachment</a> | <a href="#">Cancel Attachment</a> | <a href="#">Delete Attachment</a> |
| Additional Biographical Sketch(es) (Senior/Key Person) | <input type="text"/> | <a href="#">Add Attachment</a> | <a href="#">Cancel Attachment</a> | <a href="#">Delete Attachment</a> |
| Additional Current and Pending Support(s)              | <input type="text"/> | <a href="#">Add Attachment</a> | <a href="#">Cancel Attachment</a> | <a href="#">Delete Attachment</a> |

**BUDGET NARRATIVE**

Award Number: 2006-CS-001-000001  
Supplemental Opportunity Number: DHS-06-CS-001-001  
Dartmouth College  
September 2011  
I3P: Cyber Security Collaborations and Information Sharing Project

The following two areas are presented for the \$850,000 supplemental funding. Funding will be spent through July 31, 2013:

I3P Research  
I3P Operations

Summary breakdown by category:

| Object Class Categories: |                     | <b>TOTAL</b>      | Budget Period I thru III | Supplement May 2009 | Supplement June 2010 |                |
|--------------------------|---------------------|-------------------|--------------------------|---------------------|----------------------|----------------|
| a.                       | Personnel           | <b>3,923,738</b>  | 3,372,406                | 163,913             | 358,114              | <b>29,304</b>  |
| b.                       | Fringe Benefits     | <b>1,211,936</b>  | 1,002,534                | 62,623              | 136,083              | <b>10,696</b>  |
| c.                       | Travel              | <b>795,500</b>    | 543,575                  | 122,875             | 129,050              | -              |
| d.                       | Equipment           | <b>418,082</b>    | 418,082                  | -                   | -                    | -              |
| e.                       | Supplies            | <b>157,556</b>    | 142,823                  | 14,733              | -                    | -              |
| f.                       | Contractual         | <b>17,151,575</b> | 14,045,875               | 1,375,000           | 1,050,700            | <b>680,000</b> |
| g.                       | Construction        | -                 | -                        | -                   | -                    | -              |
| h.                       | Other               | <b>1,214,690</b>  | 914,015                  | 144,375             | 156,300              | -              |
| i.                       | Total Direct Charge | <b>24,873,076</b> | 20,439,310               | 1,883,519           | 1,830,247            | <b>720,000</b> |
| j.                       | Indirect Charges    | <b>4,776,924</b>  | 3,860,690                | 366,481             | 419,753              | <b>130,000</b> |
| k.                       | TOTAL               | <b>29,650,000</b> | 24,300,000               | 2,250,000           | 2,250,000            | <b>850,000</b> |



Close Form

RESEARCH & RELATED BUDGET - SECTION C, D, & E, BUDGET PERIOD 1

\* ORGANIZATIONAL DUNS: [text box]

\* Budget Type:  Project  Subaward/Consortium

Enter name of Organization: [text box]

\* Start Date: [text box] \* End Date: [text box] Budget Period 1

C. Equipment Description

List items and dollar amount for each item exceeding \$5,000

|     | Equipment Item                                                      | * Funds Requested (\$) |
|-----|---------------------------------------------------------------------|------------------------|
| 1.  | [text box]                                                          | [text box]             |
| 2.  | [text box]                                                          | [text box]             |
| 3.  | [text box]                                                          | [text box]             |
| 4.  | [text box]                                                          | [text box]             |
| 5.  | [text box]                                                          | [text box]             |
| 6.  | [text box]                                                          | [text box]             |
| 7.  | [text box]                                                          | [text box]             |
| 8.  | [text box]                                                          | [text box]             |
| 9.  | [text box]                                                          | [text box]             |
| 10. | [text box]                                                          | [text box]             |
| 11. | Total funds requested for all equipment listed in the attached file | [text box]             |
|     | Total Equipment                                                     | [text box]             |

Additional Equipment: [text box]

Add Attachment

Delete Attachment

View Attachment

D. Travel

Funds Requested (\$)

|    |                                                                    |            |
|----|--------------------------------------------------------------------|------------|
| 1. | Domestic Travel Costs ( Incl. Canada, Mexico and U.S. Possessions) | [text box] |
| 2. | Foreign Travel Costs                                               | [text box] |
|    | Total Travel Cost                                                  | [text box] |

E. Participant/Trainee Support Costs

Funds Requested (\$)

|            |                                 |                                                    |
|------------|---------------------------------|----------------------------------------------------|
| 1.         | Tuition/Fees/Health Insurance   | [text box]                                         |
| 2.         | Stipends                        | [text box]                                         |
| 3.         | Travel                          | [text box]                                         |
| 4.         | Subsistence                     | [text box]                                         |
| 5.         | Other [text box]                | [text box]                                         |
| [text box] | Number of Participants/Trainees | Total Participant/Trainee Support Costs [text box] |

RESEARCH & RELATED Budget (C-E) (Funds Requested)



Close Form

### RESEARCH & RELATED BUDGET - SECTION F-K, BUDGET PERIOD 1

\* ORGANIZATIONAL DUNS:

\* Budget Type:  Project  Subaward/Consortium

Enter name of Organization:

\* Start Date:  \* End Date:  Budget Period 1

| F. Other Direct Costs                     | Funds Requested (\$) |
|-------------------------------------------|----------------------|
| 1. Materials and Supplies                 | <input type="text"/> |
| 2. Publication Costs                      | <input type="text"/> |
| 3. Consultant Services                    | <input type="text"/> |
| 4. ADP/Computer Services                  | <input type="text"/> |
| 5. Subawards/Consortium/Contractual Costs | 680,000.00           |
| 6. Equipment or Facility Rental/User Fees | <input type="text"/> |
| 7. Alterations and Renovations            | <input type="text"/> |
| 8. <input type="text"/>                   | <input type="text"/> |
| 9. <input type="text"/>                   | <input type="text"/> |
| 10. <input type="text"/>                  | <input type="text"/> |
| <b>Total Other Direct Costs</b>           | 680,000.00           |

|                                      |                             |
|--------------------------------------|-----------------------------|
| <b>G. Direct Costs</b>               | <b>Funds Requested (\$)</b> |
| <b>Total Direct Costs (A thru F)</b> | 720,000.00                  |

| H. Indirect Costs           | Indirect Cost Type       | Indirect Cost Rate (%) | Indirect Cost Base (\$) | * Funds Requested (\$) |
|-----------------------------|--------------------------|------------------------|-------------------------|------------------------|
| 1.                          | MTDC - research rate     | 58.00                  | 200,000.00              | 116,000.00             |
| 2.                          | MTDC - non research rate | 35.00                  | 40,000.00               | 14,000.00              |
| 3.                          | <input type="text"/>     | <input type="text"/>   | <input type="text"/>    | <input type="text"/>   |
| 4.                          | <input type="text"/>     | <input type="text"/>   | <input type="text"/>    | <input type="text"/>   |
| <b>Total Indirect Costs</b> |                          |                        |                         | 130,000.00             |

Cognizant Federal Agency  (b)(6)  
(Agency Name, POC Name, and POC Phone Number)

|                                                              |                             |
|--------------------------------------------------------------|-----------------------------|
| <b>I. Total Direct and Indirect Costs</b>                    | <b>Funds Requested (\$)</b> |
| <b>Total Direct and Indirect Institutional Costs (G + H)</b> | 850,000.00                  |

J. Fee **Funds Requested (\$)**

K. \* Budget Justification      
(Only attach one file.)

## RESEARCH & RELATED BUDGET - Cumulative Budget

|                                                           |            | Totals (\$) |
|-----------------------------------------------------------|------------|-------------|
| <b>Section A, Senior/Key Person</b>                       |            | 40,000.00   |
| <b>Section B, Other Personnel</b>                         |            |             |
| Total Number Other Personnel                              |            |             |
| <b>Total Salary, Wages and Fringe Benefits (A+B)</b>      |            | 40,000.00   |
| <b>Section C, Equipment</b>                               |            |             |
| <b>Section D, Travel</b>                                  |            |             |
| 1. Domestic                                               |            |             |
| 2. Foreign                                                |            |             |
| <b>Section E, Participant/Trainee Support Costs</b>       |            |             |
| 1. Tuition/Fees/Health Insurance                          |            |             |
| 2. Stipends                                               |            |             |
| 3. Travel                                                 |            |             |
| 4. Subsistence                                            |            |             |
| 5. Other                                                  |            |             |
| 6. Number of Participants/Trainees                        |            |             |
| <b>Section F, Other Direct Costs</b>                      |            | 680,000.00  |
| 1. Materials and Supplies                                 |            |             |
| 2. Publication Costs                                      |            |             |
| 3. Consultant Services                                    |            |             |
| 4. ADP/Computer Services                                  |            |             |
| 5. Subawards/Consortium/Contractual Costs                 | 680,000.00 |             |
| 6. Equipment or Facility Rental/User Fees                 |            |             |
| 7. Alterations and Renovations                            |            |             |
| 8. Other 1                                                |            |             |
| 9. Other 2                                                |            |             |
| 10. Other 3                                               |            |             |
| <b>Section G, Direct Costs (A thru F)</b>                 |            | 720,000.00  |
| <b>Section H, Indirect Costs</b>                          |            | 130,000.00  |
| <b>Section I, Total Direct and Indirect Costs (G + H)</b> |            | 850,000.00  |
| <b>Section J, Fee</b>                                     |            |             |

**Personnel (\$29,304):** All personnel are Dartmouth employees. Please note that prior approved funds are currently being used to fund I3P Operations. This supplemental funding will continue to support PI, Dr. [REDACTED] through July 31, 2013.

(b)(6)

PI: Dr. [REDACTED] is the Vice-Provost at Dartmouth College. He oversees all the business, research and operational management of the I3P consortium. We budget for 5% effort throughout this supplemental project period of 23 months (\$29,304).

**Fringe (\$10,696):** In accordance with our negotiated agreement (dated 4/26/2011) with the Department of Health and Human Services, Dartmouth College uses the following approved fringe rate of 36.5%.

**Sub awards/Consortium/Contractual Costs (\$680,000):**

Research sub awards: As outlined in the proposal narrative we budget for two research projects. We plan for 8 total sub awards at a cost of \$85,000 each.

**Indirects (\$130,000):** In accordance with our negotiated agreement (dated 4/26/2011) with the Department of Health and Human Services, Dartmouth College uses a 58% MTDC indirect cost rate for research and 35% for non research activities. Total direct costs exclude participant costs, capital expenditures equipment over \$5,000, and the portion of each sub award in excess of \$25,000.

**(\$40,000 x 35% = \$14,000)**

**(\$200,000 x 58% = \$116,000)** – for 8 sub awards

|                                |                                                                            |
|--------------------------------|----------------------------------------------------------------------------|
| <b>Opportunity Title:</b>      | Cyber Security Collaboration and Information Sharing                       |
| <b>Offering Agency:</b>        | Office of Procurement Operations - Grants Division                         |
| <b>CFDA Number:</b>            |                                                                            |
| <b>CFDA Description:</b>       |                                                                            |
| <b>Opportunity Number:</b>     | DHS-06-CS-001-001                                                          |
| <b>Competition ID:</b>         | DHS-06-CS-001-001                                                          |
| <b>Opportunity Open Date:</b>  | 08/26/2011                                                                 |
| <b>Opportunity Close Date:</b> | 09/09/2011                                                                 |
| <b>Agency Contact:</b>         | Marsha Mathis<br>Grants Officer<br>E-mail: (b)(6)<br>Phone: (202) 447-5550 |

This electronic grants application is intended to be used to apply for the specific Federal funding opportunity referenced here.

If the Federal funding opportunity listed is not the opportunity for which you want to apply, close this application package by clicking on the "Cancel" button at the top of this screen. You will then need to locate the correct Federal funding opportunity, download its application and then apply.

This opportunity is only open to organizations, applicants who are submitting grant applications on behalf of a company, state, local or tribal government, academia, or other type of organization.

\* Application Filing Name: (b)(6) I3P supp DHS 2011

### Mandatory Documents

Move Form to Complete

Move Form to Delete

### Mandatory Documents for Submission

SF424 (R & R)  
 Research & Related Budget  
 Project/Performance Site Location(s)  
 Research & Related Senior/Key Person Profile  
 Research And Related Other Project Information  
 Assurances for Non-Construction Programs (SF-42)

### Optional Documents

Attachments  
 Disclosure of Lobbying Activities (SF-LLL)

Move Form to Submission List

Move Form to Delete

### Optional Documents for Submission

## Instructions

- 1** Enter a name for the application in the Application Filing Name field.

  - This application can be completed in its entirety offline; however, you will need to login to the Grants.gov website during the submission process.
  - You can save your application at any time by clicking the "Save" button at the top of your screen.
  - The "Save & Submit" button will not be functional until all required data fields in the application are completed and you clicked on the "Check Package for Errors" button and confirmed all data required data fields are completed.
- 2** Open and complete all of the documents listed in the "Mandatory Documents" box. Complete the SF-424 form first.

  - It is recommended that the SF-424 form be the first form completed for the application package. Data entered on the SF-424 will populate data fields in other mandatory and optional forms and the user cannot enter data in these fields.
  - The forms listed in the "Mandatory Documents" box and "Optional Documents" may be predefined forms, such as SF-424, forms where a document needs to be attached, such as the Project Narrative or a combination of both. "Mandatory Documents" are required for this application. "Optional Documents" can be used to provide additional support for this application or may be required for specific types of grant activity. Reference the application package instructions for more information regarding "Optional Documents".
  - To open and complete a form, simply click on the form's name to select the item and then click on the => button. This will move the document to the appropriate "Documents for Submission" box and the form will be automatically added to your application package. To view the form, scroll down the screen or select the form name and click on the "Open Form" button to begin completing the required data fields. To remove a form/document from the "Documents for Submission" box, click the document name to select it, and then click the <= button. This will return the form/document to the "Mandatory Documents" or "Optional Documents" box.
  - All documents listed in the "Mandatory Documents" box must be moved to the "Mandatory Documents for Submission" box. When you open a required form, the fields which must be completed are highlighted in yellow with a red border. Optional fields and completed fields are displayed in white. If you enter invalid or incomplete information in a field, you will receive an error message.
- 3** Click the "Save & Submit" button to submit your application to Grants.gov.

  - Once you have properly completed all required documents and attached any required or optional documentation, save the completed application by clicking on the "Save" button.
  - Click on the "Check Package for Errors" button to ensure that you have completed all required data fields. Correct any errors or if none are found, save the application package.
  - The "Save & Submit" button will become active; click on the "Save Submit" button to begin the application submission process.
  - You will be taken to the applicant login page to enter your Grants.gov username and password. Follow all onscreen instructions for submission.

## RESEARCH & RELATED Other Project Information

1. \* Are Human Subjects Involved?  Yes  No

1.a If YES to Human Subjects

Is the Project Exempt from Federal regulations?  Yes  No

If yes, check appropriate exemption number.  1  2  3  4  5  6

If no, is the IRB review Pending?  Yes  No

IRB Approval Date:

Human Subject Assurance Number:

2. \* Are Vertebrate Animals Used?  Yes  No

2.a. If YES to Vertebrate Animals

Is the IACUC review Pending?  Yes  No

IACUC Approval Date:

Animal Welfare Assurance Number

3. \* Is proprietary/privileged information included in the application?  Yes  No

4.a. \* Does this project have an actual or potential impact on the environment?  Yes  No

4.b. If yes, please explain:

4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed?  Yes  No

4.d. If yes, please explain:

5. \* Is the research performance site designated, or eligible to be designated, as a historic place?  Yes  No

5.a. If yes, please explain:

6. \* Does this project involve activities outside of the United States or partnerships with international collaborators?  Yes  No

6.a. If yes, identify countries:

6.b. Optional Explanation:

7. \* Project Summary/Abstract

8. \* Project Narrative

9. Bibliography & References Cited

10. Facilities & Other Resources

11. Equipment

12. Other Attachments

# APPLICATION FOR FEDERAL ASSISTANCE SF 424 (R&R)

|                                  |                                     |
|----------------------------------|-------------------------------------|
| <b>3. DATE RECEIVED BY STATE</b> | <b>State Application Identifier</b> |
|                                  |                                     |

|                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. * TYPE OF SUBMISSION</b>                                                                                                                  |
| <input type="checkbox"/> Pre-application <input checked="" type="checkbox"/> Application <input type="checkbox"/> Changed/Corrected Application |

|                                     |                    |
|-------------------------------------|--------------------|
| <b>4. a. Federal Identifier</b>     | 2006-CS-001-000001 |
| <b>b. Agency Routing Identifier</b> |                    |

|                          |                             |
|--------------------------|-----------------------------|
| <b>2. DATE SUBMITTED</b> | <b>Applicant Identifier</b> |
|                          |                             |

|                                             |                                             |
|---------------------------------------------|---------------------------------------------|
| <b>5. APPLICANT INFORMATION</b>             | <b>* Organizational DUNS:</b> 0410278220000 |
| * Legal Name: Trustees of Dartmouth College |                                             |
| Department: Office of Sponsored Projects    | Division:                                   |
| * Street1: 11 Rope Ferry Road, #6210        |                                             |
| Street2:                                    |                                             |
| * City: Hanover                             | County / Parish:                            |
| * State: NH: New Hampshire                  | Province:                                   |
| * Country: USA: UNITED STATES               | * ZIP / Postal Code: 037551404              |

|                                                              |                          |              |
|--------------------------------------------------------------|--------------------------|--------------|
| Person to be contacted on matters involving this application |                          |              |
| Prefix:                                                      | * First Name: (b)(6)     | Middle Name: |
| * Last Name: (b)(6)                                          | Suffix:                  |              |
| * Phone: (b)(6)                                              | Fax Number: 603-646-3670 |              |
| Email: (b)(6)                                                |                          |              |

|                                                               |
|---------------------------------------------------------------|
| <b>6. * EMPLOYER IDENTIFICATION (EIN) or (TIN):</b> 020222111 |
|---------------------------------------------------------------|

|                                         |                                                                                                       |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>7. * TYPE OF APPLICANT:</b>          | O: Private Institution of Higher Education                                                            |
| Other (Specify):                        |                                                                                                       |
| <b>Small Business Organization Type</b> | <input type="checkbox"/> Women Owned <input type="checkbox"/> Socially and Economically Disadvantaged |

|                                                                                                                     |                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>8. * TYPE OF APPLICATION:</b>                                                                                    | If Revision, mark appropriate box(es).                                                                                                                                            |
| <input type="checkbox"/> New <input type="checkbox"/> Resubmission                                                  | <input type="checkbox"/> A. Increase Award <input type="checkbox"/> B. Decrease Award <input type="checkbox"/> C. Increase Duration <input type="checkbox"/> D. Decrease Duration |
| <input type="checkbox"/> Renewal <input checked="" type="checkbox"/> Continuation <input type="checkbox"/> Revision | <input type="checkbox"/> E. Other (specify):                                                                                                                                      |

|                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|
| * Is this application being submitted to other agencies? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> What other Agencies? |
|---------------------------------------------------------------------------------------------------------------------------------------------------|

|                                               |
|-----------------------------------------------|
| <b>9. * NAME OF FEDERAL AGENCY:</b>           |
| Office of Procurement Operations - Grants Div |

|                                                           |
|-----------------------------------------------------------|
| <b>10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:</b> |
| TITLE:                                                    |

|                                                              |
|--------------------------------------------------------------|
| <b>11. * DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:</b>       |
| Cyber Security Collaboration and Information Sharing Project |

|                              |                           |
|------------------------------|---------------------------|
| <b>12. PROPOSED PROJECT:</b> |                           |
| * Start Date: 08/01/2011     | * Ending Date: 07/31/2013 |

|                                                  |
|--------------------------------------------------|
| <b>* 13. CONGRESSIONAL DISTRICT OF APPLICANT</b> |
| NH-002                                           |

|                                                                        |                                |              |
|------------------------------------------------------------------------|--------------------------------|--------------|
| <b>14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION</b> |                                |              |
| Prefix: Dr.                                                            | * First Name: (b)(6)           | Middle Name: |
| * Last Name: (b)(6)                                                    | Suffix:                        |              |
| Position/Title: Vice Provost                                           |                                |              |
| * Organization Name: Trustees of Dartmouth College                     |                                |              |
| Department: Provost                                                    | Division:                      |              |
| * Street1: Parkhurst - HB 6004                                         |                                |              |
| Street2:                                                               |                                |              |
| * City: Hanover                                                        | County / Parish:               |              |
| * State: NH: New Hampshire                                             | Province:                      |              |
| * Country: USA: UNITED STATES                                          | * ZIP / Postal Code: 037553529 |              |
| * Phone: (b)(6)                                                        | Fax Number: 603-646-0660       |              |
| * Email: (b)(6)                                                        |                                |              |

|                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>15. ESTIMATED PROJECT FUNDING</b></p> <p>a. Total Federal Funds Requested <input type="text" value="850,000.00"/></p> <p>b. Total Non-Federal Funds <input type="text" value="0.00"/></p> <p>c. Total Federal &amp; Non-Federal Funds <input type="text" value="850,000.00"/></p> <p>d. Estimated Program Income <input type="text" value="0.00"/></p> | <p><b>16. * IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?</b></p> <p>a. YES <input type="checkbox"/> THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:<br/>DATE: <input type="text"/></p> <p>b. NO <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E.O. 12372; OR<br/><input type="checkbox"/> PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

17. By signing this application, I certify (1) to the statements contained in the list of certifications\* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances \* and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

\* I agree

\* The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

**18. SFLLL or other Explanatory Documentation**

**19. Authorized Representative**

Prefix:  \* First Name:  Middle Name:

\* Last Name:  Suffix:

\* Position/Title:

\* Organization:

Department:  Division:

\* Street1:

Street2:

\* City:  County / Parish:

\* State:  Province:

\* Country:  \* ZIP / Postal Code:

\* Phone:  Fax Number:

\* Email:

\* Signature of Authorized Representative

\* Date Signed

**20. Pre-application**



# Homeland Security

## GRANT

### TERMS AND CONDITIONS

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**RECIPIENT:** Trustees of Dartmouth College

**RECIPIENT DUNS NUMBER:** 041027822

**AGREEMENT NO:** 2006-CS-001-000001-03

**AMENDMENT NO:** 8

**TITLE:** Cyber Security Collaboration and Information Sharing

**CFDA NO:** 97.001

---

#### **AMENDMENT:**

This amendment:

1. Amends Article III. B to correctly reflect the budget period duration of 60 months.
  2. Amends Article IV.D to correctly enumerate the location of approved budget in Article IV.B
- 

#### **ARTICLE III – PERIOD OF PERFORMANCE**

##### **B. Budget Period.**

1. The Budget Period shall be for a period of 60 months, from August 1, 2008 through July 31, 2013.

#### **ARTICLE IV – AMOUNT OF AWARD**

- D. Cost Share/ Match. There is no cost-share or match funding required for this Award. The



Department of Homeland Security will pay up to 100% of the allowable costs identified in the approved budget listed under Article IV, paragraph B. Subject to Article III, the maximum funding for this Award for the Budget period is \$13,690,000. If costs exceed the maximum amount of DHS-approved funding, the Recipient shall pay the costs in excess of the approved budget.

**ALL OTHER ARTICLES REMAIN IN EFFECT.**

(b)(6)

Marsha Mathis, Grants Officer  
Office of Procurement Operations  
Grants and Financial Assistance Division  
Department of Homeland Security

Oct. 4, 2011  
Date



# Homeland Security

October 4, 2011

(b)(6) Assistant Director

Office of Sponsored Projects  
Trustees of Dartmouth College  
11 Rope Ferry Road  
Hanover, NH 03755-1404

RE: Award Number: 2006-CS-001-000001-03, Amendment No. 8

Dear (b)(6)

Enclosed, please find an amendment to the above referenced award document. This amendment:

1. Amends Article III. B to correctly reflect the budget period duration of 60 months.
2. Amends Article IV.D to correctly enumerate the location of approved budget in Article IV.B

If you have questions concerning this award, please contact me at (b)(6) or via email at

(b)(6)

(b)(6)

**Marsha D. Madris**  
Grants and Financial Assistance Division  
Office of Procurement Operations  
Office of the Chief Procurement Officer

Enclosure

cc (via email):

(b)(6)

Ph.D., Vice Provost for Research, Dartmouth College  
of Sponsored Projects, Dartmouth College



# Homeland Security

## GRANT

### TERMS AND CONDITIONS

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**RECIPIENT:** Trustees of Dartmouth College

**RECIPIENT DUNS NUMBER:** 041027822

**AGREEMENT NO:** 2006-CS-001-000001-03

**AMENDMENT NO:** 7

**TITLE:** Cyber Security Collaboration and Information Sharing

**CFDA NO:** 97.001

---

#### **AMENDMENT:**

This amendment:

1. Amends Article III. A and B to extend the Period of Performance and Budget Period through July 31, 2013.
  2. Amends Article IV.B. to provide supplemental funding in the amount of \$850,000.00 as requested in an application dated September 8, 2011.
  3. Updates the Regulatory Compliance Officer, as listed in Article VI, Department of Homeland Security Officials.
- 

#### **ARTICLE III – PERIOD OF PERFORMANCE**

##### **A. Project Period.**

1. The Project Period shall be from September 30, 2006 through July 31, 2013, unless extensions are approved. This is contingent on acceptable performance of the project as determined by the Department of Homeland Security (DHS), acceptance and approval of each

non-competing continuation application by the DHS, and available annual DHS appropriations.

**B. Budget Period.**

1. The Budget Period shall be for a period of 48 months, from August 1, 2008 through July 31, 2013.

**ARTICLE IV – AMOUNT OF AWARD**

**B. Approved Budget.** The approved budget for the Budget Period of August 1, 2008 through July 31, 2013 is as follows:

| OBJECT CLASS CATEGORY | Prior FEDERAL APPROVED BUDGET | Amount of FINANCIAL ASSISTANCE this ACTION | Revised APPROVED BUDGET |
|-----------------------|-------------------------------|--------------------------------------------|-------------------------|
| Personnel             | 1,695,897                     | 29,304                                     | 1,725,201               |
| Fringe                | 554,093                       | 10,696                                     | 564,789                 |
| Travel                | 429,380                       | 0                                          | 429,380                 |
| Equipment             | 0                             | 0                                          | 0                       |
| Supplies              | 30,396                        | 0                                          | 30,396                  |
| Contractual           | 7,523,281                     | 680,000                                    | 8,203,281               |
| Construction          | 0                             | 0                                          | 0                       |
| Other                 | 649,283                       | 0                                          | 649,283                 |
| <b>Total Direct</b>   | <b>10,882,330</b>             | <b>720,000</b>                             | <b>11,602,330</b>       |
| Indirect              | 1,957,670                     | 130,000                                    | 2,087,670               |
| <b>TOTAL</b>          | <b>12,840,000</b>             | <b>850,000</b>                             | <b>13,690,000</b>       |

**C. Funding.**

|                                                    |                   |
|----------------------------------------------------|-------------------|
| <b>Total Approved Budget</b>                       | <b>13,690,000</b> |
| Less Previous Funding                              | 12,840,000        |
| Less Estimated Unobligated Balance Carried Forward | 0                 |
| <b>Funds This Action</b>                           | <b>850,000</b>    |

**D. Cost Share/ Match.** There is no cost-share or match funding required for this Award. The Department of Homeland Security will pay up to 100% of the allowable costs identified in the approved budget listed under Article V, paragraph B. Subject to Article III, the maximum funding for this Award for the Budget period is \$13,690,000. If costs exceed the maximum amount of DHS-approved funding, the Recipient shall pay the costs in excess of the approved budget.

**ARTICLE VI - DEPARTMENT OF HOMELAND SECURITY OFFICIALS**

C. The Regulatory Compliance Officer is the DHS official responsible for overseeing the DHS Regulatory Compliance Office (RCO) and implementing procedures to ensure that the Recipient of this award complies with federal regulations and DHS policies for the protection of human subjects, animal care and use, biosafety and select agent security.

(b)(6)

Associate General Counsel & Treaty Compliance Assurance Program Manager,  
Acting  
OGC Stop 0485  
Department of Homeland Security  
245 Murray Lane, SW  
Washington, D.C. 20528-0485

(b)(6)

**ALL OTHER ARTICLES REMAIN IN EFFECT.**

(b)(6)

Marsha Mathis, Grants Officer  
Office of Procurement Operations  
Grants and Financial Assistance Division  
Department of Homeland Security

September 14, 2011  
Date



# Homeland Security

December 30, 2010

(b)(6) Assistant Director  
Office of Sponsored Projects  
Trustees of Dartmouth College  
11 Rope Ferry Road  
Hanover, NH 03755-1404

RE: Award Number: 2006-CS-001-000001-03, Amendment 6

Dear (b)(6)

Enclosed, please find an Amendment 6 to the above referenced award document. This amendment amends Article VI (B) to update the Grant Officer assignment.

If you have questions concerning this award, please contact me at (b)(6) or via email at

(b)(6)

Sincerely,

(b)(6)

Marsha D. Mathis  
Grants Officer  
Grants and Financial Assistance Division  
Office of Procurement Operations  
Office of the Chief Procurement Officer

Enclosure

cc (via email): (b)(6) Ph.D.  
VICE PROVOST for Research  
Trustees of Dartmouth College

(b)(6)  
Office of Sponsored Projects  
Trustees of Dartmouth College

CONFIDENTIAL



# Homeland Security

## GRANT

### TERMS AND CONDITIONS

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**RECIPIENT:** Trustees of Dartmouth College

**RECIPIENT DUNS NUMBER:** 041027822

**AGREEMENT NO:** 2006-CS-001-000001-03

**AMENDMENT NO:** 6

**TITLE:** Cyber Security Collaboration and Information Sharing

**CFDA NO:** 97.001

---

**AMENDMENT:**

This amendment updates Article VI (B) to change the Grant Officer assignment.

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**ARTICLE VI – DEPARTMENT OF HOMELAND SECURITY OFFICIALS**

- B. The Grants Officer is: the DHS official that has the full authority to negotiate, administer and execute all terms and conditions of this Award in concurrence with the Program officer.

Marsha D. Mathis  
MGMT OPO Stop 0115  
Department of Homeland Security  
245 Murray Lane, SW  
Washington, DC 20528-0115

(b)(6)

**ALL OTHER ARTICLES REMAIN IN EFFECT.**

(b)(6)

Marsha D. Mathis, Grants Officer  
Grants and Financial Assistance Division  
Office of Procurement Operations  
Office of the Chief Procurement Officer  
Department of Homeland Security

12/30/10  
Date





# Homeland Security

## GRANT

### TERMS AND CONDITIONS

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**RECIPIENT:** Trustees of Dartmouth College

**RECIPIENT DUNS NUMBER:** 041027822

**AGREEMENT NO:** 2006-CS-001-000001-03

**AMENDMENT NO:** 5

**TITLE:** Cyber Security Collaboration and Information Sharing

**CFDA NO:** 97.001

---

#### AMENDMENT:

This amendment:

1. Amends Article III, paragraphs A and B, to extend the Period of Performance through July 31, 2012.
2. Provides supplemental funding in the amount of \$2,250,000 as requested in an application dated June 16, 2010.
3. Amends Article V.B, Amount of Award, Approved Budget, to provide the approved budget for the supplemental funding.
4. Updates the Program Officer, Grants Officer and Regulatory Compliance Officer, as listed in Article VI, Department of Homeland Security Officials, paragraphs A, B and C respectively.

#### ARTICLE III – PERIOD OF PERFORMANCE

##### A. Project Period.

1. The Project Period shall be from September 30, 2006 through July 31, 2012, unless extensions are approved. This is contingent on acceptable performance of the project as

determined by the Department of Homeland Security (DHS), acceptance and approval of each non-competing continuation application by the DHS, and available annual DHS appropriations.

**B. Budget Period.**

1. The Budget Period shall be for a period of 48 months, from August 1, 2008 through July 31, 2012.

**ARTICLE V – AMOUNT OF AWARD**

**B. Approved Budget.** The approved budget for the Budget Period of August 1, 2008 through July 31, 2012 is as follows:

| OBJECT CLASS CATEGORY | Prior FEDERAL APPROVED BUDGET | Amount of FINANCIAL ASSISTANCE this ACTION | Revised APPROVED BUDGET |
|-----------------------|-------------------------------|--------------------------------------------|-------------------------|
| Personnel             | 1,337,783                     | 358114                                     | 1,695,897               |
| Fringe                | 418,010                       | 136,083                                    | 554,093                 |
| Travel                | 300,330                       | 129,050                                    | 429,380                 |
| Equipment             |                               | 0                                          | 0                       |
| Supplies              | 30,396                        | 0                                          | 30,396                  |
| Contractual           | 6,472,581                     | 1,050,700                                  | 7,523,281               |
| Construction          |                               | 0                                          | 0                       |
| Other                 | 492,983                       | 156,300                                    | 649,283                 |
| <b>Total Direct</b>   | <b>9,052,083</b>              | <b>1,830,247</b>                           | <b>10,882,330</b>       |
| Indirect              | 1,537,917                     | 419,753                                    | 1,957,670               |
| <b>TOTAL</b>          | <b>10,590,000</b>             | <b>2,250,000</b>                           | <b>12,840,000</b>       |

**C. Funding.**

|                                                    |                   |
|----------------------------------------------------|-------------------|
| <b>Total Approved Budget</b>                       | <b>12,840,000</b> |
| Less Previous Funding                              | 10,590,000        |
| Less Estimated Unobligated Balance Carried Forward | 0                 |
| <b>Funds This Action</b>                           | <b>2,250,000</b>  |

**D. Cost Share/ Match.** There is no cost-share or match funding required for this Award. The Department of Homeland Security will pay up to 100% of the allowable costs identified in the approved budget listed under Article V, paragraph B. Subject to Article III, the maximum funding for this Award for the Budget period is \$12,840,000. If costs exceed the maximum amount of DHS-approved funding, the Recipient shall pay the costs in excess of the approved budget.

**ARTICLE VI - DEPARTMENT OF HOMELAND SECURITY OFFICIALS**

A. The Program Officer shall be the DHS staff member responsible for monitoring the completion of work and technical performance of the projects or activities described in the Program Narrative Statement.

Inette Furey, Acting Director, NCCC  
O&A NCSD Stop 0640  
Department of Homeland Security  
245 Murray Lane, SW  
Washington, DC 20528-0640

(b)(6)

B. The Grants Officer is the DHS official that has full authority to negotiate, administer and execute all terms and conditions of this Award in concurrence with the Program Officer.

Joan F. Keiser, Grants Officer  
MGMT OPO Stop 0115  
Department of Homeland Security  
245 Murray Lane, SW  
Washington, DC 20528-0115

(b)(6)

C. The Regulatory Compliance Officer is the DHS official responsible for overseeing the DHS Regulatory Compliance Office (RCO) and implementing procedures to ensure that the Recipient of this award complies with federal regulations and DHS policies for the protection of human subjects, animal care and use, biosafety and select agent security.

Brandt Pasco  
Attorney Advisor and Regulatory & Treaty Compliance Assurance Program Manager  
OGC Stop 0485  
Department of Homeland Security  
245 Murray Lane, SW  
Washington, D.C. 20528-0485

(b)(6)

**ARTICLE VIII – PERFORMANCE REPORTS**

A. Quarterly Performance Reports. The Recipient shall submit performance reports to the DHS Grants Officer. Reports may be emailed to: DHS-GrantReports@dhs.gov.

1. Performance reports are due within 30 days after the end of each calendar quarter.
2. The performance report shall consist of a comparison of actual accomplishments to the approved project objectives.

B. Final Performance Report. The Recipient shall submit the Final Performance Report to the DHS Grants Officer within 90 days after the expiration date of the project period. The report may be emailed to: DHS-GrantReports@dhs.gov.

**ALL OTHER ARTICLES REMAIN IN EFFECT.**

(b)(6)

Joan F. Keiser, Grants Officer  
Office of Procurement Operations  
Grants and Financial Assistance Division  
Department of Homeland Security

August 6, 2010  
Date



# Homeland Security

August 6, 2010

(b)(6) Assistant Director

Office of Sponsored Projects  
Trustees of Dartmouth College  
11 Rope Ferry Road  
Hanover, NH 03755-1404

RE: Award Number: 2006-CS-001-000001-03, Amendment No. 5

Dear Ms. McGovern:

The Department of Homeland Security has approved your request for supplemental funding under the Cyber Security Collaboration and Information Sharing Program. Your supplemental application was awarded in the amount of \$2,250,000.

Enclosed, please find an amendment to the above referenced award document. This amendment:

1. Amends Article III, paragraphs A and B, to extend the Period of Performance through July 31, 2012.
2. Provides supplemental funding in the amount of \$2,250,000 as requested in an application dated June 16, 2010.
3. Amends Article V.B, Amount of Award, Approved Budget, to provide the approved budget for the supplemental funding.
4. Updates the Program Officer, Grants Officer and Regulatory Compliance Officer, as listed in Article VI, Department of Homeland Security Officials, paragraphs A, B and C respectively.

If you have questions concerning this award, please contact me at (b)(6) or via email at

(b)(6)

(b)(6)

Letter, August 6, 2010

Page 2

Sincerely,

(b)(6)

**Marsha D. Mathis**  
**Grants and Financial Assistance Division**  
**Office of Procurement Operations**  
**Office of the Chief Procurement Officer**

Enclosure

cc (via email)

(b)(6)

**Ph.D.**

**Vice Provost for Research**  
**Trustees of Dartmouth College**

(b)(6)

**Office of Sponsored Projects**  
**Trustees of Dartmouth College**



# Homeland Security

U.S. Department of Homeland Security  
Washington, DC 20528

Date: August 2, 2010

## Notice of Grant Award

A grant award under the Cyber Security Information Sharing and Collaboration Program will be made on August 5, 2010.

The following award will be made:

\$2,250,000 The Trustees of Dartmouth College, Hanover, New Hampshire

The Fiscal Year (FY) 2010 Department of Homeland Security Appropriations Act (P.L. 111-83), provides \$2,250,000 for the Cyber Security Information Sharing and Collaboration Program. The funds will be allocated from the National Cyber Security Division in the FY 2010 Infrastructure Protection and Information Security appropriation.

The Cyber Security Information Sharing and Collaboration Program brings together researchers, stakeholders, and other constituencies to focus on the development of tangible means to predict, identify and remediate cyberspace vulnerabilities, as well as to heighten awareness of cybersecurity nationwide. Outcomes of the work are disseminated through demonstrations, workshops, publications, and site visits.

Under the Cyber Security Information Sharing and Collaboration Program, the Institute for Information Infrastructure Protection (I3P) is a national research consortium composed of 27 academic institutions, federally funded labs and nonprofit organizations. This consortium identifies and addresses critical research problems, works to build a community of researchers focused on cyber security, serves as a trusted partner for industry and government, fosters collaborative programs that build links between stove-piped constituencies, and provides a neutral forum for the exchange of ideas and information.

Congressional District Representatives:

NH-2 Paul Hodes

Senators:

Judd Gregg

Jeanne Shaheen

# Quarterly Report to the Department of Homeland Security October 1 – December 31, 2011

---

## Overview

The objective of this DHS-funded project is to apply the collective, diverse expertise of Dartmouth College's Institute for Information Infrastructure Protection (I3P) to critical priorities tied to the mission of the Institute. A number of topics outlined in the I3P's February 2009 report, "*National Cyber Security Research and Development Challenges Related to Economics, Physical Infrastructure, and Human Behavior: An Industry, Academic, and Government Perspective*," as well as other national research agenda documents drive the selection of high quality and relevant workshops, outreach and research to be coordinated by I3P management and performed by I3P consortium members. The I3P holds workshops and performs outreach activities to highlight and disseminate I3P research results, designs and runs forums to provide a holistic view into the information infrastructure protection challenges faced by the private and public sectors, and conducts a research program. The I3P is also continuing the postdoctoral fellowship program, performing its general management activities, and initiating new research projects with multidisciplinary research teams.

The work is being accomplished through workshops and outreach, education and research programs involving communities of researchers nationwide. This eighteenth progress report reflects I3P activities and progress made in addressing goals outlined in the proposals dated February 2007 and April 2009. The following four initiatives are discussed below in greater detail:

- **Initiative 1:** I3P Workshops and Outreach
- **Initiative 2:** I3P Postdoctoral Fellowship Program
- **Initiative 3:** I3P Management
- **Initiative 4:** I3P Research

## Initiative 1: I3P Workshops and Outreach

### 1. Project title and lead

Initiative title: I3P Workshops and Outreach

Initiative lead: (b)(6) I3P Administrative office

### 2. Description

The I3P has a well-established and nationally recognized ability to organize high impact workshops of interest to industry, government and academia, and has used these workshops to gain knowledge about cyber security problems and to demonstrate solutions. The consortium has shown its abilities to bring together important stakeholders from a variety of disciplines to



discuss security challenges and advance solutions. The I3P has a unique ability, through its wide network of contacts and the depth and breadth of its technical and policy expertise, to assemble an effective coalition of experts to address a particular issue.

We will continue to provide these high-impact events and make them widely accessible to researchers, industry participants and policy makers. We envision at least five events, in similar scope and scale to prior workshops, focusing on areas highlighted in I3P research. These interactions with a variety of constituencies will continue to facilitate an understanding of information infrastructure vulnerabilities and solutions, enabling information sharing that brings policies and practices together. Where appropriate, the workshops also serve as demonstration sites for launching a technology transfer process. Workshop topics are chosen by the I3P Research Director in consultation with the I3P Executive Committee and the I3P's program manager at NCSD.

The I3P administrative office staff will provide logistical and organizational support for the workshops. The I3P staff will work closely with researchers and leading experts from industry and government to assure well-organized and effectively run workshops. The I3P will help produce and distribute workshop materials, develop websites promoting the workshops, invite speakers, and provide on-site administrative assistance. I3P staff will also play an active role in developing workshop content and coordinating the sessions. The I3P team will be responsible for all tasks related to logistics, room and equipment reservations, arranging meals, and managing reservations. The post-workshop activities for which the I3P staff will be responsible include managing and archiving information produced from the workshops, and the preparation and distribution of publications and reports from the workshops.

### **3. Participating institutions**

This initiative is run by the I3P administrative office, working in partnership with I3P consortium members and others as needed on specific events.

### **4. Subcontractors**

The original award was made to Dartmouth College.

### **5. Relationships with academia, industry, or government**

The I3P administrative office works closely with its industry, government and academic partners and stakeholders to plan and organize workshops and conferences that add significant value to the field, and provide attendees with useful knowledge or tools. The I3P regularly recruits high-level speakers and attendees from all the major stakeholder groups for I3P events.

### **6. Activities and progress**

#### **a. Recent activities and progress**

As part of the Human Behavior research project, the I3P hosted a final workshop "Cyber Security Through a Behavioral Lens II" on October 25<sup>th</sup>, 2011 in Scottsdale, AZ. The project team discussed the reasons it was investigating effective security awareness and training techniques, presented the preliminary spear-phishing study results of its spear-phishing studies, and gave an overview of what we know in general about training, awareness and incentives. The attendees were engaged and are eager to participate in follow-on studies, should funding be made

available. MITRE reports that there have been many follow-up conversations post-workshop with some attendees. A workshop report will be posted on the I3P website in the next quarter. The I3P workshop, "Cyber Security CPR: Coordinated Private Response to Computer Security Incidents," took place October 13-14, 2011, at the SEI-CERT offices in Arlington, VA. The workshop examined a variety of possible non-governmental response models to cyber incidents. To provide historical context for the participants, the I3P organized a webinar on September 8, 2011. This event included presentations on past incidents where a private response was needed to address specific threats. As examples, details about the Morris Worm, the Stuxnet incident, and the Conficker Working Group were presented by three experts who had detailed knowledge about them. A podcast of the webinar is available at <http://www.thei3p.org/events/cybercprwebinar.html>.

Proceedings from the workshop are being edited, and will be published on the I3P website in the upcoming quarter.

**b. Where we stand**

In the past quarter, I3P workshops and meetings were well attended and met their goals.

**c. Plans**

A final Privacy project workshop will be held June 6, 2012, in Washington, DC, preceding the Privacy Law Scholars conference; key stakeholders will be invited to this workshop, and the workshop will present the project's results to them, as well as next steps to further the research and its impact.

In addition, the I3P consortium will meet in New York, NY, on February 2-3, 2012, hosted by New York University.

**d. Obstacles**

There are no significant project obstacles to report at this time.

## **Initiative 2: I3P Postdoctoral Fellowship Program**

**1. Project title and lead**

Project title: I3P Fellowship Program

Project lead: (b)(6) I3P Administrative office

**2. Description**

Since 2003, the I3P has sponsored a fellowship program open to postdoctoral researchers, junior faculty, and research scientists. The fellowship program is designed to build a nationwide cadre of investigators whose research focuses on critical infrastructure research challenges. The program also advances the I3P's national research agenda and provides expanded research opportunities at I3P consortium member institutions. The I3P may appoint up to two fellows for one-year terms. Fellows spend their fellowship term in residence at an I3P member institution

and are expected to travel to at least one I3P Consortium meeting during the fellowship to present their research findings.

A portion of current NCSD funding supports the continuation of the I3P Fellowship program that was begun in 2005.

As reported previously, based on the I3P fellowship committee's review of applicants to the 2011/2012 program, no fellowships were awarded this year.

### **Initiative 3: I3P Management**

#### **1. Project title and lead**

Initiative title: I3P Management

Initiative lead [redacted] (b)(6) I3P Administrative office

#### **2. Description**

The I3P consortium is managed and administered by a small administrative staff, all of whom are employees of Dartmouth College. The management of the consortium includes planning and administering consortium meetings and workshops, overseeing and evaluating all research projects, assisting in the evaluation of research proposals, administering the subaward process to fund projects, and ensuring compliance with all governmental and institutional rules and regulations regarding overall grant management. The I3P staff also manages the educational initiatives associated with the consortium.

Dr. [redacted] (b)(6) Vice Provost for Research at Dartmouth College, is the Principal Investigator on external awards made to the consortium. He has the responsibility to oversee all the business and operational management of the consortium. Dr. [redacted] (b)(6) is also a member of the senior administration at Dartmouth reporting directly to the Provost.

[redacted] (b)(6) Executive Director of the I3P, is responsible for the day-to-day management and strategic direction of the I3P. She is also responsible for advancing the I3P mission and goals and assisting the Executive Committee and Research Director of the I3P. No more than 20% of this position is funded by the I3P management budget.

[redacted] (b)(6) Research Director for the I3P, works closely with the Executive Director to ensure I3P research is of the highest quality, is current with national needs and priorities, and furthers the I3P mission. No more than 45% of this position is funded by the I3P management budget.

The I3P Executive Committee met via teleconference in November 2011. The Executive Committee will meet via teleconference in January 2012 and in New York, NY on February 1. In addition, the full consortium will meet in New York, NY, on February 2-3, 2012, hosted by New York University.

## **Initiative 4: I3P Research**

### **1. Project title and lead**

Initiative title: I3P Research

Initiative lead:

(b)(6)

### **2. Description**

The following projects completed work in July 2009: I3P Human Behavior, Insider Threats, and Awareness; Survivability and Recovery of Process Control Systems; Business Rationale for Cyber Security; and Assessable Identity and Privacy Protection. The project team leaders have filed final reports with the I3P, and a comprehensive final report on these projects will be completed by the I3P in the future.

Since that time, I3P research has consisted of several components: planning projects, small research projects, white papers, and seed projects. The focus of all projects is on nationally identified cyber security research priorities, with an emphasis on promoting cyber security protection, preparedness, awareness, and education. Project priorities are established in consultation with the I3P's program manager at NCSA. As with all I3P-funded research, project participants are chosen to maximize relevance, quality and national impact

#### **Planning projects**

The planning projects were designed to assess the current literature in the proposed research areas, identify appropriate priorities for critical cyber security research and development, and develop research proposals addressing these priorities. These planning projects were critical; relevant field experts and other stakeholders often participate in reviewing and commenting on future directions of research, leading to strong and valuable research projects. The four planning projects completed their work on March 31, 2010.

#### **Research projects**

This section discusses the two DHS-funded projects that are currently active: Leveraging Human Behavior to Reduce Cyber Security Risk; and the I3P Privacy Project, as well as the two new projects: Information Sharing (funded by DHS) and Useable Security (jointly funded by DHS and NIST).

##### **Leveraging Human Behavior to Reduce Cyber Security Risk**

Team members: MITRE (team lead), Dartmouth & the I3P's Research Director

Objectives of this project include:

- To identify existing behavioral science findings that can enhance cyber security in the near term,
- To identify potential behavioral science findings that will form the core of a set of empirical evaluations of their effects on cyber security,
- To hold a workshop bringing together representatives of the behavioral science community and the information infrastructure protection community,
- To create groups of researchers interested in designing and administering replicated empirical assessments of the effects of behavioral science findings on cyber security,

- To establish an initial repository of information about behavioral science and cyber security, and
- To make the results available to organizations committed to designing, building and using the information infrastructure in ways that incorporate behavioral science findings.

This project will produce several deliverables:

- A repository of behavioral science findings with demonstrated or likely relevance to information infrastructure protection. This repository will include citations of seminal papers, links to evaluations (where they exist), and links to information about products and processes that incorporate the findings.
- Data and documentation from several example evaluations performed as a result of the workshop groups.
- Publications and conference presentations describing this work, with the target audience being not only the multiple disciplines involved but also the practitioners, managers, and users of the information infrastructure protection processes and products.

Project update:

**Spear-phishing Study:** The spear-phishing embedded training study completed data collection October 2nd, 2011. MITRE also did extensive analysis of the mail logs, which revealed that a number of participants had left the company or had not received at least one trial email before the completion of the study. Therefore, MITRE had to identify these participants and remove them from the sample, losing approximately 100 participants. MITRE has drafted the introduction and abstract for the spear-phishing study publication and have also drafted a technical document providing all the procedures and code for the deploying the embedded training in an institution. MITRE also drafted and submitted a debriefing email to be sent to participants, which is still being reviewed by the IRB.

**Publications:** MITRE worked with the I3P's Research Director to rewrite and resubmit a paper to the journal "Computers and Security." It has been accepted and submitted to MITRE; it will be published subject to final MITRE approval for public release.

**Upcoming plans:**

- Finish final workshop report.
- Conduct final analysis of the spear-phishing data.
- Write and submit for publication a paper describing the entire spear-phishing study.
- Finalize the technical embedded training study document and provide to I3P.
- Send debriefing email to all participants.
- Conduct debriefing interviews if participants consent and are available.

**Workshop:** The project's final workshop "Cyber Security Through a Behavioral Lens II" was held on October 25<sup>th</sup>, 2011 in Scottsdale, AZ. MITRE presented the preliminary spear-phishing study results as well as a presentation on training, awareness and incentives.

The I3P Research Director drafted parts of the workshop report for the October workshop. The completed workshop report will be finished and posted on the I3P website during the first quarter of 2012.

#### I3P Privacy Project

Team members: Georgia Tech, Indiana, Dartmouth, UC Berkeley and Carnegie Mellon.

Objectives of this project include:

Generating frameworks permitting new ways of assessing, assuring and making more visible, usable and correctable an object's privacy in the context in which the attribute and activity data are used.

This 18-month project began in February 2011, and is addressing three sets of key questions:

- Perception and awareness: How do different cultures think about privacy? How do those differences affect the way we implement privacy controls? How can privacy controls be made more usable and effective? What are expectations of privacy in different contexts? How does someone know that the context has changed and therefore changes are needed to privacy controls? Is it possible for the data owner to find out when data are being used in a new context without the owner's permission or knowledge?
- Policy: How should we define and document a privacy policy? How do we include context and effects of contextual changes? How do we compare or combine two privacy policies? How do we model the effects of privacy policy on commerce, public health and welfare, etc.?
- Privacy metrics: Does it make sense to measure levels of privacy? What would they look like? What would we do with them, and how would their use change discourse or practice? Is there a difference between actual and perceived privacy? How could various levels of privacy be reported and enforced?

#### Project Roles:

This project has been staffed according to the major roles needed to address the three sets of issues described above.

Anticipated deliverables include the following:

- Three papers submitted for publication to a refereed periodical, one for each topic area. Each paper will address the questions expressed in the project description.
- An annotated bibliography of the resources used in performing this project. At minimum, study citations will be annotated with information about the source (citation), findings, sample size, representativeness, limitations, and external validity.
- A brief project report to be published on the I3P website. The project report will include the problem statement, a summary of the project activities, a description of the project outcomes, the impact of those outcomes, and a description of suggested next steps for

furthering the research. When the three papers are published, the I3P website will link this project report to sites where the three papers can be accessed.

- Project meetings will be held at least monthly with all of the key project experts and the I3P research director. The meetings may be in-person or teleconference, at the discretion of the project manager.

The team meets regularly via teleconference, and the independent Privacy Project Advisory Board has participated in project meetings; future Advisory Board activities will include review of intermediate project materials and providing advice to both the I3P and the project members about the quality and impact of project activities and deliverables.

A final project workshop will be held June 6, 2012, in Washington, DC, preceding the Privacy Law Scholars conference. Key stakeholders will be invited to this workshop, and the workshop will present the project's results to them, as well as next steps to further the research and its impact.

Project update:

These updates are described by project team member. Because there is considerable collaboration across member institutions, there is necessarily some repetition in the individual team member updates. The project team met October 6<sup>th</sup> in Bloomington, IN. During the meeting, the team members presented updates of their work.

#### **Georgia Tech:**

1. Comparative legal and policy study considering the rise of different privacy policies and the degree to which these address or fail to address the matter of ubiquitous data collection and the risks it poses.

January, 2012 Update:

The team is developing a taxonomy of privacy-related problems that is based on a time-series study of newspaper articles from 1994 to 2010. The initial study of the New York Times was completed in July 2011 and descriptive statistics of trends in media coverage, and hence public awareness, of education issues calculated. The project was expanded to include a comprehensive study of the LA Times, Houston Chronicle, Atlanta Journal and Constitution and Wall Street Journal. This data was fully gathered and collated by the first week of September. The team then began coding the data from the newspaper to use in statistical analysis.

The coding of the newspaper data for statistical analysis was completed in November. This has been supplemented with a thorough examination of the congressional record during the same time period to look for correlations and timing of new policy initiatives and different approaches to privacy and information policy as public awareness, as reflected in the debates recorded in the congressional record.

The team is also developing a project related to the business of privacy and the nature of information gathered by online advertisers. The project broadly considers how best to define and

approach the question of privacy from a business-friendly policy perspective. The study specifically looks at the business models of online advertisers using behavioral targeting to select and push ads toward the user. As these advertisements are based on the often surreptitious gathered of personal browsing habits and individually identifiable information, they may raise privacy concerns. The project team will look at the efficacy of this approach to advertising and thus at the economic logic for continuing or even increasing the harvesting, storage and processing of individual and private data. Once the business logic is known and understood, better policies for protecting privacy while still encouraging business innovation and marketing success can be developed. The team has secured access to a large database of advertisers' information and reports on the actions, impact, and efficacy of behavioral targeting online and is now preparing to conduct statistical analysis on the data.

The team has also paired with Professor (b)(6) at Florida International University to carry out a third research project. Professor (b)(6) is a business history scholar with expertise in the development of the credit and credit reporting industries. The team is studying the non-market behavior of information in information gathering and analytics with particular attention on how gathering more information in pursuit of perfect information actually degrades the quality of the information available.

2. White paper for policy makers and open for public distribution via a website to be set up by the team. The white paper will explicitly frame the question of "Comprehensive Privacy".

A first draft of the White Paper is currently under development with an estimated date of completion in Spring 2012.

#### **Indiana:**

1. Report on data access patterns, sharing preferences and exposure perception based on human subjects studies.
- Indiana has completed the following user study on **exposure perception and sharing preferences**, and the results have been published
    - Policy Study for sharing preferences: The goal here was to survey participants to see how they prefer to share information with their social network and gauge the level of importance of various contextual factors as they apply to exposure.

Indiana reports on a questionnaire (N = 103) in which respondents were asked to specify freeform location access control rules using everyday language. Respondents also rated and ranked the importance of a variety of contextual factors influencing their decisions for allowing or disallowing access to their location. The findings validate some prior results (e.g., requestor identity was the most highly rated and ranked factor and appeared most often in freeform rules) while challenging others (e.g., time-based constraints were deemed relatively less important, despite being features of multiple location-based services). The team also identified several themes in the freeform rules (e.g., special rules for emergency situations).



The following paper has been accepted and is available on the I3P website:  
*Sameer Patil, Yann Le Gall, Adam J. Lee, and Apu Kapadia, "My Privacy Policy: Exploring End-user Specification of Free-form Location Access Rules," To appear in Workshop on Usable Security (USEC '12). Bonaire, Mar 2, 2012.*

- Indiana has completed the following user study related to **exposure perception and sharing preferences**, and continues to analyze the results. A preliminary analysis has been submitted to CHI '12 as a Work in Progress paper.
  - Study of how location sharing services are currently being used: Indiana conducted an online study (N = 401) to uncover the impact of recent changes to the underlying social and technological landscape on the preferences and practices of LSS users in the US. The main motivations for location sharing were to connect with one's social circle, to project an interesting image of oneself, and to receive an incentive offered at a location for "checking in." Respondents overwhelmingly preferred sharing location only upon explicit user action. More than 25% of the participants recalled at least one instance of regret over having shared location.

Indiana has submitted the following work-in-progress poster abstract to CHI '12.  
*Sameer Patil, Greg Norcie, Apu Kapadia, Adam Lee, "Check out where I am!": Location Sharing Motivations, Preferences, and Practices", Submitted to CHI '12.*

The team is planning a full-length submission of this paper to SOUPS '12.

- Indiana has performed an exploration of **user interfaces** for providing **exposure feedback**:
  - Exposure feedback interfaces: Indiana explored the design space of interfaces for conveying and managing 'exposure' – the actual access to information by parties authorized to access it. The goal was to convey the resulting disclosure in a quickly interpretable form and to enable lightweight interactions to manage exposure, if needed. Toward this end, the team proposes mapping levels of exposure to levels of concepts familiar in everyday practice, e.g., the appearance and physiology of an avatar.

The proposals were accepted as a CSCW '12 poster abstract, as well as a workshop abstract. The camera-ready version is linked here: *Sameer Patil and Apu Kapadia, "Are You Exposed? Conveying Information Exposure (Extended Abstract)," To appear in The 2012 ACM Conference on Computer Supported Cooperative Work (CSCW '12), Seattle, WA, Feb 11–15, 2012.*

- Indiana is also exploring how people manage their exposure through the use of ‘circles’ on Google+. This effort is part of a class project, and the team will share any results that materialize.

As discussed in previous reports: Through discussions on study design it is now apparent that Indiana can provide deliverable 2 based on exposure perception and sharing preferences because **data access patterns can be simulated**. Furthermore, for the current timeline of the project the team thinks it may be challenging to get real data about access patterns in such systems (that would require a field trial with a real location sharing system). Since several interesting questions can be answered, including Deliverable 2 through the two studies outlined above, the team is putting the ‘data access patterns’ aspect on the back burner for now.

2. Report on framework for quantifying user exposure informed by Deliverable (1) and evaluated through human subjects studies.

Indiana is currently designing and implementing the following ESM study for developing a more concrete **framework for quantifying exposure**:

- ESM Study for quantifying exposure perception: Using the “experience sampling method” the team will ping users during the day to catch them “in context” and ask them survey questions based on their current context. This study will show how users perceive their exposure. Indiana is currently developing the ESM smartphone app and server infrastructure and simultaneously working on the methodology for our study. They plan to execute this study in the Spring semester. The goal is to present results at the June workshop and submit a paper to the CSCW 2013 conference.

3. Characterization of real-world mechanisms in which users are tracked

As of last report, Indiana had made good progress in understanding the dimensions that can be used to identify the behavior of privacy-sensitive and advertisement-related Web objects. Essentially, there are HTML aspects (such as styling of the iFrames in which ads are contained), networking aspects (referrer fields, amount of data fetched) and static and dynamic aspects of the Javascripts that accompany ads and tracking components of web pages. The team has been studying these aspects in the context of ads and other portions of various web pages. They have designed preliminary experiments to gather data to understand these aspects for many different kinds of websites. Next, they intend to train a classifier that will learn these differences in order to automatically identify portions of web pages that are advertisement or tracking related. The instrumentation will help identify advertisements and in turn understand their privacy implications. Finally, it will also help develop the tool to block advertisements on the client side. Currently, this is done via regular expressions that are based on anatomy of URLs used by specific advertisers.

4. Characterization of how modern advertisements hurt user privacy

The effort outlined above will help answer questions about user privacy as well. It may actually make sense to merge deliverables 4, 5 and 6 into one deliverable.

Indiana has gathered preliminary data to characterize differences across various popular advertisement blockers such as Ghostery and AdBlock Plus in terms of their ability to block advertisements across popular and unpopular websites scattered across various parts of the globe and in various languages. They are still in the process of analyzing the data.

5. A tool for making user tracking transparent and controlled

Once the previous two efforts succeed, we intend to convert their results into a tool that makes user tracking transparent and controlled.

6. A report on how cyberfraud is hurting Internet economy

Initially, Indiana had identified many malicious DNS resolvers and studied how they were misdirecting compromised clients and replacing advertisements on Web pages to steal revenue from both advertisement networks (such as Google's Doubleclick) as well as content providers (such as the New York Times and CNN). The team expanded the scope of this project along two dimensions. First, they mapped out the entire fraud infrastructure set up by the miscreants rather than study only the easily visible portions of it. Second, since investigations revealed that the same miscreants were leveraging the malicious DNS resolver infrastructure to steal clicks to search engines, they also investigated the privacy and economic aspects of that attack in parallel. A paper detailing all the findings from this portion of the deliverable was submitted to IEEE Symposium on Security and Privacy, 2012. This portion of the deliverable for this project is now complete and we are focusing our efforts on the other deliverables.

Publications:

- 1) Sameer Patil, Yann Le Gall, Adam J. Lee, and Apu Kapadia, "My Privacy Policy: Exploring End-user Specification of Free-form Location Access Rules," To appear in Workshop on Usable Security (USEC '12), Bonaire, Mar 2, 2012.
- 2) Sameer Patil and Apu Kapadia, "Are You Exposed? Conveying Information Exposure (Extended Abstract)," To appear in The 2012 ACM Conference on Computer Supported Cooperative Work (CSCW '12), Seattle, WA, Feb 11-15, 2012.

Presentations/meetings attended:

- Oct 2011: The entire IU team attended the Privacy Project meeting.
- Oct 2011: (b)(6) attended the ASIST 2011 Conference, New Orleans
- Oct 2011: (b)(6) visited Dartmouth for 10 days to perform research on the project with (b)(6)
- Dec 2011: (b)(6) attended The Future of Privacy Forum's Personal Information: The Benefits & Risks of De-Identification

Collaborations:

- (b)(6) has been collaborating with University of Pittsburgh on this project through their NSF grant. (b)(6) funded on the I3P grant, allows for a significant improvement of our capabilities to explore the human aspects of exposure.

**Dartmouth:**

Dartmouth's progress is described below on each of its several tasks. Many of the tasks involved project team members from Indiana University.

1. Refine and finalize experimental protocol

The protocol was finalized in August 2011, after Dartmouth and Indiana conducted piloted tests at the end of July using Amazon's Mechanical Turk.

2. Submit final protocol to TESS for review

The team's proposal was submitted to TESS on August 25, 2011. The team received a request for revision and resubmission of the TESS proposal. Dartmouth resubmitted to TESS with revision, clarifications, and pilot study results.

3. Submit final protocol to Dartmouth IRB for human subjects review  
IRB approval received on 10/18/2011.

4. Pretest final protocol

During the summer 2011, Dartmouth conducted informal testing of various parts of the protocol as they developed it. The team conducted further testing, including pilot testing on Amazon's Mechanical Turk, during the month of August. The completed pilot test of the protocol on Amazon's Mechanical Turk had n=100 subjects (which resulted in a final n=50 after deleting non-serious and non-human participants). An Indiana team member visited Dartmouth from October 18 to 28, to collaborate on analyzing the pilot data.

5. TESS runs experiment in the field

The team is currently waiting for word from TESS regarding the proposal.

6. Clean and prepare experimental data

It is anticipated that the data will be cleaned and prepared during the period from January to February 2012.

7. Analyze data, evaluate hypotheses and research questions

It is expected that the data will be analyzed and the hypotheses evaluated during the period from March through May of 2012.

8. Prepare research papers for submission to research conferences and journals, present findings to relevant audiences

9. Present final report to I3P

The final report will be delivered to the I3P at the end of the project.

## UC Berkeley:

1. Private Sector Investigations
  - a. Platforms and Standards: document the conceptions of privacy animating specific artifacts in the private sector and how they relate to the conceptions of privacy held by their users.  
Expertise on platforms developed based on policies, information flows, interfaces.  
Research on geolocation privacy
    - Case study of centralized architecture and potential violations of user expectations
    - Completed a survey among School of Information about devices in Google's database and expectations
    - Submitted a paper to the NDSS security conferenceResearch on Children's privacy
    - Research concluded, paper in progress, publication venue undecided
  - b. Explore the theories of privacy and approaches to protecting it reflected in the privacy activities of relevant standards setting bodies, and how they relate and respond to the privacy concerns of advocates and regulators.  
Initial work identifying activities to study in progress; research in fall
    - Masters student hired for document analysis
2. Analysis of Platforms:
  - a. Study the corporation's conception of privacy as reflected in the information models, user interface, and privacy policies of the platforms. (Proposed platforms for study: Facebook, Google's Android and/or Apples iPhone)  
Expertise on platforms developed based on policies, information flows, and interfaces.
    - Ongoing in relation to interviews and papers
  - b. Conduct semi-structured interviews with 30-40 users of each platform aimed at exploring their conception of privacy, their understanding of the information flows enabled by the platform in question, and privacy concerns related to their use and experience with the platform.
    - i. Conducted 24 interviews with iPhone and Android phone users (completed Aug.)
    - ii. Currently coding interview data; will review findings to discern whether an additional round of interviews is necessary.
    - iii. Based on findings, may also propose a second stage where we explore potential solutions with additional phone users for addressing privacy concerns.
    - iv. Exploring potential publication venues for Spring/Fall 2012
    - v. Preparing first paper for submission, most likely to Mobile HCI, due 2/17

3. Standards Bodies:
  - a. Compare the conception of privacy at work in the standards setting body with the conceptions of privacy offered by relevant advocates, academics and regulators, through analysis of relevant standard setting organizations work product and process documentation, and participant interviews, focused on standard setting activities related to location information, applications, and privacy expression languages and negotiation protocols.
    - i. Public policy student hired to assist with data analysis of mailing lists and meeting minutes
    - ii. Presentation planned at UC Boulder on challenges of standard setting organizations involving values for multi-stakeholder processes
    - iii. Developed interview guide and IRB protocol for qualitative interviewing with software engineer participants in the standards setting process.
  - b. Background research on standard development organizations begun
    - i. Consideration of the challenge of addressing policy questions—in this instance privacy—through the technical standardization process. Drawing from literature in organization theory around boundary organizations and innovation in organizational fields, Berkeley is investigating how the Working Group participants (and their own organizations) respond to questions at the intersection of two fields and among a diverse set of opinions. Drawing from the literature of privacy in technology and regulation and conflict resolution processes, Berkeley is developing and testing a set of success criteria for these novel policy-technical standardization efforts.
4. Privacy Approaches:
  - a. Consider the conditions (if any) under which the techniques and processes used to drive security considerations in the work of internet standards bodies could be effective for advancing privacy
  - b. Consider the relevance to privacy of the various decisional documents and processes used in corporations to address environmental protection
    - i. Assessment of various privacy decisional tools ongoing.
    - ii. Literature review on security, usability, software engineering and environmental tools and processes in progress. Literature review ongoing.
    - iii. Specific work on privacy patterns, modeled on patterns in architecture and software engineering, underway.
      1. Small set of patterns developed and being shared through web site.
      2. Testing them with various audiences to determine utility.

3. Launched a beta version of web site:  
<http://staging.privacypatterns.org>
  - a. Written some introductory content and a collaborative workflow for contributing via github
4. Looking for feedback from developers and privacy experts
5. Masters student hired to assist with privacy patterns, currently working on the workflow for contributions from outside engineers and lawyers
6. [privacypatterns.org](http://privacypatterns.org) to be presented at SXSW in Austin, March 2012 as part of a panel on developer tools for building privacy into applications.

Publications:

Submitted

D.K. Mulligan and J. King, *Bridging the Gap between Privacy and Design*, University of Pennsylvania Law School Journal of Constitutional Law.

N.P.Doty, M.Gupta, A. Soltani, D.K. Mulligan, *WiFi Geolocation: The Privacy Impacts of Centralized Architecture*, NDSS.

Presentations/meetings:

(b)(6) University of Pennsylvania Law School Journal of Constitutional Law  
Symposium on Privacy February 2011

(b)(6) Microsoft Privacy Team March 2011

**Carnegie Mellon:**

During the spring of 2011, CMU team members

- Identified key stakeholders and broader impact
- Identified framework use cases
- Selected relevant privacy laws (stratified sampling)

Next, during the summer, CMU accomplished two key tasks:

- Building framework theory for comparing privacy laws
- Linking framework findings to privacy theories

During the autumn, the CMU team identified low- and high-water mark requirements for privacy policies. It examined reasons for and implications of policy differences in privacy related outcomes. CMU also completed the encoding of state data breach notification laws and one proposed national law.

Following CMU's meeting with HP, CMU has established plans to validate HP's research on comparing privacy policy and law with HP's software developers and designers for cloud-based services. CMU has recently engaged in teleconferences with HP software developers and designers to ground research in industrial practice and perspectives.

It is anticipated that in Spring 2012 the CMU team will perform two tasks:

- Assess empirical evidence for privacy control effectiveness across contexts, and
- Identify ways to specify semi-formal privacy policies that are more comparable.

In Summer 2012, the team expects to prepare a project report on when empirical evidence suggests one control works better over another in a particular context, and present these project results at the I3P workshop scheduled for June 6.

Publications:

David G. Gordon, Travis D. Breaux. Managing Multi-Jurisdictional Requirements in the Cloud: Towards a Computational Legal Landscape. 3rd ACM Cloud Computing Security Workshop (CCSW'11), Chicago, Illinois, Oct. 2011.

Travis D. Breaux, Catherine B. Lotrionte. Towards a Privacy Management Framework for Distributed Cybersecurity in the New Data Ecology, IEEE International Conference on Technologies for Homeland Security, Waltham, Massachusetts, Oct. 2011.

CMU presentations and meetings include:

Oct. 4-5, 2011. Presentation by (b)(6) and tool demonstration by (b)(6) to the Hewlett-Packard Cloud Security Laboratory in Bristol, England, UK.

### **New I3P Projects**

In late October, the I3P published a call for proposals for two new projects. The projects are described below. I3P leadership, along with representatives from the sponsors and an independent reviewer met in Washington, DC on December 6<sup>th</sup> to discuss the proposals, the responses to the calls, and determine final team compilation. In January, the teams will finalize their statements of work and budgets. The teams expect to begin work on these projects in February.

### **Information Sharing**

#### **Participating institutions:**

RAND

University of Virginia

#### **Background Statement: What is the Problem?**

There is a need for mechanisms for permitting secure, controlled, accountable communication among virtual machines in different administrative security domains, capable of handling high volume, and able to scale as the virtual hosting infrastructure grows. How can providers and users of virtualized machines and domains evaluate the likelihood of exploitable vulnerabilities? Typically, inputs to the risk evaluation process include historical data, trends in component



functional areas, the current states of development practices, exposure to adversaries, and threat actors in operational deployment. System architects need a design and optimization process for evaluating alternative architectures with respect to these risks. This process should be able to answer questions such as:

- What types of attacks have the highest risk, and what are the best defenses against them?
- How many layers are needed to bring the risk down to an acceptable level?
- What is the role of inter-layer dependence?
- How can configurations be updated safely?

The process must also include a way to test layered security solutions to identify end-to-end vulnerabilities that contribute to the risk level. In addition, the solution must be analyzed over time to determine how risk may change. This assessment will include information about vulnerabilities and expected configuration change.

### **Project Description**

The interdisciplinary team will provide models for evaluating the risks that will include:

- A trust model and a description of how it will be used with the architectural model
- Models and methods for expressing the virtual architecture
- Models and methods for specifying the (administratively) secure information sharing
- Methods for evaluating the security risks, including compromise and disclosure
- Methods for testing the risks inherent in a variety of candidate architectures

The methods developed will be applied to a set of incident response sharing architectures in a cloud computing environment, to evaluate the collective methods' ability to identify risks and suggest mitigation strategies.

Expected outcomes may include:

- Documentation of the models and methods listed above
- A framework for combining the methods into an approach for building and evaluating administratively secure, multi-layer information sharing in a virtual environment
- An analysis of applying the models, methods and framework to the incident response sharing example
- A comparison of results of the research results with commercially-available products that claim to address the problem.

Deliverables may include at least the following:

- *Papers* submitted to a refereed periodical: at least one for each of the four major questions posed in the project description, plus one reporting on the results of the comparative analysis.

- *An annotated bibliography* of the resources used in performing this project. At minimum, study citations will be annotated with information about the source (citation), findings, sample size, representativeness, limitations, and external validity.
- A brief *project report* (no more than 5 pages) to be published on the I3P website. The project report will include the problem statement, a summary of the project activities, a description of the project outcomes, the impact of those outcomes, and a description of suggested next steps for furthering the research. When the papers are published, the I3P website will link this project report to sites where the papers can be accessed.

Project meetings will be held at least monthly with all of the key project experts and the I3P research director. The meetings may be in-person or teleconference, at the discretion of the project manager.

An independent Information Sharing Project Advisory Board will be convened by the I3P. Consisting of 3 to 5 members representing both government and private enterprise, the Advisory Board will participate quarterly in project meetings, review intermediate project materials, and advise both the I3P and the project members about the quality and impact of project activities and deliverables.

A final project workshop is expected be held in June 2013 in Washington, DC; key stakeholders will be invited to this workshop, and the workshop will present the project's results to them, as well as next steps to further the research and its impact.

This project is expected to run from February 2012 through July 2013.

## Usable Security

### **Participating institutions:**

The MITRE Corporation  
 Sandia National Laboratories  
 George Mason University

### **Background Statement: What is the Problem?**

Developers want to build usable security into their projects, prompted by their having experienced lost sales, lost time, and a profusion of misuse errors. A July 2009 National Academy of Sciences workshop (see [http://sites.nationalacademies.org/CSTB/CurrentProjects/CSTB\\_045475](http://sites.nationalacademies.org/CSTB/CurrentProjects/CSTB_045475)) identified challenges to advancing research in usability, security and privacy: inconsistent terminology and definitions, limited access to data, scarcity of expertise, unfamiliarity with work at the intersection of usability, security, and privacy, and difficulty moving security usability research results into

practice. A March 2011 NIST workshop, facilitated by the I3P, recommended the development of case studies of usable security design and implementation, for use in understanding the problems and in teaching developers about solutions. (The draft report is available at <http://www.thei3p.org/docs/publications/436.pdf>) In particular, the case studies will investigate how to incorporate usability and security issues in software engineering processes.

### **Project Description**

In concert with the sponsors and the I3P, the project team will identify three providers of cyber security systems willing to be profiled in a case study. Each organization will provide access to:

- Documentation of its perceived need for usable security
- The steps taken to build usable security into its development process
- Data useful in evaluating the effects of using the enhanced development process

By March 1, 2012, the I3P will provide to team members a description of the case study methodology. This uniform methodology will enable others to conduct similar case studies of other organizations, thereby building a body of literature that can be compared across case study subjects.

Team members will apply the case study methodology and analyze the data to determine relevant variables and relationships. In particular, the team will identify key developer knowledge, skills and abilities that contribute to building usable security in their products, and use the case studies to show how the knowledge, skills and abilities affect the desired outcomes.

Expected project outcomes may include:

- A documented case study of each participating organization, using the provided methodology
- An analysis of the initial case studies, to identify commonalities and success factors
- A comparison of results of the research results with commercially-available products that claim to address the problem.
- A workshop to present the findings to interested parties and to encourage the performance of more case studies.

Deliverables may include at least the following:

- *Papers* submitted for publication to a refereed periodical, including at least one for each of the case studies and one for the comparative analysis.
- *An annotated bibliography* of the resources used in performing this project. At minimum, study citations will be annotated with information about the source (citation), findings, sample size, representativeness, limitations, and external validity.
- A brief *project report* (no more than 5 pages) to be published on the I3P website. The project report will include the problem statement, a summary of the project activities, a

description of the project outcomes, the impact of those outcomes, and a description of suggested next steps for furthering the research. When the papers are published, the I3P website will link this project report to sites where the papers can be accessed.

Project meetings will be held at least monthly with all of the key project experts and the I3P research director. The meetings may be in-person or teleconference, at the discretion of the project manager.

An independent Usable Security Project Advisory Board will be convened by the I3P. Consisting of 3 to 5 members representing both government and private enterprise, the Advisory Board will participate quarterly in project meetings, review intermediate project materials, and advise both the I3P and the project members about the quality and impact of project activities and deliverables.

A final project workshop will be held in September 2013 in Washington, DC; key stakeholders will be invited to this workshop, and the workshop will present the project's results to them, as well as next steps to further the research and its impact.

This project is expected to run February 2012 through September 2013.

### **White papers**

Periodically, the I3P commissions white papers to allow members to explore some aspect of security threats. The topics may include a description of the problems, impacts and possible approaches to solutions. These papers can add value to many stakeholders in industry, government and academia. Currently, no new white papers are anticipated in the future.

### **Seed projects**

Seed projects are designed to quickly assess the practicality, utility and maturity of novel approaches to information security. These projects are critical because they enable the exploration of ideas that could otherwise be lost; indeed, sometimes seed projects lead to strong and valuable research projects. Currently, no new seed projects are being considered for the remainder of this funding period.



January 25, 2012

(b)(6)

Inette Furey  
Program Officer  
Attn: National Cyber Security Division/Preparedness Directorate  
Department of Homeland Security  
Washington, DC 20528

Dear Ms. Furey:

On behalf of the Institute for Information Infrastructure Protection (I3P), we are pleased to submit this Cyber Security and Information Sharing Progress Report, providing detailed information on the research and development efforts funded under award number 2006-CS-001-000001. This report covers I3P activities between October 1, 2011 and December 31, 2011.

We trust this report illustrates the progress the two institutes have made to address the approved project(s) objectives. We look forward to working closely with you as we move the I3P forward. If you require any further information please contact me at either (b)(6)  
Thank you for your continued support.

Sincerely,

(b)(6)

Principal Investigator

cc: Marsha Mathis, Grants Officer