Purchasing Divison
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation

Proc Folder: 170041

Doc Description: Addendum #2 - SAN Storage Systems (OT1699)

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2016-01-11	2016-01-19 13:30:00	CRFQ 0210 ISC1600000005	3

RECEIVED LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:
Hewlett Packard Enterprise Company
3000 Hanover Street
Palo Alto, CA 94304
Representative - David Howerton
Enterprise Account Manager - SLED WV
Phone: (304) 963-2726

01/19/16 12:10:50
WV Purchasing Division

FOR INFORMATION CONTACT THE BUYER
Stephanie L Gale
(304) 558-7023
stephanie.l.gale@wv.gov

Signature X David Howerton **FEIN #** 47-3298624 **DATE** 01/18/2016

All offers subject to all terms and conditions contained in this solicitation

Hewlett Packard Enterprise

Hewlett Packard Enterprise Company
3000 Hanover Street
Palo Alto, CA 94304-1185
www.hpe.com

January 19, 2016

Brian J. Pratt
Director
WV OT IS&C
1900 Kanawha Blvd., E.; Bldg. 6, RmB-110
Charleston, WV 25305

Mr. Brian J. Pratt,

The West Virginia Information Services and Communications Agency (herein after WV IS&C) can improve service levels, optimize storage investments, and reduce the total cost of ownership with Hewlett Packard Enterprise (HPE) storage consolidation solutions. HPE's response to the WV IS&C's Request for Quotation "SAN Storage Systems" demonstrates the comprehensive features of HPE storage consolidation solutions and the resulting benefits for WV IS&C.

Hewlett Packard Enterprise's vision for the future of storage is built on Converged Infrastructure with HPE CloudSystem solutions, where storage devices of many different types can be pooled and managed centrally and collectively while preserving the same robustness and features of existing proprietary storage environments. Converged Infrastructure with HPE CloudSystem solutions promotes a network-centric approach to storage wherein heterogeneous devices work together seamlessly in a centrally managed environment. These devices can both scale "up" to higher capacity, as well as scale "out" to more processing power—without downtime. HPE storage consolidation solutions, based on Converged Infrastructure with HPE CloudSystem solutions, can help WV IS&C realize increases in operational efficiency while effectively managing unpredictable storage demands. WV IS&C can choose from a portfolio of storage products that offer the most complete, integrated systems to build and manage services across public, private, and hybrid Clouds.

Hewlett Packard Enterprise's proposed solution offers the WV IS&C significant cost savings, flexibility for future growth, and a rapid return on IT infrastructure investments. Ultimately, these benefits enable WV IS&C to achieve its strategic business outcomes: increased operational efficiency, faster time-to-market, and better asset management.

Hewlett Packard Enterprise appreciates the opportunity to offer a total solution that leverages the full value of HPE industry-leading storage products with HPE CloudSystem solutions, demonstrated experience, and world-class services. The HPE Account Team is fully committed to making WV IS&C's SAN Storage System initiative a success by providing exceptional service during all project phases—from implementation planning to deployment to ongoing support. Hewlett Packard Enterprise looks forward to presenting its capabilities to the WV IS&C's evaluation team and discussing how we can work together to implement the proposed solution. If there is any area of this proposal that requires further clarification or discussion, please contact me at (304) 963-2726 or David.Howerton@hpe.com.

Sincerely,

David Howerton

David Howerton
HPE SLED Enterprise Account Manager - WV
(304) 963-2726
David.Howerton@hpe.com

ATTACHMENT A – Pricing Page (Option #1)

Commodity Line Number	Part Number	Description	Unit of Measure	Quantity	Unit Cost	Extended Cost
Commodity Line 1, Specification 3.1.1	03230-00-HWSWINST	HP 3PAR SAN Storage Solutions- Charleston and Clarksburg	Each	2	107330.26	214,660.52
Commodity Line 2, Specification 3.1.2	03230-00-SUPP4	HP 3PAR Initial Year Maintenance & Support	Each	2	34919.55	69,839.10
Commodity Line 3, Specification 3.1.3	03230-00-SUPPINCLD	Year 2 Maintenance & Support	Each	2	0.00	0.00
Commodity Line 4, Specification 3.1.3	03230-00-SUPPINCLD	Year 3 Maintenance & Support	Each	2	0.00	0.00
Commodity Line 5, Specification 3.1.3	03230-00-SUPPINCLD	Year 4 Maintenance & Support	Each	2	0.00	0.00
				Total Cost		284,499.62

(Option #1 - (4) Years M&S included)

See Attached Quotation

ATTACHMENT A – Pricing Page (Option #2)

Commodity Line Number	Part Number	Description	Unit of Measure	Quantity	Unit Cost	Extended Cost
Commodity Line 1, Specification 3.1.1	03230-00-HWSWINST	HP 3PAR SAN Storage Solutions- Charleston and Clarksburg	Each	2	107330.26	214,660.52
Commodity Line 2, Specification 3.1.2	135073090NBQ	HP 3PAR Initial Year Maintenance & Support	Each	2	14529.24	29,058.48
Commodity Line 3, Specification 3.1.3	135073090NBQ	Year 2 Maintenance & Support	Each	2	14529.24	29,058.48
Commodity Line 4, Specification 3.1.3	135073090NBQ	Year 3 Maintenance & Support	Each	2	14529.24	29,058.48
Commodity Line 5, Specification 3.1.3	135073090NBQ	Year 4 Maintenance & Support	Each	2	14529.24	29,058.48
		Maintenance & Support bought annually		**Total Cost**		330,894.44

Hewlett Packard Enterprise

Legal Quotation

Changing the configuration may affect the offer.

The following structured solution, items 0100 and subitems, is offered for sale with a defined configuration menu and solution adjustment.

"For inquiries regarding this quote please contact: rfq-us-sled@hpe.com

Upon issuing a Purchase Order to Hewlett Packard Enterprise please include the following:
Hewlett Packard Enterprise listed as the Vendor
Bill to & ship to addresses
PO# and valid Hewlett Packard Enterprise quote number
Hewlett Packard Enterprise Purchase Agreement # (if applicable)
Contact name, phone number & e-Mail address
For electronic software include the end user e-Mail Address
Requested delivery date (per SLA requirements) and any special delivery requirements
Tax status
If support is ordered provide the end user's name and phone number. For upgrades include the serial number or the support identifier for contract entitlement.

*Prices are exclusive of use, sales value added and other taxes. Should the item(s) being quoted herein be exempt from sales tax please include the appropriate valid tax exemption certificate referencing Hewlett Packard Enterprise as the vendor.

*If quoted herein, Remarketed Products are fully remanufactured and carry new product warranty. Purchase is subject to inventory availability at receipt of order. Inventory may not be reserved. Hewlett Packard Enterprise reserves the right to substitute new components if appropriate, or to cancel orders by notifying the customer if necessary components are unavailable.

*If quoted herein, Hewlett Packard Enterprise Promotions must be ordered as quoted, no substitutions will be allowed. POs must be received on or prior to the expiration date of the quote or special promotion whichever comes first.

*If quoted herein, Hewlett Packard Enterprise Consignment/Demo equipment is currently at the location listed on this quote. Issuing a PO against this formal quotation will imply acceptance and delivery of the Consignment/Demo inventory. The standard warranty applicable to new equipment will apply. Some demo equipment may contain products that are remanufactured to be functionally equivalent to new."
Quote contains special discounts. Unless the customer has another valid agreement with Hewlett Packard Enterprise, this quotation is governed by Hewlett Packard Enterprise Customer Terms - Portfolio. A copy of these terms can be found on-line at http://www8.hp.com/us/en/hpe/hp-information/end-user-agreement/terms.html.

Hewlett Packard Enterprise

Legal Quotation

Quote Number	Page
SLED-03230-00	2

Changing the configuration may affect the offer.

The following structured solution, items 0100 and subitems, is offered for sale with a defined configuration menu and solution adjustment.

No.	Qty	Product	Description	EDT
	2	Opt. YUA	HP 3PAR 8200 OS Suite Base Supp	
	20	Opt. YUB	HP 3PAR 8200 OS Suite Drive Supp	
	2	Opt. YUE	HP 3PAR 8200 Replication Suite Base Supp	
	20	Opt. YUF	HP 3PAR 8200 Replication Ste Drive Supp	
1100	16	QK734A	HP Premier Flex LC/LC OM4 2f 5m Cbl	10
1200	1	HA124A1	HP Technical Installation Startup SVC	
	2	Opt. 5T7	HPE StoreOnce single n Catalyst Stup SVC	
	2	Opt. 5WE	HPE StoreOnce RMC VMw for 3PAR SVC	
	2	Opt. 55Q	HP Startup StoreOnce Backup System SVC	
	2	Opt. 5Y8	HP Startup 3PAR 8K Rpl Ste VC-RC-PP SVC	
			Grand Total:	**US$ 284,499.62**

Hewlett Packard Enterprise

Legal Quotation

Quote Number	Page
SLED-03230-00	1

Changing the configuration may affect the offer.

The following structured solution, items 0100 and subitems, is offered for sale with a defined configuration menu and solution adjustment.

No.	Qty	Product	Description	EDT
0100	2	K2Q36A	HP 3PAR StoreServ 8200 2N Fld Int Base	10
0101	4	H6Z10A	HP 3PAR 8000 2-pt 10Gb iSCSI/FCoE Adptr	10
	4	Opt. 0D1	Factory integrated	14
0102	20	K2P91A	HP 3PAR 8000 3.84TB SAS cMLC SFF SSD	19
	20	Opt. 0D1	Factory integrated	19
0103	2	L7B45A	HP 3PAR 8200 OS Suite Base LTU	10
	2	Opt. 0D1	Factory integrated	14
0104	20	L7B46A	HP 3PAR 8200 OS Suite Drive LTU	10
	20	Opt. 0D1	Factory integrated	14
0105	2	L7B49A	HP 3PAR 8200 Replication Suite Base LTU	10
	2	Opt. 0D1	Factory integrated	14
0106	20	L7B50A	HP 3PAR 8200 Replication Ste Drive LTU	10
	20	Opt. 0D1	Factory integrated	14
0200	1	HA114A1	HP Installation and Startup Service	
	2	Opt. 5XU	HP Startup 3PAR 8200 2N Fld Int Base SVC	
0300	2	BB915A	HPE StoreOnce 5100 48TB System	Unreleased Product
0301	2	BB926A	HPE StoreOnce 10GbE Network Card	10
	2	Opt. 0D1	Factory integrated	14
0302	2	BB928A	HPE StoreOnce 8Gb Fibre Channel Card	10
	2	Opt. 0D1	Factory integrated	14
0303	2	BB949A	HPE StoreOnce 10GbE Netwrk Exp LTU	10
	2	Opt. 0D1	Factory integrated	14
0304	2	BB951A	HPE StoreOnce 8Gb Fibre Channel Card LTU	10
	2	Opt. 0D1	Factory integrated	14
0400	2	K2R28A	HP 3PAR StoreServ SPS Service Processor	10
0500	2	BB888AAE	HPE StoreOnce 4500/5100 Catalyst E-LTU	5
0600	2	BD362AAE	HP 3PAR StoreServ Mgmt/Core SW E-Media	5
0700	2	BD363AAE	HP 3PAR OS Suite Latest E-Media	5
0800	2	BD365AAE	HP 3PAR SP SW Latest E-Media	5
0900	2	D4U64AAE	HP StoreOnce RMC-V 7200/8200 E-LTU	5
1000	1	H1K92A4	HP 4Y 4 hr 24x7 Proactive Care SVC	
	2	Opt. QBS	HPE StoreOnce 4500/5100 Catalyst Supp	
	2	Opt. U29	HP SO Rec Mgr StoreServe 7200 SW Supp	
	6	Opt. WSF	HP 3PAR Internal Entitlement Purpose	
	2	Opt. XDR	HPE StoreOnce 5100 48TB Backup Supp	
	2	Opt. YT8	HP 3PAR StoreServ 8200 2N Base Supp	
	4	Opt. YTN	HP 3PAR 8000 2-pt 10Gb FCoE Adptr Supp	
	2	Opt. YTQ	HP 3PAR StoreServ SPS Srvc Proc Supp	
	20	Opt. YU2	HP 3PAR 8000 3.84TB cMLC SFF SSD Supp	

Hewlett Packard Enterprise

Legal Quotation

To: **State of West Virginia**
1900 KANAWHA BLVD E RM 1
CHARLESTON, WV 25305-0001

Phone:
Fax:
Email:

In reply to your request:
3PAR 8200 x2

HPE Quote #	Created	Expires
SLED-03230-00	1/5/2016	4/4/2016

Your HPE Sales Contact:

Jamie Rice,
Phone: +1 614 3013248
Fax:
Email: jamie.rice@hpe.com

Payment Terms:
Net 30 days from the invoice date, subject to credit approval.

Submit Purchase Order To:
U.S. SLED Order Management,
Phone:
Fax: 1-800-825-2329
Email: US-SLED-ORDERS@hpe.com

Solution		Net Price
Hardware:	US$	180,409.12
Software:	US$	6,433.06
Support:	US$	69,839.10
Installation:	US$	27,818.34
Other:	US$	0.00
Sub-Total:	US$	284,499.62
Shipping and Handling:	US$	0.00
Grand Total:	**US$**	**284,499.62**

Estimated delivery upon PO receipt (in business days):
Unreleased Product
Delivery Method:
Standard
Delivery Duty Paid
Shipping & Handling and Special Handling Exempt

Print Date: 1/6/2016 12:53:46PM

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation

Proc Folder: 170041

Doc Description: Addendum #2 - SAN Storage Systems (OT1699)

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2016-01-11	2016-01-19 13:30:00	CRFQ 0210 ISC1600000005	3

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:
Hewlett Packard Enterprise Company
3000 Hanover Street
Palo Alto, CA 94304
Representative - David Howerton
Enterprise Account Manager - SLED WV
Phone: (304) 963-2726

FOR INFORMATION CONTACT THE BUYER
Stephanie L Gale
(304) 558-7023
stephanie.l.gale@wv.gov

Signature X David Howerton FEIN # 47-3298624 DATE 01/18/2016

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION:

Addendum #2 issued to:

1. Provide attachment for Addendum #1.

End of Addendum #2

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	SAN Storage Solutions	2.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43210000			

Extended Description :
SAN Storage Solutions

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Initial Year Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Initial Year Maintenance and Support

Invoice To	Ship To
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Optional Year 2 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 2 Maintenance and Support

Invoice To	Ship To
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Optional Year 3 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 3 Maintenance and Support

Invoice To	Ship To
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Optional Year 4 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :

Optional Year 4 Maintenance and Support

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Technical Questions Due	2015-12-30

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

New Business Quotes
Hewlett Packard Enterprise Company
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE CA 95747

Hewlett Packard Enterprise

BRIAN J. PRATT
STATE OF WEST VIRGINIA
DEPARTMENT OF INFORMATION
SERVICES AND COMMUNICATION
1900 Kanawha Blvd E
Charleston WV 25305-0009

01/15/2016

Support Account Reference: WV 3PAR01
HPE Reference Number: 46717642

Dear BRIAN J. PRATT:

Enclosed is a Hewlett Packard Enterprise support service quote for your products. Review the services, support items, coverage dates, addresses, and company contacts for accuracy. Please advise Hewlett Packard Enterprise of any changes prior to submitting your purchase order or authorization. To order support services detailed in this package, please return billing authorization by choosing one of the following convenient options. Subject to HPE Single Order Terms for Support or purchase agreement with Hewlett Packard Enterprise and if applicable, Exhibit E24.

Option 1: Provide an open-ended purchase order. An open-ended purchase order allows Hewlett Packard Enterprise to add products to your agreement as necessary, as well as renew your support from year to year. Cancellation of the support service agreement requires a 30-day written notice.

Option 2: Provide a PO for the coverage dates specified in the enclosed referenced proposal.
Your PO must note at least one of the following, along with the support coverage period:
1. Hewlett Packard Enterprise Reference (quote) number(s),
2. Support Account Reference(s) (SAR)
3. Service Agreement ID(s) (SAID)
4. AMP ID(s)

* If there is an approval signature section on your PO then it should be signed/approved before sending to Hewlett Packard Enterprise. Please indicate if you are taxable or tax exempt. If your organization is Tax Exempt, please send a copy of your Tax Exemption Certificate with your PO. Include your billing frequency and current invoice-to address.

Option 3: Sign and return the attached Signature Authorization Form (SAM).
* If you provide authorization via the SAM form (Signature Authorization Method), please insure that all of the applicable boxes are checked on the form, along with the printed name and signature of the authorizing party.

Note: If the information in Options 1 through 3 is not included in your PO or SAM Form then Hewlett Packard Enterprise will need to contact you to collect this missing data, which will cause a delay in activating your support contract(s). Hewlett Packard Enterprise requires these details for audit purposes.

Hewlett Packard Enterprise values your business and looks forward to providing you with continued support. If you require further assistance, please contact your Contract Administrator at (800) 386-1115 OPT-4-4-2. You can send your PO or SAM to your Support Services Representative, or FAX it to (800) 307-0361.

Sincerely,
New Business Quotes
Contract Admin.

Hewlett Packard Enterprise

SIGNATURE AUTHORIZATION METHOD (SAM)

The Signature Authorization Method (SAM) may be used to order Hewlett Packard Enterprise (HPE) Support Services **ONLY IF A PURCHASE ORDER IS NOT REQUIRED TO AUTHORIZE SERVICE DELIVERY AND REMIT PAYMENT.** This SAM form, including the quotation(s) and governing terms referenced herein shall be referred to collectively as the "Support Agreement."

(1) Customer Information:

Company Name	**Invoice to Address**
STATE OF WEST VIRGINIA DEPARTMENT OF IS&C	1900 Kanawha Blvd E Charleston WV 25305-0009

(2) Contract Information: Unless otherwise notified all quotes under the AMP ID below will be renewed:

[ ] Initial Quote Number:46717642 **[ ]** AMP ID:** 135073090NBQ

Support Account Reference: WV 3PAR01 **Coverage Period:** 02/12/2016 - 02/11/2017

***The enclosed Support Account Overview dated 01/15/2016 summarizes the quotes contained within the above AMP ID.

This quote bundle is valid until: 02/11/2016

[ ] Check as applicable if your authorization is open-ended.

The following term applies only to open-ended support agreements. This Support Agreement is for the period stated on Hewlett Packard Enterprise's quote. It will be extended without modification by consecutive terms of 12 months unless one of the parties gives written notice in accordance with the underlying business terms prior to the end of the respective 12 months. If modifications of the Support Agreement are necessary, Hewlett Packard Enterprise will notify Customer in writing 60 days before the modifications are effective. Customer may terminate this Support Agreement within 30 days from receipt of notice. If Customer does not exercise this right of termination, this Support Agreement will be continued to the end of the current term with the modifications, and extended by consecutive 12-month terms. Re-pricing will occur automatically without further authorization.

(3) REQUIRED- Tax Information:

[ ] Taxable **OR [ ]** Tax Exempt Exemption #_____ (Attach copy of exemption certificate)

(4) REQUIRED- Billing Frequency: Do not enclose Payment. Please select one of the following:

Please bill me: [ ] Pre-Pay up front for the entire coverage term

[ ] Annually

[ ] Quarterly (Total annual amount must exceed $2400)

[ ] Semi-Annually (Total annual amount must exceed $2400)

[ ] Monthly (Total annual amount must exceed $2400)

[ ] Charge my credit card. Check one: [ ]Visa [ ]MasterCard [ ]American Express

For your protection, please call your HPE Sales Representative or Contract Admin with the credit card number.

Cardholder Name (Print) _____

Cardholder's Signature_____

Credit Card Invoice-To Address _____

(5) REQUIRED- Service Authorization and Terms and Conditions:

Customer's signature on this form constitutes authorization for Hewlett Packard Enterprise to invoice Customer for the Hewlett Packard Enterprise support services represented in this Support Agreement. This support agreement will be governed by the following: i) The purchase agreement currently in effect between Customer and Hewlett Packard Enterprise that includes the delivery of Support Services, or if none, the Hewlett Packard Enterprise Customer Terms-Support (CTSP01), the Supplemental Data Sheet (CTDS01); and ii) any applicable Transaction Documents thereto.

_____

Authorized Signature and Date

_____ _____

Printed Name, Title and Phone Number

(6) Completed form should be returned to:

Hewlett Packard Enterprise Company
New Business Quotes
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE, CA 95747

TEL:(800) 386-1115 OPT-4-4-2
FAX:(800) 307-0361

Support Account Overview

Hewlett Packard Enterprise

AMP ID: 135073090NBQ

Special Terms and Conditions No: EANDI-2006

Customer Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

HPE Address:
Hewlett Packard Enterprise Company
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE CA 95747

Customer Contact:
Brian J. Pratt
Tel: (304) 957-8285
Fax: (n/a)
E-mail: Brian.J.Pratt@wv.gov

HPE Contact:
New Business Quotes
Tel: (800) 386-1115 OPT-4-4-2
Fax: (800) 307-0361

This quote is valid until 02/11/2016

This order is governed by the specific agreement referenced below in the comment section. If none is identified, then Hewlett Packard Enterprise's standard terms, as indicated below for the services you purchased will apply. Either one is the "Agreement". Multi-year support renewals are governed by the Exhibit E24 in addition to the Agreement unless otherwise specified.

Hewlett Packard Enterprise Standard Terms:
For HPE Software Support terms and datasheets, visit https://www.hpe.com/software/support_options
For HPE terms for Software-as-a-Service, visit www.hpe.com/docs/customerterms
For all other support terms and datasheets, including information on the format of this document, visit:
www.hpe.com/services/supportdocs2

Your Support Access Options for Service Agreement Customers:

- **Manage your service agreement online, visit** - https://s360.hpe.com / https://esam.hpe.com
- **HPE Support Center** - www.hpe.com/support/hpesc
- **HPE Software Support Online** https://softwaresupport.hpe.com

Please have your Service Agreement ID and Product/Serial available to expedite your support experience.
For Support, please call: 800-633-3600

Support Account Reference	Service Agreement ID	Coverage Period From	To	Description	Contract Total/USD
WV 3PAR01	1046 0358 4098	02/12/2016	02/11/2017	Case 5306191609 / CSIF ID DAUS00-99815N	29,058.48
				Total Excluding Taxes	**29,058.48**

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Support Account Overview

Hewlett Packard Enterprise

AMP ID: 135073090NBQ

Customer Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

HPE Address:
Hewlett Packard Enterprise Company
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE CA 95747

Support Account Reference	Coverage Period From: To:	Description	Contract Total/USD

Summary of Charges	
Hardware Support	20,980.08
Software Support-Labor	5,298.48
Software Support-Materials	2,779.92
Total Excluding Taxes	**29,058.48**

Total excludes all taxes. If applicable, taxes will be added at the time of invoicing at the current tax rate.
Total price includes all additions, deletions, warranties, discounts and adjustments if applicable.
Refer to the detail document for any applicable state & local tax

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Support Account Detail

Hewlett Packard Enterprise

Special Terms and Conditions No: EANDI-2006
Your PO Reference:
CCRN Number: 0460358400

Support Account Reference: WV 3PAR01

HPE Reference No.: 46717642

Equipment Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

Software Update Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

Hardware Contact:
Brian J. Pratt
Tel: (304) 957-8285
Fax: (n/a)

Software Contact:
Brian J. Pratt
Tel: (304) 957-8285
Fax: (n/a)

This quote is valid until 02/11/2016
Coverage from: 02/12/2016 to: 02/11/2017

Service Agreement ID: 1046 0358 4098 **For Support, please call: 800-633-3600**

Product No.	Description	Serial No.	Coverage Period from: to:	Qty	Price/USD
H1K92AC	**HP 4 hour 24x7 Proactive Care SVC**				
***** Hardware Support *****					
	HPE Hardware Maintenance Onsite Support				
	Hardware Problem Diagnosis				
	Onsite Support				
	Parts and Material provided				
	4 Hr Onsite Response				
	24 Hrs Std Office Days				
	24 hrs, Day 6				
	24 hrs, Day 7				
	Holidays Covered				
	Travel Zone 1				
	No Usage Limitation				
	Remote Delivery SVC Advanced				
	Access to Adv Tech Specialists				
K2Q36A	HP 3PAR StoreServ 8200 2N Fld Int Base			2	53.46
H6Z10A	HP 3PAR 8000 2-pt 10Gb iSCSI/FCoE Adptr			4	27.72
K2P91A	HP 3PAR 8000 3.84TB SAS cMLC SFF SSD			20	1,346.40
BB915A	HPE StoreOnce 5100 48TB System			2	297.00
BB926A	HPE StoreOnce 10GbE Network Card			2	0.00
BB928A	HPE StoreOnce 8Gb Fibre Channel Card			2	0.00
BB949A	HPE StoreOnce 10GbE Netwrk Exp LTU			2	0.00
BB951A	HPE StoreOnce 8Gb Fibre Channel Card LTU			2	0.00
K2R28A	HP 3PAR StoreServ SPS Service Processor			2	23.76
Discounts					
Pre Payment HdrDisc% -1%					*17.66-*

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Hewlett Packard Enterprise

Special Terms and Conditions No: EANDI-2006
Your PO Reference:
CCRN Number: 0460358400

Product No.	Description	Serial No.	Coverage Period from to	Qty	Price/USD

***** Software Support *****

HPE Software Technical Unlimited Support
SW Technical Support
SW Electronic Support
24 Hrs Std Office Days
24 Hrs Day 6
24 Hrs Day 7
Holidays Covered
Standard Response
Access to Adv Tech Specialists

L7B45A	HP 3PAR 8200 OS Suite Base LTU	2	168.30
L7B46A	HP 3PAR 8200 OS Suite Drive LTU	20	39.60
L7B49A	HP 3PAR 8200 Replication Suite Base LTU	2	79.20
L7B50A	HP 3PAR 8200 Replication Ste Drive LTU	20	39.60
BB888AAE	HPE StoreOnce 4500/5100 Catalyst E-LTU	2	63.36
D4U64AAE	HP StoreOnce RMC-V 7200/8200 E-LTU	2	51.48

HPE Software Updates SVC
License to Use & SW Updates
HPE Recommended SW Upd Method
HPE Recommended Doc Upd Method

L7B45A	HP 3PAR 8200 OS Suite Base LTU	2	89.10
L7B46A	HP 3PAR 8200 OS Suite Drive LTU	20	19.80
L7B49A	HP 3PAR 8200 Replication Suite Base LTU	2	41.58
L7B50A	HP 3PAR 8200 Replication Ste Drive LTU	20	19.80
BB888AAE	HPE StoreOnce 4500/5100 Catalyst E-LTU	2	33.66
BD362AAE	HP 3PAR StoreServ Mgmt/Core SW E-Media	2	0.00
BD363AAE	HP 3PAR OS Suite Latest E-Media	2	0.00
BD365AAE	HP 3PAR SP SW Latest E-Media	2	0.00
D4U64AAE	HP StoreOnce RMC-V 7200/8200 E-LTU	2	27.72

Discounts
Pre Payment HdrDisc% -1% *6.80-*

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Special Terms and Conditions No: EANDI-2006
Your PO Reference:
CCRN Number: 0460358400

Hewlett Packard Enterprise

Product No.	Description	Serial No.	Coverage Period from:	to:	Qty	Price/USD

Summary of Charges	
Hardware Support	1,748.34
Hardware Support Tax WV	0.00
Software Support-Labor	441.54
Software Support-Labor Tax WV	0.00
Software Support-Materials	231.66
Software Support-Materials Tax WV	0.00
TOTAL INCLUDING TAX	**2,421.54**

Taxes have been added at current rate, however, tax rates will be those in effect at the time of invoicing.
Total price includes all additions, deletions, warranties, discounts and adjustments if applicable.

Hardware products under warranty

K2Q36A	HP 3PAR StoreServ 8200 2N Fld Int Base	02/12/2016	03/13/2019	2
H6Z10A	HP 3PAR 8000 2-pt 10Gb iSCSI/FCoE Adptr	02/12/2016	03/13/2019	4
K2P91A	HP 3PAR 8000 3.84TB SAS cMLC SFF SSD	02/12/2016	03/13/2021	20
BB915A	HPE StoreOnce 5100 48TB System	02/12/2016	03/13/2017	2
BB926A	HPE StoreOnce 10GbE Network Card	02/12/2016	03/13/2017	2
BB928A	HPE StoreOnce 8Gb Fibre Channel Card	02/12/2016	03/13/2017	2
BB949A	HPE StoreOnce 10GbE Netwrk Exp LTU	02/12/2016	03/13/2017	2
BB951A	HPE StoreOnce 8Gb Fibre Channel Card LTU	02/12/2016	03/13/2017	2
K2R28A	HP 3PAR StoreServ SPS Service Processor	02/12/2016	03/13/2019	2

SW products with pre paid support

BB915A	HPE StoreOnce 5100 48TB System	02/12/2016	03/13/2017	2

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Payment Schedule as of 01/15/2016

AMP ID: 135073090NBQ

Settlement Period from: From: 02/12/2016 to: 02/11/2017

Support Account Reference	02/12/2016 02/11/2017
WV 3PAR01	29,058.48

Applicable tax to be added to the invoice.

Please refer to the payment schedule for prices to be invoiced yearly in advance. Price in USD.

Hewlett Packard Enterprise

Hewlett Packard Enterprise Company
3000 Hanover Street
Palo Alto, CA 94304-1185
www.hpe.com

January 18, 2016

Brian J. Pratt
Director
WV OT IS&C
1900 Kanawha Blvd., E.; Bldg. 6, RmB-110
Charleston, WV 25305

Mr. Brian J. Pratt,

The West Virginia Information Services and Communications Agency (herein after WV IS&C) can improve service levels, optimize storage investments, and reduce the total cost of ownership with Hewlett Packard Enterprise (HPE) storage consolidation solutions. HPE's response to the WV IS&C's Request for Quotation "SAN Storage Systems" demonstrates the comprehensive features of HPE storage consolidation solutions and the resulting benefits for WV IS&C.

Hewlett Packard Enterprise's vision for the future of storage is built on Converged Infrastructure with HPE CloudSystem solutions, where storage devices of many different types can be pooled and managed centrally and collectively while preserving the same robustness and features of existing proprietary storage environments. Converged Infrastructure with HPE CloudSystem solutions promotes a network-centric approach to storage wherein heterogeneous devices work together seamlessly in a centrally managed environment. These devices can both scale "up" to higher capacity, as well as scale "out" to more processing power—without downtime. HPE storage consolidation solutions, based on Converged Infrastructure with HPE CloudSystem solutions, can help WV IS&C realize increases in operational efficiency while effectively managing unpredictable storage demands. WV IS&C can choose from a portfolio of storage products that offer the most complete, integrated systems to build and manage services across public, private, and hybrid Clouds.

Hewlett Packard Enterprise's proposed solution offers the WV IS&C significant cost savings, flexibility for future growth, and a rapid return on IT infrastructure investments. Ultimately, these benefits enable WV IS&C to achieve its strategic business outcomes: increased operational efficiency, faster time-to-market, and better asset management.

Hewlett Packard Enterprise appreciates the opportunity to offer a total solution that leverages the full value of HPE industry-leading storage products with HPE CloudSystem solutions, demonstrated experience, and world-class services. The HPE Account Team is fully committed to making WV IS&C's SAN Storage System initiative a success by providing exceptional service during all project phases—from implementation planning to deployment to ongoing support. Hewlett Packard Enterprise looks forward to presenting its capabilities to the WV IS&C's evaluation team and discussing how we can work together to implement the proposed solution. If there is any area of this proposal that requires further clarification or discussion, please contact me at (304) 963-2726 or David.Howerton@hpe.com.

Sincerely,

David Howerton

David Howerton
HPE SLED Enterprise Account Manager - WV
(304) 963-2726
David.Howerton@hpe.com

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation

—

Proc Folder: 170041

Doc Description: SAN Storage Systems (OT1699)

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2015-12-18	2016-01-14 13:30:00	CRFQ 0210 ISC1600000005	1

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

FOR INFORMATION CONTACT THE BUYER

Stephanie L Gale
(304) 558-7023
stephanie.l.gale@wv.gov

Signature X **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

The West Virginia Purchasing Division is soliciting bids on behalf of the West Virginia Office of Technology to establish a contract for the one time purchase of hardware, software, licensing, and support for a Storage Area Network (SAN) solution.

DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	SAN Storage Solutions	2.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43210000			

Extended Description :
SAN Storage Solutions

DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Initial Year Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Initial Year Maintenance and Support

DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Optional Year 2 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
112201			

Extended Description :

Optional Year 2 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Optional Year 3 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :

Optional Year 3 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Optional Year 4 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :

Optional Year 4 Maintenance and Support

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Technical Questions Due	2015-12-30

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation

Proc Folder: 170041

Doc Description: Addendum #1 - SAN Storage Systems (OT1699)

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2016-01-08	2016-01-19 13:30:00	CRFQ 0210 ISC1600000005	2

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

Vendor Name, Address and Telephone Number:

FOR INFORMATION CONTACT THE BUYER
Stephanie L Gale
(304) 558-7023
stephanie.l.gale@wv.gov

Signature X **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION:

Addendum #1 issued to:

1. Provide responses to technical questions.
2. To move the bid opening date to 1/19/2016 @ 1:30pm

End of Addendum #1

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	SAN Storage Solutions	2.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43210000			

Extended Description :
SAN Storage Solutions

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Initial Year Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Initial Year Maintenance and Support

Invoice To	Ship To
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY /00 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Optional Year 2 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 2 Maintenance and Support

Invoice To	Ship To
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

ne	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Optional Year 3 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 3 Maintenance and Support

Invoice To	Ship To
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Optional Year 4 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :

Optional Year 4 Maintenance and Support

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Technical Questions Due	2015-12-30

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

Purchasing Divison
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation

Proc Folder: 170041

Doc Description: Addendum #2 - SAN Storage Systems (OT1699)

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2016-01-11	2016-01-19 13:30:00	CRFQ 0210 ISC1600000005	3

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

FOR INFORMATION CONTACT THE BUYER
Stephanie L Gale
(304) 558-7023
stephanie.l.gale@wv.gov

Signature X **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION:

Addendum #2 issued to:

1. Provide attachment for Addendum #1.

End of Addendum #2

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	SAN Storage Solutions	2.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43210000			

Extended Description :
SAN Storage Solutions

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Initial Year Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Initial Year Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY)00 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Optional Year 2 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 2 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

ne	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Optional Year 3 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 3 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Optional Year 4 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :

Optional Year 4 Maintenance and Support

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Technical Questions Due	2015-12-30

ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions

Purchasing Divison
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation

Proc Folder: 170041

Doc Description: Addendum #1 - SAN Storage Systems (OT1699)

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2015-12-18	2016-01-19 13:30:00	CRFQ 0210 ISC1600000005	2

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

FOR INFORMATION CONTACT THE BUYER

Stephanie L Gale
(304) 558-7023
stephanie.l.gale@wv.gov

gnature X **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMAITON:

Addendum #1 issued to:

1. Provide responses to technical questions.
2. To move the bid opening date to 1/19/2016 @ 1:30pm

End of Addendum #1

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	SAN Storage Solutions	2.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43210000			

Extended Description :
SAN Storage Solutions

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Initial Year Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Initial Year Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Optional Year 2 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 2 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Optional Year 3 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 3 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Optional Year 4 Maintenance and Support				

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :

Optional Year 4 Maintenance and Support

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Technical Questions Due	2015-12-30

SOLICITATION NUMBER: CRFQ ISC1600000005
Addendum Number:

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[✓] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[✓] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[ ] Other

Description of Modification to Solicitation:

Addendum #1 issued to:

1. Provide responses to technical questions.
2. To move the bid opening date to 1/19/2016 @ 1:30pm

End of Addendum #1

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

CRFQ ISC16-05 SAN Storage System
Vendor Questions and WVOT Responses
1/8/16

Question 1

3.1.1.7 – Must have the ability to enable or disable compression on a per-LUN basis.

Is this a requirement for systems that don't perform garbage collection at the storage processor level?

WVOT Response 1: Yes, this is a requirement for all storage systems.

Question 2

3.1.1.12 – Each system must provide a minimum of 4-ports of 8 Gigabit Fibre Channel (FC) connectivity and be upgradeable to 16 Gigabit FC.

Can the proposed solution have 16Gb FC in a future release if it isn't available today?

WVOT Response: No.

Question 3

3.1.1.13 – Must provide 1 and 10 Gigabit Ethernet connectivity.

Does Ethernet imply that the solution should support both file and block access?

WVOT Response: Yes.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: ISC1600000005

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[✓] Addendum No. 1	[ ] Addendum No. 6
[✓] Addendum No. 2	[ ] Addendum No. 7
[ ] Addendum No. 3	[ ] Addendum No. 8
[ ] Addendum No. 4	[ ] Addendum No. 9
[ ] Addendum No. 5	[ ] Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Hewlett Packard Enterprise Company
Company

David Howerton
Authorized Signature

01/18/16
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.
Revised 6/8/2012

Purchasing Divison
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Request for Quotation

Proc Folder: 170041

Doc Description: Addendum #2 - SAN Storage Systems (OT1699)

Proc Type: Central Contract - Fixed Amt

Date Issued	Solicitation Closes	Solicitation No	Version
2016-01-11	2016-01-19 13:30:00	CRFQ 0210 ISC1600000005	3

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

FOR INFORMATION CONTACT THE BUYER

Stephanie L Gale
(304) 558-7023
stephanie.l.gale@wv.gov

gnature X **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMAITON:

Addendum #2 issued to:

1. Provide attachment for Addendum #1.

End of Addendum #2

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	SAN Storage Solutions	2.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43210000			

Extended Description :
SAN Storage Solutions

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Initial Year Maintenance and Support	0.00000			

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Initial Year Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Optional Year 2 Maintenance and Support	0.00000			

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 2 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Optional Year 3 Maintenance and Support	0.00000			

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :
Optional Year 3 Maintenance and Support

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	WV OFFICE OF TECHNOLOGY BLDG 5, 10TH FLOOR 1900 KANAWHA BLVD E CHARLESTON WV 25304 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	Optional Year 4 Maintenance and Support	0.00000			

Comm Code	Manufacturer	Specification	Model #
81112201			

Extended Description :

Optional Year 4 Maintenance and Support

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Technical Questions Due	2015-12-30

SOLICITATION NUMBER: CRFQ ISC1600000005
Addendum Number: 2

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[ ] Modify bid opening date and time

[ ] Modify specifications of product or service being sought

[ ] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[✓] Other

Description of Modification to Solicitation:

Addendum #2 issued to:

1. Provide attachment for Addendum #1.

End of Addendum #2

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment A and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: ISC1600000005

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

[✓]	Addendum No. 1	[ ]	Addendum No. 6
[✓]	Addendum No. 2	[ ]	Addendum No. 7
[ ]	Addendum No. 3	[ ]	Addendum No. 8
[ ]	Addendum No. 4	[ ]	Addendum No. 9
[ ]	Addendum No. 5	[ ]	Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Hewlett Packard Enterprise Company
Company

David Hamerton
Authorized Signature

01/18/16
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.
Revised 6/8/2012

ATTACHMENT A · ricing Page (Option #1)

Commodity Line Number	Part Number	Description	Unit of Measure	Quantity	Unit Cost	Extended Cost
Commodity Line 1, Specification 3.1.1	03230-00-HWSWINST	HP 3PAR SAN Storage Solutions- Charleston and Clarksburg	Each	2	107330.26	214,660.52
Commodity Line 2, Specification 3.1.2	03230-00-SUPP4	HP 3PAR Initial Year Maintenance & Support	Each	2	34919.55	69,839.10
Commodity Line 3, Specification 3.1.3	03230-00-SUPPINCLD	Year 2 Maintenance & Support	Each	2	0.00	0.00
Commodity Line 4, Specification 3.1.3	03230-00-SUPPINCLD	Year 3 Maintenance & Support	Each	2	0.00	0.00
Commodity Line 5, Specification 3.1.3	03230-00-SUPPINCLD	Year 4 Maintenance & Support	Each	2	0.00	0.00
				Total Cost		284,499.62

(Option #1 - (4) Years M&S included)

See Attached Quotation

ATTACHMENT A · ricing Page (Option #2)

Commodity Line Number	Part Number	Description	Unit of Measure	Quantity	Unit Cost	Extended Cost
Commodity Line 1, Specification 3.1.1	03230-00-HWSWINST	HP 3PAR SAN Storage Solutions- Charleston and Clarksburg	Each	2	107330.26	214,660.52
Commodity Line 2, Specification 3.1.2	135073090NBQ	HP 3PAR Initial Year Maintenance & Support	Each	2	14529.24	29,058.48
Commodity Line 3, Specification 3.1.3	135073090NBQ	Year 2 Maintenance & Support	Each	2	14529.24	29,058.48
Commodity Line 4, Specification 3.1.3	135073090NBQ	Year 3 Maintenance & Support	Each	2	14529.24	29,058.48
Commodity Line 5, Specification 3.1.3	135073090NBQ	Year 4 Maintenance & Support	Each	2	14529.24	29,058.48
		Maintenance & Support bought annually		**Total Cost**		330,894.44

Hewlett Packard Enterprise

Legal Quotation

To: **State of West Virginia**
1900 KANAWHA BLVD E RM 1
CHARLESTON, WV 25305-0001

Phone:
Fax:
Email:

In reply to your request:
3PAR 8200 x2

HPE Quote #	Created	Expires
SLED-03230-00	1/5/2016	4/4/2016

Your HPE Sales Contact:

Jamie Rice,
Phone: +1 614 3013248
Fax:
Email: jamie.rice@hpe.com

Payment Terms:
Net 30 days from the invoice date, subject to credit approval.

Submit Purchase Order To:
U.S. SLED Order Management,
Phone:
Fax: 1-800-825-2329
Email: US-SLED-ORDERS@hpe.com

Solution		Net Price
Hardware:	US$	180,409.12
Software:	US$	6,433.06
Support:	US$	69,839.10
Installation:	US$	27,818.34
Other:	US$	0.00
Sub-Total:	US$	284,499.62
Shipping and Handling:	US$	0.00
Grand Total:	**US$**	**284,499.62**

Estimated delivery upon PO receipt (in business days):
Unreleased Product
Delivery Method:
Standard
Delivery Duty Paid
Shipping & Handling and Special Handling Exempt

Print Date: 1/6/2016 12:53:46PM

Hewlett Packard Enterprise

Legal Quotation

Quote Number	Page
SLED-03230-00	1

Changing the configuration may affect the offer.

The following structured solution, items 0100 and subitems, is offered for sale with a defined configuration menu and solution adjustment.

No.	Qty	Product	Description	EDT
0100	2	K2Q36A	HP 3PAR StoreServ 8200 2N Fld Int Base	10
0101	4	H6Z10A	HP 3PAR 8000 2-pt 10Gb iSCSI/FCoE Adptr	10
	4	Opt. 0D1	Factory integrated	14
0102	20	K2P91A	HP 3PAR 8000 3.84TB SAS cMLC SFF SSD	19
	20	Opt. 0D1	Factory integrated	19
0103	2	L7B45A	HP 3PAR 8200 OS Suite Base LTU	10
	2	Opt. 0D1	Factory integrated	14
0104	20	L7B46A	HP 3PAR 8200 OS Suite Drive LTU	10
	20	Opt. 0D1	Factory integrated	14
0105	2	L7B49A	HP 3PAR 8200 Replication Suite Base LTU	10
	2	Opt. 0D1	Factory integrated	14
0106	20	L7B50A	HP 3PAR 8200 Replication Ste Drive LTU	10
	20	Opt. 0D1	Factory integrated	14
0200	1	HA114A1	HP Installation and Startup Service	
	2	Opt. 5XU	HP Startup 3PAR 8200 2N Fld Int Base SVC	
0300	2	BB915A	HPE StoreOnce 5100 48TB System	Unreleased Product
0301	2	BB926A	HPE StoreOnce 10GbE Network Card	10
	2	Opt. 0D1	Factory integrated	14
0302	2	BB928A	HPE StoreOnce 8Gb Fibre Channel Card	10
	2	Opt. 0D1	Factory integrated	14
0303	2	BB949A	HPE StoreOnce 10GbE Netwrk Exp LTU	10
	2	Opt. 0D1	Factory integrated	14
0304	2	BB951A	HPE StoreOnce 8Gb Fibre Channel Card LTU	10
	2	Opt. 0D1	Factory integrated	14
0400	2	K2R28A	HP 3PAR StoreServ SPS Service Processor	10
0500	2	BB888AAE	HPE StoreOnce 4500/5100 Catalyst E-LTU	5
0600	2	BD362AAE	HP 3PAR StoreServ Mgmt/Core SW E-Media	5
0700	2	BD363AAE	HP 3PAR OS Suite Latest E-Media	5
0800	2	BD365AAE	HP 3PAR SP SW Latest E-Media	5
0900	2	D4U64AAE	HP StoreOnce RMC-V 7200/8200 E-LTU	5
1000	1	H1K92A4	HP 4Y 4 hr 24x7 Proactive Care SVC	
	2	Opt. QBS	HPE StoreOnce 4500/5100 Catalyst Supp	
	2	Opt. U29	HP SO Rec Mgr StoreServe 7200 SW Supp	
	6	Opt. WSF	HP 3PAR Internal Entitlement Purpose	
	2	Opt. XDR	HPE StoreOnce 5100 48TB Backup Supp	
	2	Opt. YT8	HP 3PAR StoreServ 8200 2N Base Supp	
	4	Opt. YTN	HP 3PAR 8000 2-pt 10Gb FCoE Adptr Supp	
	2	Opt. YTQ	HP 3PAR StoreServ SPS Srvc Proc Supp	
	20	Opt. YU2	HP 3PAR 8000 3.84TB cMLC SFF SSD Supp	

Hewlett Packard Enterprise

Legal Quotation

Quote Number	Page
SLED-03230-00	2

Changing the configuration may affect the offer.

The following structured solution, items 0100 and subitems, is offered for sale with a defined configuration menu and solution adjustment.

No.	Qty	Product	Description	EDT
	2	Opt. YUA	HP 3PAR 8200 OS Suite Base Supp	
	20	Opt. YUB	HP 3PAR 8200 OS Suite Drive Supp	
	2	Opt. YUE	HP 3PAR 8200 Replication Suite Base Supp	
	20	Opt. YUF	HP 3PAR 8200 Replication Ste Drive Supp	
1100	16	QK734A	HP Premier Flex LC/LC OM4 2f 5m Cbl	10
1200	1	HA124A1	HP Technical Installation Startup SVC	
	2	Opt. 5T7	HPE StoreOnce single n Catalyst Stup SVC	
	2	Opt. 5WE	HPE StoreOnce RMC VMw for 3PAR SVC	
	2	Opt. 55Q	HP Startup StoreOnce Backup System SVC	
	2	Opt. 5Y8	HP Startup 3PAR 8K Rpl Ste VC-RC-PP SVC	
			Grand Total:	**US$ 284,499.62**

Hewlett Packard Enterprise

Legal Quotation

Changing the configuration may affect the offer.

The following structured solution, items 0100 and subitems, is offered for sale with a defined configuration menu and solution adjustment.

"For inquiries regarding this quote please contact: rfq-us-sled@hpe.com

Upon issuing a Purchase Order to Hewlett Packard Enterprise please include the following:
Hewlett Packard Enterprise listed as the Vendor
Bill to & ship to addresses
PO# and valid Hewlett Packard Enterprise quote number
Hewlett Packard Enterprise Purchase Agreement # (if applicable)
Contact name, phone number & e-Mail address
For electronic software include the end user e-Mail Address
Requested delivery date (per SLA requirements) and any special delivery requirements
Tax status
If support is ordered provide the end user's name and phone number. For upgrades include the serial number or the support identifier for contract entitlement.

*Prices are exclusive of use, sales value added and other taxes. Should the item(s) being quoted herein be exempt from sales tax please include the appropriate valid tax exemption certificate referencing Hewlett Packard Enterprise as the vendor.

*If quoted herein, Remarketed Products are fully remanufactured and carry new product warranty. Purchase is subject to inventory availability at receipt of order. Inventory may not be reserved. Hewlett Packard Enterprise reserves the right to substitute new components if appropriate, or to cancel orders by notifying the customer if necessary components are unavailable.

*If quoted herein, Hewlett Packard Enterprise Promotions must be ordered as quoted, no substitutions will be allowed. POs must be received on or prior to the expiration date of the quote or special promotion whichever comes first.

*If quoted herein, Hewlett Packard Enterprise Consignment/Demo equipment is currently at the location listed on this quote. Issuing a PO against this formal quotation will imply acceptance and delivery of the Consignment/Demo inventory. The standard warranty applicable to new equipment will apply. Some demo equipment may contain products that are remanufactured to be functionally equivalent to new."
Quote contains special discounts. Unless the customer has another valid agreement with Hewlett Packard Enterprise, this quotation is governed by Hewlett Packard Enterprise Customer Terms - Portfolio. A copy of these terms can be found on-line at http://www8.hp.com/us/en/hpe/hp-information/end-user-agreement/terms.html.

Support Account Overview

Hewlett Packard Enterprise

AMP ID: 135073090NBQ

Special Terms and Conditions No: EANDI-2006

Customer Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

HPE Address:
Hewlett Packard Enterprise Company
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE CA 95747

Customer Contact:
Brian J. Pratt
Tel: (304) 957-8285
Fax: (n/a)
E-mail: Brian.J.Pratt@wv.gov

HPE Contact:
New Business Quotes
Tel: (800) 386-1115 OPT-4-4-2
Fax: (800) 307-0361

This quote is valid until 02/11/2016

This order is governed by the specific agreement referenced below in the comment section. If none is identified, then Hewlett Packard Enterprise's standard terms, as indicated below for the services you purchased will apply. Either one is the "Agreement". Multi-year support renewals are governed by the Exhibit E24 in addition to the Agreement unless otherwise specified.

Hewlett Packard Enterprise Standard Terms:
For HPE Software Support terms and datasheets, visit https://www.hpe.com/software/support_options
For HPE terms for Software-as-a-Service, visit www.hpe.com/docs/customerterms
For all other support terms and datasheets, including information on the format of this document, visit:
www.hpe.com/services/supportdocs2

Your Support Access Options for Service Agreement Customers:

- **Manage your service agreement online, visit** - https://s360.hpe.com / https://esam.hpe.com
- **HPE Support Center** - www.hpe.com/support/hpesc
- **HPE Software Support Online** https://softwaresupport.hpe.com

Please have your Service Agreement ID and Product/Serial available to expedite your support experience.
For Support, please call: 800-633-3600

Support Account Reference	Service Agreement ID	Coverage Period From:	To:	Description	Contract Total/USD
WV 3PAR01	1046 0358 4098	02/12/2016	02/11/2017	Case 5306191609 / CSIF ID DAUS00-99815N	29,058.48
				Total Excluding Taxes	**29,058.48**

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Support Account Overview

Hewlett Packard Enterprise

AMP ID: 135073090NBQ

Customer Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

HPE Address:
Hewlett Packard Enterprise Company
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE CA 95747

Support Account Reference	Coverage Period From	To	Description	Contract Total/USD

Summary of Charges	
Hardware Support	20,980.08
Software Support-Labor	5,298.48
Software Support-Materials	2,779.92
Total Excluding Taxes	**29,058.48**

Total excludes all taxes. If applicable, taxes will be added at the time of invoicing at the current tax rate.
Total price includes all additions, deletions, warranties, discounts and adjustments if applicable.
Refer to the detail document for any applicable state & local tax

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Support Account Detail

Hewlett Packard Enterprise

Special Terms and Conditions No: EANDI-2006
Your PO Reference:
CCRN Number: 0460358400

Support Account Reference: WV 3PAR01

HPE Reference No.: 46717642

Equipment Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

Software Update Address:
STATE OF WEST VIRGINIA
DEPARTMENT OF IS&C
1900 Kanawha Blvd E
Charleston WV 25305-0009

Hardware Contact:
Brian J. Pratt
Tel: (304) 957-8285
Fax: (n/a)

Software Contact:
Brian J. Pratt
Tel: (304) 957-8285
Fax: (n/a)

This quote is valid until 02/11/2016
Coverage from: 02/12/2016 to: 02/11/2017

Service Agreement ID: 1046 0358 4098 **For Support, please call: 800-633-3600**

Product No.	Description	Serial No.	Coverage Period from	to	Qty	Price/USD
H1K92AC	**HP 4 hour 24x7 Proactive Care SVC**					
***** Hardware Support *****						
	HPE Hardware Maintenance Onsite Support					
	Hardware Problem Diagnosis					
	Onsite Support					
	Parts and Material provided					
	4 Hr Onsite Response					
	24 Hrs Std Office Days					
	24 hrs, Day 6					
	24 hrs, Day 7					
	Holidays Covered					
	Travel Zone 1					
	No Usage Limitation					
	Remote Delivery SVC Advanced					
	Access to Adv Tech Specialists					
K2Q36A	HP 3PAR StoreServ 8200 2N Fld Int Base				2	53.46
H6Z10A	HP 3PAR 8000 2-pt 10Gb iSCSI/FCoE Adptr				4	27.72
K2P91A	HP 3PAR 8000 3.84TB SAS cMLC SFF SSD				20	1,346.40
BB915A	HPE StoreOnce 5100 48TB System				2	297.00
BB926A	HPE StoreOnce 10GbE Network Card				2	0.00
BB928A	HPE StoreOnce 8Gb Fibre Channel Card				2	0.00
BB949A	HPE StoreOnce 10GbE Netwrk Exp LTU				2	0.00
BB951A	HPE StoreOnce 8Gb Fibre Channel Card LTU				2	0.00
K2R28A	HP 3PAR StoreServ SPS Service Processor				2	23.76
Discounts						
Pre Payment HdrDisc% -1%						*17.66-*

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Hewlett Packard Enterprise

Special Terms and Conditions No: EANDI-2006
Your PO Reference:
CCRN Number: 0460358400

Product No.	Description	Serial No.	Coverage Period from: to:	Qty	Price/USD

***** Software Support *****

HPE Software Technical Unlimited Support
SW Technical Support
SW Electronic Support
24 Hrs Std Office Days
24 Hrs Day 6
24 Hrs Day 7
Holidays Covered
Standard Response
Access to Adv Tech Specialists

L7B45A	HP 3PAR 8200 OS Suite Base LTU	2	168.30
L7B46A	HP 3PAR 8200 OS Suite Drive LTU	20	39.60
L7B49A	HP 3PAR 8200 Replication Suite Base LTU	2	79.20
L7B50A	HP 3PAR 8200 Replication Ste Drive LTU	20	39.60
BB888AAE	HPE StoreOnce 4500/5100 Catalyst E-LTU	2	63.36
D4U64AAE	HP StoreOnce RMC-V 7200/8200 E-LTU	2	51.48

HPE Software Updates SVC
License to Use & SW Updates
HPE Recommended SW Upd Method
HPE Recommended Doc Upd Method

L7B45A	HP 3PAR 8200 OS Suite Base LTU	2	89.10
L7B46A	HP 3PAR 8200 OS Suite Drive LTU	20	19.80
L7B49A	HP 3PAR 8200 Replication Suite Base LTU	2	41.58
L7B50A	HP 3PAR 8200 Replication Ste Drive LTU	20	19.80
BB888AAE	HPE StoreOnce 4500/5100 Catalyst E-LTU	2	33.66
BD362AAE	HP 3PAR StoreServ Mgmt/Core SW E-Media	2	0.00
BD363AAE	HP 3PAR OS Suite Latest E-Media	2	0.00
BD365AAE	HP 3PAR SP SW Latest E-Media	2	0.00
D4U64AAE	HP StoreOnce RMC-V 7200/8200 E-LTU	2	27.72

Discounts

Pre Payment HdrDisc% -1%	*6.80-*

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Hewlett Packard Enterprise

Special Terms and Conditions No: EANDI-2006
Your PO Reference:
CCRN Number: 0460358400

Product No.	Description	Serial No.	Coverage Period from:	to:	Qty	Price/USD

Summary of Charges	
Hardware Support	1,748.34
Hardware Support Tax WV	0.00
Software Support-Labor	441.54
Software Support-Labor Tax WV	0.00
Software Support-Materials	231.66
Software Support-Materials Tax WV	0.00
TOTAL INCLUDING TAX	**2,421.54**

Taxes have been added at current rate, however, tax rates will be those in effect at the time of invoicing.
Total price includes all additions, deletions, warranties, discounts and adjustments if applicable.

Hardware products under warranty				
K2Q36A	HP 3PAR StoreServ 8200 2N Fld Int Base	02/12/2016	03/13/2019	2
H6Z10A	HP 3PAR 8000 2-pt 10Gb iSCSI/FCoE Adptr	02/12/2016	03/13/2019	4
K2P91A	HP 3PAR 8000 3.84TB SAS cMLC SFF SSD	02/12/2016	03/13/2021	20
BB915A	HPE StoreOnce 5100 48TB System	02/12/2016	03/13/2017	2
BB926A	HPE StoreOnce 10GbE Network Card	02/12/2016	03/13/2017	2
BB928A	HPE StoreOnce 8Gb Fibre Channel Card	02/12/2016	03/13/2017	2
BB949A	HPE StoreOnce 10GbE Netwrk Exp LTU	02/12/2016	03/13/2017	2
BB951A	HPE StoreOnce 8Gb Fibre Channel Card LTU	02/12/2016	03/13/2017	2
K2R28A	HP 3PAR StoreServ SPS Service Processor	02/12/2016	03/13/2019	2

SW products with pre paid support				
BB915A	HPE StoreOnce 5100 48TB System	02/12/2016	03/13/2017	2

Please refer to the payment schedule for prices to be invoiced yearly in advance.

Payment Schedule as of 01/15/2016

AMP ID: 135073090NBQ

Settlement Period from: From: 02/12/2016 to: 02/11/2017

Support Account Reference	02/12/2016 02/11/2017
WV 3PAR01	29,058.48

Applicable tax to be added to the invoice.

Please refer to the payment schedule for prices to be invoiced yearly in advance. Price in USD.

New Business Quotes
Hewlett Packard Enterprise Company
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE CA 95747

Hewlett Packard Enterprise

BRIAN J. PRATT
STATE OF WEST VIRGINIA
DEPARTMENT OF INFORMATION
SERVICES AND COMMUNICATION
1900 Kanawha Blvd E
Charleston WV 25305-0009

01/15/2016

Support Account Reference: WV 3PAR01
HPE Reference Number: 46717642

Dear BRIAN J. PRATT:

Enclosed is a Hewlett Packard Enterprise support service quote for your products. Review the services, support items, coverage dates, addresses, and company contacts for accuracy. Please advise Hewlett Packard Enterprise of any changes prior to submitting your purchase order or authorization. To order support services detailed in this package, please return billing authorization by choosing one of the following convenient options. Subject to HPE Single Order Terms for Support or purchase agreement with Hewlett Packard Enterprise and if applicable, Exhibit E24.

Option 1: Provide an open-ended purchase order. An open-ended purchase order allows Hewlett Packard Enterprise to add products to your agreement as necessary, as well as renew your support from year to year. Cancellation of the support service agreement requires a 30-day written notice.

Option 2: Provide a PO for the coverage dates specified in the enclosed referenced proposal.
Your PO must note at least one of the following, along with the support coverage period:
1. Hewlett Packard Enterprise Reference (quote) number(s),
2. Support Account Reference(s) (SAR)
3. Service Agreement ID(s) (SAID)
4. AMP ID(s)

* If there is an approval signature section on your PO then it should be signed/approved before sending to Hewlett Packard Enterprise. Please indicate if you are taxable or tax exempt. If your organization is Tax Exempt, please send a copy of your Tax Exemption Certificate with your PO. Include your billing frequency and current invoice-to address.

Option 3: Sign and return the attached Signature Authorization Form (SAM).
* If you provide authorization via the SAM form (Signature Authorization Method), please insure that all of the applicable boxes are checked on the form, along with the printed name and signature of the authorizing party.

Note: If the information in Options 1 through 3 is not included in your PO or SAM Form then Hewlett Packard Enterprise will need to contact you to collect this missing data, which will cause a delay in activating your support contract(s). Hewlett Packard Enterprise requires these details for audit purposes.

Hewlett Packard Enterprise values your business and looks forward to providing you with continued support. If you require further assistance, please contact your Contract Administrator at (800) 386-1115 OPT-4-4-2. You can send your PO or SAM to your Support Services Representative, or FAX it to (800) 307-0361.

Sincerely,
New Business Quotes
Contract Admin.

Hewlett Packard Enterprise

SIGNATURE AUTHORIZATION METHOD (SAM)

The Signature Authorization Method (SAM) may be used to order Hewlett Packard Enterprise (HPE) Support Services **ONLY IF A PURCHASE ORDER IS NOT REQUIRED TO AUTHORIZE SERVICE DELIVERY AND REMIT PAYMENT.** This SAM form, including the quotation(s) and governing terms referenced herein shall be referred to collectively as the "Support Agreement."

(1) Customer Information:

Company Name	**Invoice to Address**
STATE OF WEST VIRGINIA DEPARTMENT OF IS&C	1900 Kanawha Blvd E Charleston WV 25305-0009

(2) Contract Information: Unless otherwise notified all quotes under the AMP ID below will be renewed:

[ ] Initial Quote Number:46717642 **[ ]** AMP ID:** 135073090NBQ

Support Account Reference: WV 3PAR01 **Coverage Period:** 02/12/2016 - 02/11/2017

***The enclosed Support Account Overview dated 01/15/2016 summarizes the quotes contained within the above AMP ID.

This quote bundle is valid until: 02/11/2016

[ ] Check as applicable if your authorization is open-ended.

The following term applies only to open-ended support agreements. This Support Agreement is for the period stated on Hewlett Packard Enterprise's quote. It will be extended without modification by consecutive terms of 12 months unless one of the parties gives written notice in accordance with the underlying business terms prior to the end of the respective 12 months. If modifications of the Support Agreement are necessary, Hewlett Packard Enterprise will notify Customer in writing 60 days before the modifications are effective. Customer may terminate this Support Agreement within 30 days from receipt of notice. If Customer does not exercise this right of termination, this Support Agreement will be continued to the end of the current term with the modifications, and extended by consecutive 12-month terms. Re-pricing will occur automatically without further authorization.

(3) REQUIRED- Tax Information:

[ ] Taxable **OR** [ ] Tax Exempt Exemption #_____ (Attach copy of exemption certificate)

(4) REQUIRED- Billing Frequency: Do not enclose Payment. Please select one of the following:

Please bill me: [ ] Pre-Pay up front for the entire coverage term

[ ] Annually

[ ] Quarterly (Total annual amount must exceed $2400)

[ ] Semi-Annually (Total annual amount must exceed $2400)

[ ] Monthly (Total annual amount must exceed $2400)

[ ] Charge my credit card. Check one: [ ]Visa [ ]MasterCard [ ]American Express

For your protection, please call your HPE Sales Representative or Contract Admin with the credit card number.

Cardholder Name (Print) _____

Cardholder's Signature_____

Credit Card Invoice-To Address _____

(5) REQUIRED- Service Authorization and Terms and Conditions:

Customer's signature on this form constitutes authorization for Hewlett Packard Enterprise to invoice Customer for the Hewlett Packard Enterprise support services represented in this Support Agreement. This support agreement will be governed by the following: i) The purchase agreement currently in effect between Customer and Hewlett Packard Enterprise that includes the delivery of Support Services, or if none, the Hewlett Packard Enterprise Customer Terms-Support (CTSP01), the Supplemental Data Sheet (CTDS01); and ii) any applicable Transaction Documents thereto.

_____

Authorized Signature and Date

_____ _____

Printed Name, Title and Phone Number

(6) Completed form should be returned to:

Hewlett Packard Enterprise Company
New Business Quotes
8000 FOOTHILLS BLVD MS 5511
ROSEVILLE, CA 95747

TEL:(800) 386-1115 OPT-4-4-2
FAX:(800) 307-0361

RFQ No. ISC1600000005

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Hewlett Packard Enterprise Company

Authorized Signature: David Howerton Date: 01/18/16

David Howerton

State of Kentucky

County of Scott, to-wit:

Taken, subscribed, and sworn to before me this 19th day of January, 2016.

My Commission expires October 4th, 2017.

AFFIX SEAL HERE

NOTARY PUBLIC Jodi Gulley

Jodi Gulley
Notary Public, ID No. 498554
State at Large, Kentucky
My Commission Expires on Oct. 4, 2017

Rev. 04/14

State of West Virginia
VENDOR PREFERENCE CERTIFICATE

Certification and application* is hereby made for Preference in accordance with ***West Virginia Code***, §5A-3-37. (Does not apply to construction contracts). ***West Virginia Code***, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the ***West Virginia Code***. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Vendor Preference, if applicable.

1. **Application is made for 2.5% vendor preference for the reason checked:**
   ____ Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**
   ____ Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**
   ____ Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or,**

2. **Application is made for 2.5% vendor preference for the reason checked:**
   ____ Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

3. **Application is made for 2.5% vendor preference for the reason checked:**
   ____ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

4. **Application is made for 5% vendor preference for the reason checked:**
   ____ Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or,**

5. **Application is made for 3.5% vendor preference who is a veteran for the reason checked:**
   ____ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or,**

6. **Application is made for 3.5% vendor preference who is a veteran for the reason checked:**
   ____ Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

7. **Application is made for preference as a non-resident small, women- and minority-owned business, in accordance with *West Virginia Code* §5A-3-59 and *West Virginia Code of State Rules*.**
   ____ Bidder has been or expects to be approved prior to contract award by the Purchasing Division as a certified small, women- and minority-owned business.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: Hewlett Packard Enterprise Company **Signed:** David Hewitt

Date: 01/10/16 **Title:** Sales

INSTRUCTIONS TO VENDORS SUBMITTING BIDS

1. REVIEW DOCUMENTS THOROUGHLY: The attached documents contain a solicitation for bids. Please read these instructions and all documents attached in their entirety. These instructions provide critical information about requirements that if overlooked could lead to disqualification of a Vendor's bid. All bids must be submitted in accordance with the provisions contained in these instructions and the Solicitation. Failure to do so may result in disqualification of Vendor's bid.

2. MANDATORY TERMS: The Solicitation may contain mandatory provisions identified by the use of the words "must," "will," and "shall." Failure to comply with a mandatory term in the Solicitation will result in bid disqualification.

3. PREBID MEETING: The item identified below shall apply to this Solicitation.

☑ A pre-bid meeting will not be held prior to bid opening

☐ A **NON-MANDATORY PRE-BID** meeting will be held at the following place and time:

☐ A **MANDATORY PRE-BID** meeting will be held at the following place and time:

All Vendors submitting a bid must attend the mandatory pre-bid meeting. Failure to attend the mandatory pre-bid meeting shall result in disqualification of the Vendor's bid. No one person attending the pre-bid meeting may represent more than one Vendor.

An attendance sheet provided at the pre-bid meeting shall serve as the official document verifying attendance. The State will not accept any other form of proof or documentation to verify attendance. Any person attending the pre-bid meeting on behalf of a Vendor must list on the attendance sheet his or her name and the name of the Vendor he or she is representing.

Additionally, the person attending the pre-bid meeting should include the Vendor's E-Mail address, phone number, and Fax number on the attendance sheet. It is the Vendor's responsibility

to locate the attendance sheet and provide the required information. Failure to complete the attendance sheet as required may result in disqualification of Vendor's bid.

All Vendors should arrive prior to the starting time for the pre-bid. Vendors who arrive after the starting time but prior to the end of the pre-bid will be permitted to sign in, but are charged with knowing all matters discussed at the pre-bid.

Questions submitted at least five business days prior to a scheduled pre-bid will be discussed at the pre-bid meeting if possible. Any discussions or answers to questions at the pre-bid meeting are preliminary in nature and are non-binding. Official and binding answers to questions will be published in a written addendum to the Solicitation prior to bid opening.

4. VENDOR QUESTION DEADLINE: Vendors may submit questions relating to this Solicitation to the Purchasing Division. Questions must be submitted in writing. All questions must be submitted on or before the date listed below and to the address listed below in order to be considered. A written response will be published in a Solicitation addendum if a response is possible and appropriate. Non-written discussions, conversations, or questions and answers regarding this Solicitation are preliminary in nature and are nonbinding.

Submitted e-mails should have solicitation number in the subject line.

Question Submission Deadline: 2:00pm December 30,2015

Submit Questions to: Stephanie Gale
2019 Washington Street, East
Charleston, WV 25305
Fax: (304) 558-4115 (Vendors should not use this fax number for bid submission)
Email: stephanie.l.gale@wv.gov

5. VERBAL COMMUNICATION: Any verbal communication between the Vendor and any State personnel is not binding, including verbal communication at the mandatory pre-bid conference. Only information issued in writing and added to the Solicitation by an official written addendum by the Purchasing Division is binding.

6. BID SUBMISSION: All bids must be submitted electronically through wvOASIS or signed and delivered by the Vendor to the Purchasing Division at the address listed below on or before the date and time of the bid opening. Any bid received by the Purchasing Division staff is considered to be in the possession of the Purchasing Division and will not be returned for any reason. The Purchasing Division will not accept bids, modification of bids, or addendum acknowledgment forms via e-mail. Acceptable delivery methods include electronic submission via wvOASIS, hand delivery, delivery by courier, or facsimile.

The bid delivery address is:
Department of Administration, Purchasing Division
2019 Washington Street East
Charleston, WV 25305-0130

A bid that is not submitted electronically through wvOASIS should contain the information listed below on the face of the envelope or the bid may be rejected by the Purchasing Division.:

SEALED BID:
BUYER:
SOLICITATION NO.:
BID OPENING DATE:
BID OPENING TIME:
FAX NUMBER:

In the event that Vendor is responding to a request for proposal, the Vendor shall submit one original technical and one original cost proposal plus _____ convenience copies of each to the Purchasing Division at the address shown above. Submission of a response to a request for proposal is not permitted in wvOASIS. Additionally, the Vendor should identify the bid type as either a technical or cost proposal on the face of each bid envelope submitted in response to a request for proposal as follows:

BID TYPE: (This only applies to CRFP)
☐ Technical
☐ Cost

7. BID OPENING: Bids submitted in response to this Solicitation will be opened at the location identified below on the date and time listed below. Delivery of a bid after the bid opening date and time will result in bid disqualification. For purposes of this Solicitation, a bid is considered delivered when confirmation of delivery is provided by wvOASIS (in the case of electronic submission) or when the bid is time stamped by the official Purchasing Division time clock (in the case of hand delivery).

Bid Opening Date and Time: 1:30pm January 14, 2016

Bid Opening Location: Department of Administration, Purchasing Division
2019 Washington Street East
Charleston, WV 25305-0130

8. ADDENDUM ACKNOWLEDGEMENT: Changes or revisions to this Solicitation will be made by an official written addendum issued by the Purchasing Division. Vendor should acknowledge receipt of all addenda issued with this Solicitation by completing an Addendum Acknowledgment Form, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

9. BID FORMATTING: Vendor should type or electronically enter the information onto its bid to prevent errors in the evaluation. Failure to type or electronically enter the information may result in bid disqualification.

10. ALTERNATES: Any model, brand, or specification listed in this Solicitation establishes the acceptable level of quality only and is not intended to reflect a preference for, or in any way favor, a particular brand or vendor. Vendors may bid alternates to a listed model or brand provided that the alternate is at least equal to the model or brand and complies with the required specifications. The equality of any alternate being bid shall be determined by the State at its sole discretion. Any Vendor bidding an alternate model or brand should clearly identify the alternate items in its bid and should include manufacturer's specifications, industry literature, and/or any other relevant documentation demonstrating the equality of the alternate items. Failure to provide information for alternate items may be grounds for rejection of a Vendor's bid.

11. EXCEPTIONS AND CLARIFICATIONS: The Solicitation contains the specifications that shall form the basis of a contractual agreement. Vendor shall clearly mark any exceptions, clarifications, or other proposed modifications in its bid. Exceptions to, clarifications of, or modifications of a requirement or term and condition of the Solicitation may result in bid disqualification.

12. COMMUNICATION LIMITATIONS: In accordance with West Virginia Code of State Rules §148-1-6.6, communication with the State of West Virginia or any of its employees regarding this Solicitation during the solicitation, bid, evaluation or award periods, except through the Purchasing Division, is strictly prohibited without prior Purchasing Division approval. Purchasing Division approval for such communication is implied for all agency delegated and exempt purchases.

13. REGISTRATION: Prior to Contract award, the apparent successful Vendor must be properly registered with the West Virginia Purchasing Division and must have paid the $125 fee, if applicable.

14. UNIT PRICE: Unit prices shall prevail in cases of a discrepancy in the Vendor's bid.

15. PREFERENCE: Vendor Preference may only be granted upon written request and only in accordance with the West Virginia Code § 5A-3-37 and the West Virginia Code of State Rules. A Vendor Preference Certificate form has been attached hereto to allow Vendor to apply for the preference. Vendor's failure to submit the Vendor Preference Certificate form with its bid will result in denial of Vendor Preference. Vendor Preference does not apply to construction projects.

16. SMALL, WOMEN-OWNED, OR MINORITY-OWNED BUSINESSES: For any solicitations publicly advertised for bid, in accordance with West Virginia Code §5A-3-37(a)(7) and W. Va. CSR § 148-22-9, any non-resident vendor certified as a small, women-owned, or minority-owned business under W. Va. CSR § 148-22-9 shall be provided the same preference made available to any resident vendor. Any non-resident small, women-owned, or minority-owned business must identify itself as such in writing, must submit that writing to the Purchasing Division with its bid, and must be properly certified under W. Va. CSR § 148-22-9 prior to contract award to receive the preferences made available to resident vendors. Preference for a non-resident small, women-owned, or minority owned business shall be applied in accordance with W. Va. CSR § 148-22-9.

17. WAIVER OF MINOR IRREGULARITIES: The Director reserves the right to waive minor irregularities in bids or specifications in accordance with West Virginia Code of State Rules § 148-1-4.6.

18. ELECTRONIC FILE ACCESS RESTRICTIONS: Vendor must ensure that its submission in wvOASIS can be accessed by the Purchasing Division staff immediately upon bid opening. The Purchasing Division will consider any file that cannot be immediately opened and/or viewed at the time of the bid opening (such as, encrypted files, password protected files, or incompatible files) to be blank or incomplete as context requires, and are therefore unacceptable. A vendor will not be permitted to unencrypt files, remove password protections, or resubmit documents after bid opening if those documents are required with the bid.

19. NON-RESPONSIBLE: The Purchasing Division Director reserves the right to reject the bid of any vendor as Non-Responsible in accordance with W. Va. Code of State Rules § 148-1-5.3, when the Director determines that the vendor submitting the bid does not have the capability to fully perform, or lacks the integrity and reliability to assure good-faith performance."

20. ACCEPTANCE/REJECTION: The State may accept or reject any bid in whole, or in part in accordance with W. Va. Code of State Rules § 148-1-4.5. and § 148-1-6.4.b."

21. YOUR SUBMISSION IS A PUBLIC DOCUMENT: Vendor's entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled "confidential," "proprietary," "trade secret," "private," or labeled with any other claim against public disclosure of the documents, to

include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

GENERAL TERMS AND CONDITIONS:

1. CONTRACTUAL AGREEMENT: Issuance of a Award Document signed by the Purchasing Division Director, or his designee, and approved as to form by the Attorney General's office constitutes acceptance of this Contract made by and between the State of West Virginia and the Vendor. Vendor's signature on its bid signifies Vendor's agreement to be bound by and accept the terms and conditions contained in this Contract.

2. DEFINITIONS: As used in this Solicitation/Contract, the following terms shall have the meanings attributed to them below. Additional definitions may be found in the specifications included with this Solicitation/Contract.

2.1. "Agency" or **"Agencies"** means the agency, board, commission, or other entity of the State of West Virginia that is identified on the first page of the Solicitation or any other public entity seeking to procure goods or services under this Contract.

2.2. "Bid" or **"Proposal"** means the vendors submitted response to this solicitation.

2.3. "Contract" means the binding agreement that is entered into between the State and the Vendor to provide the goods or services requested in the Solicitation.

2.4. "Director" means the Director of the West Virginia Department of Administration, Purchasing Division.

2.5. "Purchasing Division" means the West Virginia Department of Administration, Purchasing Division.

2.6. "Award Document" means the document signed by the Agency and the Purchasing Division, and approved as to form by the Attorney General, that identifies the Vendor as the contract holder.

2.7. "Solicitation" means the official notice of an opportunity to supply the State with goods or services that is published by the Purchasing Division.

2.8. "State" means the State of West Virginia and/or any of its agencies, commissions, boards, etc. as context requires.

2.9. "Vendor" or **"Vendors"** means any entity submitting a bid in response to the Solicitation, the entity that has been selected as the lowest responsible bidder, or the entity that has been awarded the Contract as context requires.

3. CONTRACT TERM; RENEWAL; EXTENSION: The term of this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below:

☐ **Term Contract**

Initial Contract Term: This Contract becomes effective on _____ and extends for a period of _____year(s).
Renewal Term: This Contract may be renewed upon the mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any request for renewal should be submitted to the Purchasing Division thirty (30) days prior to the expiration date of the initial contract term or appropriate renewal term. A Contract renewal shall be in accordance with the terms and conditions of the original contract. Renewal of this Contract is limited to _____ successive one (1) year periods or multiple renewal periods of less than one year, provided that the multiple renewal periods do not exceed _____ months in total. Automatic renewal of this Contract is prohibited. Notwithstanding the foregoing, Purchasing Division approval is not required on agency delegated or exempt purchases. Attorney General approval may be required for vendor terms and conditions.

Delivery Order Limitations: In the event that this contract permits delivery orders, a delivery order may only be issued during the time this Contract is in effect. Any delivery order issued within one year of the expiration of this Contract shall be effective for one year from the date the delivery order is issued. No delivery order may be extended beyond one year after this Contract has expired.

☐ **Fixed Period Contract:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and must be completed within _____ days.

☑ **Fixed Period Contract with Renewals:** This Contract becomes effective upon Vendor's receipt of the notice to proceed and part of the Contract more fully described in the attached specifications must be completed within 60 (sixty) days.

Upon completion, the vendor agrees that maintenance, monitoring, or warranty services will be provided for one year thereafter with an additional _____ successive one year renewal periods or multiple renewal periods of less than one year provided that the multiple renewal periods do not exceed _____ months in total. Automatic renewal of this Contract is prohibited.

☐ **One Time Purchase:** The term of this Contract shall run from the issuance of the Award Document until all of the goods contracted for have been delivered, but in no event will this Contract extend for more than one fiscal year.

☐ **Other:** See attached.

4. NOTICE TO PROCEED: Vendor shall begin performance of this Contract immediately upon receiving notice to proceed unless otherwise instructed by the Agency. Unless otherwise specified, the fully executed Award Document will be considered notice to proceed.

5. QUANTITIES: The quantities required under this Contract shall be determined in accordance with the category that has been identified as applicable to this Contract below.

☐ **Open End Contract:** Quantities listed in this Solicitation are approximations only, based on estimates supplied by the Agency. It is understood and agreed that the Contract shall cover the quantities actually ordered for delivery during the term of the Contract, whether more or less than the quantities shown.

☐ **Service:** The scope of the service to be provided will be more clearly defined in the specifications included herewith.

☑ **Combined Service and Goods:** The scope of the service and deliverable goods to be provided will be more clearly defined in the specifications included herewith.

☐ **One Time Purchase:** This Contract is for the purchase of a set quantity of goods that are identified in the specifications included herewith. Once those items have been delivered, no additional goods may be procured under this Contract without an appropriate change order approved by the Vendor, Agency, Purchasing Division, and Attorney General's office.

6. PRICING: The pricing set forth herein is firm for the life of the Contract, unless specified elsewhere within this Solicitation/Contract by the State. A Vendor's inclusion of price adjustment provisions in its bid, without an express authorization from the State in the Solicitation to do so, may result in bid disqualification.

7. EMERGENCY PURCHASES: The Purchasing Division Director may authorize the Agency to purchase goods or services in the open market that Vendor would otherwise provide under this Contract if those goods or services are for immediate or expedited delivery in an emergency. Emergencies shall include, but are not limited to, delays in transportation or an unanticipated increase in the volume of work. An emergency purchase in the open market, approved by the Purchasing Division Director, shall not constitute of breach of this Contract and shall not entitle the Vendor to any form of compensation or damages. This provision does not excuse the State from fulfilling its obligations under a One Time Purchase contract.

8. REQUIRED DOCUMENTS: All of the items checked below must be provided to the Purchasing Division by the Vendor as specified below.

☐ **BID BOND:** All Vendors shall furnish a bid bond in the amount of five percent (5%) of the total amount of the bid protecting the State of West Virginia. The bid bond must be submitted with the bid.

☐ **PERFORMANCE BOND:** The apparent successful Vendor shall provide a performance bond in the amount of _____. The performance bond must be received by the Purchasing Division prior to Contract award. On construction contracts, the performance bond must be 100% of the Contract value.

☐ **LABOR/MATERIAL PAYMENT BOND:** The apparent successful Vendor shall provide a labor/material payment bond in the amount of 100% of the Contract value. The labor/material payment bond must be delivered to the Purchasing Division prior to Contract award.
In lieu of the Bid Bond, Performance Bond, and Labor/Material Payment Bond, the Vendor may provide certified checks, cashier's checks, or irrevocable letters of credit. Any certified check, cashier's check, or irrevocable letter of credit provided in lieu of a bond must be of the same amount and delivered on the same schedule as the bond it replaces. A letter of credit submitted in lieu of a performance and labor/material payment bond will only be allowed for projects under $100,000. Personal or business checks are not acceptable.

☐ **MAINTENANCE BOND:** The apparent successful Vendor shall provide a two (2) year maintenance bond covering the roofing system. The maintenance bond must be issued and delivered to the Purchasing Division prior to Contract award.

☐ **INSURANCE:** The apparent successful Vendor shall furnish proof of the following insurance prior to Contract award and shall list the state as a certificate holder:

☐ **Commercial General Liability Insurance:** In the amount of _____ _____ or more.

☐ **Builders Risk Insurance:** In an amount equal to 100% of the amount of the Contract.

☐

☐

☐

☐

☐

The apparent successful Vendor shall also furnish proof of any additional insurance requirements contained in the specifications prior to Contract award regardless of whether or not that insurance requirement is listed above.

☐ **LICENSE(S) / CERTIFICATIONS / PERMITS:** In addition to anything required under the Section entitled Licensing, of the General Terms and Conditions, the apparent successful Vendor shall furnish proof of the following licenses, certifications, and/or permits prior to Contract award, in a form acceptable to the Purchasing Division.

☐

☐

☐

☐

The apparent successful Vendor shall also furnish proof of any additional licenses or certifications contained in the specifications prior to Contract award regardless of whether or not that requirement is listed above.

9. WORKERS' COMPENSATION INSURANCE: The apparent successful Vendor shall comply with laws relating to workers compensation, shall maintain workers' compensation insurance when required, and shall furnish proof of workers' compensation insurance upon request.

10. LITIGATION BOND: The Director reserves the right to require any Vendor that files a protest of an award to submit a litigation bond in the amount equal to one percent of the lowest bid submitted or $5,000, whichever is greater. The entire amount of the bond shall be forfeited if the hearing officer determines that the protest was filed for frivolous or improper purpose, including but not limited to, the purpose of harassing, causing unnecessary delay, or needless expense for the Agency. All litigation bonds shall be made payable to the Purchasing Division. In lieu of a bond, the protester may submit a cashier's check or certified check payable to the Purchasing Division. Cashier's or certified checks will be deposited with and held by the State Treasurer's office. If it is determined that the protest has not been filed for frivolous or improper purpose, the bond or deposit shall be returned in its entirety.

11. LIQUIDATED DAMAGES: Vendor shall pay liquidated damages in the amount of

_____

for _____.

This clause shall in no way be considered exclusive and shall not limit the State or Agency's right to pursue any other available remedy.

12. ACCEPTANCE: Vendor's signature on its bid, or on the certification and signature page, constitutes an offer to the State that cannot be unilaterally withdrawn, signifies that the product or service proposed by vendor meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise indicated, and signifies acceptance of the terms and conditions contained in the Solicitation unless otherwise indicated.

13. FUNDING: This Contract shall continue for the term stated herein, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise made available, this Contract becomes void and of no effect beginning on July 1 of the fiscal year for which funding has not been appropriated or otherwise made available.

14. PAYMENT: Payment in advance is prohibited under this Contract. Payment may only be made after the delivery and acceptance of goods or services. The Vendor shall submit invoices, in arrears.

15. TAXES: The Vendor shall pay any applicable sales, use, personal property or any other taxes arising out of this Contract and the transactions contemplated thereby. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.

16. CANCELLATION: The Purchasing Division Director reserves the right to cancel this Contract immediately upon written notice to the vendor if the materials or workmanship supplied do not conform to the specifications contained in the Contract. The Purchasing Division Director may also cancel any purchase or Contract upon 30 days written notice to the Vendor in accordance with West Virginia Code of State Rules §§ 148-1-6.1.e.

17. TIME: Time is of the essence with regard to all matters of time and performance in this Contract.

18. APPLICABLE LAW: This Contract is governed by and interpreted under West Virginia law without giving effect to its choice of law principles. Any information provided in specification manuals, or any other source, verbal or written, which contradicts or violates the West Virginia Constitution, West Virginia Code or West Virginia Code of State Rules is void and of no effect.

19. COMPLIANCE: Vendor shall comply with all applicable federal, state, and local laws, regulations and ordinances. By submitting a bid, Vendor acknowledges that it has reviewed, understands, and will comply with all applicable laws, regulations, and ordinances.

20. PREVAILING WAGE: Vendor shall be responsible for ensuring compliance with prevailing wage requirements and determining when prevailing wage requirements are applicable.

21. ARBITRATION: Any references made to arbitration contained in this Contract, Vendor's bid, or in any American Institute of Architects documents pertaining to this Contract are hereby deleted, void, and of no effect.

22. MODIFICATIONS: This writing is the parties' final expression of intent. Notwithstanding anything contained in this Contract to the contrary no modification of this Contract shall be binding without mutual written consent of the Agency, and the Vendor, with approval of the Purchasing Division and the Attorney General's office (Attorney General approval is as to form only). Any change to existing contracts that adds work or changes contract cost, and were not included in the original contract, must be approved by the Purchasing Division and the Attorney General's Office (as to form) prior to the implementation of the change or commencement of work affected by the change.

23. WAIVER: The failure of either party to insist upon a strict performance of any of the terms or provision of this Contract, or to exercise any option, right, or remedy herein contained, shall not be construed as a waiver or a relinquishment for the future of such term, provision, option, right, or remedy, but the same shall continue in full force and effect. Any waiver must be expressly stated in writing and signed by the waiving party.

24. SUBSEQUENT FORMS: The terms and conditions contained in this Contract shall supersede any and all subsequent terms and conditions which may appear on any form documents submitted by Vendor to the Agency or Purchasing Division such as price lists, order forms, invoices, sales agreements, or maintenance agreements, and includes internet websites or other electronic documents. Acceptance or use of Vendor's forms does not constitute acceptance of the terms and conditions contained thereon.

25. ASSIGNMENT: Neither this Contract nor any monies due, or to become due hereunder, may be assigned by the Vendor without the express written consent of the Agency, the Purchasing Division, the Attorney General's office (as to form only), and any other government agency or office that may be required to approve such assignments. Notwithstanding the foregoing, Purchasing Division approval may or may not be required on certain agency delegated or exempt purchases.

26. WARRANTY: The Vendor expressly warrants that the goods and/or services covered by this Contract will: (a) conform to the specifications, drawings, samples, or other description furnished or specified by the Agency; (b) be merchantable and fit for the purpose intended; and (c) be free from defect in material and workmanship.

27. STATE EMPLOYEES: State employees are not permitted to utilize this Contract for personal use and the Vendor is prohibited from permitting or facilitating the same.

28. BANKRUPTCY: In the event the Vendor files for bankruptcy protection, the State of West Virginia may deem this Contract null and void, and terminate this Contract without notice.

29. PRIVACY, SECURITY, AND CONFIDENTIALITY: The Vendor agrees that it will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the Agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the Agency's policies, procedures, and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in http://www.state.wv.us/admin/purchase/privacy/default.html.

30. YOUR SUBMISSION IS A PUBLIC DOCUMENT: Vendor's entire response to the Solicitation and the resulting Contract are public documents. As public documents, they will be disclosed to the public following the bid/proposal opening or award of the contract, as required by the competitive bidding laws of West Virginia Code §§ 5A-3-1 et seq., 5-22-1 et seq., and 5G-1-1 et seq. and the Freedom of Information Act West Virginia Code §§ 29B-1-1 et seq.

DO NOT SUBMIT MATERIAL YOU CONSIDER TO BE CONFIDENTIAL, A TRADE SECRET, OR OTHERWISE NOT SUBJECT TO PUBLIC DISCLOSURE.

Submission of any bid, proposal, or other document to the Purchasing Division constitutes your explicit consent to the subsequent public disclosure of the bid, proposal, or document. The Purchasing Division will disclose any document labeled "confidential," "proprietary," "trade secret," "private," or labeled with any other claim against public disclosure of the documents, to include any "trade secrets" as defined by West Virginia Code § 47-22-1 et seq. All submissions are subject to public disclosure without notice.

31. LICENSING: In accordance with West Virginia Code of State Rules § 148-1-6.1.e, Vendor must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agency or political subdivision. Upon request, the Vendor must provide all necessary releases to obtain information to enable the Purchasing Division Director or the Agency to verify that the Vendor is licensed and in good standing with the above entities.

32. ANTITRUST: In submitting a bid to, signing a contract with, or accepting a Award Document from any agency of the State of West Virginia, the Vendor agrees to convey, sell, assign, or transfer to the State of West Virginia all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the State of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the State of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to Vendor.

33. VENDOR CERTIFICATIONS: By signing its bid or entering into this Contract, Vendor certifies **(1)** that its bid or offer was made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership, person or entity submitting a bid or offer for the same material, supplies, equipment or services; **(2)** that its bid or offer is in all respects fair and without collusion or fraud; **(3)** that this Contract is accepted or entered into without any prior understanding, agreement, or connection to any other entity that could be considered a violation of law; and **(4)** that it has reviewed this Solicitation in its entirety; understands the requirements, terms and conditions, and other information contained herein.

Vendor's signature on its bid or offer also affirms that neither it nor its representatives have any interest, nor shall acquire any interest, direct or indirect, which would compromise the performance of its services hereunder. Any such interests shall be promptly presented in detail to the Agency. The individual signing this bid or offer on behalf of Vendor certifies that he or she is authorized by the Vendor to execute this bid or offer or any documents related thereto on Vendor's behalf; that he or she is authorized to bind the Vendor in a contractual relationship; and that, to the best of his or her knowledge, the Vendor has properly registered with any State agency that may require registration.

34. PURCHASING CARD ACCEPTANCE: The State of West Virginia currently utilizes a Purchasing Card program, administered under contract by a banking institution, to process payment for goods and services. The Vendor must accept the State of West Virginia's Purchasing Card for payment of all orders under this Contract unless the box below is checked.

☐ Vendor is not required to accept the State of West Virginia's Purchasing Card as payment for all goods and services.

35. VENDOR RELATIONSHIP: The relationship of the Vendor to the State shall be that of an independent contractor and no principal-agent relationship or employer-employee relationship is contemplated or created by this Contract. The Vendor as an independent contractor is solely liable for the acts and omissions of its employees and agents. Vendor shall be responsible for selecting, supervising, and compensating any and all individuals employed pursuant to the terms of this Solicitation and resulting contract. Neither the Vendor, nor any employees or subcontractors of the Vendor, shall be deemed to be employees of the State for any purpose whatsoever. Vendor shall be exclusively responsible for payment of employees and contractors for all wages and salaries, taxes, withholding payments, penalties, fees, fringe benefits, professional liability insurance premiums, contributions to insurance and pension, or other deferred compensation plans, including but not limited to, Workers' Compensation and Social Security obligations, licensing fees, etc. and the filing of all necessary documents, forms, and returns pertinent to all of the foregoing.

Vendor shall hold harmless the State, and shall provide the State and Agency with a defense against any and all claims including, but not limited to, the foregoing payments, withholdings, contributions, taxes, Social Security taxes, and employer income tax returns.

36. INDEMNIFICATION: The Vendor agrees to indemnify, defend, and hold harmless the State and the Agency, their officers, and employees from and against: (1) Any claims or losses for services rendered by any subcontractor, person, or firm performing or supplying services, materials, or supplies in connection with the performance of the Contract; (2) Any claims or losses resulting to any person or entity injured or damaged by the Vendor, its officers, employees, or subcontractors by the publication, translation, reproduction, delivery, performance, use, or disposition of any data used under the Contract in a manner not authorized by the Contract, or by Federal or State statutes or regulations; and (3) Any failure of the Vendor, its officers, employees, or subcontractors to observe State and Federal laws including, but not limited to, labor and wage and hour laws.

37. PURCHASING AFFIDAVIT: In accordance with West Virginia Code § 5A-3-10a, all Vendors are required to sign, notarize, and submit the Purchasing Affidavit stating that neither the Vendor nor a related party owe a debt to the State in excess of $1,000. The affidavit must be submitted prior to award, but should be submitted with the Vendor's bid. A copy of the Purchasing Affidavit is included herewith.

38. ADDITIONAL AGENCY AND LOCAL GOVERNMENT USE: This Contract may be utilized by other agencies, spending units, and political subdivisions of the State of West Virginia; county, municipal, and other local government bodies; and school districts ("Other Government Entities"). Any extension of this Contract to the aforementioned Other Government Entities must be on the same prices, terms, and conditions as those offered and agreed to in this Contract, provided that such extension is in compliance with the applicable laws, rules, and ordinances of the Other Government Entity. If the Vendor does not wish to extend the prices, terms, and conditions of its bid and subsequent contract to the Other Government Entities, the Vendor must clearly indicate such refusal in its bid. A refusal to extend this Contract to the Other Government Entities shall not impact or influence the award of this Contract in any manner.

39. CONFLICT OF INTEREST: Vendor, its officers or members or employees, shall not presently have or acquire an interest, direct or indirect, which would conflict with or compromise the performance of its obligations hereunder. Vendor shall periodically inquire of its officers, members and employees to ensure that a conflict of interest does not arise. Any conflict of interest discovered shall be promptly presented in detail to the Agency.

40. REPORTS: Vendor shall provide the Agency and/or the Purchasing Division with the following reports identified by a checked box below:

☐ Such reports as the Agency and/or the Purchasing Division may request. Requested reports may include, but are not limited to, quantities purchased, agencies utilizing the contract, total contract expenditures by agency, etc.

☐ Quarterly reports detailing the total quantity of purchases in units and dollars, along with a listing of purchases by agency. Quarterly reports should be delivered to the Purchasing Division via email at purchasing.requisitions@wv.gov.

41. BACKGROUND CHECK: In accordance with W. Va. Code § 15-2D-3, the Director of the Division of Protective Services shall require any service provider whose employees are regularly employed on the grounds or in the buildings of the Capitol complex or who have access to sensitive or critical information to submit to a fingerprint-based state and federal background inquiry through the state repository. The service provider is responsible for any costs associated with the fingerprint-based state and federal background inquiry.

After the contract for such services has been approved, but before any such employees are permitted to be on the grounds or in the buildings of the Capitol complex or have access to sensitive or critical information, the service provider shall submit a list of all persons who will be physically present and working at the Capitol complex to the Director of the Division of Protective Services for purposes of verifying compliance with this provision. The State reserves the right to prohibit a service provider's employees from accessing sensitive or critical information or to be present at the Capitol complex based upon results addressed from a criminal background check.

Service providers should contact the West Virginia Division of Protective Services by phone at (304) 558-9911 for more information.

42. PREFERENCE FOR USE OF DOMESTIC STEEL PRODUCTS: Except when authorized by the Director of the Purchasing Division pursuant to W. Va. Code § 5A-3-56, no contractor may use or supply steel products for a State Contract Project other than those steel products made in the United States. A contractor who uses steel products in violation of this section may be subject to civil penalties pursuant to W. Va. Code § 5A-3-56. As used in this section:

a. "State Contract Project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of and materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited on or after June 6, 2001.
b. "Steel Products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more or such operations, from steel made by the open heath, basic oxygen, electric furnace, Bessemer or other steel making process. The Purchasing Division Director may, in writing, authorize the use of foreign steel products if:
c. The cost for each contract item used does not exceed one tenth of one percent (.1%) of the total contract cost or two thousand five hundred dollars ($2,500.00), whichever is greater. For the purposes of this section, the cost is the value of the steel product as delivered to the project; or
d. The Director of the Purchasing Division determines that specified steel materials are not produced in the United States in sufficient quantity or otherwise are not reasonably available to meet contract requirements.

43. PREFERENCE FOR USE OF DOMESTIC ALUMINUM, GLASS, AND STEEL: In Accordance with W. Va. Code § 5-19-1 et seq., and W. Va. CSR § 148-10-1 et seq., for every contract or subcontract, subject to the limitations contained herein, for the construction, reconstruction, alteration, repair, improvement or maintenance of public works or for the purchase of any item of machinery or equipment to be used at sites of public works, only domestic aluminum, glass or steel products shall be supplied unless the spending officer determines, in writing, after the receipt of offers or bids, (1) that the cost of domestic aluminum, glass or steel products is unreasonable or inconsistent with the public interest of the State of West Virginia, (2) that domestic aluminum, glass or steel products are not produced in sufficient quantities to meet the contract requirements, or (3) the available domestic aluminum, glass, or steel do not meet the contract specifications. This provision only applies to public works contracts awarded in an amount more than fifty thousand dollars ($50,000) or public works contracts that require more than ten thousand pounds of steel products.

The cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than twenty percent (20%) of the bid or offered price for foreign made aluminum, glass, or steel products. If the domestic aluminum, glass or steel products to be supplied or produced in a "substantial labor surplus area", as defined by the United States Department of Labor, the cost of domestic aluminum, glass, or steel products may be unreasonable if the cost is more than thirty percent (30%) of the bid or offered price for foreign made aluminum, glass, or steel products. This preference shall be applied to an item of machinery or equipment, as indicated above, when the item is a single unit of equipment or machinery manufactured primarily of aluminum, glass or steel, is part of a public works contract and has the sole purpose or of being a permanent part of a single public works project. This provision does not apply to equipment or machinery purchased by a spending unit for use by that spending unit and not as part of a single public works project.

All bids and offers including domestic aluminum, glass or steel products that exceed bid or offer prices including foreign aluminum, glass or steel products after application of the preferences provided in this provision may be reduced to a price equal to or lower than the lowest bid or offer price for foreign aluminum, glass or steel products plus the applicable preference. If the reduced bid or offer prices are made in writing and supersede the prior bid or offer prices, all bids or offers, including the reduced bid or offer prices, will be reevaluated in accordance with this rule.

CERTIFICATIONAND SIGNATURE PAGE

By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Hewlett-Packard Enterprise Company

(Company)

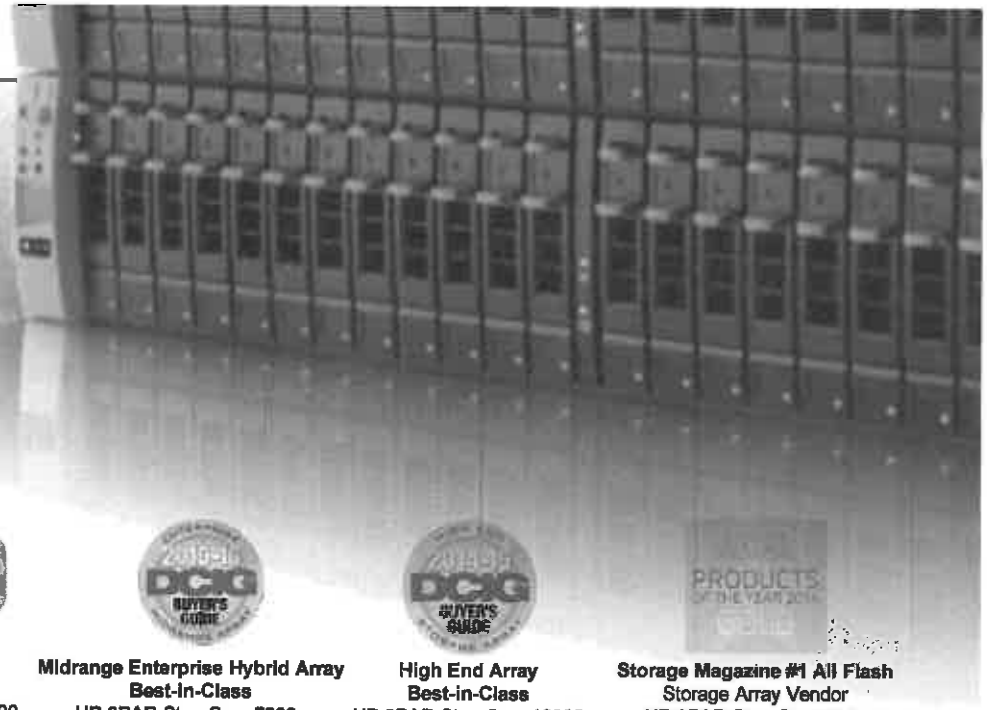
David Howerton, Sales

(Authorized Signature) (Representative Name, Title)

P: (304) 963-2726 01/12/2016

(Phone Number) (Fax Number) (Date)

HPE 3PAR StoreServ validated for the New Style of Business



#1 Market Share

Midrange SAN Storage
HP 3PAR StoreServ

IDC

IDC Worldwide Disk Storage Systems Tracker for CQ2, 2015

Flash Memory Summit
Best of Show
3PAR StoreServ 20850

All-Flash Storage Array
Recommended
HP 3PAR StoreServ 20000

Flash Memory Storage Array
Recommended
HP 3PAR StoreServ 7450

Midrange Array
Best-in-Class
HP 3PAR StoreServ 7000

Midrange Enterprise Hybrid Array
Best-in-Class
HP 3PAR StoreServ 7200c

High End Array
Best-in-Class
HP 3PAR StoreServ 10800

Storage Magazine #1 All Flash
Storage Array Vendor
HP 3PAR StoreServ 7450

InfoWorld
Technology of the Year
HP 3PAR StoreServ 7400

Storage Magazine
#1 Midrange Storage Vendor
3PAR StoreServ 7400

2014
PC World
HP 3PAR StoreServ
Best Storage Media HDD

2015 Gartner Critical
Systems Capabilities
#1 Mid Range In ALL 6 Use Cases
HP 3PAR StoreServ

2015 Gartner Critical
Systems Capabilities
Top 3 High End Overall Use Case
HP 3PAR StoreServ

Gartner 2015 Magic Quadrant for
General Purpose Storage Quadrant
#2 In Leaders Quadrant
HP 3PAR StoreServ

Gartner Solid State Array
2015 Magic Quadrant
Leaders Quadrant
HP 3PAR StoreServ All-Flash

Hewlett Packard Enterprise

Gartner Magic Quadrants

HPE named a leader in General-Purpose Disk and Solid State Arrays

October 2015 Gartner Magic Quadrant

for General-Purpose Disk Arrays

June 2015 Gartner Magic Quadrant

for Solid State Arrays

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HPE 3PAR StoreServ 8000 Storage

HPE 3PAR StoreServ 8000 Storage (HPE 3PAR StoreServ 8200, 8400, 8440, and 8450 Storage) delivers the performance advantages of a purpose-built, flash-optimized architecture without compromising resiliency, efficiency, or data mobility. The new HPE 3PAR Gen5 Thin Express ASIC provides silicon-based hardware acceleration of thin technologies, including inline deduplication, to reduce acquisition and operational costs by up to 75 percent without compromising performance.

With unmatched versatility, performance, and density, HPE 3PAR StoreServ 8000 Storage gives West Virginia Information Services and Communications (herein after WV IS&C) a range of options that support true convergence of block and file protocols, all-flash array performance, and the use of spinning media to further optimize costs.

HPE 3PAR StoreServ 8000 Storage

Features

Lower your cost of storage by up to 75 percent:

- Benefit from an all-flash architecture as low as $19K USD or $1.50 USD per GB usable with a five-year warranty on all SSDs.
- Cut capacity requirements by up to 75 percent with data compaction technologies.
- Simplify storage management and reduce your footprint by up to 67 percent with unified block and file.
- Get industry-leading density of 5.5 PB per floor tile.

Deliver performance without compromise:

- Remove bottlenecks with a flash-optimized, scale-out architecture delivering over one million IOPS.
- Protect service levels with Quality of Service (QoS) optimization and consistent, sub-millisecond latency.
- Support mixed workloads and accelerate performance with the Gen5 Thin Express ASIC.

- Boost flash performance by up to 35 percent and reduce latency by up to 2.5 times with 16 Gb/s Fibre Channel.

Avoid downtime and consolidate with confidence:

- Maintain high availability and Tier-1 resiliency with a complete set of persistent technologies.
- Achieve near-synchronous RPOs with flexible, transparent, and model-agnostic remote replication.
- Simplify backup and restores with application-aware, storage-integrated data protection.

Respond effortlessly to unpredictable and changing demands:

- Grow with freedom in any direction, from as little as 3.6 TB to 7.3 PB usable in a single system.
- Remove complexity with iSCSI for Ethernet and speed configuration with automated storage networking.
- Modernize your EMC® and Hitachi Data Systems storage infrastructure with painless, no-cost data migration.
- Optimize storage at the data center level with seamless data movement between arrays.

Product Details

HPE 3PAR StoreServ 8200, 8400, 8440, and 8450 Storage Details

	HPE 3PAR StoreServ 8200	HPE 3PAR StoreServ 8400	HPE 3PAR StoreServ 8440	HPE 3PAR StoreServ 8450
Number of Controller Nodes	2	2 or 4		
HPE 3PAR Gen5 ASICs	2	2 or 4		
Processors	2 x 6-core 2.2 GHz	2 - 4 x 6-core 2.2 GHz	2 - 4 x 10-core 2.4 GHz	
Total Cache	832 GiB	1664 GiB	8384 GiB	384 GiB
• Flash Cache (optional)	768 GiB	1536 GiB	8000 GiB	Not applicable
• On-Node Cache	64 GiB	128 GiB	384 GiB	
Total Cache Per Node Pair	832 GiB		4192 GiB	192 GiB
• Flash Cache Per Node Pair	768 GiB		4000 GiB	Not applicable
• On-Node Cache Per Node Pair	64 GiB		192 GiB	
Maximum Host Ports	12 ports	24 ports		
• 16 Gb/s Fibre Channel Host Ports	4 - 12 ports	4 - 24 ports		

	HPE 3PAR StoreServ 8200	HPE 3PAR StoreServ 8400	HPE 3PAR StoreServ 8440	HPE 3PAR StoreServ 8450
• 10 Gb/s iSCSI Host Ports	0 - 4 ports	0 - 8 ports		
• 10 Gb/s FCoE Host Ports	0 - 4 ports	0 - 8 ports		
• 1 Gb/s Ethernet Adapter	0 - 8 ports	0 - 16 ports		
• 10 Gb/s Ethernet Adapter	0 - 4 ports	0 - 8 ports		
Maximum Initiators Supported	2048	4096		
Built-in 1 GbE Ports[1]	2 ports	2 - 4 ports		
2U Controller Node Drive Capacity	24			
Number of Hard Disk Drives[2]	6 - 240	6 - 576	6 - 960	Not applicable
Number of Solid State Drives	6 - 120	6 - 240	6 - 480	
Maximum Raw Capacity (approximate)[3]	750 TiB[4]	2400 TiB	3000 TiB	1843 TiB
Usable File Capacity[5]	2 - 128 TiB	2 - 256 TiB	2 - 256 TiB	2 - 256 TiB

Capacity Details

	HPE 3PAR StoreServ 8200	HPE 3PAR StoreServ 8400	HPE 3PAR StoreServ 8440	HPE 3PAR StoreServ 8450
RAID Levels	RAID 0, 1, 5, 6			
RAID 5 Data to Parity Ratios	2:1 - 8:1			
RAID 6 Data to Parity Ratios	4:2, 6:2, 8:2, 10:2, 14:2			
Drive Capacities (SSDs)[6]	400 MLC SSD, 480 MLC SSD, 920 MLC SSD, 480 cMLC SSD, 1920 cMLC SSD, 3840 cMLC SSD			
Drive Capacities (HDD)	300 15K SAS[7], 600 15K SAS 600 10K SAS, 1200 10K SAS, 1800 10K SAS 2000 7.2K NL[8], 4000 7.2K NL, 6000 7.2K NL			Not applicable
Number of Add-on Drive Enclosures[9]	0 - 9 enclosures	0 - 22 enclosures	0 - 38 enclosures	0 - 18 enclosures

Notes:

[1] Two built-in 1 GbE ports per node pair can be used either for Remote Copy (RCIP) or for HPE 3PAR File Persona Software.
[2] Not applicable to the HPE 3PAR StoreServ 8200 All-Flash Starter Kit and HPE 3PAR StoreServ 8400 All-Flash Starter Kit.

[3] Maximum raw capacity currently supported with any and all drive types. The minimum supported raw capacity is equal to eight times the minimum available drive size.
[4] For storage capacity, 1 GiB = 230 bytes and 1 TiB = 1,024 GiB.
[5] Usable file capacity supported for the HPE 3PAR File Persona Software Suite.
[6] SSDs are Solid State Drives.
[7] SAS drives are Serial Access SCSI drives.
[8] NL drives are Nearline (7200 RPM) Enterprise SAS drives.
[9] Each drive enclosure holds up to 24 drives in 2U for small form factor (2.5 inch) drives and 4U for large form factor (3.5 inch) drives.

Specifications are subject to change without notice.

HPE 3PAR StoreServ 8200 All-Flash Starter Kit

The HPE 3PAR StoreServ 8200 All-Flash Starter Kit is an all-flash version of the HPE 3PAR StoreServ 8200 that provides all-flash acceleration at an entry-level price. The kit includes the HPE 3PAR StoreServ 8200 Storage System Base equipped with 8 x 480 GB SFF cMLC SSD drives, the OS Suite, and HPE 3PAR Virtual Copy Software. The kit also includes three-year 24x7 Proactive Care Support. The HPE 3PAR StoreServ 8200 All-Flash Starter Kit has the same Drive LTUs cap (48) and maximum number of SSDs (120) as the HPE 3PAR StoreServ 8200.

HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit

The HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit is a converged file/block version of the HPE 3PAR StoreServ 8200, but is twice as easy to manage, has up to 40 percent better density, and is more attractively priced than other comparable unified storage arrays. The kit includes the HPE 3PAR StoreServ 8200 Storage System Base equipped with 8 x 600 GB 10K SFF HDDs and 12 x 2 TB 7.2K LFF HDDs, an LFF SAS Drive Enclosure, 2 x 2-port 10 GbE adapters, the HPE 3PAR Operating System Software Suite, HPE 3PAR Replication Software Suite, and 16 x File Persona 1TB LTUs. The kit also includes three-year 24x7 Proactive Care Support. The HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit has the same Drive LTUs cap (48) and maximum number of HDDs/SSDs (240/120) as the HPE 3PAR StoreServ 8200.

HPE 3PAR StoreServ 8400 All-Flash Starter Kit

The HPE 3PAR StoreServ 8400 All-Flash Starter Kit provides all-flash acceleration at an entry level price in a 4-node scalable system. The kit includes the HPE 3PAR StoreServ 8400 2-node Storage System Base equipped with 8 x 480 GB SFF cMLC SSD drives, the OS Suite, and HPE 3PAR Virtual Copy Software. The kit also includes three-year 24x7 Proactive Care Support. The HPE 3PAR StoreServ 8400 All-Flash Starter Kit has the same drive LTUs cap (168) and maximum number of SSDs (240) as the HPE 3PAR StoreServ 8400.

HPE 3PAR StoreServ 8000 Storage Software

In addition to the extensive selection of software applications for HPE 3PAR StoreServ 8000 Storage, Hewlett Packard Enterprise provides the opportunity for WV IS&C to purchase software bundled into a series of suites designed to be affordable and simple to purchase. The software suites are:

- **HPE 3PAR Operating System Software Suite (required)**— Provides everything WV IS&C needs to get up and running quickly and efficiently. Powered by HPE 3PAR ASIC

with HPE 3PAR StoreServ Storage's Thin Technologies, which include HPE 3PAR Thin Provisioning, HPE 3PAR Thin Persistence, HPE 3PAR Thin Conversion, and HPE 3PAR Thin Deduplication. Performance acceleration is provided by HPE 3PAR Adaptive Flash Cache, which reduces application response time.

Network simplification is handled with VLAN tagging. Simplified management is offered by the HPE 3PAR Operating System, HPE 3PAR StoreServ Management Console, and HPE 3PAR Host Explorer. HPE SmartStart software is designed to get you off to a quick start with your new HPE 3PAR StoreServ system; HPE 3PAR System Reporter and HPE 3PARInfo Software are designed to track performance and capacity utilization trends for multiple HPE 3PAR StoreServ Systems. Other highlights of this suite include HPE 3PAR Full Copy, autonomic rebalancing capabilities that help you optimize the use of future capacity expansions, and support for standard multipathing software for high availability in clustered environments. A one year license for online import is included to enable migration from HPE EVA, EMC CLARiiON CX4, EMC VNX/VNX2, EMC VMAX (VMAX, VMAX SE, VMAX 10K, 20K, 40K) or HDS NSC, USP, USP V, or USP VM.

- **HPE 3PAR Replication Software Suite**—Bundles HPE 3PAR Virtual Copy Software with HPE 3PAR Remote Copy Software. HPE 3PAR Virtual Copy Software protects and shares data affordably with rapid recovery using reservationless, non-duplicative, copy-on-write snapshots. HPE 3PAR Remote Copy Software offers simple and cost effective data protection for efficient multi-tenant disaster recovery. Also included in this bundle is HPE 3PAR Peer Persistence Software, which helps ensure transparent automatic failover over metropolitan distances using Remote Copy Synchronous mode. The Suite also includes HPE 3PAR Cluster Extension Software, which enables automatic failover across data centers using Remote Copy Asynchronous mode.
- **HPE 3PAR Data Optimization Software Suite**—Combines HPE 3PAR Dynamic Optimization Software, HPE 3PAR Adaptive Optimization Software, HPE 3PAR Priority Optimization Software, and HPE 3PAR Peer Motion Software. HPE 3PAR Dynamic Optimization delivers the required service levels for the lowest possible cost throughout the data lifecycle. HPE 3PAR Adaptive Optimization improves storage utilization by enabling cost-optimized storage tiering. HPE 3PAR Priority Optimization helps ensure service levels with QoS controls for mission critical applications. HPE 3PAR Peer Motion enables load balancing at will such that movement of data and workloads between arrays is initiated without impacting applications, users, or services.
- **HPE 3PAR File Persona Suite**—Enables file protocol services and an Object Access API to extend the spectrum of primary storage workloads natively addressed by HPE 3PAR StoreServ Storage Systems. With this solution, the architectural benefits of HPE 3PAR StoreServ Storage can be extended to the following use cases: enterprise file sync and share; home directory consolidation; group, departmental and corporate shares; and custom cloud applications.
- **HPE 3PAR Security Software Suite**—Bundles HPE 3PAR Virtual Domains Software and HPE 3PAR Virtual Lock Software. With this suite, you can segregate access and deliver robust storage services for different applications and user groups with additional security attached to retention of storage volumes.
- **HPE 3PAR Application Software Suite for Hyper-V**— Protects your Microsoft Hyper-V environment with HPE 3PAR Recovery Manager Software for Microsoft Hyper-V and the HPE 3PAR VSS Provider Software.

- **HPE 3PAR Application Software Suite for Exchange** — Gives you the essentials for use with Microsoft Exchange, including HPE 3PAR Recovery Manager for Exchange and the HPE 3PAR VSS Provider Software.
- **HPE 3PAR Application Software Suite for SQL**—Protect Microsoft SQL databases with HPE 3PAR Recovery Manager for Microsoft SQL and the HPE 3PAR VSS Provider Software.
- **HPE 3PAR Application Software Suite for Oracle**—Protect Oracle databases with HPE 3PAR Recovery Manager for Oracle and Oracle space reclamation capabilities.
- **HPE StoreOnce Recovery Central Manager**— By combining the performance of snapshots with the protection of backups, this software integrates HPE 3PAR StoreServ with HPE 3PAR StoreOnce Backup Systems to provide a converged availability and flat backup service that augments traditional backup processes. With this automated, non-intrusive software, the simplicity and performance of local and remote snapshots can be combined with the reliability and cost effective retention of deduplicated backups.
- **HPE StoreFront Remote SaaS Portal**— Provides proactive tools and integrated data collection from the HPE 3PAR StoreServ Storage arrays that call home; delivers unique insights and analytics in one dashboard. Identifies capacity and performance issues early through intuitive capacity and performance trend analysis and forecasting. These valuable analytics help maximize asset utilization and optimize the data center with recommendations and remedial actions when issues arise.

HPE Helion OpenStack

HPE Helion OpenStack is an open, scalable, and extensible cloud platform that enables enterprises and service providers to build, manage, and consume hybrid clouds. HPE 3PAR StoreServ Storage for the OpenStack platform makes it easier to configure, deploy, and manage WV IS&C's new or existing data center for the cloud, regardless of whether you are adapting a test/development environment or online business applications.

Integrated tightly with OpenStack Manila (file services) and Cinder (block) drivers, HPE Storage delivers industry-leading resiliency, agility, and enterprise class features. With simplified converged storage management, build and manage your cloud environment. Deploy and manage Tier 1 storage with full block, file and object access through HPE 3PAR StoreServ Storage.

Cinder Drivers for HPE 3PAR StoreServ Storage

Features:

- Smart, reliable, and efficient volume provisioning using infrastructure-based templates and adaptive volume provisioning mechanism.
- Enables Amazon EBS-like services.
- HPE Helion OpenStack Commercial distribution includes a 50 TB per node VSA license.

Manila Drivers for HPE 3PAR File Persona

Features:

- Enable home directory consolidation and file share access in cloud environments.
- Single HPE 3PAR Storage system addressing multiple workloads in hybrid environments using a single, cost-optimized pool of storage.

Cinder Drivers for HPE 3PAR Flash

Feature:

- Utilize the benefits of reduced latency and space efficiency using HPE 3PAR Adaptive Flash Cache and HPE 3PAR thin deduplication for cloud workloads.

Warranty

Hewlett Packard Enterprise provides a three-year, on-site warranty service for hardware components and 24x7 four-hour remote response with next business day on-site response.

Why HPE 3PAR StoreServ 8000 Storage?

Consolidate onto an enterprise-class flash array without compromising performance, scalability, data services, or resiliency with HPE 3PAR StoreServ 8000 Storage's unmatched versatility, performance, and density. HPE 3PAR StoreServ 8000 Storage offers rich, Tier-1 data services, quad-node resiliency, seamless data mobility between systems, high availability through a complete set of persistent technologies, and simple and efficient data protection with a flat backup to HPE StoreOnce Backup appliances.

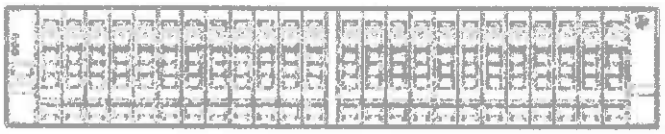
Overview

HPE 3PAR StoreServ 8000 Storage

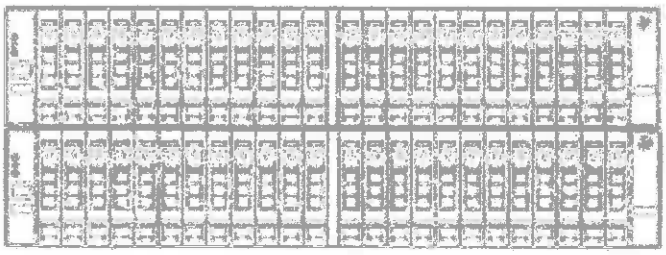
The HPE 3PAR StoreServ 8000 Storage offers enterprise Tier 1 storage at a midrange price. HPE 3PAR StoreServ 8000 Storage delivers the performance advantages of a purpose-built, flash-optimized architecture without compromising resiliency, efficiency, or data mobility. The new HPE 3PAR Gen5 Thin Express ASIC provides silicon-based hardware acceleration of thin technologies, including inline deduplication, to reduce acquisition and operational costs by up to 75% without compromising performance. With unmatched versatility, performance, and density, HPE 3PAR StoreServ 8000 Storage gives you a range of options that support true convergence of block and file protocols, all-flash array performance, and the use of spinning media to further optimize costs. HPE 3PAR StoreServ 8000 Storage offers rich, Tier-1 data services, quad-node resiliency, seamless data mobility between systems, high availability through a complete set of persistent technologies, and simple and efficient data protection with a flat backup to HPE StoreOnce Backup appliances. Four models are available: 8200, 8400, 8440, and 8450. You can start small and grow without painful upgrades down the road.

NOTE: For more information about the value of HPE 3PAR StoreServ 8000 Storage refer to the HPE 3PAR SoreServ 8000 Datasheet

HPE 3PAR StoreServ 8000 is storage made effortless.



HPE 3PAR StoreServ 8000 Storage (2-Node Storage Base)



HPE 3PAR StoreServ 8000 Storage (4-Node Storage Base)

What's New

- HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit
- New 400GB MLC SSD drives
- New 4TB 7.2K and 3.84TB SSD FIPS 140-2 validated self-encrypting drives

Host OS Support

Citrix® XenServer® | HPE-UX® | IBM® AIX® | Microsoft® Windows® Server, including Microsoft® Hyper-V™ | Apple Mac OS
OpenVMS* | Oracle® Linux® (UEK and RHEL compatible kernels) | Oracle® Solaris | Ubuntu | VMware vSphere™
Red Hat® Enterprise Linux® | Red Hat® Enterprise Virtualization
SUSE® Linux Enterprise | SUSE® Linux Virtualization | IBM Virtualization | Oracle VM

Overview

For the latest information on supported operating systems refer to Single Point of Connectivity Knowledge for HPE Storage Products (SPOCK): **http://www.hpe.com/storage/spock**

Overview

Summary	8200	8400	8440	8450
Number of Controller Nodes	2	2 or 4	2 or 4	2 or 4
HPE 3PAR Gen5 ASICs	2	2 or 4	2 or 4	2 or 4
Processors	2 x 6-core 2.2 GHz	2-4 x 6-core 2.2 GHz	2-4 x 10-core 2.4 GHz	2-4 x 10-core 2.4 GHz
Total Cache	832 GiB	1664 GiB	8384 GiB	384 GiB
Flash Cache (optional)	768 GiB	1536 GiB	8000 GiB	Not Applicable
On-Node Cache	64 GiB	128 GiB	384 GiB	384 GiB
Total Cache per node pair	832 GiB	832 GiB	4192 GiB	192 GiB
Flash Cache per node pair	768 GiB	768 GiB	4000 GiB	Not Applicable
On-Node Cache per node pair	64 GiB	64 GiB	192 GiB	192 GiB
Maximum Host Ports	12 ports	24 ports	24 ports	24 ports
16Gb/s Fibre Channel Host Ports	4 - 12 ports	4 - 24 ports	4 - 24 ports	4 - 24 ports
10Gb/s iSCSI Host Ports	0 - 4 ports	0 - 8 ports	0 - 8 ports	0 - 8 ports
10Gb/s FCoE Host Ports	0 - 4 ports	0 - 8 ports	0 - 8 ports	0 - 8 ports
1Gb/s Ethernet Adapter	0 - 8 ports	0 - 16 ports	0 - 16 ports	0 - 16 ports
10Gb/s Ethernet Adapter	0 - 4 ports	0 - 8 ports	0 - 8 ports	0 - 8 ports
Maximum Initiators Supported	2048	4096	4096	4096
Built-in 1GbE Ports[1]	2	2 - 4	2 - 4	2 - 4
2U Controller Node Drive Capacity	24	24	24	24
Number of Hard Disk Drives[2]	6 – 240	6 – 576	6 – 960	Not Applicable
Number of Solid State Drives	6 – 120	6 – 240	6 – 480	6 – 480
Max Raw Capacity (approx.)[3]	750 TiB[4]	2400 TiB	3000 TiB	1843 TiB
Usable File Capacity[5]	2 - 128TiB	2 - 256TiB	2 - 256TiB	2 - 256TiB

Capacity Details	8200	8400	8440	8450
RAID Levels	RAID 0, 1, 5, 6			
RAID 5 Data to Parity Ratios	2:1 - 8:1			
RAID 6 Data to Parity Ratios	4:2, 6:2, 8:2, 10:2, 14:2			
Drive Capacities (SSDs)[6]	400 MLC SSD, 480 MLC SSD, 920 MLC SSD, 480 cMLC SSD, 1920 cMLC SSD, 3840 cMLC SSD			
Drive Capacities (HDD)	300 15K SAS[7], 600 15K SAS 600 10K SAS, 1200 10K SAS, 1800 10K SAS 2000 7.2K NL[8], 4000 7.2K NL, 6000 7.2K NL			Not Applicable
Number of Add-on Drive Enclosures[9]	0 - 9 enclosures	0 - 22 enclosures	0 - 38 enclosures	0 - 18 enclosures

NOTE: Specifications are subject to change without notice.

[1] Two built-in 1GbE ports per node pair can be used either for Remote Copy (RCIP) or for File Persona.

[2] Not applicable to HPE 3PAR StoreServ 8200 All-Flash Starter Kit and HPE 3PAR StoreServ 8400 All-Flash Starter Kit

[3] Maximum raw capacity currently supported with any and all drive types. The minimum supported raw capacity is equal to 8 * Min drive size available.

Overview

[4] For storage capacity, 1 GiB = 230 bytes and 1 TiB = 1,024 GiB
[5] Usable file capacity supported for HPE 3PAR File Persona Software Suite
[6] SSDs are Solid State Drives
[7] SAS drives are Serial Access SCSI Drives
[8]NL drives are Nearline (7200 RPM) Enterprise SAS drives
[9] Each Drive Enclosure holds up to 24 drives in 2U for small form factor (2.5") drives and 4U for large form factor (3.5") drives

HP 3PAR StoreServ 8000 Converged File/Block Starter Kit

HPE 3PAR StoreServ 8200 All-Flash Starter Kit

The HPE 3PAR StoreServ 8200 All-Flash Starter Kit is an all-flash version of the HPE 3PAR StoreServ 8200 that provides all-flash acceleration at entry-level price. The kit includes the HPE 3PAR StoreServ 8200 Storage System Base equipped with 8 x 480GB SFF cMLC SSD drives, the OS Suite, and Virtual Copy software. It also includes 3 year 24x7 Proactive Care Support. The HPE 3PAR StoreServ 8200 All-Flash Starter Kit has the same Drive LTUs cap (48) and maximum number of SSDs (120) as the HPE 3PAR StoreServ 8200.

Model

HPE 3PAR StoreServ 8200 All Flash Starter Kit M0S95A

The HPE 3PAR StoreServ 8200c All-Flash Starter Kit is an orderable part number that includes the following individual parts.

Quantity	Component	
1	HP 3PAR StoreServ 8200 2-node Field Integrated Storage Base	K2Q36A
8	HP 3PAR 8000 480GB SAS cMLC SFF SSD	K2P88A
1	HP 3PAR 8200 Operating System Suite Base LTU	L7B45A
8	HP 3PAR 8200 Operating System Suite Drive LTU	L7B46A
1	HP 3PAR 8200 Virtual Copy Base LTU	L7B57A
8	HP 3PAR 8200 Virtual Copy Drive LTU	L7B58A
1	OS Media Kit	BD362AAE / BD363AAE

HPE 3PAR StoreServ 8400 All-Flash Starter Kit

The HPE 3PAR StoreServ 8400 All-Flash Starter Kit is an all-flash version of the HPE 3PAR StoreServ 8400 that provides all-flash acceleration at entry-level price in a 4-node scalable system. The kit includes the HPE 3PAR StoreServ 8400 2-Node Storage System Base equipped with 8 x 480GB SFF cMLC SSD drives, the OS Suite, and Virtual Copy software. It also includes 3 year 24x7 Proactive Care Support. The HPE 3PAR StoreServ 8400 All-Flash Starter Kit has the same Drive LTUs cap (168) and maximum number of SSDs (240) as the HPE 3PAR StoreServ 8400.

Model

HPE 3PAR StoreServ 8400 All-Flash Starter Kit M0T18A

The HPE 3PAR StoreServ 8400 All-Flash Starter Kit is an orderable part number that includes the following individual parts.

Quantity	Component	
1	HP 3PAR StoreServ 8400 2-node Field Integrated Storage Base	H6Y96A
8	HP 3PAR 8000 480GB SAS cMLC SFF SSD	K2P88A
1	HP 3PAR 8400 Operating System Suite Base LTU	L7B69A
8	HP 3PAR 8400 Operating System Suite Drive LTU	L7B70A
1	HP 3PAR 8400 Virtual Copy Base LTU	L7B81A
8	HP 3PAR 8400 Virtual Copy Drive LTU	L7B82A

HP 3PAR StoreServ 8000 Converged File/Block Starter Kit

1	OS Media Kit	BD362AAE / BD363AAE

NOTE: It is possible to add more SSDs, drive enclosures (and any other 8000 accessory), and software to the HPE 3PAR StoreServ 8200/8400 All-Flash Starter Kit quote. Each of the nested components will appear as separate parts on the quote and will be priced accordingly

HP 3PAR StoreServ 8000 Converged File/Block Starter Kit

HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit

The HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit is a converged file/block version of the HPE 3PAR StoreServ 8200 that is twice as easy to manage, has 40% better density, and is more attractively priced than other comparable unified storage arrays. The kit includes the HPE 3PAR StoreServ 8200 Storage System Base equipped with 8 x 600GB 10K SFF HDDs and 12 x 2TB 7.2K LFF HDDs, a LFF SAS Drive Enclosure, 2 x 2-port 10GbE adapters, the OS Suite, Replication Suite, and 16 x File Persona 1TB LTUs. It also includes 3 year 24x7 Proactive Care Support. The HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit has the same Drive LTUs cap (48) and maximum number of HDDs/SSDs (240/120) as the HPE 3PAR StoreServ 8200.

Model

HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit	M0T74A

The HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit is an orderable part number that includes the following individual parts.

Quantity	Component	
1	HP 3PAR StoreServ 8200 2N Fld Int Base	K2Q36A
1	HP 3PAR 8200 OS Suite Base LTU	L7B45A
20	HP 3PAR 8200 OS Suite Drive LTU	L7B46A
1	HP 3PAR 8200 Replication Suite Base LTU	L7B49A
20	HP 3PAR 8200 Replication Ste Drive LTU	L7B50A
16	HP 3PAR 8200 File Persona Ste 1TB LTU	BD440A
8	HP 3PAR 8000 600GB SAS 10K SFF HDD	K2P99A
12	HP 3PAR 8000 2TB SAS 7.2K LFF HDD	K2P95A
1	HP 3PAR 8000 LFF(3.5in) SAS Drive Encl	H6Z27A
2	HP 3PAR 8000 2-pt 10Gb Eth Adapter	E7Y70A
1	OS Media Kit	BD362AAE / BD363AAE

NOTE: It is possible to add more HDDs/SSDs, drive enclosures (and any other 8000 accessory), and software to the HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit quote. Each of the nested components will appear as separate parts on the quote and will be priced accordingly

Service and Support, HP Care Pack, and Warranty Information

Warranty

3 Year, On-site Warranty Service for hardware components. 7x24 4-hour remote response with next business day on-site response.

The warranty on all HPE 3PAR StoreServ 8000 Solid State Drives is 5 years, parts only. Please refer to the HPE 3PAR StoreServ 8000 Drives section for the complete list of SSD SKUs. The warranty on all other HPE 3PAR StoreServ 8000 drives (SAS performance and Nearline SAS) is 3 years, parts only. Hewlett Packard Enterprise warrants only that the Software media will be free of physical defects for a period of ninety (90) days from delivery.

For more information about Hewlett Packard Enterprise's Global Limited Warranty and Technical Support, visit: **http://www.hpe.com/products/storageworks/warranty**

NOTE: SSDs have a limited number of writes that can occur before reaching the SSD's write endurance limit. This limit is generally high enough so wear out will not occur during the expected service life of an HPE 3PAR StoreServ under the great majority of configurations, IO patterns, and workloads. HPE 3PAR StoreServ tracks all writes to SSDs and can report the percent of the total write endurance limit that has been used. This allows any SSD approaching the write endurance limit to be proactively replaced before they are automatically spared out. An SSD has reached the maximum usage limit once it exceeds its write endurance limit. Following the product warranty period, SSDs that have exceeded the maximum usage limit will not be repaired or replaced under Hewlett Packard Enterprise support contracts.

Service and Support

Technology Services for increased uptime, productivity and ROI

Trust HPE storage technology experts for every level of service and support. Our integrated portfolio of services for storage help customers reduce costs, optimize data, streamline storage management, and improve backup and recovery. Capitalizing on HPE Storage Systems' capabilities requires a service partner who understands your increasingly complex environment. Team with the people who know Hewlett Packard Enterprise infrastructure hardware and software best-the experienced professionals at HPE Services.

Protect your business beyond warranty

Warranty protects against manufacturer defects, however warranty uplifts, such as HPE Care Pack Services protect the business-by reducing downtime risks and providing operational consistency for mission-critical and standard business computing.

What HPE Storage Technology Services can do for you

HPE Storage Technology Services can help you design, deploy, test, integrate, support, and manage IT and infrastructure solutions. HPE storage lifecycle support services offers a full spectrum of customer care-from technology support to complex migrations to complete managed services.

Choose the right level of support, deployment and integration services

Hewlett Packard Enterprise support recommendations are designed to help you enhance technology operations and lower risk-and make it easier for you to seek the right balance between affordability and service-level commitments. Depending on your individual support needs, choose from three levels of care that cover the entire lifecycle to better address your needs-Optimized Care, Standard Care, and Basic Care. If none of our support recommendations meet your needs, we can tailor a service solution for your unique support requirements. Only Hewlett Packard Enterprise brings together deep

Service and Support, HP Care Pack, and Warranty Information

expertise, proactive and business critical support and a strong partner network-together with, a full set of infrastructure services designed to power a Converged Infrastructure

Optimized Care - delivers best performance and stability through deployment and proactive management practices

HPE Proactive Care Advanced 24x7 - This service builds and incorporates on Proactive Care Service and also gives customers personalized technical and operational advice from an assigned, local Account Support Manager for personalized technical collaboration, flexible access to specialist skills to help optimize business critical IT, and enhanced Critical Incident Management to help so the business is not affected if there is a system or device outage.

Additional Option:
3 Year (or) 1 Year HPE Proactive Select Credits, HPE Data Sanitization Tier 1 Service

Standard Care - maintains high level of uptime, along with expert help to cut the cost and complexity of implementation and support

HPE Proactive Care 24x7 - for a higher return on your storage investment, Proactive Care delivers hardware and software support services designed specifically for your technology; rapid access to Advanced Solution Center Specialists plus, Firmware/Software management and best practice advice. Customers can optimize the return on their IT investment and realize the advantage of running their business critical applications on virtualized infrastructure. Plus, HPE Proactive Select 20 credits per year, select from an extensive menu of consultancy and technical services, such as health checks, assessments, and education.

Additional Option:
3 Year (or) 1 Year HPE Proactive Select Credits, HPE Data Sanitization Tier 1 Service

Basic Care - Recommended support

HPE Proactive Care 24x7 - for a higher return on your storage investment, Proactive Care delivers hardware and software support services designed specifically for your technology; rapid access to Advanced Solution Center Specialists plus, Firmware/Software management and best practice advice. Customers can optimize the return on their IT investment and realize the advantage of running their business critical applications on virtualized infrastructure.

Additional Option:
3 Year (or) 1 Year HPE Proactive Select Credits, HPE Data Sanitization Tier 1 Service

HPE Proactive Select is a flexible way to purchase services to fit your particular environment or situation. Working with a Hewlett Packard Enterprise Account Support Manager, you select a package of services in the form of services credits that include proactive services spanning many technologies and processes, such as on-site firmware upgrades, health checks, assessments, and education. You tailor the service delivery to improve time to production, optimize performance, or build in continuous improvements.

Implementation

Installation:
Whichever level of care you select, consider our Installation and Startup Services for a smooth implementation.

HPE 3PAR StoreServ 8000 Storage Installation and Startup Service - For smooth startup, this service provides you with deployment of your HPE 3PAR StoreServ 8000 Storage, ensuring proper installation into your storage environment and helping you realize the maximum benefit from your storage investment.
http://h71028.www7.hpe.com/ERC/downloads/4AA5-8035ENW.pdf

Related Services

HPE Storage Transformation Workshop - Explore data management transformation journey to

Service and Support, HP Care Pack, and Warranty Information

business-aligned visions, aligning your specific situation and Hewlett Packard Enterprise's experiences.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-9541ENW.pdf

HPE Storage Modernization Service - Modernize your storage to take better advantage of physical or virtualized server environments.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-4620ENW.pdf

HPE StoreServ Integration Service - Integrate your new HPE 3PAR StoreServ system so that it is agile, performs effectively, and scales to rapid growth.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-9254ENW.pdf

HPE Storage Data Migration Service - Hewlett Packard Enterprise expertise and tools help you migrate data across your data center or around the globe. Take the burden of migration off your shoulders and put it in the capable hands of expert HPE storage migration consultants. Our proven approach helps orchestrate the complete data migration and consolidation process while maintaining consistent data availability during the transfer process.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-0774ENW.pdf

HPE QuickStart Service for HPE 3PAR StoreServ Storage - Choose the most effective, appropriate methods for configuring and migrating to a HPE 3PAR platform.
http://www8.hpe.com/us/en/services/services-detail.html?compURI=tcm:245-826727&pageTitle=Consulting-Services&contentView=business

HPE EVA to HPE 3PAR Acceleration Service - The HPE EVA to HPE 3PAR Acceleration Service can help guide you or even execute data migration activities on your behalf that can not only optimize, but provide OPEX and CAPEX savings as a result of your journey from HPE EVA to HPE 3PAR StoreServ. This service provides customers with an alternative DIY ("do-it-yourself") data migration option with guidance from TS Storage migration specialists. With the help of migration experts, this service allows customers to execute an HPE EVA to HPE 3PAR StoreServ data migration at their own pace and lowered cost.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-4234ENW.pdf

HPE 3PAR StoreServ 8000 Software Installation and Startup Service - Designed to provide a smooth startup, HPE 3PAR 8000 Software Installation and Startup Service provides deployment of your HPE 3PAR 8000 storage software, helping to ensure proper installation in your storage environment as well as helping you increase the benefit from your storage investment. Complementing your new HPE 3PAR 8000 storage software, HPE 3PAR 8000 Software Installation and Startup Service provides the necessary activities required to help you deploy your licensed HPE 3PAR 8000 software products into operation.
http://h71028.www7.hpe.com/ERC/downloads/4AA5-8036ENW.pdf

HPE SAN Deployment Service - Hewlett Packard Enterprise delivers complete design and implementation services for Fibre Channel, FCoE, FCIP, SAS, and iSCSI storage area network (SAN) connectivity components. This service includes three levels of support based on the type of environment, ranging from simple to more complex. A trained service specialist guides the implementation of the storage switches in the SAN environment according to Hewlett Packard Enterprise quality standards.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/5981-8527EN.pdf

HPE 3PAR Replication Software Suite Installation and Startup Service - Provides implementation

Service and Support, HP Care Pack, and Warranty Information

of the HPE 3PAR Virtual Copy, Remote Copy, Peer Persistence and Cluster Extension components of the HPE 3PAR Replication Software Suite product. The service is designed to help get HPE 3PAR 8000 Replication Software Suite up and running quickly and to provide a demonstration of the product's key features using sample or test data only. HPE 3PAR 8000 Replication Suite includes HPE 3PAR Remote Copy, HPE 3PAR Virtual Copy, HPE 3PAR Peer Persistence, and HPE 3PAR Cluster Extension. The HPE 3PAR Cluster Extension Implementation service is available separately.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-2570ENW.pdf

HPE Data Replication Solution Service for HPE 3PAR Virtual Copy - HPE Data Replication Solution Service for HPE 3PAR Virtual Copy Software helps create, manage and configure local replication data mirroring and snapshot capabilities of HPE 3PAR StoreServ storage systems. This service enables snapshots and mirroring to facilitate data restores, minimize downtime for backups, perform application testing, support data mining use with decision-support tools.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-8107ENW.pdf

HPE Data Replication Solution Service for HPE 3PAR Remote Copy - HPE Data Replication Solution Service for HPE 3PAR Remote Copy Software configures real-time data mirroring between local and remote HPE 3PAR StoreServ storage systems to safeguard critical business information. Provides scalable deployment of HPE 3PAR Remote Copy Software with real-time data mirroring between a local and a remote HPE 3PAR StoreServ storage system.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-8627ENW.pdf

HPE 3PAR Adaptive Optimization Policy Implementation Service - HPE 3PAR Adaptive Optimization Policy Implementation Service provides analysis, recommendations, and implementation of HPE 3PAR Adaptive Optimization policies to enable storage tiering using data collected from the HPE 3PAR Storage system over time. With the assistance of a designated IT storage administrator, a service specialist works with the customer to implement Adaptive Optimization policies on the HPE 3PAR Storage system to help deliver service level optimization for virtual and cloud data centers while reducing cost, increasing agility and minimizing risk.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA2-3842ENW.pdf

HPE Storage Virtual Volume Design and Implementation Service - When redeploying an HPE StorageWorks Disk Array, the HPE Virtual Volume Design and Implementation Service provides the necessary activities required to design and implement a new virtual volume configuration.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA2-3764ENN.pdf

HPE Thin Volume Conversion Service - Provides evaluation and execution of conversion from standard to thin provisioned virtual volumes for HPE 3PAR Storage. A service specialist advises the customer on HPE 3PAR Thin Provisioning best practices, provides evaluation of potential disk capacity savings if target virtual volumes are converted, and plans and implements thin conversion processing. The service leverages 3PAR thin provisioning capabilities to help optimize storage capacity, reduce cost, increase agility and maintain performance.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA2-3842ENW.pdf

HPE Performance Analysis Service for HPE Disk Arrays - The service provides data collection, detailed I/O analysis and enhancement recommendations for HPE 3PAR StoreServ Storage disk arrays, HPE EVA P6000 Storage disk arrays and HPE XP P9000 Storage disk arrays. HPE Performance Analysis Service for HPE Storage Disk Arrays provides a single engagement concerning the

Service and Support, HP Care Pack, and Warranty Information

performance of a single HPE 3PAR StoreServ Storage disk array, HPE EVA P6000 Storage disk array and HPE XP P9000 Storage disk array
http://h20195.www2.hpe.com/V2/GetPDF.aspx/5982-6668EN.pdf

HPE 3PAR Health Check Service - The HPE 3PAR Health Check service is delivered as a single engagement, providing data collection, analysis, report creation, and a briefing session concerning the performance of a single HPE 3PAR StoreServ Storage System. This health check service is best for HPE 3PAR StoreServ Storage Systems that have been installed and are in normal production mode. It can also be used to establish a baseline for future reference to improve the effective use of your storage system.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-3225ENW.pdf

HPE 3PAR Storage Rebalance Service - The HPE 3PAR Rebalance Service helps balance data across an HPE 3PAR StoreServ Storage array to take advantage of the capabilities of the array architecture. The service provides analysis, planning, and implementation of data movement and/or physical movement of drive magazines within the array.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-0280ENW.pdf

For more information **http://www.hpe.com/services/storage**

To learn more on HPE Storage Services, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner.HPE Care Pack Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise Authorized Service Partners:

- Services for customers purchasing from Hewlett Packard Enterprise or an enterprise reseller are quoted using Hewlett Packard Enterprise order configuration tools.
- Customers purchasing from a commercial reseller can find HPE Care Pack Services at: **http://www.hpe.com/go/lookuptool**

Configuration Information

Step 1 - Choose a Base configuration

HPE 3PAR StoreServ 8000 configurations start with the selection of the Base. The Base includes controller nodes, bays for small form factor drives, and PCIe slots for host adapter cards. SAN Kits are also considered base configurations.

HPE 3PAR StoreServ 8000 Base Configurations

Factory Integrated in HPE rack	HP 3PAR StoreServ 8200 2-node Storage Base	K2Q35A
	HP 3PAR StoreServ 8400 2-node Storage Base	H6Y95A
	HP 3PAR StoreServ 8400 4-node Storage Base	H6Z01A
	HP 3PAR StoreServ 8440 2-node Storage Base	H6Y97A
	HP 3PAR StoreServ 8440 4-node Storage Base	H6Y98A
	HP 3PAR StoreServ 8450 2-node Storage Base	H6Z17A
	HP 3PAR StoreServ 8450 4-node Storage Base	H6Z23A
Factory Integrated in HPE rack in a Storage Centric Configuration	HP 3PAR StoreServ 8200 2-node Storage Base for Storage Centric Rack	K2Q37A
	HP 3PAR StoreServ 8400 2-node Storage Base for Storage Centric Rack	H6Z12A
	HP 3PAR StoreServ 8400 4-node Storage Base for Storage Centric Rack	H6Z03A
	HP 3PAR StoreServ 8440 2-node Storage Base for Storage Centric Rack	H6Z09A
	HP 3PAR StoreServ 8440 4-node Storage Base for Storage Centric Rack	H6Z14A
	HP 3PAR StoreServ 8450 2-node Storage Base for Storage Centric Rack	H6Z20A
	HP 3PAR StoreServ 8450 4-node Storage Base for Storage Centric Rack	H6Z25A
Field Integrated	HP 3PAR StoreServ 8200 2-node Field Integrated Storage Base	K2Q36A
	HP 3PAR StoreServ 8400 2-node Field Integrated Storage Base	H6Y96A
	HP 3PAR StoreServ 8400 4-node Field Integrated Storage Base	H6Z02A
	HP 3PAR StoreServ 8440 2-node Field Integrated Storage Base	H6Z07A
	HP 3PAR StoreServ 8440 4-node Field Integrated Storage Base	H6Z13A
	HP 3PAR StoreServ 8450 2-node Field Integrated Storage Base	H6Z18A
	HP 3PAR StoreServ 8450 4-node Field Integrated Storage Base	H6Z24A

- A minimum of one (1) configuration base must be ordered for each array.
- The HPE 3PAR StoreServ 8000 base configuration includes (2 or 4) controller nodes, (24) small form factor drive bays per node pair, (4) built-in 16 Gb/sec FC ports per node pair, (4) 16Gb shortwave FC SFP per node pair, (2) PCIe adapter slots for host adapter cards per node pair (one slot per node), (2) 2m SAS cables per node pair, (1) mounting rail kit per node pair, and power cords.
- The HPE 3PAR StoreServ 8000 2-node base configuration also includes (2) 1U rack filler panels to reserve 2U of rack space above the 2-node Storage Base for a future upgrade to a 4-node configuration
- All base configurations include (1) built-in 1GbE port for management

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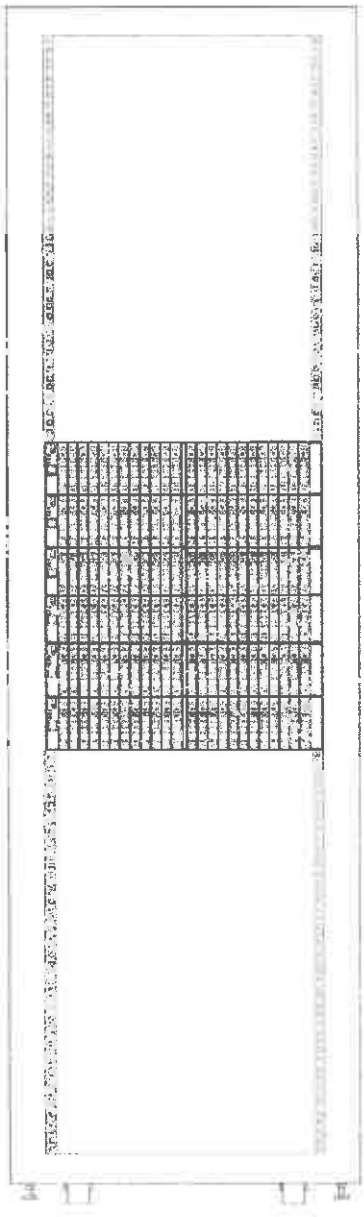
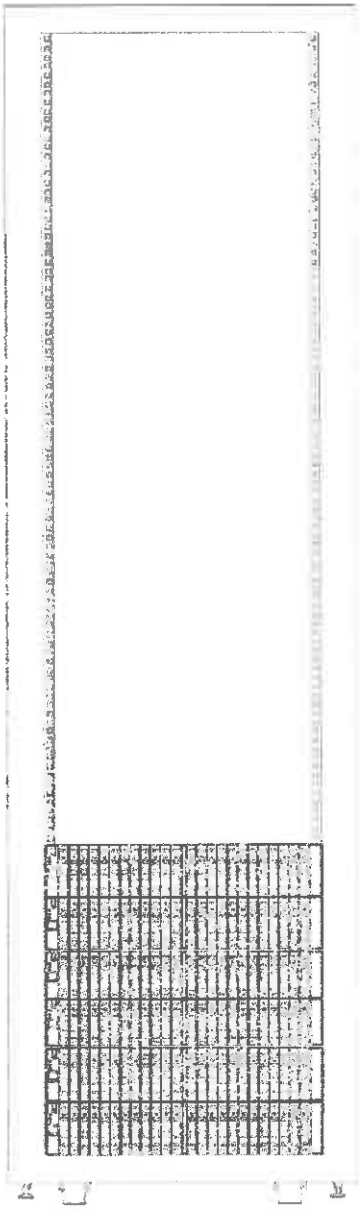
and (1) 1GbE port for either Remote Copy over IP or File Persona, per node.

- The Storage Centric rack versions of HPE 3PAR StoreServ 8000 are for CTO (factory Configure-To-Order) only. With a Storage Centric configuration, the storage system gets placed in the center of the rack so that future expansion of that storage system becomes easier.
- In Storage Centric configurations, non-3PAR components, with the exception of certain StoreFabric Storage Networking switches, if added to the same order, get placed in a separate rack.

The following diagrams show a HPE 3PAR StoreServ 8000 4N Storage System in Storage Centric and non-Storage Centric configurations



StoreServ 8000 4-node Storage system in a storage centric



StoreServ 8000 4-node Storage system in a non-storage centric

Configuration Information

configuration in a HPE Intelligent Series Rack

configuration in a HPE Intelligent Series Rack

HPE 3PAR StoreServ 8000 Upgrade Controller Node Pair

Use the HPE 3PAR StoreServ 8000 Upgrade Node Pair to convert an existing previously installed HPE 3PAR StoreServ 8000 2-node Storage Base into a 4-node configuration.

HP 3PAR StoreServ 8400 Upgrade Node Pair	H6Z06A
HP 3PAR StoreServ 8440 Upgrade Node Pair	H6Z08A
HP 3PAR StoreServ 8450 Upgrade Node Pair	H6Z19A

- H6Z06A is used to upgrade a HPE 3PAR StoreServ 8400 2-node Storage Base into a 4-node configuration.
- H6Z08A is used to upgrade a HPE 3PAR StoreServ 8440 2-node Storage Base into a 4-node configuration.
- H6Z19A is used to upgrade a HPE 3PAR StoreServ 8450 2-node Storage Base into a 4-node configuration.
- One (1) pair of controller nodes beyond the base configuration is supported on the 3PAR StoreServ 8000.
- The 3PAR StoreServ 8000 Upgrade Node Pair includes (2) controller nodes, (24) small form factor drive bays, (4) built-in 16 Gb/sec FC ports, (4) 16Gb shortwave FC SFP, (2) PCIe adapter slots for host adapter cards (one slot per node), (2) 2m SAS cables, (4) node link cables, (1) mounting rail kit, and power cords
- The upgrade node pair includes (2) built-in 1GbE ports for management and (2) 1GbE ports for either Remote Copy over IP or File Persona.

Step 2 - Choose Host Adapter

Host adapters can be ordered separately to be installed in the field or they can be factory configured into controller nodes. Host adapter cards provide the array with additional FC ports, with 10Gb/s iSCSI/FCoE ports, or with 1GbE/s and 10Gb/s Ethernet ports. The additional FC ports can be used for connection to hosts or used to connect to other HPE 3PAR StoreServ Storage systems in a Remote Copy relationship. The iSCSI/FCoE ports permit host connection in iSCSI and FCoE environments. The Ethernet ports can be used only with the HPE 3PAR File Persona Software Suite for File services connectivity.

HPE 3PAR StoreServ 8000 Host Adapters

HP 3PAR StoreServ 8000 4-port 16Gb Fibre Channel Adapter	H6Z00A
HP 3PAR StoreServ 8000 2-port 10Gb iSCSI/FCoE Adapter	H6Z10A
HP 3PAR StoreServ 8000 4-port 1Gb Ethernet Adapter	H6Z05A
HP 3PAR StoreServ 8000 2-port 10Gb Ethernet Adapter	E7Y70A

- The host adapter cards are optional because the Storage Base products and the Upgrade Controller Node Pair include built-in FC ports.
- Ethernet Adapters (H6Z05A and E7Y70A) can be used exclusively with the HPE 3PAR File Persona Software Suite.
- The 16Gb/s Fiber Channel Adapter (H6Z00A) includes (4) 16Gb/s shortwave FC SFP+. The 10Gb/s iSCSI/FCoE Adapter (H6Z10A)

Configuration Information

includes (2) 10Gb/s shortwave SFP+. The 10Gb/s Ethernet Adapter (E7Y70A) includes (2) 10Gb/s SR SFP+

- Each node in a node pair (a node pair is composed of the two controller nodes in a single 2U enclosure) must have the same number and type of adapters: FC, iSCSI/FCoE, and Ethernet adapters may not be intermixed in a node pair.
- The 4 ports of the FC adapter can be individually configured to connect to a host or to a remote array in an RC configuration.
- The two ports of the iSCSI/FCoE adapter can be individually configured by the user as iSCSI or FCoE.

Adapter Configurations permitted on HPE 3PAR StoreServ 8000 2-node systems

Product	Nodes	A	B	C	D				
2-node Storage Base	Node 0 Node 1	Empty Empty	FC FC	iSCSI/FCoE iSCSI/FCoE	Eth Eth				
Upgrade Node Pair	Node 2 Node 3	Empty Empty	FC FC	iSCSI/FCoE iSCSI/FCoE	Eth Eth				

Adapter Configurations permitted on HPE 3PAR StoreServ 8000 4-node systems

Product	Nodes	A	B	C	D	E	F	G	H
4-node Storage Base	Node 0 Node 1 Node 2 Node 3	Empty Empty Empty Empty	FC FC Empty Empty	iSCSI/FCoE iSCSI/FCoE Empty Empty	Eth Eth Empty Empty	Empty Empty FC FC	Empty Empty iSCSI/FCoE iSCSI/FCoE	Empty Empty Eth Eth	FC FC iSCSI/FCoE iSCSI/FCoE
		I	J	K	L	M	M	O	P
	Node 0 Node 1 Node 2 Node 3	iSCSI/FCoE iSCSI/FCoE FC FC	FC FC Eth Eth	Eth Eth FC FC	iSCSI/FCoE iSCSI/FCoE Eth Eth	Eth Eth iSCSI/FCoE iSCSI/FCoE	FC FC FC FC	iSCSI/FCoE iSCSI/FCoE iSCSI/FCoE iSCSI/FCoE	Eth Eth Eth Eth

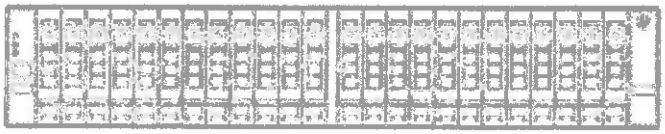
NOTE: If the configuration includes Remote Copy over Fibre Channel it is recommended that optional Fiber Channel HBAs are purchased as the built in ports will not offer sufficient connectivity.

NOTE: Ethernet Adapters can be used only with the HPE 3PAR File Persona Software Suite for File services connectivity

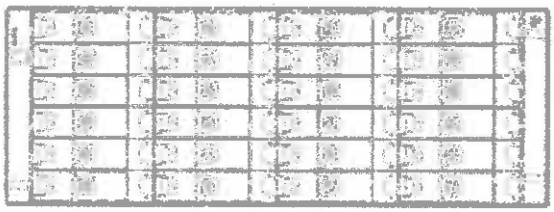
Step 3 - Choose Drive Enclosures

Add drive enclosures to expand the configuration and to add large form factor drives to the configuration. Drive enclosures can be ordered separately for installation in the field, or they can be factory configured in a rack. Drive enclosures are optional. Because the Storage Base products and the Upgrade Node Pair include small form factor drive bays, the minimum configuration does not require any additional drive enclosures. For larger configurations, attach drive enclosures. Each drive enclosure includes 24 drive bays. The two drive enclosure types can be intermixed in a single array. The HPE 3PAR StoreServ 8200 supports up to nine (9) added drive enclosures. The HPE 3PAR StoreServ 8400 supports up to twenty-two (22) added drive enclosures. The HPE 3PAR StoreServ 8440 supports up to thirty-eight (38) added drive enclosures. The HPE 3PAR StoreServ 8450 supports up to eighteen (18) added drive enclosures.

Configuration Information



HPE 3PAR StoreServ 8000 SFF(2.5in) SAS Drive Enclosure



HPE 3PAR StoreServ 8000 LFF(3.5in) SAS Drive Enclosure

Drive Enclosures

HP 3PAR StoreServ 8000 SFF(2.5in) SAS Drive Enclosure	H6Z26A
HP 3PAR StoreServ 8000 LFF(3.5in) SAS Drive Enclosure	H6Z27A
HP 3PAR StoreServ 8000 SFF(2.5in) Field Integrated SAS Drive Enclosure	E7Y71A
HP 3PAR StoreServ 8000 LFF(3.5in) Field Integrated SAS Drive Enclosure	E7Y72A

- Each drive enclosure includes 24 drive bays, (2) IO modules, (2) 1m SAS cables, (1) mounting rail kit, and power cables.
- The 2U SAS drive enclosure provides 24 SFF drive bays arranged in a single row.
- The 4U drive enclosure provides 24 LFF drive bays, arranged in four (4) columns of six (6) slots each.
- Drive enclosures are connected in daisy chains from the SAS ports of the controller nodes.
- The best practice is to balance the drive enclosures across the SAS ports, remembering that the controller node enclosures include (24) drives attached to the SAS port labeled DP-1.
- The best practice when including LFF and SFF drive enclosures in the same array is to arrange them in the rack so that all of the 2U enclosures that belong to one node pair are together and all of the 4U enclosures for that node pair are together. When connecting the backend SAS cables, intermix the 2U and 4U SAS enclosures on each SAS port.
- With a four node configuration, the best practice is to attach the same number of drive enclosures and drive types to each node pair.
- To achieve highest availability in multi-enclosure configurations, configure a minimum of two (2) enclosures per node pair for RAID 1, a minimum of four (4) enclosures per node pair if RAID 5 is included, and a minimum of three (3) enclosures per node pair if RAID 6 is included. Include enclosures containing node pairs in the count with the 2U SAS enclosures.
- Drive bays that are not filled with a drive must be covered with a drive blank to preserve proper air flow.
- If future capacity upgrades are expected, include enough Drive Enclosures so that there are some empty bays in each enclosure after all drives are added.

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Step 4 - Choose Drives

Drives are orderable at the time the array is purchased, or can be added in the future when additional capacity is required. HPE 3PAR StoreServ 8000 drives are sold as single drives. Note that these drives are only compatible with the HPE 3PAR StoreServ 8000 SAS Drive Enclosures.

HPE 3PAR StoreServ 8000 SAS Drives

HPE 3PAR SSDs	HP 3PAR StoreServ 8000 400GB SAS MLC SFF(2.5in) Solid State Drive	N9Y06A
	HP 3PAR StoreServ 8000 480GB SAS MLC SFF(2.5in) Solid State Drive	K2Q95A
	HP 3PAR StoreServ 8000 480GB SAS cMLC SFF(2.5in) Solid State Drive	K2P88A
	HP 3PAR StoreServ 8000 480GB SAS cMLC LFF(3.5in) Solid State Drive	K2Q96A
	HP 3PAR StoreServ 8000 1.92TB SAS cMLC SFF(2.5in) Solid State Drive	K2P89A
	HP 3PAR StoreServ 8000 3.84TB SAS cMLC SFF(2.5in) Solid State Drive	K2P91A
HPE 3PAR SAS HDDs (Performance HDDs)	HP 3PAR StoreServ 8000 300GB SAS 15K SFF(2.5in) Hard Drive	K2P97A
	HP 3PAR StoreServ 8000 600GB SAS 15K SFF(2.5in) Hard Drive	K2P98A
	HP 3PAR StoreServ 8000 600GB SAS 10K SFF(2.5in) Hard Drive	K2P99A
	HP 3PAR StoreServ 8000 1.2TB SAS 10K SFF(2.5in) Hard Drive	K2P93A
	HP 3PAR StoreServ 8000 1.8TB SAS 10K SFF(2.5in) Hard Drive	K2P94A
HPE 3PAR NL SAS HDDs	HP 3PAR StoreServ 8000 2TB SAS 7.2K SFF(2.5in) Hard Drive	M0S92A
	HP 3PAR StoreServ 8000 2TB SAS 7.2K LFF(3.5in) Hard Drive	K2P95A
	HP 3PAR StoreServ 8000 4TB SAS 7.2K LFF(3.5in) Hard Drive	K2P87A
	HP 3PAR StoreServ 8000 6TB SAS 7.2K LFF(3.5in) Hard Drive	K2P96A

- For each drive type installed in the array, the minimum recommended initial quantity is eight (8) drives per node pair for SSD and SAS performance HDDs, and twelve (12) drives per node pair for Nearline HDDs.
  NOTE: 8 drives support RAID 1 and RAID 5. For RAID 6 choose 12 drives.
- Minimum upgrade quantity is 4 drives per node pair or 2 drives per enclosure, whichever is larger. Best practice is to run Autonomic Rebalance (also known as tunesys) after adding the drives.
- RAID 6 is strongly recommended for Nearline drives.
- All node enclosures must contain either zero (0) or an even number of the same type of drives (FC, NL, SSD).
- All drive enclosures must contain an even number of drives, with a minimum of two.
- A best practice is to add equal numbers of drives to all enclosures compatible with the drive type being added.
- With a four node configuration, the best practice is to attach the same number and type of drives to each node pair.
- Small Form Factor (SFF)-specific configuration practices
  - SFF drives may be loaded into the Storage Base enclosures, the Upgrade Node Pair enclosure and the 2U SAS drive

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enclosure.
  - SFF drives must be loaded in pairs of identical drives, beginning with the leftmost slot, slot 0, and filling to the right, leaving no empty slots between drives.
- Large Form Factor (LFF)-specific configuration practices
  - LFF drives may be loaded into the 4U SAS drive enclosure.
  - LFF drives must be loaded in pairs of identical drives starting at the bottom of a column, leaving no empty slots between drives in the column.
  - Intermixing SSDs and spinning media in a LFF drive enclosure is allowed as long as each drive type is installed in even pairs in the same column.
  - It is permitted to have empty columns between columns containing drives. Different columns do not have to contain the same number of drives.
  - An all LFF drive configuration is permitted, leaving the Storage Base Enclosure empty.

HPE 3PAR FIPS Encrypted SSD/HDD	HP 3PAR StoreServ 8000 920GB SAS MLC SFF(2.5in) FIPS Encrypted Solid State Drive	K2P90A
	HP 3PAR StoreServ 8000 1.92TB SAS cMLC SFF(2.5in) FIPS Encrypted Solid State Drive	K2R27A
	HP 3PAR StoreServ 8000 3.84TB SAS cMLC SFF(2.5in) FIPS Encrypted Solid State Drive	M0T66A
	HP 3PAR StoreServ 8000 600GB SAS 15K SFF(2.5in) FIPS Encrypted Hard Drive	K2P92A
	HP 3PAR StoreServ 8000 1.2TB SAS 10K SFF(2.5in) FIPS Encrypted Hard Drive	K2P85A
	HP 3PAR StoreServ 8000 4TB SAS 7.2K LFF(3.5in) FIPS Encrypted Hard Drive	N9Y05A
	HP 3PAR StoreServ 8000 6TB SAS 7.2K LFF(3.5in) FIPS Encrypted Hard Drive	K2P86A
HPE 3PAR Encryption License	HP 3PAR 8200 Data Encryption LTU	L7B67A
	HP 3PAR 8200 Data Encryption E-LTU	L7B67AAE
	HP 3PAR 8400 Data Encryption LTU	L7B91A
	HP 3PAR 8400 Data Encryption E-LTU	L7B91AAE
	HP 3PAR 8440 Data Encryption LTU	L7C15A
	HP 3PAR 8440 Data Encryption E-LTU	L7C15AAE
	HP 3PAR 8450 Data Encryption LTU	L7C39A
	HP 3PAR 8450 Data Encryption E-LTU	L7C39AAE

- An encrypted HPE 3PAR StoreServ array, i.e. any HPE 3PAR StoreServ array that has the HPE 3PAR Data Encryption license activated or intended to be activated, must have only self-encrypted drives installed.
- A non-encrypted HPE 3PAR StoreServ array can have a mix of encrypted and non-encrypted drives.
- Customers have option to turn on encryption, non-disruptively, at any time, even after data has been written to the system.
- FIPS 140-2 Validated Self-Encrypting Drives (SEDs) have been certified by the U.S. National Institute of Standards and Technology (NIST) and

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Canadian Communications Security Establishment (CSE) as meeting the Level 2 security requirements for cryptographic modules as defined in the Federal Information Processing Standards (FIPS) 140-2 Publication

- Strengthen the DAR solution with an optional FIPS 140-2 Level-2 validated external key manager. Supports KMIP 1.1 for key management communications
- Supports HPE Enterprise Secure Key Manager 4.0 and SafeNet KeySecure k460 and k150 centralized key management
- A data encryption license (LTU) is required to enable encryption on the array. One encryption license is required for each encrypted array.
- Once encryption is enabled on the HPE 3PAR StoreServ Storage, it cannot be disabled.
- The local key manager is included in the HPE 3PAR OS. There is not a separately orderable part number for the local key manager.

Step 5 - Choose Service Processor Implementation

The HPE 3PAR Service Processor remotely monitors the HPE 3PAR StoreServ 8000 and enables remote servicing of the array. The key capabilities of the Service Processor are to:

- Enable rapid, proactive responses to issues
- Provide a secure communication channel between the customer's data center and HPE 3PAR Central for:
  - Remote Online Software Upgrade --Upgrade software with no application disruption
  - Remote Diagnostics --Maintain key diagnostic information centrally on a historical basis
  - Remote Serviceability--Provide fast predictive response and remediation

Each HPE 3PAR StoreServ 8000 requires its own Service Processor. The Service Processor functions as the communication interface between a customer's IP network and HPE 3PAR Central by managing all service-related communications. The Service Processor leverages the industry-standard HTTP over Secure Sockets Layer (HTTPS) protocol to secure and encrypt data communication.

The Service Processor can be deployed either as a virtual Service Processor (VSP) or a physical Service Processor. A virtual Service Processor is included free with the base HPE 3PAR Operating System. The virtual Service Processor can be installed on a customer-provided VMware or Microsoft Hyper-V system that meets the following specifications:

- Virtualization operating system
  - VMware vSphere ESXi 4.1, 5.0, 5.1, 5.5
  - Microsoft Hyper-V Server 2008 R2, 2012 or 2012 R2
- Server features
  - 2 GB RAM (minimum for the VSP Virtual Machine)
  - 256 GB free disk space (minimum for the VSP Virtual Machine)
    NOTE: VSP storage must not reside on the array it is managing.
  - DVD ROM or DVD RW
  - 1 Gb Ethernet port
  - For VSP on VMware, the server must be listed in the VMware Compatibility Guide
  - For VSP on Hyper-V, the server must be listed on the Windows Server Catalog

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Physical Service Processor

The physical Service Processor is a dedicated storage appliance located within the storage rack providing close proximity to the HPE 3PAR StoreServ 8000 Storage. The physical Service Processor is fully supported and maintained by HPE Services. The physical Service Processor has serial port connectivity that provides maintenance access for trouble shooting capabilities.

If a VMware server is not available to run the virtual Service Processor, the physical Service Processor is the alternative choice for remote monitoring and remote service. The physical Service Processor is available in two version: with Single Power Supply and with Redundant Power Supply.

Service Processor	HP 3PAR StoreServ SPS Service Processor	K2R28A
	HP 3PAR StoreServ RPS Service Processor	K2R29A

HPE 3PAR Policy Server

HPE 3PAR Policy Server works to implement customer-configurable remote service access policies. Installed on a customer-provided host, Policy Server provides the customer with ultimate flexibility and control to allow or deny outbound communication or remote service connections to and from an HPE 3PAR StoreServ Storage system. Policy Server also serves as the centralized point for collecting and storing audit logs of all diagnostic data transfers and authorized remote service connections to and from all configured HPE 3PAR Storage systems. HPE 3PAR Policy Server provides the

- The customer has complete control over policy administration.
- A centralized policy administration for all HPE 3PAR Storage systems is provided.
- A centralized audit log to facilitate security audits is provided.
- Up to 100 3PAR systems can be managed with a single 3PAR Policy Server license
- Policy Server 6.1.5 can be run on a Virtual Machine. For the latest information on supported hypervisors, refer to Single Point of Connectivity Knowledge for HPE Storage Products (SPOCK): **https://www.hpe.com/storage/spock**

	HP 3PAR Policy Manager Software LTU	TE400B

Step 6 - Choose Cables for host connection and remote copy connection

Cables are required on the HPE 3PAR StoreServ 8000 Storage for drive enclosure connections and for host connectivity. Copper SAS cables are required for connecting the drive enclosures to the nodes on the same rack and for daisy chaining between adjacent drive enclosures. Storage Base products, the Upgrade Node Pair and the Drive Enclosures all include Copper SAS cables. SAS Active Optical Cables are required if an HPE 3PAR StoreServ 8000 needs to be expanded into an adjacent rack, to connect drive enclosures in adjacent racks to the nodes in the base rack. OM4 Fiber Cables are required for host connectivity, Remote Copy and Peer Motion. The copper 1GbE cables are used for Remote Copy over IP and for connection to the Management Port.

Cables

SAS Active Optical Cables	HP 10m Mini SAS High Density Active Optical Cable	E7V95A
	HP 25m Mini SAS High Density Active Optical Cable	E7V96A
OM4 Cables	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable	QK732A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable	QK733A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A

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Copper 1GbE cables	HP 4.3m/14ft CAT5 RJ45 M/M Ethernet Cable	C7536A
	HP 7.6m/25ft CAT5 RJ45 M/M Ethernet Cable	C7537A
	HP 15.2m/50ft CAT5 RJ45 M/M Ethernet Cable	C7542A

Step 7 - Choose Racking Options

The HPE 3PAR StoreServ 8000 is compatible with most industry standard 4-post EIA 19 inch racks with square mounting holes, including the HPE Intelligent Series Rack and the HPE 10000 G2 Series Rack. The HPE 3PAR StoreServ 8000 can be factory configured and shipped in a rack or shipped without a rack for field integration into an existing rack. The rack used for factory integration is the HPE Intelligent Series Rack.

HPE Rack and Rack Options

Factory Integration

Select a rack to house your HPE 3PAR StoreServ 8000.

NOTE: The HPE Intelligent Series Rack is the only series supported for factory configuration.

Primary Configuration Rules

The HPE 3PAR StoreServ 8000 will be configured into an HPE Intelligent Series Rack with the appropriate power distribution units (PDUs). If other products such as servers or back-up products are included in the cab, a different PDU will be added (if required) or can be chosen from a list of appropriate offerings shown in the configuration tool. The HPE Intelligent Series Rack must be purchased for factory configuration. Additional 3PAR StoreServ 8000 controller node enclosures and drive enclosures may be ordered for multiple subsystem integration at the factory. The 3PAR StoreServ 8000 is also supported in HPE 10000 G2 Series racks for field installation. When calculating available U-space, assume that no space will be placed between the mounted components. For redundancy, order PDUs in quantities of two. Refer to the Configuration and User Guide in the Information Library at the Rack Solutions webpage.

HPE Intelligent Series Racks

NOTE: The number of components that will fit in a rack varies and is determined by the interior U-space of the rack.

HP 47U 600mm x 1075mm Enterprise Shock Rack	BW912A
HP 47U 1075mm Side Panel Kit	BW915A
HP 42U 600mm x 1075mm Enterprise Shock Rack	BW904A
HP 42U 1075mm Side Panel Kit	BW906A
HP 36U 600mm x 1075mm Enterprise Shock Rack	BW896A
HP 36U 1075mm Side Panel Kit	BW898A
HP 42U 600mm x 1200mm Enterprise Shock Rack	BW908A
HP 42U 1200mm Side Panel Kit	BW909A

For more information on the HPE rack offerings, please see the following URL: **http://h18004.www1.hpe.com/products/servers/platforms/rackandpower.html.**
For more information on rack options, see: **http://www.hpe.com/products/rackoptions.**
For more information on PDUs, see: **http://h18004.www1.hpe.com/products/servers/proliantstorage/power-protection/pdu.html.**

HPE PDU Pivot Kit

HP EVA PDU Pivot Kit — AG730A

Used to reclaim 2U of space in an HPE Intelligent Series Rack with HPE 3PAR StoreServ 8000 configurations. This kit allows the PDUs to be placed in the back of the rack without requiring any rack U space.

NOTE: The use of the PDU Pivot Kit is strongly recommended and is the default option when

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orders are configured, as it will save 2U of valuable rack space.

NOTE: 0D1 will appear after this part number to indicate factory integration where appropriate.

Non-HPE rack and power requirements

The Storage Bases, the Upgrade Node Pair, and the Drive Enclosures include mounting rails that are compatible with industry standard 4-post EIA 19 inch racks with square mounting holes. For detailed information on determining compatibility of a non-HPE rack, please review the information included in the HPE 3PAR StoreServ 8000 StoreServ 8000 Site Planning Guide

Step 8 - Choose Software

HPE provides an extensive selection of features for HPE 3PAR StoreServ Storage. All of the features available on the HPE 3PAR StoreServ 20000 Storage system are also available on the HPE 3PAR StoreServ 8000 Storage system, the result of a common architecture that spans from small and medium businesses to the largest global enterprise. For convenient ordering, the 3PAR StoreServ 8000 provides the features in Suites.

Two types of software licensing methods are employed with the HPE 3PAR StoreServ 8000. Some software titles are licensed per system; other titles are licensed by drive. With system-based licensing one license covers the whole array, independent of configuration or capacity. Drive-based licensing, in contrast, is licensed per installed drive. A software title with drive-based licensing includes two Licenses to Use (LTU), a Base LTU that enables the software feature for the system and a Drive LTU that licenses the use of one drive. For each software title, purchase one Base LTU per title per array, and one Drive LTU, up to a cap, for every drive, that is installed in the array, independent of drive type. For the HPE 3PAR StoreServ 8200 the Drive LTUs cap at 48. For the HPE 3PAR StoreServ 8400 the Drive LTUs cap at 168. For the HPE 3PAR StoreServ 8440 the Drive LTUs cap at 320. For the HPE 3PAR StoreServ 8450 the Drive LTUs cap at 168. After reaching the cap, you do not need to purchase any more Drive LTUs for that title.

For more information regarding HPE 3PAR software see **http://h18006.www1.hpe.com/storage/solutions/3par/software.html**
For more information regarding HPE 3PAR 8000 software SKUs see:
http://h20195.www2.hpe.com/v2/GetPDF.aspx/c04199812.pdf

HPE 3PAR Operating System Software Suite (Required)

Required for all new HPE 3PAR StoreServ systems, this foundational software suite gives you everything you need to get up and running quickly and efficiently. Powered by HPE 3PAR ASIC, HPE 3PAR StoreServ's Thin Technologies which include HPE 3PAR Thin Provisioning, HPE 3PAR Thin Persistence, HPE 3PAR Thin Conversion and HPE 3PAR Thin Deduplication, form the base of this software suite. Performance acceleration is assured with HPE 3PAR Adaptive Flash Cache by reducing application response time.
Network simplification are security are covered with VLAN tagging. Simplified management is offered by HPE 3PAR Operating System, HPE 3PAR StoreServ Management Console, HPE 3PAR Host Explorer and HPE SmartStart software designed to get you off to a quick start with your new HPE 3PAR StoreServ system; HPE 3PAR System Reporter and HPE 3PARInfo software are designed to track performance and capacity utilization trends for multiple HPE 3PAR StoreServ Systems. Other highlights of this suite include HPE 3PAR Full Copy, autonomic rebalancing capabilities that help you optimize the use of future capacity expansions, and support for standard multipathing software for high availability in clustered environments. A one year license for online import is included to enable migration from HPE EVA, EMC CLARiiON CX4, EMC VNX/VNX2, EMC VMAX (VMAX, VMAX SE, VMAX 10K, 20K, 40K) or HDS NSC, USP, USP V, USP VM.

HPE 3PAR Replication Software Suite

This suite bundles HPE 3PAR Virtual Copy with HPE 3PAR Remote Copy software, both also sold separately for all HPE 3PAR StoreServ models. HPE 3PAR Virtual Copy software protects and shares data affordably with rapid recovery using reservation-less, non-duplicative, copy-on-write snapshots. HPE 3PAR Remote Copy offers simple and cost effective data protection for efficient multi-tenant

Configuration Information

	disaster recovery. Also, included in this bundle is Peer Persistence which ensures transparent automatic failover over metropolitan distances using Remote Copy Synchronous mode. The Suite also includes HPE 3PAR Cluster Extension Software which enables automatic failover across data centers using Remote Copy Asynchronous mode.
HPE 3PAR Data Optimization Software Suite	This software bundle combines HPE 3PAR Dynamic Optimization, HPE 3PAR Adaptive Optimization, HPE 3PAR Priority Optimization and HPE 3PAR Peer Motion software together. HPE 3PAR Dynamic Optimization delivers the required service levels for the lowest possible cost throughout the data lifecycle. HPE 3PAR Adaptive Optimization improves storage utilization by enabling cost-optimized storage tiering. HPE 3PAR Priority Optimization assures service levels with QoS controls for mission critical applications. HPE 3PAR Peer Motion enables load balancing at will wherein, movement of data and workloads between arrays is initiated without impacting applications, users or services. The four software titles bundled in this suite are also sold separately for all HPE 3PAR StoreServ models.
HPE 3PAR File Persona Software Suite	This software suite enables file protocol services and an Object Access API to extend the spectrum of primary storage workloads natively addressed by HPE 3PAR StoreServ Storage Systems, with Converged Controllers. With this solution, the architectural benefits of HPE 3PAR StoreServ Storage can be extended to the following use cases: enterprise file sync and share; home directory consolidation; group, departmental and corporate shares; and custom cloud applications.
HPE 3PAR Security Software Suite	This software suite bundles HPE 3PAR Virtual Domains and HPE 3PAR Virtual Lock software. With this suite, you can segregate access and deliver robust storage services for different applications and user groups with additional security attached to the retention of storage volumes.
HPE 3PAR Application Software Suite for Hyper-V	Protect your Microsoft Hyper-V environment with HPE 3PAR Recovery Manager for Microsoft Hyper-V and the HPE 3PAR VSS Provider software, included in this software bundle.
HPE 3PAR Application Software Suite for Exchange	This bundle gives you the essentials for use with Microsoft Exchange, including HPE 3PAR Recovery Manager for Exchange and the HPE 3PAR VSS Provider software.
HPE 3PAR Application Software Suite for Oracle	Everything you need for protecting Oracle databases, including HPE 3PAR Recovery Manager for Oracle and Oracle space reclamation capabilities.
HPE 3PAR Application Software Suite for SQL	Protect Microsoft SQL databases with HPE 3PAR Recovery Manager for Microsoft SQL and the HPE 3PAR VSS Provider software.
HPE StoreOnce Recovery Central Manager	By combining the performance of snapshots with the protection of backups, this software integrates HPE 3PAR StoreServ with HPE 3PAR StoreOnce Backup Systems to provide a converged availability and flat backup service that augments traditional backup processes. With this automated, non-intrusive software, the simplicity and performance of local and remote snapshots can be combined with the reliability and cost effective retention of deduplicated backups

Configuration Information

HPE StoreFront Remote SaaS Portal

The HPE StoreFront Remote SaaS Portal provides proactive tools and integrated data collection from the HPE 3PAR StoreServ Storage arrays that call home to deliver unique insights and analytics all in one dashboard. Identify capacity and performance issues early through intuitive capacity and performance trend analysis and forecasting. These valuable analytics help maximize asset utilization and optimize the datacenter with recommendations and remedial actions when issues arise. Users can log into **https://www.storefrontremote.com** to claim their arrays and get access for free.

Step 9 - Choose File Controller

With HPE 3PAR StoreServ File Controller you get an efficient, bulletproof, and effortless way to provide file storage from HPE 3PAR StoreServ Storage. 3PAR StoreServ File Controller saves you time and money by supporting hundreds to thousands of concurrent users and diverse file workloads .It also has non-intrusive data deduplication that provides an average 50-60% in space savings. It provides security through features such as built-in encryption, sophisticated access controls, online snapshots, and the ability to run endpoint protection and backup software onboard so that data is protected at rest and in flight. HPE 3PAR StoreServ File Controllers are clustered file gateway configurations with transparent failover and online rolling maintenance updates that deliver continuous availability of data to users, servers, and applications. With a straightforward and consistent management experience, it also provides robust capabilities for demanding 24 x 7 file storage environments.

For more details on the specifications and data services offered by the HPE 3PAR StoreServ File Controller please refer to the following link: **http://www8.hpe.com/h20195/v2/GetHtml.aspx?docname=c04637524**

Technical Specifications

Physical Dimensions	Width in/mm	Depth in/mm	Height in/mm/U	Weight lb/kg
36U 1075mm Intelligent Series Rack	23.54/597.9	44.3/1125.2	68.84/1748.6	428/195
42U 1075mm Intelligent Series Rack	23.54/597.9	44.3/1125.2	79/2006.6	451/205
42U 1200mm Intelligent Series Rack	23.54/597.9	51.19/1300.2	79/2006.6	531/241
47U 1075mm Intelligent Series Rack	23.54/597.9	44.3/1125.2	88.53/2248.7	483/220
HPE 3PAR StoreServ 8200 2N Storage Base (no host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	47.7/21.6
HPE 3PAR StoreServ 8200 2N Storage Base (with two host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	48.7/22.1
HPE 3PAR StoreServ 8400 2N Storage Base (no host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	47.7/21.6
HPE 3PAR StoreServ 8400 2N Storage Base (with two host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	48.7/22.1
HPE 3PAR StoreServ 8400 4N Storage Base (no host adapters, no drives)	19/483	26.6/676.1*	6.925/175.9/4	97.8/44.4
HPE 3PAR StoreServ 8400 4N Storage Base (with four host adapters, no drives)	19/483	26.6/676.1*	6.925/175.9/4	99.8/45.3
HPE 3PAR StoreServ 8440 2N Storage Base (no host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	47.7/21.6
HPE 3PAR StoreServ 8440 2N Storage Base (with two host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	48.7/22.1
HPE 3PAR StoreServ 8440 4N Storage Base (no host adapters, no drives)	19/483	26.6/676.1*	6.925/175.9/4	97.8/44.4
HPE 3PAR StoreServ 8440 4N Storage Base (with four host adapters, no drives)	19/483	26.6/676.1*	6.925/175.9/4	99.8/45.3
HPE 3PAR StoreServ 8450 2N Storage Base (no host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	47.7/21.6
HPE 3PAR StoreServ 8450 2N Storage Base (with two host adapters, no drives)	19/483	26.6/676.1*	3.46/87.95/2	48.7/22.1
HPE 3PAR StoreServ 8450 4N Storage Base (no host adapters, no drives)	19/483	26.6/676.1*	6.925/175.9/4	97.8/44.4
HPE 3PAR StoreServ 8450 4N Storage Base (with four host adapters, no drives)	19/483	26.6/676.1*	6.925/175.9/4	99.8/45.3
HPE 3PAR StoreServ 8000 SFF(2.5in) SAS Drive Enclosure (without drives)	19/483	24.8/630.7	3.46/87.95/2	33.5/15.2
HPE 3PAR StoreServ 8000 LFF(3.5in) SAS Drive Enclosure (without drives)	19/483	24.9/631.4	6.89/175/4	42.9/19.5
SFF SAS drive with carrier	0.78/19.9**	896/227.7	3.42/86.85**	0.7/0.32 (varies by type)
LFF SAS drive with carrier	4.36/110.84**	8.67/220.26	1.18/30.0**	1.9/0.86 (varies by type)

Technical Specifications

Service Processor	37.48/17

Technical Specifications

Power Requirements

Input Voltage (VAC)	100 - 240 VAC
Frequency (Hz)	50 - 60

Component	Idle (watts / BTU/hr)	Transactional (watts / BTU/hr)
Node Pair (8200 or 8400), no drives, no add-on host adapters	236 / 803	398 / 1357
Node Pair (8440 or 8450), no drives, no add-on host adapters	344 / 1173	363 / 1238
4-port 16Gb/s Fibre Channel Adapter	18.61 / 63.5	19.13 / 65.3
2-port 10Gb/s iSCSI/FCoE Adapter	34 / 115.8	40 / 136.4
2-port 10Gb/s Ethernet Adapter	5.69 / 19.4	5.71 / 19.5
4-port 1Gb/s Ethernet Adapter	1.97 / 6.7	1.97 / 6.7
8000 SFF(2.5in) SAS Drive Enclosure, no drives	150 / 512 (average)	150 / 512 (average)
8000 LFF(3.5in) SAS Drive Enclosure, no drives	164 / 559 (average)	164 / 559 (average)
300GB 15K Small Form Factor HDD	6.7 / 22.9	6.9 / 23.1
600GB 15K Small Form Factor HDD	7.0 / 24.0	7.3 / 25.1
600 GB 10K Small Form Factor HDD	6.3 / 21.4	7.4 / 25.2
1.2TB 10K Small Form Factor HDD	6.2 / 21.1	8.2 / 27.9
1.8TB 10K Small Form Factor HDD	7.3 / 24.8	7.5 / 25.6
1 TB 7.2k Small Form Factor NL HDD	2.95 / 10.1	3.84 / 13.1
2TB 7.2K Small Form Factor NL HDD	6.1 / 20.8	7.2 / 24.6
2TB 7.2K Large Form Factor NL HDD	7.5 / 25.6	10.6 / 36.1
4TB 7.2K Large Form Factor NL NDD	9.1 / 31.1	13.1 / 44.6
6TB 7.2K Large Form Factor NL NDD	11.9 / 40.7	14.3 / 48.74
400GB Small Form Factor MLC SSD	3.3/11.3	5.8/19.8
480GB Small Form Factor MLC SSD	2.2 / 7.5	5.5 / 18.7
480GB Small Form Factor cMLC SSD	3.2 / 11	7.1 / 24.4
480GB Large Form Factor cMLC SSD	1.8 / 6.1	6.7 / 22.9
920GB Small Form Factor MLC FIPS SSD	2.2 / 7.5	5.5 / 18.7
1920GB Small Form Factor cMLC SSD	3.5 / 11.9	8.9 / 30.5
3840GB Small Form Factor cMLC SSD	3.4 / 11.6	11.0 / 37.5

Technical Specifications

Environmental Specifications[4]

Operating Temperature	41° to 104° F (5° to 40° C) - Reduce rating by 1° F for each 1000 ft altitude (1.8° C/1,000 m)
Shipping Temperature	32° to 140° F (0° to 60° C)
Altitude (ft/m) max.	10,000 ft / 3,048 m
Shipping Altitude (ft/m) max.	40,000ft/ 12,192 m
Humidity	10% to 90% non-condensing
Shipping Humidity	10% to 90% non-condensing
Operating Vibration	0.25 G, Sine, 5-500 Hz, 0.1 Grms, Random 10-100Hz
Non-operating Vibration	0.5 G, 5 - 500 Hz, Sine
Operating Shock	2 G, 11ms, half-sine
Non-operating Shock	10 G, 11ms, half-sine
Maximum Air Flow	Storage Base and Upgrade Node Pair - 109 CFM per enclosure 8000 SFF(2.5in) SAS Drive Enclosure - 105 CFM 8000 SFF(2.5in) SAS Drive Enclosure - 109 CFM
Electromagnetic Compatibility	CISPR 22:2008/ EN55022:2010 Class A CISPR 24:2010/ EN 55024:2010 IEC 61000-3-2:2005/ EN 61000-3-2:2006 +A1:2009 +A2:2009 IEC/ EN 61000-3-3:2008 AS/NZS CIPSR 22: 2009 Class A CNS 13438:2006 Class A 47 CFR Part 15 Subpart b Class A ICES-003 Issue 5 Class A V-3/2014.04 RRA Notice No. 2014-8 (2014.06.23) & 2014-37 (204.06.23) Class A RRA Notice No. 2014-9 (2014.06.23) & 2014-38 (2014.06.23)

Acoustics Sound pressure level measured per ISO 7779 specs during normal operating fan conditions, from a minimum of 3,000 RPM to a maximum of 10,000 RPM

Fan Speed (RPM)	8200/8400 2N Storage Base	8400 4N Storage Base	8440 2N Storage Base	8440 4N Storage Base	8000 2U SAS Drive Enclosure	8000 4U SAS Drive Enclosure
Minimum	63.8	67.2	72	74	62.6	61.3
Maximum	93.4	96.5	93	97	85.4	88

Safety	IEC 60950-1:2005 (2nd Edition); Am 1:2009 EN 60950-1:2006 +A11:2009+A12 EN 62479:2010 CNS 14336-1 2nd Edition UL 60950-1 2nd Ed. CAN/CSA C22.2 No. 60950-1

[4] Specifications are subject to change without notice.

Certifications / Markings	cTUVus Mark	KCC
	TUV T-mark (EN 60950)	GOST-R
	CE Mark	C-Tick
	FCC Class A	WEEE China RoHS

Technical Specifications

	IC Class A VCCI Class A BSMI Class A	EU RoHS

Summary of Changes

Date	Version History	Action	Description of Change:
04-Dec-2015	From Version 3 to 4	Changed	Added HPE 3PAR StoreServ 8200 Converged File/Block Starter Kit. Added new drives (400GB MLC SSD, 3.84TB FE SSD, 4TB NL FE HDD).
02-Oct-2015	From Version 2 to 3	Added	Added The HPE StoreFront Remote SaaS Portal
28-Sept-2015	From Version 1 to 2	Changed	Changes made throughout the Quickspecs
24-Aug-2015	Version 1	Created	Create first version

Hewlett Packard Enterprise

c04607918 - 15247 - Worldwide - V4 - 4-December-2015

Overview

HPE StoreOnce Systems

Does data growth leave you struggling with complex, distributed, and costly data protection? Is some of your data not being protected because backup windows aren't long enough or backup jobs are failing? Keep pace with HPE StoreOnce Systems; disk-based, deduplicating, backup systems. Use StoreOnce deduplication, available in a range of scalable dedicated appliances and flexible virtual appliances, with your choice of backup and recovery software to deliver robust enterprise-wide data protection. HPE StoreOnce Systems reduce the amount of backup data you need to store by up to 95% and with our scale-out architecture you can pay-as-you-grow to retain up to 34 petabytes of data in a single pool. HPE StoreOnce Systems provide automated backup and DR operations with all the features you'd expect from disk backup, together with secure data retention with built-in data encryption for Data at Rest and Data in Flight**.

HPE StoreOnce Catalyst delivers industry-leading backup speeds of up to 139 TB/hr* enabling you to meet shrinking backup windows, plus Federated Deduplication across the enterprise so you choose where to deduplicate data. Federated Catalyst allows Catalyst stores to span nodes simplifying backup management and optimizing available storage in large environments

Choose between powerful dedicated appliances for larger offices and data centers, flexible virtual appliances for highly virtualized or smaller and remote offices and Data Protector software with StoreOnce Federated Deduplication and StoreOnce Catalyst when you don't want to use a dedicated deduplication appliance. With HPE's single StoreOnce deduplication technology, managing the movement of data across the enterprise has never been easier.

Protect data from unauthorized access through Data at Rest encryption, Data in Flight** encryption and secure erase functionality for disks that are lost, stolen or discarded.

Seamlessly integrating with your current backup applications, StoreOnce Backup provides flexible integration into both Fibre Channel (FC) and iSCSI SAN, GbE, 10 GbE or virtualized and other environments. Catalyst over Fibre Channel provides all the ISV control and source side deduplication benefits of current StoreOnce Catalyst but via your Fibre Channel fabric. HPE StoreOnce offers flexible choices for the number and types of connectivity on StoreOnce 3520, 3540 and 5100. Choose the connectivity options, 10 GbE-T, 10 GbE, or 8 GB FC, which makes the most sense for your environment and also, provides flexibility for future growth/changes.

NOTES: 4900 and 6500 have fixed Ethernet and FC connectivity.
***Actual performance is dependent upon configuration data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration.**
**** Data in Flight encryption via IPSec is supported on StoreOnce Catalyst only. In addition, write performance may be impacted, however performance improvements should be seen after first ingest.**

What's New

The HPE StoreOnce Systems family will include:

- A new StoreOnce 3100 system
  - The StoreOnce 3100 delivers a 1U solution with 5.5 TB of usable*** capacity (8 TB RAW)
  - With speeds of up to 6.4 TB/hour* using HPE StoreOnce Catalyst.
- A new StoreOnce 3520 system
  - The StoreOnce 3520 delivers a scalable 2U solution with 7.5 to 15.5 TB of usable*** capacity (12-24 TB RAW)
  - With speeds of up to 12.7 TB/hour* using HPE StoreOnce Catalyst.
- A new StoreOnce 3540 system

Overview

  - The StoreOnce 3540 delivers a scalable 2U solution with 15.5 TB to 31.5 TB of usable*** capacity (24-48 TB RAW)
  - With speeds of up to 12.7 TB/hour* using HPE StoreOnce Catalyst.
- A new StoreOnce 5100 system
  - The StoreOnce 5100 delivers a scalable solution with 36 TB to 216 TB of usable*** capacity (48-288 TB RAW)
  - With speeds of up to 26.7 TB/hour* using HPE StoreOnce Catalyst.

The HPE StoreOnce Backup family features:

- Flexible choice for number and types of connectivity, 10GbE-T, 10GbE, or 8Gb FC, on StoreOnce 3520, 3540 and 5100
  - Customers can choose the connectivity options that makes the most sense for their environment. Also, provides flexibility for future growth/changes
- Initial licenses for StoreOnce 3100, 3520, 3540 and 5100 pre-installed in the factory
  - Provides customers with a smoother out of box experience – no longer needing to download license keys or possibly losing the entitlement documentation during unpacking
- IPv6 support for NFS and VT iSCSI interfaces
  - Meets the growing demands for IPv6 support. More customers (especially governmental) need products that support IPv6.
- Addition of a simple network wizard
  - Provides customers with a tool to ease the initial IP configuration prior to continuing with the remaining product setup
- Gen9 Catalyst over Fibre Channel support on IBM AIX platforms
  - Catalyst over Fibre Channel provides all the ISV control and source side deduplication benefits of current StoreOnce Catalyst but via your Fibre Channel fabric.
  - Ability to support Fibre Channel environments running StoreOnce Catalyst on IBM AIX servers
- Centralized Encryption Key Management support for 3100, 3520, 3540 and 5100 products

NOTE: Pre-installed licenses not available on StoreOnce 4900 or 6500
*****Actual usable capacity for customer data storage is dependent upon drive formatting, log file and Meta data size, housekeeping backlog.**

HPE StoreOnce Backup Models

HPE StoreOnce Backup Models

Target deployment	Product options	Usable *** capacity (before dedupe)
Enterprise data center	HPE StoreOnce 6500	Scale from 72 to 1728 TB usable ***
	HPE StoreOnce 4900	Scale from 36 to 432 TB usable ***
Mid-size data center or large regional office	HPE StoreOnce 5100	Scale from 36 TB to 216 TB usable ***
	HPE StoreOnce 3540	Scale from 15.5TB to 31.5 TB usable***
Small data center or remote office	HPE StoreOnce 3520	Scale from 7.5 to 15.5 TB usable ***
	HPE StoreOnce 3100	5.5 TB usable ***
	HPE StoreOnce VSA	4, 10 or 50 TB usable*** depending on license

For help with choosing the most appropriate StoreOnce Backup systems for your specific environment, we recommend you talk to your Hewlett Packard Enterprise partner or sales advisor about using the HPE Storage Sizing Tool which can be downloaded from the Downloads section of **http://www.hp.com/go/storeoncesizer**

For previous versions of HPE StoreOnce Backup models please refer to:
http://h18004.www1.hp.com/products/quickspecs/13218_div/13218_div.html

NOTE: In all cases, actual performance is dependent upon configuration, data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration. To optimize capacity utilization and in accordance with performance requirements, your capacity requirements should be planned following Recommended Configuration guidelines:
http://h20565.www2.hpe.com/portal/site/hpsc/public/psi/manualsResults/?sp4ts.oid=5196525
***Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.**

Common Features and Benefits

Common Features and Benefits

The following features and benefits apply to all HPE StoreOnce products. Where differences exist between models, they are explained in the description of the benefit.

Scaling out capacity across the enterprise

Keeping pace with data growth, HPE StoreOnce Systems offer scale-out architecture that allows you to pay as you grow.

Choose from dedicated backup appliances to match the capacity and performance requirements of larger offices and data center deployments. For virtualized environments and smaller and remote offices, HPE StoreOnce is also available as a virtual appliance for virtualized data protection that utilizes existing infrastructure.

Whatever the HPE StoreOnce solution that meets your needs, you can choose capacity points that start small and scale-out - just configure for a higher capacity (with StoreOnce VSA), or use upgrade kits with expansion licenses or shelves (3520, 3540, 5100) or simply add more disks (4900, 6500) or additional nodes (StoreOnce 6500 only).

Please refer to the latest Concepts and Configuration Guide for more information:
http://h20565.www2.hpe.com/portal/site/hpsc/public/psi/manualsResults/?sp4ts.oid=5196525
NOTE: *To optimize capacity utilization and in accordance with performance requirements, your capacity requirements should be planned following Recommended Configuration Guidelines

Reducing your backup data storage needs

HPE StoreOnce deduplication reduces the disk space required to store backup data sets by typically 20x without impacting backup performance. Retaining more backup data on disk for longer, enables greater backup data accessibility for rapid restore of lost or corrupt files and reduces impact on business productivity while providing cost savings in disk storage, IT resource, physical space, and power requirements.

For example, using HPE StoreOnce deduplication with a fully configured HPE StoreOnce 6500 can provide extended data retention on the same disk footprint for up to 34 PBs of backup data.

Meeting shrinking backup windows

Industry leading performance - protect large amounts of data within short backup windows with HPE StoreOnce high performance multi-streaming capability. Choose Ethernet (to Catalyst, iSCSI VTL or NAS targets) or Fibre Channel (To Catalyst or VTL targets) to integrate into your network environment. Catalyst over Fibre Channel provides all the ISV control and source side deduplication benefits of current StoreOnce Catalyst but via your Fibre Channel fabric.

Consolidate multiple parallel backup streams via standard Ethernet or Fibre Channel network to a single disk-based system to achieve industry-leading aggregate backup speeds of up to 139 TB* per hour with the top of the range HPE StoreOnce 6500 and HPE StoreOnce Catalyst.

You can enhance performance by deduplicating anywhere; at the application source or at the backup server or at the target HPE StoreOnce appliance. Federated Deduplication means you can deduplicate where it makes sense for your business, not where technology vendor limitations mandate. Federated Deduplication is available across all new HPE StoreOnce systems, in conjunction with all applications that support StoreOnce Catalyst.
NOTE: *Actual performance is dependent upon configuration data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as

Common Features and Benefits

housekeeping or replication and storage configuration.

Reducing the time to restore data

Hewlett Packard Enterprise offers industry-leading restore speeds with its StoreOnce product line; up to 119% of ingest performance in the high end appliance. This ensures when you have a system failure you can restore your data in the shortest time possible and minimize downtime

Freeing up your IT resources

HPE StoreOnce Systems allow you to reduce the complexity of your backup environment by consolidating and automating all of your backup processes using a single HPE StoreOnce system, reducing the time spent managing multiple data protection devices and processes, reducing cost and simplifying your data protection environment. What's more, for organizations that have branch and small offices, HPE StoreOnce Backup with supported backup software helps you automatically protect the data at these sites without the need for trained staff, or dedicated hardware if you use StoreOnce VSA, reducing the risk of important data loss.

With HPE StoreOnce Catalyst, movement of deduplicated data across the enterprise is even easier. There's no need to deduplicate and rehydrate at each step, data can be replicated from these sites to a central data center or disaster recovery site in deduplicated form, reducing network bandwidth requirements. All backup and replication jobs may be seamlessly managed by the backup application at your central data center.

StoreOnce Federated Catalyst allows Catalyst stores to span nodes simplifying backup management and optimizing available storage in large environments yet continuing to provide failover and autonomic restart to ensure your backups do not fail.

Lowering the cost of data protection

With a typical deduplication ratio of 20:1, more backup data can be stored in a smaller footprint meaning less capacity needs to be purchased.

HPE StoreOnce deduplication also enables network efficient offsite data replication. All HPE StoreOnce systems use StoreOnce Federated data deduplication to significantly reduce the amount of data that needs to be replicated, enabling the use of lower bandwidth, lower cost links to transmit data offsite.

StoreOnce enabled replication opens the way to cost-effective centralized backup from remote sites or branch offices, and delivers a consolidated disaster recovery solution for the data center.

Protecting your remote offices

HPE StoreOnce systems are ideal for remote offices - providing a local backup target and an efficient deduplicated local data repository. If you are running a virtual server environment you can use the flexibility and simplicity of the HPE StoreOnce VSA or choose dedicated appliances such as the StoreOnce 3100 depending on the infrastructure, performance and management requirements of your remote office deployments.

HPE StoreOnce also enables a Federated Deduplication solution for replication of backup to other sites, including the consolidation of backup and DR from multiple remote offices to the data center. Multiple StoreOnce appliances and virtual machines can replicate to a single central StoreOnce appliance with for example 384 remote offices replicating to a single HPE StoreOnce 6500 target at the data center.

For very small remote offices which don't need a local store for fast recovery StoreOnce Catalyst may be installed on a local server at no cost. This performs deduplication of new or changed data and sends the data over the WAN for disaster recovery.

With HPE StoreOnce Catalyst the movement of data between sites is configured and controlled using

Common Features and Benefits

your backup application as a single interface for the data protection solution. StoreOnce Catalyst supports a range of flexible configurations that enable the concurrent movement of data from one site to multiple sites, and the ability to cascade data around the enterprise (sometimes referred to as multi-hop).

Reducing the risk to Data at Rest and Data in Flight**

With high-profile reports of data loss, and increasing levels of government legislation concerning data security, companies are seeking to encrypt their data. The HPE StoreOnce Security Pack provides for Data at Rest and Data in Flight encryption which prevents unauthorized access to data on disk that has been lost, stolen, or discarded, as well as, data being transmitted between devices. It also offers secure erase functionality. These functions can be configured on an application or store basis and are not restricted to the whole appliance. HPE StoreOnce Security pack is available for all HPE StoreOnce products.

Data in flight encryption is intended to be used to secure links between data centers for StoreOnce Replication or Low Bandwidth Catalyst Copy operations.
Using Data In Flight Encryption for direct backup operations to the StoreOnce appliance over a local network is not supported due to the performance impact of the encryption.
NOTE: ** Data in Flight encryption via IPSec is supported on StoreOnce Catalyst only. In addition, write performance may be impacted, however performance improvements should be seen after first ingest.

Seamlessly integrating into your environment

The HPE StoreOnce systems offer flexibility with NAS (NFS, CIFS), iSCSI and FC virtual tape libraries (VTL) and StoreOnce Catalyst targets for backup applications. This means that you can easily integrate StoreOnce Backup into your existing IT environment with minimum disruption. Supported by all leading backup applications, this allows each StoreOnce Backup system to be installed and used without additional investment in software.

The HPE StoreOnce systems are easily rack-mounted in standard racks, while the performance leading HPE StoreOnce 6500 is pre-integrated into an HPE 42U rack for efficient use of space in the data center.

Delivering reliable backup and restore

HPE StoreOnce systems can enhance reliability by automating and consolidating backup to reduce operator intervention and consequently user-generated errors.

Hewlett Packard Enterprise understands the need for highly reliable, highly available data protection. Consequently HPE StoreOnce systems feature hardware RAID 6 (RAID 5 on StoreOnce 3100) to reduce the risk of data loss due to disk failure. The high performance HPE StoreOnce 6500 extends this reliability with autonomic restart and no single point of failure in your backup process by offering redundancy at every level.

In any storage system it is essential to ensure that the integrity of the data stored is maintained so data can be recovered exactly as it was written and Storage Administrators live in fear of corrupted backups only discovered when they need to restore their data. StoreOnce appliances have been designed with the necessary technology which delivers this essential high degree of data protection. Hewlett Packard Enterprise has unique intellectual property which protects data throughout its lifecycle when stored on the HPE StoreOnce appliance. HPE StoreOnce Integrity Plus is a market leader in data integrity. HPE StoreOnce technology has inbuilt protection which not only checks data at many stages both in the backup process and when recovered but also continually checks the data when at rest, correcting errors if necessary.

Common Features and Benefits

Protecting your primary storage directly

HPE StoreOnce Recovery Manager Central facilitates automated, efficient, non-intrusive backup and disaster recovery and provides converged data protection by integrating 3PAR StoreServ primary storage and StoreOnce Backup storage directly without the need for third-party ISVs. Customers get the simplicity and performance of snapshot-based protection to generate application-consistent recovery points as well as the reliability and efficiency of deduplicated backups for guaranteed recovery.

HPE StoreOnce VSA Backup

HPE StoreOnce VSA Backup

The HPE StoreOnce VSA extends the deployment options for StoreOnce with the agility and flexibility of a virtual appliance, removing the need to install dedicated hardware. This provides a flexible and a cost effective backup target for virtualized server environments. StoreOnce VSA can be used as part of a pure software defined data protection solution or in conjunction with StoreOnce purpose built appliances. Operation and integration with backup software is the same for the StoreOnce VSA and the purpose built appliances.

Overview product specifications

	VSA 4 TB	VSA 10 TB	VSA 50 TB
Usable configurable capacity	4TB	10TB	50 TB
Catalyst write performance (max)	1 TB/hour	2 TB/hour	6 TB/hour
NAS, VT write performance (max)	400 GB/hour	800 GB/hour	2.4 TB/hour
Replication fan-in/fan-out (appliance)	8/2	8/2	8/2
Backup targets (recommended max)	4	6	8
Concurrent data streams (max)	16	24	32
Backup targets supported	Catalyst, VTL, NFS, CIFS over Ethernet		
Hypervisor support	VMware ESXi, Microsoft Hyper-V - for details see **http://www.hp.com/go/BURAcompatibility**		
license-to-use **term**	3 or 5 years		
Technical support	Business hours phone technical support included for license-to-use term		
Care Packs	Available to upgrade included technical support		

Freeware: A 1 TB StoreOnce VSA is also available for extended evaluation or non-critical deployments. This offers the same features as the larger products. This freeware product comes without entitlement to Hewlett Packard Enterprise support or the ability to buy Care Packs for Hewlett Packard Enterprise support. This freeware version can be upgraded to any of the products in the table above by purchasing and applying the appropriate license. This is available from **http://www.hp.com/go/freebackup**

Key features and benefits of the StoreOnce VSA

- Flexibility – fast deployment, fast expansion and leverage of the hypervisor features for mobility and availability
- Easy to manage - the same well proven management interfaces as the purpose built StoreOnce appliances
- Exceptional value – one license includes all product features (Catalyst, Replication, Security) and access to Hewlett Packard Enterprise support for the duration of the licensed term
- Scalability – capacity upgrade licenses to scale from 4 TB to 50 TB

Configuration notes

Backup data capacity is added to the StoreOnce VSA using 1 TB, 5 TB or 10 TB virtual disks up to the licensed capacity. Attempts to add virtual disk of other sizes will fail. It is recommended that at least one virtual disk is added before the StoreOnce VSA is powered-on. To achieve the performance detailed in the table above, it is recommended that the StoreOnce VSA is configured with the following minimum resources:

HPE StoreOnce VSA Backup

Configured capacity	1 TB to 4 TB	5 TB to 10 TB	10 TB to 50 TB
Memory (min)	16GB	24 GB	32 GB
Processor (min @ 2.2GHz)	2 vCPU	4 vCPU	12 vCPU
IOPs (typical)	450	900	2,700

Configuring additional resources can improve the performance and enable more backup targets to be created. For details on setting up the StoreOnce VSA see the StoreOnce VSA Deployment and Configuration Guide that is included with the download package and also available via **http://www.hp.com/go/support**

For VMware

- It is recommended that the virtual disks used to provide capacity for StoreOnce VSA are in a .vmdk format from a VMFS3 or VMFS5 data store. NFS data stores are supported but careful consideration of the performance implications should be made before deployment. RAW disks are not supported. Virtual disks should be thick provisioned.
- Typical Installation will take 20 minutes depending on the installation method used and the environment. Other factors that determine the installation time are the storage used, the host platform and the storage capacity configured.
- If the VMware host has AMD CPUs some configuration is needed to run the StoreOnce VSA. It is necessary to create a single host cluster with the EVC (Enhanced vMotion Compatibility) mode set to AMD generation 3 or earlier.
- StoreOnce VSA is supported for use with VMware vMotion and VMware Storage vMotion. It is not supported for use with the following VMware features: VMware High Availability (HA), VMware Fault Tolerance (FT), VMware Distributed Resource Scheduler (DRS), VMware Distributer Power Manager (DPM) and VMware Site Recovery Manager (SRM).

For Hyper-V

- StoreOnce VSA requires NTFS storage. There is no support for NFS data stores or pass-through disks. StoreOnce VSA can run on all processors supported for Windows Server Hyper-V provided the performance and quantity meets the minimum requirements for the capacity of StoreOnce VSA configured.
- Unzipping the virtual machine file can take up to 15 minutes. Installation time depends upon how heavily the Hyper-V Server is being used and how much capacity is configured.
- StoreOnce VSA supports thick provisioned virtual hard disks (.VHDX or .VHD).
- StoreOnce VSA supports use of Hyper-V Live Migration during backup and recovery operations.

For all hypervisors

- Capacity upgrade licenses are available – see table below. Adding a capacity upgrade license is non-disruptive. Once the new license is added increased backup data capacity can be configured. The larger usable capacity will require adding more memory and processor resources to meet stated performance. Adding resources requires the StoreOnce VSA to be restarted so these upgrades should be done outside backup times.
- The StoreOnce VSA requires significant disk I/O for backup and recovery operations as shown in the table above. The number, type and configuration of hard disks that provide capacity for the virtual disks is an important choice. The number of disks and the type of disk will significantly affect the I/O potential and consequently backup and recovery performance.
- To be resilient to hard disk failure it is recommended that RAID protection is used. To further reduce risk from physical hard disk failure, the disks used for StoreOnce VSA backup data storage should not be shared with hard drives that provide storage for the protected data and virtual machines particularly if backup data copy/replication is not used.
- It is recommended that the effect of the resource consumption of the StoreOnce VSA on other virtual applications running on the same pool of resources is assessed. This impact assessment should consider any backup software components, running in virtual machines, which will require resources to execute backup and recovery jobs.

Purchasing Information

Description	**3 year** license-to-use	**5 year** license-to-use
StoreOnce VSA 4 TB	D4T77AAE, D4T77A	D4U49AAE, D4U49A
StoreOnce VSA 10 TB	TC458AAE, TC458A	D4U62AAE, D4U62A
StoreOnce VSA 4 TB to 10 TB Capacity Upgrade	D4U56AAE, D4U56A	D4U58AAE, D4U58A
StoreOnce VSA 50 TB	D4U47AAE, D4U47A	D4U48AAE, D4U48A

HPE StoreOnce VSA Backup

StoreOnce VSA 10 TB to 50 TB Capacity Upgrade	D4U57AAE, D4U57A	D4U59AAE, D4U59A

Licensing notes

- All products ending in AAE (xxxxxAAE) are for eDelivery. These are delivered via an email that will contain a link to download the software and the Entitlement Order Number (EON) that is used to acquire the license key.
- All products ending in A (xxxxxA) are for physical delivery. Delivery takes several days. A paper letter is delivered with a link to download the software and the license key Entitlement Order Number (EON) that is used to acquire the license key. A DVD is also delivered containing the software.
- The StoreOnce VSA is fully functional from its first installation with a 60-day instant-on period. If no license key is added within 60 days of start up all backup targets become read-only. Once a license key is added full functionality is returned.
- If a license-to-use (LTU) reaches the end of its term all backup targets become read-only. Once a valid license key is added full functionality is returned.
- The StoreOnce VSA license enables use as a replication target and does not require an additional Replication license. If you intend to replicate to VTL and/or NAS targets on StoreOnce purpose built appliances a Replication license will need to be installed on the target appliance.
- The StoreOnce VSA license enables creation of Catalyst Stores and execution of Catalyst Copy operations and does not require an additional Catalyst license. If you intend to use Catalyst Copy between a StoreOnce VSA and a purpose built StoreOnce appliance, the purpose built StoreOnce appliance will need a Catalyst license installed.
- The StoreOnce VSA license enables users to create Catalyst Stores and act as a replication target, configuration of the Catalyst Stores and Replication Targets is covered in the following configuration services.
  - Data Replication Service: **http://dccappshares01.austin.hpe.com/SALES_LIBRARY-PRO/CONCENTRA/Autofed%20Content/UCM/UCM-Concentra/Pub/ucm4AA4-3945ENW/4AA4-3945ENW.pdf**
  - Catalyst Solution service: **http://dccappshares01.austin.hpe.com/SALES_LIBRARY-PRO/CONCENTRA/Autofed%20Content/UCM/UCM-Concentra/Pub/ucm4AA4-4489ENW/4AA4-4489ENW.pdf**
- The StoreOnce VSA license enables data at rest encryption, data in flight encryption and secure erase and does not require an additional Security Pack license.
- A capacity upgrade license can be added only if there is a valid license installed on the StoreOnce VSA.
  - For example, a 4TB to 10TB capacity upgrade license can be applied only if a 4TB base license is installed on the StoreOnce VSA.
  - For example, a 10TB to 50TB capacity upgrade license can be applied only if a 10TB base license is installed on the StoreOnce VSA.
- There is no license to upgrade directly from 4TB to 50TB. This is accomplished by upgrading first to 10TB, then to 50TB.
- Once the capacity upgrade license is added, the licensed term of the StoreOnce VSA will be 3 or 5 years, depending on license purchased, regardless of the remaining term of the previous smaller capacity license.
- For more information on adding capacity expansion licenses see the StoreOnce VSA Deployment and Configuration Guide
- The StoreOnce VSA licenses can be used for an initial 3 or 5 year license-to-use term. The same licenses can be used to extend a license-to-use term.
- A license to extend a current license-to-use term can only be activated, less than 180 days from the end of the current license term.
  NOTE: A check for the time left on the current license is made at activation time, not at purchase time. If you attempt to activate a license for a StoreOnce VSA with more than 180 days of the existing license left to run, the activation will fail.
- A license to extend an existing license-to-use period term must match the capacity of the existing base license. If you attempt to activate a license for an already licensed StoreOnce VSA that has a non-matching capacity license the activation will fail.
- For more information on extending the license-to-use term see the StoreOnce VSA Deployment and Configuration Guide
- The license-to-use term starts from the day the license is redeemed from the Hewlett Packard Enterprise licensing portal.

HPE StoreOnce VSA Backup

HPE StoreOnce Systems

HPE StoreOnce 3100 System

HPE StoreOnce 3100 delivers entry-level disk-based backup and disaster recovery that's ideal for smaller remote or branch offices and data centers. This 1U Backup system offers 5.5 TB of usable capacity (8 TB RAW) and speeds of up to 6.4 TB/hour* with StoreOnce Catalyst, allowing a full 25.6 TB* of backup to be completed in just 4 hours.

Overview Product Specifications

	StoreOnce 3100
Form Factor	1U Rack
Total capacity (raw)	8 TB
Total capacity (usable*)**	5.5 TB
Write performance (max)	1.6 TB/hour
Catalyst performance (max)	6.4 TB/hour
Max fan-in/backup targets	8

See **Detailed Technical Specifications** and **Physical Dimensions** later in this document for more details

NOTE:

***Actual performance is dependent upon configuration, data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration.**

*****Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.**

Compatibility:

Hewlett Packard Enterprise extensive compatibility testing program assures that your HPE Systems work with leading servers, operating systems, and backup applications, including those not manufactured by Hewlett Packard Enterprise.

Compatibility details on specific servers and the latest hardware compatibility information, can be found **HERE**

Warranty

Hewlett-Packard Enterprise provides a 1 year parts exchange, 1 year labor, 1 year on site, normal business hours, next business day response for StoreOnce 3100, StoreOnce 3520, StoreOnce 3540, StoreOnce 5100, StoreOnce 4900 and StoreOnce 6500 Backup systems, plus 9x5 phone support for the duration of the warranty.

Purchasing Information:

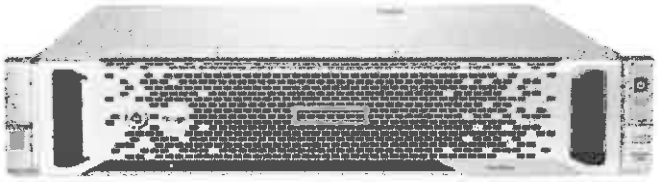
Also refer to **Software Options**

HPE StoreOnce Systems

Product name	Part-number	Description	Includes
HPE StoreOnce 3100 8 TB System	BB913A	HPE StoreOnce 3100 System with 8 TB of RAW disk storage	• HPE 3100 system • 4x 2 TB Hot swap hard drives • Easy Install Rail Kit • EAC Card • Accessory Kit featuring: • Important Card • Start Here Poster • Ethernet cable(Cat 5e) 3m (x2) • Power cable (IEC 320 C13 Connector for Rack PDU)

HPE StoreOnce Systems

HPE StoreOnce 3520 System



HPE StoreOnce 3520 is designed for small to midsized data centers and as a replication target device for up to remote and branch offices. The StoreOnce 3520 delivers a scalable 2U solution from 7.5 to 15.5 TB of usable*** capacity (12-24 TB RAW) using an upgrade license. Meet backup windows with speeds of up to 12.7 TB/hour* using HPE StoreOnce Catalyst for protection of up to 50.8 TB* of data in a 4-hour window.

Overview Product Specifications

	StoreOnce 3520
Form Factor	2U Scalable Rack
Total capacity (raw)	Up to 24 TB
Total capacity (usable*)**	Up to 15.5 TB
Write performance (max)	4.6 TB/hour
Catalyst performance (max)	12.7 TB/hour
Max fan-in/backup targets	24

See **Detailed Technical Specifications** and **Physical Dimensions** later in this document for more details

NOTE: *Actual performance is dependent upon configuration, data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration.

Scalability:

Start out with the HPE StoreOnce base unit at 2U with 12 TB of RAW capacity (7.5 TB usable***). When you're ready, simply purchase a capacity upgrade license to increase available capacity to a total of 24TB RAW (15.5 TB usable***).

NOTE: The StoreOnce 3520 comes fully populated with 12x 2 TB disks. However, initial working capacity is 12 TB RAW, a capacity upgrade license is required to activate the additional disk capacity.

Compatibility:

Hewlett Packard Enterprise extensive compatibility testing program assures that your HPE Systems work with leading servers, operating systems, and backup applications, including those not manufactured by HP.

Compatibility details on specific servers and the latest hardware compatibility information, can be found **HERE**

Configuration notes:

- HPE StoreOnce 3520 systems can be connected to the servers they protect via 1 GB Ethernet as well as 10 GbE Ethernet and 8 GB Fibre Channel when the appropriate optional hardware is installed.
- They are supported on all 10 GB Ethernet network interface cards (NICs) and switches, dependent on product. 1Gb Ethernet network connections are also supported for sites without 10 GB Ethernet networks (with reduced performance)
- HPE StoreOnce systems are also supported on 100 base-T Ethernet networks, for connection for the Web GUI and CLI access, such as a management network in a Data Centre.

HPE StoreOnce Systems

- This product is not supported on networks using slower Ethernet technology

Warranty

Hewlett-Packard Enterprise provides a 1 year parts exchange, 1 year labor, 1 year on site, normal business hours, next business day response for StoreOnce 3100, StoreOnce 3520, StoreOnce 3540, StoreOnce 5100, StoreOnce 4900 and StoreOnce 6500 Backup systems, plus 9x5 phone support for the duration of the warranty.

Purchasing information:

Product name	Part-number	Description	Includes
HPE StoreOnce 3520 12 TB System	BB922A	HPE StoreOnce 3520 System with 24 TB of RAW disk storage	• HPE StoreOnce 3520 System (12 x 2 TB disks) • Easy Install Rail Kit • EAC Card • Accessory Kit featuring: • Important Card • Start Here Poster • Ethernet cable(Cat 5e) 3m (x2) • Power cable (IEC 320 C13 Connector for Rack PDU)
HPE StoreOnce 3520 12 TB Capacity Upgrade LTU/E-LTU	BB944A/AAE	StoreOnce 3520 12 TB Capacity Upgrade LTU/E-LTU	• Entitlement certificate

Also refer to **Software Options** to add licenses for:

- HPE StoreOnce Replication
- HPE StoreOnce Catalyst
- HPE StoreOnce Enterprise Manager
- HPE StoreOnce Security Pack

Also refer to Network/Chanel cards:

HPE StoreOnce 10 GbE Network Card

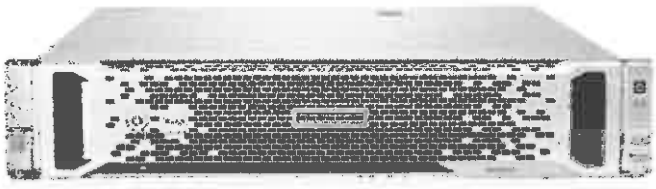
HPE StoreOnce 10 GbE-T Network Card

HPE StoreOnce 8 GB Fibre Channel Card

NOTE: A total number of 4 in any combination can be used.

HPE StoreOnce Systems

HPE StoreOnce 3540 Systems



HPE StoreOnce 3540 is designed for small to midsized data centers and as a replication target device for up to 24 remote and branch offices. The StoreOnce 3540 delivers a scalable 2U solution from 16 to 31.5 TB of usable*** capacity (24 to 48 TB RAW) using a simple and cost effective capacity upgrade. Meet backup windows with speeds of up to 12.7 TB/hour* using HPE StoreOnce Catalyst for protection of up to 50.8 TB* of data in a 4-hour window.

Overview Product Specifications

	StoreOnce 3540
Form Factor	2U Scalable Rack
Total capacity (raw)	Up to 48 TB
Total capacity (usable***)	Up to 31.5 TB
Write performance (max)	4.6 TB/hour
Catalyst performance (max)	12.7 TB/hour
Max fan-in/backup targets	24

See **Detailed Technical Specifications** and **Physical Dimensions** later in this document for more details

NOTE: *Actual performance is dependent upon configuration, data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration. ***Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.

Scalability:

Start out with the HPE StoreOnce base unit at 2U with 24 TB of RAW capacity (15.5 TB usable***). When you're ready, simply purchase a capacity upgrade license to increase available capacity to a total of 48 TB RAW (31.5 TB usable***).

NOTE: The StoreOnce 3540 comes fully populated with 12x 2 TB disks. However, initial working capacity is 24 TB RAW, a capacity upgrade license is required to activate the additional disk capacity.

Compatibility:

Hewlett Packard Enterprise extensive compatibility testing program assures that your HPE Systems work with leading servers, operating systems, and backup applications, including those not manufactured by Hewlett Packard Enterprise.

Compatibility details on specific servers and the latest hardware compatibility information, can be found **HERE**

Configuration notes:

- HPE StoreOnce 3540 systems can be connected to the servers they protect via 1 GB Ethernet as well as 10 GBE Ethernet and 8 GB Fibre Channel when the appropriate optional hardware is installed.
- They are supported on all 10 GB Ethernet network interface cards (NICs) and switches, dependent on product. 1 GB Ethernet network connections are also supported for sites without 10Gb Ethernet networks (with reduced performance)
- HPE StoreOnce Backup systems are also supported on 100 base-T Ethernet networks, for connection for the Web GUI and CLI access, such as a management network in a Data Centre.
- This product is not supported on networks using slower Ethernet technology

HPE StoreOnce Systems

Warranty

Hewlett-Packard Enterprise provides a 1 year parts exchange, 1 year labor, 1 year on site, normal business hours, next business day response for StoreOnce 3100, StoreOnce 3520, StoreOnce 3540, StoreOnce 5100, StoreOnce 4900 and StoreOnce 6500 Backup systems, plus 9x5 phone support for the duration of the warranty.

Purchasing Information:

Product name	Part-number	Description	Includes
HPE StoreOnce 3540 24 TB System	BB914A	HPE StoreOnce 3540 System with 24 TB of RAW disk storage	• HPE StoreOnce 3540 System (12 x 4 TB disks) • Easy Install Rail Kit • EAC Card • Accessory Kit featuring: • Important Card • Start Here Poster • Ethernet cable(Cat 5e) 3m (x2) • Power cable (IEC 320 C13 Connector for Rack PDU) •
HPE StoreOnce 3540 24 TB Capacity Upgrade LTU/E-LTU	BB943A/AAE	StoreOnce 3540 24 TB Capacity Upgrade LTU/E-LTU	• Entitlement certificate

Also refer to **Software Options** to add licenses for:

- HPE StoreOnce Replication
- HPE StoreOnce Catalyst
- HPE StoreOnce Enterprise Manager
- HPE StoreOnce Security Pack

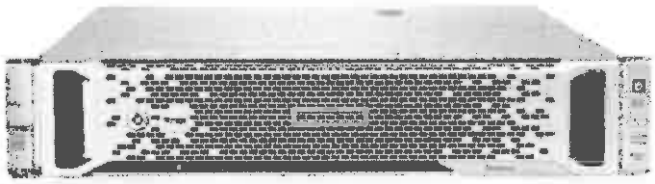
Also refer to Network/Channel Cards

- HPE StoreOnce 10 GBE Network Card
- HPE StoreOnce 10 GBE-T Network Card
- HPE StoreOnce 8 GB Fibre Channel Card

NOTE: A total number of 4 in any combination can be used.

HPE StoreOnce Systems

HPE StoreOnce 5100 Systems



HPE StoreOnce 5100 delivers cost-effective, scalable disk-based backup with deduplication for longer term on-site data retention and off-site disaster recovery for larger data centers or regional offices. It also provides a replication target device for up to 50 remote or branch offices. StoreOnce 5100 delivers a scalable 2U to 12U solution from 36 TB to 216 TB of usable*** capacity (48 TB to 288 TB RAW)and speeds of up to 26.7 TB/hour* with HPE StoreOnce Catalyst for protection of over 106.8 TB* of data in a 4-hour window

Overview Product Specifications

	StoreOnce 5100
Form Factor	2U Scalable Rack
Total capacity (raw)	Up 288 TB
Total capacity (usable*)**	Up to 216 TB
Write performance (max)	13.8 TB/hour
Catalyst performance (max)	26.7 TB/hour
Max fan-in/backup targets	32

See **Detailed Technical Specifications** and **Physical Dimensions** later in this document for more details

NOTE: *Actual performance is dependent upon configuration, data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration. ***Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.

Scalability:

Start out with the HPE StoreOnce base unit at 2U with 48 TB RAW (36 TB usable) capacity. When you're ready, simply purchase up to 5 additional shelves using the corresponding storage expansion/capacity upgrade kit for up to 288 TB RAW (216 TB) of total usable storage. A fully configured StoreOnce 5100 is 12U.

Compatibility:

Hewlett Packard Enterprise extensive compatibility testing program assures that your HPE Systems work with leading servers, operating systems, and backup applications, including those not manufactured by HP.

Compatibility details on specific servers and the latest hardware compatibility information, can be found **HERE**

Configuration notes:

- HPE StoreOnce 3520 systems can be connected to the servers they protect via 1 GB Ethernet as well as 10 GbE Ethernet and 8 GB Fibre Channel when the appropriate optional hardware is installed.
- They are supported on all 10 GB Ethernet network interface cards (NICs) and switches, dependent on product. 1 GB Ethernet network connections are also supported for sites without 10Gb Ethernet networks (with reduced performance)
- HPE StoreOnce Backup systems are also supported on 100 base-T Ethernet networks, for connection for the Web GUI and CLI access, such as a management network in a Data Centre.
- This product is not supported on networks using slower Ethernet technology.

HPE StoreOnce Systems

Warranty

Hewlett-Packard Enterprise provides a 1 year parts exchange, 1 year labor, 1 year on site, normal business hours, next business day response for StoreOnce 3100, StoreOnce 3520, StoreOnce 3540, StoreOnce 5100 StoreOnce 4900 and StoreOnce 6500 Backup systems, plus 9x5 phone support for the duration of the warranty.

Purchasing information:

Product name	Part-number	Description	Includes
HPE StoreOnce 5100 48 TB System	BB915A	HPE StoreOnce 5100 with 48 TB of RAW disk storage	• HPE 5100 System (includes 12 x 4 TB disks for data storage and 2 x 900 GB SAS disks for OS) • Easy Install Rail Kit • EAC Card • Accessory Kit featuring: • Important Card • Start Here Poster • Ethernet cable(Cat 5e) 3m (x2) • Power cable (IEC 320 C13 Connector for Rack PDU)
HPE StoreOnce 5100 48 TB Capacity Upgrade Kit	BB916A	HPE StoreOnce 5100 48 TB System upgrade kit - a D3650 base enclosure offering additional 48 TB of RAW disk storage	• D3650 storage enclosure with 12 x 4 TB discs, redundant power supplies and fan modules. • Rack-mounting hardware kit • 1m mini-SAS cable + 2m mini-SAS cable • Two AC power cords and two PDU interconnect cords • Entitlement certificate • Installation instructions

Also refer to **Software Options** to add licenses for:

- HPE StoreOnce Replication
- HPE StoreOnce Catalyst
- HPE StoreOnce Enterprise Manager
- HPE StoreOnce Security Pack

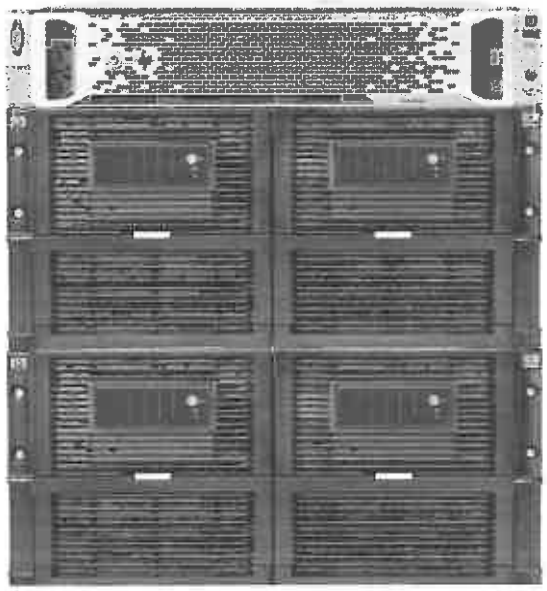
Also refer to Network/Channel Cards

- HPE StoreOnce 10 GbE Network Card
- HPE StoreOnce 10 GbE-T Network Card
- HPE StoreOnce 8 GB Fibre Channel Card

NOTE: A total **number of 4 in any combination can be used.**

HPE StoreOnce 4900 Backup

HPE StoreOnce 4900 Backup



HPE StoreOnce 4900 delivers cost-effective, scalable disk-based backup with deduplication for longer term on-site data retention and off-site disaster recovery for large data centers or regional offices. It also provides a replication target device for up to 50 remote or branch offices. The StoreOnce 4900 delivers a scalable 7U to 12U solution from 36 TB to 432 TB of usable*** capacity (60 to 560 TB RAW) and speeds of up to 22 TB/hour* with HPE StoreOnce Catalyst for protection of 88 TBs* of data in a 4-hour window.

Overview Product Specifications

	StoreOnce 4900
Form Factor	7 to 12U Scalable Rack (plus 1U support shelf- not shown)
Total capacity (raw)	Up 560 TB
Total capacity (usable*)**	Up to 432 TB
Write performance (max)	8.5 TB/hour
Catalyst performance (max)	22 TB/hour
Max fan-in/backup targets	50

See **Detailed Technical Specifications** and **Physical Dimensions** later in this document for more details

NOTE: *Actual performance is dependent upon configuration, data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration. ***Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.

Scalability

Start out with the 7U HPE StoreOnce base unit with 60 TB RAW (36 TB usable***) capacity. When you're ready, simply purchase up to 5x 44 TB (36 TB usable***) capacity upgrade kits to complete the first two storage drawers for up to 280 TB RAW (216 TB usable***).

If more storage is needed, simply purchase an additional expansion kit containing 60 TB RAW (36 TB usable***) capacity and again add up to 5 additional 44 TB (36 TB usable***) capacity upgrade kits to complete the second set of drawers for a total capacity of up to 560 TB RAW (432 TB usable***). Note that fully expanded the HPE StoreOnce 4900 includes 4 drawers of disk (2 drawers in

HPE StoreOnce 4900 Backup

each unit). A fully configured HPE StoreOnce 4900 is 12U (or 36 TB per U in terms of density).

Compatibility:

Hewlett Packard Enterprise extensive compatibility testing program assures that your HPE Backup Systems work with leading servers, operating systems, and backup applications, including those not manufactured by Hewlett Packard Enterprise.

Compatibility details on specific servers and the latest hardware compatibility information, can be found **HERE**

Configuration notes:

- The StoreOnce 4900 can only be installed in racks which provide a distance from the front mounting-rail of the rack to the rear rack-face (the vertical rack surface onto which the rear doors close, the depth of the doors themselves should not be included) of at least 920mm to allow sufficient clearance at the rear for cabling and to allow the hot-swapping of fan modules, PSU modules and I/O modules. Additionally, 35mm of space is required between the front mounting-rail and the nearest point on the inside surface of the front door of the rack to provide sufficient space for the front panels of the system components when the front door is closed.
- HPE StoreOnce 4900 Backup systems can be connected to the servers they protect via a 10 GB Ethernet or 8Gb Fibre Channel.
- They are supported on all 10 GB Ethernet network interface cards (NICs) and switches, dependent on product. 1Gb Ethernet network connections are also supported for sites without 10Gb Ethernet networks (with reduced performance)
- HPE StoreOnce Backup systems are also supported on 100 base-T Ethernet networks, for connection for the Web GUI and CLI access, such as a management network in a Data Centre.
- This product is not supported on networks using slower Ethernet technology.
- If a second disk enclosure is to be installed, Hewlett Packard Enterprise recommends installing the second disk enclosure below the head server unit. If the second disk enclosure is installed above the head server unit, a 1U support shelf supplied with the disk enclosure, should be installed immediately above the head server unit to protect it from the weight of the disk enclosure.

Warranty

Hewlett-Packard Enterprise provides a 1 year parts exchange, 1 year labor, 1 year on site, normal business hours, next business day response for StoreOnce 4500, StoreOnce 4700, StoreOnce 4900 and StoreOnce 6500 Backup systems, plus 9x5 phone support for the duration of the warranty.

Purchasing information:

Product name	Part-number	Description	Includes
HP StoreOnce 4900 Backup	BB903A	HP StoreOnce 4900 Backup with 60 TB of RAW disk storage	• HP 4900 Backup (15 x 4 TB disks) • Ethernet cable(Cat 5e) 3m (x2) • 2 x Power cords (with IEC 320 C13 plug for Rack PDU) • Installation poster • HPE StoreOnce Backup CD (contains installation wizard, device drivers, and documentation, all localized in multiple languages)
HP StoreOnce 4900 60TB Drawer/Capacity Upgrade Kit	BB904A	HP 4900 Backup additional drawers and capacity upgrade kit, D6000 base enclosure including additional 60 TB of RAW disk storage	• 1 storage enclosure with 15 x 4 TB discs, redundant power supplied and fan modules. • Rack-mounting hardware kit • 0.5m mini-SAS cable + 2m mini-SAS cable

HPE StoreOnce 4900 Backup

			• Two AC power cords and two PDU interconnect cords • Entitlement certificate
HP StoreOnce 4900 44TB Capacity Upgrade Kit	BB908A	HP 4900 Backup 44 TB Capacity Upgrade Kit	• 11 x 4 TB disks and entitlement certificate

Also refer to **Software Options** to add licenses for:

- HPE StoreOnce Replication
- HPE StoreOnce Catalyst
- HPE StoreOnce Enterprise Manager
- HPE StoreOnce Security Pack

HPE StoreOnce 6500 Backup

HPE StoreOnce 6500 Backup

Shown with initial 120 TB 6500 Backup system with 88 TB Capacity Upgrade Kit in a 42U rack

HPE StoreOnce 6500 takes HPE StoreOnce to the enterprise, providing disk based backup with deduplication for cost effective, longer term on site data retention and off site disaster recovery. The highest performance HPE StoreOnce Backup system, these highly scale-out solutions offer from 72 TB to 1728 TB of usable*** capacity (120 to 2240 TB RAW) and industry-leading aggregate speeds of up to 139 TB/hr* with StoreOnce Catalyst to match enterprise performance requirements and meet ever shrinking backup windows.

Overview Product Specifications

	StoreOnce 6500
Form Factor	Provided in a 42U rack
Total capacity (raw)	Up to 2240 TB
Total capacity (usable***)	Up to 1728 TB
Write performance (max)	63.2 TB/hour
Catalyst performance (max)	139 TB/hour
Max fan-in/backup targets	384

See **Performance Specifications**, **Detailed Technical Specifications** and **Physical Dimensions** later in this document

NOTE: ***Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.

Special feature: Highly Resilient

HPE StoreOnce 6500 is designed with no single point of hardware failure. The hardware of the HPE StoreOnce 6500's couplet is resilient to any one component failing. This means the following high availability features:

- Autonomic Restart and node failover
- RAID storage, with RAID6 as the minimum redundancy level (so each RAID set can survive a double disk failure)
- The front-end controllers (nodes) within a couplet are configured in failover mode so that if one controller fails all critical non-replaceable aspects of that controller are transparently moved to another controller and the failed controller is disabled.
- Dual storage controllers (RAID and JBOD), with cache mirroring between the RAID controllers (so that if a controller fails

HPE StoreOnce 6500 Backup

the data is preserved and is still written to media by the other controller)
- Dual paths to the disk drives
- 8 hot spare drives included within each couplet in the event of a disk failure
- Power failure protection for all caching within the storage
- Dual power supplies, such that the hardware will continue operating at full performance if one power supply is offline.
- Redundant fans, such that the hardware will continue operating at full performance if one fan is offline
- Mirrored system disks in each controller (node) to store the device operating system and software
- Front-end high availability (dual fabric support): each controller will have at least two front-end ports per port type to support the customer's external LAN/SAN fabrics. Thus if any fail there is still full access to every node in the device.
- Hot add additional storage or server nodes without scheduled downtime.
- A single GUI/CLI interface is presented from any one node in the system, if that controller fails then the GUI will automatically move to a different controller whilst still being presented at the same network address.

Scalability

Upgrading with HPE StoreOnce 6500:

- Start out with the HPE StoreOnce 6500 120 TB system consisting of two nodes connected in failover configuration as a couplet. This is delivered pre-integrated into HPE's 42U racks which also contain the necessary networking capabilities for future expansion within the entire rack using an HPE StoreOnce 6500 switch assembly.
- To scale-out in terms of capacity, simply add up to 5 capacity upgrade kits to each couplet. Each upgrade kit comprises 22 disks which are added symmetrically. Each upgrade kit contains 22 x 4 TB disks, giving 88 TB RAW capacity (72 TB usable***), allowing up to a maximum of 560 TB RAW capacity (432 TB usable***) associated with the original couplet. Capacity upgrade kits can be added to the couplet while the Backup System is online in order to reduce unnecessary downtime.

  A fully configured couplet with 5 capacity upgrade kits, can be managed as a single file system of up to 560 TB RAW capacity (432 TB usable***), however to optimize performance within a couplet, capacity usage should be balanced across both nodes within a couplet. To scale-out in terms of performance, add in one more HPE StoreOnce 6500 120TB system and again scale up by adding capacity upgrade kits. This gives you a maximum configuration of two fully configured HPE StoreOnce 6500 120 TB systems of two couplets with a total capacity of 1120 TB RAW capacity (864 TB usable***) in a single rack.

  To scale-out to 2240 TB RAW (1728 TB usable***) purchase the HPE StoreOnce 6500 120TB Backup for extra Racks (contains additional base couplet, switch, cables and pulls in another 42U rack), and populate as before.

Upgrading an existing HPE StoreOnce B6200:

Customers who have already invested in the HPE StoreOnce B6200 are still able to expand their storage to its full capacity of 768 TB RAW (512 TB usable***) by purchasing additional capacity upgrade kits or utilizing mixed couplet support to scale up.

- To scale out in terms of capacity, simply add up to 3 capacity upgrade kits to each couplet for a maximum of 192 TB RAW capacity (128 TB usable***) per couplet. A fully configured couplet with 3 capacity upgrade kits, can be managed as a single file system of up to 192 TB RAW capacity (128 TB usable***), however to optimize performance within a couplet, capacity usage should be balanced across both nodes within a couplet.

NOTE: ***Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.

Expanding an existing StoreOnce B6200 by adding StoreOnce 6500 couplet(s) via mixed couplet support:

- Facilitates expanding an existing 1 to 3 couplet B6200 configuration
- Existing B6200 does not have to be fully populated with capacity upgrades
- Existing configuration can be expanded to currently supported maximum of 4 couplets
- Existing B6200 system needs to be on 3.11.3 firmware as a minimum
- Use the table below to determine what components are necessary to complete the expansion (note that the 6500 couplets can be expanded beyond their initial capacity as usual by ordering the 6500 capacity upgrade kit – BB899A 88

HPE StoreOnce 6500 Backup

TB Capacity Upgrade Kit).

Existing Configuration		Upgrade	SKUs Required				
B6200 Couplet(s)	6500 Couplet(s)	Adding 6500 couplet(s)	BB897A For existing racks	BB897A#0D1 For existing racks, factory integrated	BB900A For extra racks	BB902A Mixed couplet interlink cable kit	BB912A Mixed couplet SFP kit
1	0	1	1	0	0	0	1
1	0	2	1	0	1	1	0
1	0	3	1	1	1	1	0
2	0	1	0	0	1	1	0
2	0	2	0	1	1	1	0
3	0	1	1	0	0	0	1
1	1	1	0	0	1	1	0
1	1	2	0	1	1	1	0
1	2	1	1	0	0	0	0
2	1	1	1	0	0	0	0

See **purchasing information** and **configuration notes** for more detail.

Compatibility:

Hewlett Packard Enterprise's extensive compatibility testing program assures that your HPE Backup Systems work with leading servers, operating systems, and backup applications, including those not manufactured by Hewlett Packard Enterprise.

Compatibility details on specific servers and the latest hardware compatibility information, can be found **HERE**

Warranty

Hewlett-Packard Enterprise provides a 1 year parts exchange, 1 year labor, 1 year on site, normal business hours, next business day response for StoreOnce 4500, StoreOnce 4700, StoreOnce 4900 and StoreOnce 6500 Backup systems, plus 9x5 phone support for the duration of the warranty.

Purchasing information:

Product name	Part-number	Description	Includes
HP StoreOnce 6500 120 TB for Initial Rack	BB896A	HP StoreOnce 6500 Backup with 120 TB of RAW disk storage	• HPE 6500 Processing Nodes (2) • HPE 6500 Switch kit • HPE 6500 Storage Drawers (2)(each with 15* 4 TB HDDs) • 4 x 0.5m Mini SAS cables • 16 x 2m SAS-HD to Mini SAS cables • 16 x Power cords (with IEC 320 C13 plug for Rack PDU) • Provided in a 42U rack
HP StoreOnce 6500 88 TB Capacity Upgrade Kit	BB899A	HP StoreOnce 6500 88 TB upgrade kit, offering additional 88 TB of RAW disk storage	• 22 * 4 TB HDDs • HPE 6500 88TB Capacity Upgrade License Entitlement Certificate
HP StoreOnce 6500 120 TB for Existing Rack	BB897A	HP StoreOnce 6500 Backup with 120 TB of RAW disk storage	• HPE 6500 Processing Nodes (2) • HPE 6500 Storage Drawers (2)(each

HPE StoreOnce 6500 Backup

(**NOTE:** for use in existing StoreOnce B6200/6500 systems only)			with 15* 4 TB HDDs) • 4 x 0.5m Mini SAS cables • 12 x Power cords (with IEC 320 C13 plug for Rack PDU)
HP StoreOnce 6500 120 TB for Second Rack	BB900A	HP StoreOnce 6500 Backup with 120 TB of RAW disk storage	• HPE 6500 Processing Nodes (2) • HPE 6500 Switch kit • HPE 6500 Storage Drawers (2)(each with 15* 4 TB HDDs) • 4 x 0.5m Mini SAS cables • 16 x 2m SAS-HD to Mini SAS cables • 16 x Power cords (with IEC 320 C13 plug for Rack PDU) • Provided in a 42U rack
HP StoreOnce B6200 to 6500 Interlink Kit	BB902A	Cables required to implement mixed couplet support between currently installed B6200 and 6500	• 8 x 15m optical cables • 4 x 10GbE SFP+ transceivers
HP StoreOnce 6500 Mixed Couplet SFP Kit	BB912A	SFPs required to connect an HP StoreOnce 6500 Couplet (BB897A) into an existing HPE StoreOnce B6200 installation to create a Mixed Couplet.	• 4 x 10GbE SFP+ transceivers • 8 x 2m SAS HD to Mini SAS cables

Also refer to **Software Options**

HPE StoreOnce 6500 Detailed Performance Specifications

StoreOnce 6500 maximum RAW capacity TB				
	1 couplet	2 couplet	3 couplet	4 couplet
Base storage	120	240	360	480
1 * 88 TB expansion kit	208	416	624	832
2 * 88 TB expansion kit	296	592	888	1184
3 * 88 TB expansion kit	384	768	1152	1536
4 * 88 TB expansion kit	472	944	1416	1888
5 * 88 TB expansion kit	560	1120	1680	2240
NOTE: A maximum of 5 expansion kits can be used per couplet.				
StoreOnce 6500 maximum usable* capacity TB**				
	1 couplet	2 couplet	3 couplet	4 couplet
Base storage	72	144	216	288
1 * 88 TB expansion kit	144	288	432	576
2 * 88 TB expansion kit	216	432	648	864
3 * 88 TB expansion kit	288	576	864	1152
4 * 88 TB expansion kit	360	720	1080	1440
5 * 88 TB expansion kit	432	864	1296	1728
StoreOnce 6500 with Data Deduplication (usable*** capacity using data deduplication at 20:1*)				
	1 couplet	2 couplet	3 couplet	4 couplet
Base storage	1440	2880	4320	5760
1 * 88 TB expansion kit	2880	5760	8640	11520
2 * 88 TB expansion kit	4320	8640	12960	17280
3 * 88 TB expansion kit	5760	11520	17280	23040

HPE StoreOnce 6500 Backup

4 * 88 TB expansion kit	7200	14400	21600	28800
5 * 88 TB expansion kit	8640	17280	25920	34560

NOTE: Actual results of data deduplication will vary with data type, change rates over time and backup methodologies used.

A maximum of 5 expansion kits can be used per couplet.

StoreOnce 6500 Performance*(maximum aggregated data transfer rate using VTL)				
	1 couplet	2 couplet	3 couplet	4 couplet
Write Performance	15.8 TB/hr	31.6 TB/hr	47.4 TB/hr	63.2 TB/hr
Read Performance	18.8 TB/hr	37.6 TB/hr	56.4 TB/hr	75.2 TB/hr
StoreOnce 6500 with StoreOnce Catalyst Performance*(maximum aggregated data transfer rate using Catalyst)				
	1 couplet	2 couplet	3 couplet	4 couplet
Write Performance	34.8 TB/hr	69.6 TB/hr	104.4 TB/hr	139.2 TB/hr

NOTE: *Actual performance is dependent upon configuration, data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication.

*****Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.**

Configuration notes:

Sizing the StoreOnce 6500:

- The HPE Storage Sizer tool must be used to correctly size a deduplication and replication enabled system
- To optimize capacity utilization and in accordance with performance requirements, your capacity requirements should be planned following Recommended Configuration Guidelines. Please refer to the latest Concepts and Configuration Guide for more information:
  http://h20565.www2.hpe.com/portal/site/hpsc/public/psi/manualsResults/?sp4ts.oid=5196525

Rack-configuring the StoreOnce 6500:

- The StoreOnce 6500 is mandatory factory integrated and shipped in a 42U rack
  - It can be re-racked, subject to a number of constraints.
  - Splitting the switch, server and\or storage of a 6500, between racks is not supported.
  - A minimum contiguous space of 18U is required to house a couplet and its associated switches.
  - If a customer does choose to re-rack, then future storage and\or couplet expansion must be taken into account and additional contiguous rack space allowed.
  - Full details of the re-racking constraints and process are available - please ask your sales representative or partner for details.
- To configure the StoreOnce 6500 use the steps below as a guide, but to place actual orders use Watson and CLIC to configure a system.
  - This is especially true for the customers 1st or 3rd 6500 which require mandatory factory express integration of the 6500 couplet and required switch kit into the 42U rack that does not need to be ordered separately, but is automatically added to the order configuration when the associated BB896A or BB900A SKU's are ordered.
  - When wishing to expand an existing system, the customers 2nd or 4th 6500 couplet (BB897A) is not factory integrated and can be ordered without the #0D1 option, as the 1st and 3rd 6500 couplets are already housed in the 42U racks and have been factory integrated with switch kits
- It is NOT possible to order BB897A or BB900A without first ordering BB896A. It is NOT possible to order BB896A without the factory integrated rack (BW904A)
- Option #0D1 must be added to products listed for essential factory integration, i.e. BB896A HPE StoreOnce 6500 120TB for Initial Rack and\or BB900A HPE StoreOnce 6500 120TB for Extra Racks

Factory Integrated Cluster:

	Couplet 1	Couplet 2	Couplet 3	Couplet 4

HPE StoreOnce 6500 Backup

	HP StoreOnce 6500 120TB for Initial Rack BB896A		HP StoreOnce 6500 120TB for Extra Racks BB900A	
Rack	Automatically added to Config when BB896A ordered	If required, order BB897A HP StoreOnce 6500 120TB for Existing Rack	Automatically added to Config when BB900A ordered	If required, order BB897A HP StoreOnce 6500 120TB for Existing Rack
Add capacity	BB899A	BB899A	BB899A	BB899A
Add capacity	BB899A	BB899A	BB899A	BB899A
Add capacity	BB899A	BB899A	BB899A	BB899A
Add capacity	BB899A	BB899A	BB899A	BB899A
Add capacity	BB899A	BB899A	BB899A	BB899A
HP 6000 StoreOnce Replication License	Qty 1 - EJ026A\AAE	Qty 1 - EJ026A\AAE	Qty 1 - EJ026A\AAE	Qty 1 - EJ026A\AAE
HP 6000 StoreOnce Encryption License	Qty 1 - BB894A\AAE	Qty 1 - BB894A\AAE	Qty 1 - BB894A\AAE	Qty 1 - BB894A\AAE
HP 6000 StoreOnce Catalyst License	Qty 1 - BB895A\AAE	Qty 1 - BB895A\AAE	Qty 1 - BB895A\AAE	Qty 1 - BB895A\AAE

Factory Integrated Cluster - Additional Form Factors

	Couplet 1	**Couplet 2**	**Couplet 3**	**Couplet 4**
	HP StoreOnce 6500 120TB for Initial Rack BB896A		HP StoreOnce 6500 120TB for Extra Racks BB900A	
Couplet	18U	16U	18U	16U
Add capacity	N/A	N/A	N/A	N/A
Add capacity	N/A	N/A	N/A	N/A
Add capacity	N/A	N/A	N/A	N/A
Add capacity	N/A	N/A	N/A	N/A
Add capacity	N/A	N/A	N/A	N/A
NOTE: Capacity additions are housed within the existing Couplet footprint thus require no additional rack space				
HPE 642 1075mm Shock Intelligent Series Rack	42U		42U	

Software and Software Options

HPE StoreOnce Catalyst

HPE StoreOnce Catalyst brings to fruition the HPE StoreOnce vision of seamless movement of deduplicated data across the enterprise. This is enabled by the single, integrated enterprise-wide deduplication algorithm. This means that you can benefit from:

- Federated Catalyst is a new feature for the StoreOnce multi-node products.
- StoreOnce Federated Catalyst allows Catalyst stores to span nodes simplifying backup management and optimizing available storage in large environments yet continues to provide high resiliency and optimize performance
- Catalyst over Fibre Channel provides all the ISV control and source side deduplication benefits of current StoreOnce Catalyst but via your Fibre Channel fabric meaning you don't have to invest in additional infrastructure
- Simplified management of data movement from a single pane of glass: tighter integration with your backup application to centrally manage file replication across the enterprise.
- Seamless control across complex environments: supporting a range of flexible configurations that enable the concurrent movement of data from one site to multiple sites, and the ability to cascade data around the enterprise (sometimes referred to as multi-hop).
- Enhance performance: distributed deduplication processing using StoreOnce Catalyst stores on the StoreOnce Backup systems and on multiple servers can optimize loading and utilization of backup hardware, network links and backup servers for faster deduplication and backup performance.
- Faster time to backup to meet shrinking backup windows: up to 139 TB/hour* aggregate throughput.

***Actual performance is dependent upon configuration data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication and storage configuration.**

Ordering Information

HPE StoreOnce Catalyst is available by electronic license for customers of any of the latest HPE StoreOnce Backup systems with a wide range of backup applications via.
http://www.webware.hp.com

Model / license for	StoreOnce License/E-LTU	Part number
HP StoreOnce 6500 and B6200	E-LTU	BB895AAE
	LTU	BB895A
HP StoreOnce 4900	E-LTU	BB906AAE
	LTU	BB906A
HP StoreOnce 4500/ HPE StoreOnce 5100	E-LTU	BB888AAE
	LTU	BB888A
HPE StoreOnce 2000/3000	E-LTU	BB887AAE
	LTU	BB887A

NOTE: HPE StoreOnce VSA license already includes StoreOnce Catalyst. No additional license required.

Configuration notes

- A StoreOnce Catalyst license is required for each appliance that will host Catalyst Stores. The license enables backup and copy to Catalyst Stores on the appliance.
- The license is locked to the appliance and cannot be transferred to another appliance.
- There is no need to purchase a replication license when using StoreOnce Catalyst Copy. However, if VTL or NAS replication is configured on the same appliance, a replication license

Software and Software Options

will be required for each target appliance.

- Every StoreOnce Backup system (and 6500 couplet) that uses StoreOnce Catalyst requires a license
- StoreOnce Catalyst also provides seamless control of data movement across the organization and better utilization of servers, network bandwidth.
- StoreOnce Catalyst is supported by:
  - HPE Data Protector (for supported versions see
  - **http://www.hp.com/go/buracompatibility**
  - **BridgeHead Software (for supported versions see**
  - **http://www.hp.com/go/buracompatibility**
  - Symantec NetBackup (via an HPE OST plug-in) available from **http://www.hp.com/go/StoreOnce/VERITAS**
  - Symantec Backup Exec (via an HPE OST plug-in available from
  - **http://www.hp.com/go/StoreOnce/VERITAS**
  - Oracle RMAN (via an HPE plug-in) available from
  - **http://www.hp.com/go/StoreOnce/OracleRMAN**
  - Microsoft SQL Server (via HPE plug-in) available from **http://www.hpe.com/go/StoreOnce/SQLServer**
  - **http://www.hp.com/go/StoreOnce/SQLServer**
  - SAP HANA (via HPE plug-in) available from **http://www.hpe.com/go/StoreOnce/SAPHANA**
  - SAP on Oracle (via HPE plug-in) available from **http://www.hpe.com/storage/storeonce-SAPOracle**

HPE StoreOnce Replication

Hewlett Packard Enterprise data replication feature includes replication bandwidth limiting functionality, constraining the amount of bandwidth being used when replicating data for even more network-efficient replication. Without replication bandwidth limiting, a replication job could use as much bandwidth as is available, potentially making other network activities unresponsive. Replication bandwidth limiting is customer configurable at the appliance level via the graphical user interface and is set as a percentage of the available network bandwidth.

Ordering Information

Hewlett Packard Enterprise delivers replication by license, either as a standalone replication solution, or as part of the **HPE StoreOnce Catalyst licensing**. With HPE StoreOnceSystems, replication is licensed by VTL/NAS target, this means that with one replication license:

Model / license for	Max number of targets supported	Replication License/E-LTU	Part number
HP StoreOnce 6500 and B6200	384	E-LTU	EJ026AAE
		LTU	EJ0206A
HP StoreOnce 4900	50	E-LTU	BB905AAE
		LTU	BB905A
HP StoreOnce 4500/ HPE StoreOnce 5100	24	E-LTU	BB885AAE
		LTU	BB885A
HPE StoreOnce 2000/3000	8	E-LTU	BB884AAE
		LTU	BB884A

NOTE: HPE StoreOnce VSA license already includes replication. No additional license required.

- Replication licenses enable an appliance to host replication target libraries. (No license is

Software and Software Options

required for appliances which only act as replication sources)

- Licensing is "per appliance" i.e. a single license is required to enable an appliance to host as many replication target libraries as it is capable of.
- The license is locked to the appliance and cannot be transferred to another appliance.
- For the 6500 a separate license is required per couplet (EJ026A or EJ026AAE)
- No license is required for StoreOnce VSA to act as a replication target

HPE Reporting Central and StoreOnce Enterprise Manager

Monitor multiple StoreOnce appliances through a single interface with StoreOnce Reporting Central, a default feature shipped with all HPE StoreOnce Systems within the StoreOnce GUI. Reporting Central provides a rolled up status of up to 20 registered StoreOnce appliances in a single pane of glass and allows drill-down reporting into areas of interest such as deduplication ratio, capacity usage for StoreOnce Catalyst stores, VTL libraries, NAS shares, read/write throughput, replication throughput, stream count, CPU, memory, disk I/O and networking and FC channel utilization. Reports for a desired time frame can be exported to a CSV or PNG format file.

NOTE: Reporting of stream count, CPU, memory, disk I/O and networking and FC channel utilization are only supported on 3100, 3520, 3540 and 5100 products

For larger installations HPE StoreOnce Enterprise Manager (SEM) is a centralized management console to analyze up to 400 physical and virtual StoreOnce devices across multiple sites. It provides advanced monitoring, reporting, and forecasting and trend analysis in NAS, VTL, and StoreOnce Catalyst environments and integrates with the StoreOnce GUI for single pane-of-glass management - for both physical appliances and the StoreOnce VSA.

Specifically, SEM provides granular reporting and trends analysis of vital parameters such as disk capacity utilization, deduplication ratios, and performance and helps customers plan ahead by providing forecasts of disk usage and replication duration. SEM can be installed on a separate Windows server management station and contains a full database of statistics that is pulled periodically from each device and allows reporting over a long period. In addition to reporting capacity, performance and device status the tool allows logical groupings of devices with different polices and then allows these virtual groups to be managed independently. Through SEM the user is able to drill down to individual StoreOnce appliances and launch their GUI's to manage them in more depth. All reports and graphs can be exported in CSV or PNG formats for further analysis. Users can also schedule e-mail reports for alerts and notifications, such as when pre-set capacity thresholds are crossed. SEM is supported on 64 bit machines only. StoreOnce Enterprise Manager software is available as a free download from **http://www.hp.com/go/StoreOnce/SEM**

In order to benefit from StoreOnce Enterprise Manager, StoreOnce systems require the latest firmware, which can be obtained via a free firmware upgrade by following the "Support & Drivers" link on **http://www.hp.com/go/storeonce** or by following the "HPE Support & Drivers" link from: **http://www.hpe.com**

HPE StoreOnce REST API SDK

The StoreOnce REST API SDK provides a well-defined RESTful application programming interface (API) that customers can use for integrating and automating reporting/management capabilities with StoreOnce appliances. The SDK essentially delivers a programming interface for polling StoreOnce systems with reporting queries at a desired granularity, and the information extracted from the appliances can then be integrated with the customer's own reporting tool allowing for considerable flexibility in monitoring large StoreOnce environments. The SDK also allows customers to automate select management tasks such as creating and deleting backup targets (StoreOnce Catalyst stores, VTL libraries, NAS shares) and this capability can be integrated with the customer's own management tools. The StoreOnce SDK can be downloaded at **http://h20564.www2.hp.com/hpsc/doc/public/display?docId=c04608993**

Software and Software Options

HPE StoreOnce Security Package

The HPE StoreOnce Security Package delivers a Data at Rest and Data in Flight encryption solution and secure Data Shredding features for data privacy, confidentiality, and integrity of your critical business data while supporting compliance requirements. These are configurable on a by application or by store basis ensuring that you have maximum control over the data you are protecting.

- HPE StoreOnce Data at Rest encryption feature is a software-based solution which provides protection against unauthorized access to data through a stolen, discarded or replaced disk.
- Encryption occurs after data has been deduplicated and prior to writing the data onto disk
- Encryption is enabled on a per store basis (StoreOnce Catalyst, VTL, and NAS targets)
- Meets compliance needs using industry standard Advanced Encryption Standard (AES)-256 encryption algorithm
- Standard FIPS 140-2 level 1 capable
- It enables the StoreOnce System to request encryption keys from HPE ESKM version 4.0 or greater using KMIP 1.2 protocol or SafeNet's KeySecure key manager using KMIP protocol for centralized encryption key management.
  NOTE: Centralized Encryption Key Management is currently only supported on 3100, 3520, 3540 and 5100 products.
- Local Key Management is included with 1 key per store and the ability to backup and restore keys
- HPE StoreOnce Data in Flight encryption feature protects against unauthorized access of data being transferred over the wire between devices.
- Data in Flight encryption via IPSec is supported on StoreOnce Catalyst only. Encryption is enabled via the operating system utilizing IPSec. In addition, write performance may be impacted, however performance improvements should be seen after first ingest.
- Works between client and StoreOnce device or between StoreOnce devices
- HPE StoreOnce Secure Erase feature protects against unauthorized recovery of deleted data by allowing customers to securely and permanently shred confidential data.
- Secure Erase can be carried out on all data backed up to a VTL, NAS or StoreOnce Catalyst Store
- The HPE StoreOnce Secure Erase feature meets industry standards of NIST SP 800-88
- Secure Erase can erase with 1 pass or multiple random overwrites of 3, 5 or 7 passes

Ordering Information

An HPE StoreOnce Security Pack license is required for each appliance .The StoreOnce Security Pack license for the 6000 is required per couplet. A 90 day trial license is available. Each license includes HPE StoreOnce Data at Rest, Data in Flight Encryption, Centralized Encryption Key Management and Secure Erase.

Model / license for	Security Pack License/E-LTU	Part number
HP StoreOnce 6500 and B6200	E-LTU	BB894AAE
	LTU	BB894A
HP StoreOnce 4900	E-LTU	BB907AAE
	LTU	BB907A
HP StoreOnce 4500/ HPE StoreOnce 5100	E-LTU	BB892AAE
	LTU	BB892A
HPE StoreOnce 2000/3000 series	E-LTU	BB891AAE
	LTU	BB891A

Cabling and other options

HPE 10GbE Connectivity	**The following cables are recommended for HPE 10GbE connectivity.**	
	NOTE: Optical 10GbE SFPs are included in 4900 and 6500 but should be purchased separately for the B6200 or previous version of StoreOnce products.	
10GbE Fibre Optic Modules	HP BladeSystem c-Class 10Gb SFP+ SR Transceiver	455883-B21
	NOTE: Fibre transceivers and cables must be purchased separately for B6200 fibre-optic environments - 4 transceivers are required for each couplet.	
HPE ProCurve 10GbE Connectivity	The following cables are recommended for 10GbE connectivity with HPE ProCurve network switches.	
Direct Attach Copper Cables	HP X242 10G SFP+ to SFP+ 1m Direct Attach Copper Cable	J9281B
	HP X242 10G SFP+ to SFP+ 3m Direct Attach Copper Cable	J9283B
	HP X242 10G SFP+ to SFP+ 7m Direct Attach Copper Cable	J9285B
	HP X244 10G XFP to SFP+ 1m Direct Attach Copper Cable	J9300A
	HP 10G X244 XFP to SFP+ 3m Direct Attach Copper Cable	J9301A
	NOTE: Direct Attach Cable (DAC) must be purchased separately for copper environments.	
Fibre Optic Cables	**PremierFlex OM4 FC cables**	
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 1m Cable	QK732A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 2m Cable	QK733A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 5m Cable	QK734A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 15m Cable	QK735A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 30m Cable	QK736A
	HP Premier Flex LC/LC Multi-mode OM4 2 fiber 50m Cable	QK737A
	OM3 FC cables	
	HP LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A
	HP LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable	AJ834A
	HP LC to LC Multi-mode OM3 2-Fiber 2.0m 1-Pack Fiber Optic Cable	AJ835A
	HP LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A
	HP LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
	HP LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
	HP LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable	AJ839A
	NOTE: Fibre transceivers and cables must be purchased separately for Fibre-optic environments. For additional information on 10Gb cable specifications go to: **http://www.Hewlett-Packard Enterprise.com/rnd/pdfs/10gig_cabling_technical_brief.pdf**	
Fibre Optic Cables	**The following cables are available for connectivity with other 10GbE switch environments**	
	HP LC to LC Multi-mode OM3 2-Fiber 0.5m 1-Pack Fiber Optic Cable	AJ833A

Technical Specifications

	HP LC to LC Multi-mode OM3 2-Fiber 1.0m 1-Pack Fiber Optic Cable	AJ834A
	HP LC to LC Multi-mode OM3 2-Fiber 5.0m 1-Pack Fiber Optic Cable	AJ836A
	HP LC to LC Multi-mode OM3 2-Fiber 15.0m 1-Pack Fiber Optic Cable	AJ837A
	HP LC to LC Multi-mode OM3 2-Fiber 30.0m 1-Pack Fiber Optic Cable	AJ838A
	HP LC to LC Multi-mode OM3 2-Fiber 50.0m 1-Pack Fiber Optic Cable	AJ839A
	NOTE: Fibre transceivers and cables must be purchased separately for fibre-optic environments.	
Power Supply	**The following power supply is available for StoreOnce 3100 only**	
	HP 500W Flex Slot Platinum Hot Plug Power Supply Kit	720478-B21
Network/Channel Cards	**The following cards are available for StoreOnce 3520, 3540 and 5100 only**	
	HPE StoreOnce 10 GbE Network Card	BB926A
	HPE StoreOnce 10 GbE-T Network Card	BB927A
	HPE StoreOnce 8 GB Fibre Channel Card	BB928A
	NOTE: A total number of four in any combination can be used. These optional hardware cards come with a license that is pre-installed and activated when ordered with the initial product. However, if not ordered at the same time as the base product these licenses will need to be installed and activated.	
	NOTE: The cards are supplied with the necessary SFPs, with the exception of the 10GbE- T network card. The 10GbE-T card uses RJ45 connectors.	

Technical Specifications

	StoreOnce VSA 4 TB	StoreOnce VSA 10 TB	StoreOnce VSA 50 TB	StoreOnce 3100	StoreOnce 3520	StoreOnce 3540	StoreOnc e 5100	StoreOnce 4900	StoreOnce 6500
Form Factor	Virtual appliance	Virtual appliance	Virtual appliance	1U rack	2U rack	2U rack	2 to 12U scalable rack	7 to 12U scalable rack	Provided in 42U 1075mm rack
Total Capacity (RAW)				8 TB	24 TB	48 TB	288 TB	Up to 560 TB	Up to 2240 TB
Total Capacity (Usable***)	up to 4 TB	up to 10 TB	1 to 50 TB	5.5 TB	15.5 TB	31.5 TB	216 TB	Up to 432 TB	Up to 1728 TB
Data retention with deduplication	80 TB	200 TB	1000 TB	110 TB	282 TB	573 TB	3360 TB	8.6 PB	34 PB
Fan-in Max	8	8	8	24	96	96	96	50	384
Write Performance	400 GB/hr	800 GB/hr	2.4 TB/hr	1.6 TB/hr	4.6 TB/hr	4.6 TB/hr	13.8 TB/hr	8.5 TB/hr	63.2 TB/hr
	(max aggregated data transfer rate using VTL)								
Read Performance	225 GB/hr	600 GB/hr	1.8 TB/hr	1.4 TB/hr	4.1 TB/hr	4.1 TB/hr	14.2 TB/hr	10.1 TB/hr	75.2 TB/hr
	(max aggregated data transfer rate using VTL)								
StoreOnce Catalyst Performance	1 TB/hr	2 TB/hr	6 TB/hr	6.4 TB/hr	12.7 TB/hr	12.7 TB/hr	26.7 TB/hr	22 TB/hr	139 TB/hr
	(max aggregated data transfer rate)								
Targets for backup applications	Catalyst, VTL, CIFS, NFS				: HPE StoreOnce Catalyst, Virtual Tape Library (VTL) CIF			HPE StoreOnce Catalyst, Virtual Tape Library (VTL) NAS	
Device Interfaces	Up to 2 x 1GbE vNICs	Up to 2 x 1GbE vNICs	2 x 1GbE vNICs (min)	4 x 1 GB Ethernet	4 x 1GbE, Up to 8 x 10GbE SFP+ or 10GbE Base-T or 8Gb FC	4 x 1GbE, Up to 8 x 10GbE SFP+ or 10GbE Base-T or 8Gb FC	4 x 1GbE, Up to 8 x 10GbE SFP+ or 10GbE Base-T or 8Gb FC	4x 8Gb Fibre Channel, 4x 1Gb Ethernet, 4x10Gb Ethernet	8x 8Gb Fibre Channel, 8 x 1Gb Ethernet, 4 x10Gb Ethernet Per Couplet
Disk drives	n/a	n/a	n/a	2 TB, SAS 7200rpm,	2 TB, SAS 7200rpm,	4 TB, SAS 7200rpm,	4 TB, SAS 7200rpm,	4 TB, SAS 7200rpm,	4 TB, SAS 7200rpm,

Technical Specifications

				3.5-inch	3.5-inch	3.5-inch	3.5-inch	3.5-inch	3.5-inch
Number of Disk Drives	n/a	n/a	n/a	4	12	12	12 to 72 (max)	15 (min), 140 (max)	30 (min), 560 (max)

NOTE: ***Actual usable capacity for customer data storage is dependent upon drive formatting, log file and meta data size, housekeeping backlog.

RAID Support	n/a	n/a	n/a	Hardware RAID 5	Hardware RAID 6	Hardware RAID 6	Hardware RAID 6	Hardware RAID 6	Hardware RAID 6
Total number of backup targets	4	12	16	8	24	24	32	50	384
	StoreOnce Catalyst, Virtual Tape Libraries and NAS backup targets combined								
Max Number of Cartridges Emulated	2048	6144	8192	768	24,576	24,576	32,768	819,200	6,553,600
Power Requirements per power supply • Range input voltage	n/a	n/a	n/a	100 to 120 VAC 200 to 240 VAC	100 to 120 VAC 200 to 240 VAC	100 to 120 VAC 200 to 240 VAC	100 to 120 VAC 200 to 240 VAC	**See table below**	**See table below**
• Rated input frequency	n/a	n/a	n/a	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz		
• Rated input current	n/a	n/a	n/a	x A (at 120VAC) x A (at 240 VAC)	x A (at 120VAC) x A (at 240 VAC)	x A (at 120VAC) x A (at 240 VAC)	x A (at 120VAC) x A (at 240 VAC)		
Heat dissipated BTU	n/a	n/a	n/a	1979 BTU/hr (at 120 VAC) 1965 BTU/hr (at 240 VAC)	3207 BTU/hr (at 120 VAC) 3112 BTU/hr (at 240 VAC)	3207 BTU/hr (at 120 VAC) 3112 BTU/hr (at 240 VAC)	3207 BTU/hr (at 120 VAC) 3112 BTU/hr (at 240 VAC)	**See table below**	**See table below**
Rated steady-state power and max peak power	n/a	n/a	n/a	500 W (at 100 to 120 VAC) 500 W (at 200 to 240 VAC)	800 W (at 100 to 120 VAC) 800 W (at 200 to 240 VAC)	800 W (at 100 to 120 VAC) 800 W (at 200 to 240 VAC)	800 W (at 100 to 120 VAC) 800 W (at 200 to 240 VAC)		
Idle (disks spinning)	n/a	n/a	n/a	LWAd 5.5A LpAm 37dBA	LWAd 5.7A LpAm 39dBA	LWAd 5.7A LpAm 39dBA	LWAd 5.7A LpAm 39dBA		
Operating	n/a	n/a	n/a	LWAd 3.2C	LWAd 5.9C	LWAd 5.9C	LWAd		

Technical Specifications

(random seeks to disks)	LpAm 46dBA	LpAm 31dBA	LpAm 31dBA	5.9C LpAm 31dBA

Power requirements for StoreOnce 4900

Input Voltage	208V				220V				240V			
	A	W	VA	BTU/hr	A	W	VA	BTU/hr	A	W	VA	BTU/hr
Base configuration (1 drive enclosure) (total 15 drives)	6.7	1374	1384	4989	6.3	1373	1385	4987	5.8	1373	1387	4987
Expansion 1 (total 26 drives)	7.2	1490	1504	5427	6.8	1490	1503	5425	6.3	1490	1505	5425
Expansion 2 (total 37 drives)	7.8	1607	1619	5866	7.4	1606	1621	5863	6.8	1606	1623	5863
Expansion 3 (total 48 drives)	8.3	1724	1737	6304	7.9	1723	1739	6302	7.3	1723	1741	6302
Expansion 4 (total 59 drives)	8.9	1841	1854	6743	8.4	1840	1857	6740	7.7	1840	1859	6740
Expansion 5 (total 70 drives) (Max)	9.5	1957	1972	6683	9	1957	1975	6680	8.2	1957	1977	6680
Expansion 6 (additional drive enclosure) (total 85 drives)	13.8	2844	2866	10010	13	2843	2869	10008	12	2843	2872	10008
Expansion 7 (total 96 drives)	14.3	2960	2983	10448	13.6	2956	2987	10446	12.5	2956	2990	10446
Expansion 8 (total 107 drives)	14.9	3077	3100	10887	14.1	3076	3105	10884	13	3076	3108	10884
Expansion 9 (total 118 drives)	15.5	3194	3218	11325	14.6	3193	3222	11323	13.4	3193	3226	11323
Expansion 10 (total 129 drives)	16	331	3336	11764	15.2	3310	3340	11761	13.9	3310	3344	11761
Expansion 11 - Maximum Capacity (total 140 drives)	16.6	3427	3453	11704	15.7	3427	3458	11701	14.4	3427	3462	11701

Power requirements for StoreOnce 6500

Input Voltage	208V				220V				240V			
	A	W	VA	BTU/hr	A	W	VA	BTU/hr	A	W	VA	BTU/hr
1st-couplet base configuration (total 30 drives)	16.9	3479	3505	1247	15.9	3478	3510	12471	14.6	3478	3513	12471
Expansion 1 (total 52 drives)	18.0	3713	3741	13353	17.0	3711	3745	13348	15.6	3711	3750	13348

Technical Specifications

Expansion 2 (total 74 drives)	19.1	3946	3976	14230	18.1	3945	3981	14225	16.6	3945	3985	14225
Expansion 3 (total 96 drives)	20.2	4180	4211	15106	19.2	4178	4217	15101	17.6	4178	4221	15102
Expansion 4 (total 118 drives)	21.4	4413	4446	15983	20.2	4412	4452	15978	18.6	4412	4457	15978
Expansion 5 (total 140 drives) (Max)	22.5	4647	4682	16860	21.3	4645	4688	16855	19.6	4645	4693	16855
2nd-couplet base configuration (assuming 1st couplet at full capacity) (total 30 drives)	35.8	7394	7449	25841	33.9	7391	7459	25831	31.1	7391	7467	25832
Expansion 1 (total 52 drives)	36.9	7627	7685	26718	35.0	7624	7694	26708	32.1	7624	7703	26708
Expansion 2 (total 74 drives)	38.1	7861	7920	27595	36.0	7858	7930	27585	33.1	7858	7939	27585
Expansion 3 (total 96 drives)	39.2	8094	8155	28472	37.1	8091	8166	28462	34.1	8091	8175	28462
Expansion 4 (total 118 drives)	40.3	8328	8390	29349	38.2	8325	8401	29338	35.1	8325	8411	29339
Expansion 5 (total 140 drives) (Max)	41.5	8561	8626	30225	39.3	8558	8637	30215	36.0	8558	8647	30216

Physical Dimensions

Please refer to refer to the latest Concepts and Configuration Guide for more information:
http://h20565.www2.hpe.com/portal/site/hpsc/public/psi/manualsResults/?sp4ts.oid=5196525

StoreOnce Backup system:		**3100**	**3520**	**3540**	**5100**	**4900**	**6500 120 TB for Initial Rack**
	Form factor	1U	2U	2U	2U	7U	42U
Dimensions	Out of box	1.7 x 17.1 x 29.5 inches (4.32 x 43.46 x 75.0 cm)	3.44 x 17.54 x 28.75 in (8.73 x 44.55 x 73.02 cm)	3.44 x 17.54 x 28.75 in (8.73 x 44.55 x 73.02 cm)	3.44 x 17.54 x 28.75 in (8.73 x 44.55 x 73.02 cm)	17.6 x 35.1 x 12.2 in (44.7 x 89.12 x 30.83 cm)	23.54 x 44.30 x 79.00 in (59.78 x 112.52 x 200.66 cm)
	Shipping	10.4 x 38.4 x 24 in (26 x 96 x 60 cm)	10.4 x 38.4 x 24 in (26 x 96 x 60 cm)	10.4 x 38.4 x 24 in (26 x 96 x 60 cm)	10.4 x 38.4 x 24 in (26 x 96 x 60 cm)	24.1 x 43 x 31.9 in (61 x 109 x 81 cm)	35.43 x 50.87 x 85.35 in (90 x 129.20 x 216.80 cm)
Weight	Out of box	37 lb. (16.78kg)	66 lb (30kg)	67.1 lb (30.5kg)	68.2 lb (31kg)	249.28 lb (113 kg)	953 lb (433 kg)
	Shipping	70 lb (31.8 kg)	90 lb (41 kg)	92 lb (42 kg)	93 lb (42.5 kg)	297.62 lb (135 kg)	1162 lb (528 kg)
Environmental	Operating temperature	10° to 35°C (50° to 95°F) at sea level with an altitude derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea level to a maximum of 3050					

Technical Specifications

	m (10,000 ft), no direct sustained sunlight. Maximum rate of change is 20°C/hr (36°F/hr). The upper limit and rate of change may be limited by the type and number of options installed. **NOTE: System performance during standard operating support may be reduced if operating with a fan fault or above 30°C (86°F).**
Shipping temperature	
Operating humidity	Minimum to be the higher (more moisture) of -12°C (10.4°F) dew point or 8% relative humidity. Maximum to be the lower (less moisture) of 24°C (75.2°F) dew point or 90% relative humidity.

StoreOnce Backup Upgrade Kits:		StoreOnce 5100 48 TB Upgrade Kit	StoreOnce 4900 44 TB Drawer/Cap Upgrade Kit	StoreOnce 4900 60 TB Drawer/Cap Upgrade Kit	6500 120 TB for Existing Rack	6500 120 TB for Extra Racks	6500 88 TB Capacity Upgrade Kit
	Form factor	2U		5U	14U	42U	N/A
Dimensions	Out of box	3.44" x 17.64" x 23.54" in (8.7 x 44.8 x 59.8 cm)	n/a	17.6 x 35.1 x 8.8 in (44.7 x 89.12 x 22.1 cm)	17.6 x 35.1 x 24.3 in (44.7 x 89.12 x 61.66 cm)	23.54 x 44.30 x 79.00 in (59.78 x 112.52 x 200.66 cm)	N/A
	Shipping	11.13 x 38.12 x 23.75 in (27.8 x 95.3 x 59.3 cm)	35.5 x 23 x 9.5 in /90.2 x 54.4 x 24.1 cm	24.1 x 43 x 21.3 in (61 x 109 x 54 cm)	24.1 x 43 x 63.8 in (61 x 109 x 162 cm)	35.43 x 50.87 x 85.35 in (90 x 129.20 x 216.80 cm)	21.5 x 12.5 x 19.3 in (54.5 x 31.5 x 49 cm)
Weight	Out of box	60 lb (27.2 kg)		198.68 lb (90.31 kg)	556.87 lb (253.12 kg)	953 lb (433 kg)	43.56 lb (19.8 kg)
	Shipping	78lbs (35.38kg)		238.78 lb (108.31 kg)	615.35 lb (279.12 kg)	1162 lb (528 kg)	50.16 lb (22.8 kg)

HPE Support Services and Warranty Information

HPE Support Services and Warranty Information Services to accelerate time to results

HPE Support Services bring you a rich portfolio of consulting and support services designed to add value to our core storage products and solutions. We have the know-how and experience to put storage technology to work for you. We work closely with you as your strategic partner, leveraging our full services portfolio to make sure that everything works to optimize your enterprise. Choose from services aligned to our storage product offerings and lifecycle. From mission-critical onsite services to innovative web-based remote support, you choose the precise level of attention and support your business demands.

Technical Specifications

Discover, plan, and design

Choose from a rich portfolio of services to make the most of HPE StoreOnce Storage, so you can efficiently and affordably consolidate, manage, and extract value from unstructured data.
Start here to understand your data protection options. Next, develop a methodical plan and design the optimal HPE StoreOnce Storage solution that addresses your unique technology requirements.
HPE Backup Recovery Impact Analysis - Focus placed on service requirements and design as the key to success for gaining a clear understanding of the role of increasingly diverse data protection strategies.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-1175ENW.pdf

Deploy and integrate

Implement HPE StoreOnce Storage correctly-right from the start-so you can count on reduced risk and accelerated deployment, while implementing a best-practice configuration from day one. Then move on to proactively leverage products, tools, and technology to avoid problems and optimize performance. In this way, you get the most out of your HPE StoreOnce Storage investment, as you keep your staff certified through project-based or residency services.

Installation of StoreOnce VSA and all aspects of the Virtual environment and are a customer responsibility. To configure StoreOnce VSA to act as a replication target or to host Catalyst Stores the appropriate service is required. The HPE StoreOnce Data Replication Solution Service is required if the StoreOnce VSA is to act as a replication target. The HPE StoreOnce Catalyst Solution Service is required if the StoreOnce VSA is to host Catalyst Stores and use Catalyst Copies.

HPE StoreOnce Data Replication Solution Service - Three levels of service to deliver the right level of business continuity that enables you to easily manage disaster recovery while providing data replication across distances with HPE StoreOnce Storage.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-3945ENW.pdf

HPE StoreOnce Catalyst Solution and Startup Service - Configuration of the best possible performance for HPE StoreOnce Catalyst software environments with your choice of three levels of service, based on the complexity of the environment and the level of service desired.
Catalyst Solution Service: **http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-4489ENN.pdf**
Catalyst single node startup service: **http://h20195.www2.hpe.com/v2/GetPDF.aspx/4aa4-9988ENW.pdf**

HPE StoreOnce Recovery Manager Central (RMC) Software Installation and Startup Service—Provides deployment of HPE StoreOnce RMC software with features designed to help enable proper installation in the customer's storage environment and increase the benefit from the storage investment
http://h20195.www2.hpe.com/v2/GetPDF.aspx/4aa5-6254ENW.pdf

HPE StoreOnce Health Check - Proactive review of your HPE StoreOnce Storage solution or other HPE deduplication systems, including a review of operational, capacity, and performance data so you can rest assured that everything is operating effectively.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-3821ENN.pdf

HPE StoreOnce Firmware Analysis and Implementation Service
HPE Firmware Analysis and Update Implementation Services are technical services that provides the analysis and implementation of firmware updates, taking into account the relevant revision dependencies within the IT environment.
http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA4-7728ENW.pdf

HPE Storage Data Migration Services - End-to-end data migration service providing seamless discovery, assessment, planning, and design, completely customizable to your organization's storage area network or network attached storage environment and using innovative software to help you migrate to HPE storage quickly and efficiently.

Technical Specifications

http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA3-0774ENW.pdf

HPE Proactive Select - A flexible way to purchase services to fit your environment with an extensive menu of HPE Proactive Select event and technical services, such as onsite firmware upgrades, health checks, assessments, and education.
http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA2-3842ENW.pdf

Operate and support

Choose the right support to maximize uptime, free up your resources, and achieve improved value-as you get the most out of the existing IT assets while accelerating time-to-revenue. HPE Support Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise Authorized Service Partners.
Services for customers purchasing from Hewlett Packard Enterprise or an enterprise reseller are quoted using Hewlett Packard Enterprise order configuration tools. Customers purchasing from a commercial reseller can find HPE Support Services at
http://www.hp.com/go/lookuptool

HPE Proactive Care 24x7 - Hardware and software support services designed specifically for your technology with rapid access to Advanced Solution Center Specialists plus firmware and software management and best practice advice
http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA3-8855ENW.pdf

HPE Proactive Care Advanced builds and incorporates on Proactive Care and also gives customers personalized technical and operational advice from an assigned, local Account Support Manager for personalized technical collaboration, flexible access to specialist skills to help optimize business critical IT, and enhanced Critical Incident Management to help so the business is not affected if there is a system or device outage.
http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA5-3259ENW.pdf

HPE Datacenter Care
Get the support you need to deploy, operate, and evolve your data center environment to be hybrid-cloud ready with single-point-of-accountability for Hewlett Packard Enterprise and others' product.
http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA4-0459ENW.pdf

HPE Foundation Care - HPE Foundation Care connects you to HPE 24 hours a day, seven days a week for assistance on resolving issues - hardware onsite response within four hours and software call back within two hours after opening your case. Three years' coverage recommended with HPE support Service.
http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA4-8876ENW.pdf

HPE Education Services - Comprehensive training for new, as well as experienced, storage administrators designed to expand your skills and keep you up to speed with the latest storage and virtualization technology from HPE Storage.
http://www.hp.com/learn/storage

Get connected and get back to business – HPE Storage Technology Services provide the path to get your HPE Storage solutions and your business connected to Hewlett Packard Enterprise. Once connected, our experts are able to scan your system and run health checks, then use that data to create personalized reports and recommendations for actions to take to prevent problems and downtime.

Flexible Installation and Startup SKU's and option bands

Technical Specifications

HPE StoreOnce 6500HP StoreOnce 6500 System Installation and Startup service

		Up to 4-Couplets, Initial Installation	Add-On Couplet without #0D1	Add-On 2 or 3 Couplets with Expansion Rack	Capacity Upgrade
		Same Site	Same Site	Same Site	Same Site
		(Quote qty one for each additional site)			
Part	**Description**	**Service SKU**			
BB896A	HP StoreOnce 6500 120 TB Backup Couplet for Initial Rack	HA124A1#5RZ			
BB897A	HP StoreOnce 6500 120 TB Backup Couplet for Existing Racks		HA124A1#5S0	HA124A1#5S1	
BB900A	HP StoreOnce 6500 120 TB Backup Couplet for Additional Racks				
BB899A	HP StoreOnce 6500 88 TB Capacity Upgrade Kit				HA124A1#5S2

HPE StoreOnce 6500 Rack Transition Service

This service provides for the re-racking of HPE StoreOnce B6200 and 6500 products into a rack other than originally installed in.
Per rack - HA124A1#5UK

HPE StoreOnce 3100, 3520, 3540, 4900 and 5100 System Installation and Startup service

	Service SKU	
Description		**Additional StoreOnce system on same site**
HPE StoreOnce 3100, 3520, 3540, HP StoreOnce 4900 and 5100 System	HA124A1#55Q	HA124A1#55R
HP StoreOnce 4900 system (additional for non #0D1)	HA124A1#5V0	
HP StoreOnce 4900 capacity upgrade (additional for non #0D1)	HA124A1#5V0	
HPE StoreOnce 5100 Capacity upgrade (non #0D1)	HA113A1#5KK	

(*) Optional for HPE StoreOnce 3100, 3520, 3540 and 5100

Advanced start-up services

Technical Specifications

HPE StoreOnce Catalyst and Replication Solution Service

HPE StoreOnce Catalyst Solution and Replication Solution Services. These are for the HPE StoreOnce 6500 and 4900 systems mandatory service included when the appropriate licenses are ordered. They provide a configuration and verification service in the Customer environment to optimize the benefits of deploying Replication and\or Catalyst functionality. These service are optional for the HPE StoreOnce 3100, 3520, 3540 and 5100 and are available in 3 levels.

Description	Service SKU
HP StoreOnce Catalyst solution service lvl1	HA124A1#58E
HP StoreOnce Catalyst solution service lvl2	HA115A1#58F
HP StoreOnce Catalyst solution service lvl3	HA115A1#58G
HP StoreOnce Replication solution service lvl1	HA124A1#5TY
HP StoreOnce Replication solution service lvl2	HA115A1#5TZ
HP StoreOnce Replication solution service lvl3	HA115A1#5UO
NOTE: One service is required for each site when the appropriate licenses are ordered	

HPE StoreOnce single node Catalyst Startup Service for 3100, 3520, 3540, 4900 and 5100

HPE StoreOnce single node Catalyst Startup Service provides implementation and verification of the backup and remote copy features of HP
StoreOnce Catalyst functionality – HA124A1#5T7
NOTE: one service is required for each site when the appropriate licenses are ordered

HPE StoreOnce Recovery Manager Central software installation and startup service

The HPE StoreOnce Recovery Manager Central software installation and startup service provides deployment of the HPE StoreOnce Recovery Manager Central software, with features designed to both help ensure proper installation in the storage environment and increase the benefit from the storage investment.

Description	Service SKU
HP StoreOnce RMC for 3PAR	HA124A1#5WD
HP StoreOnce RMC-V for 3PAR	HA124A1#5WE
HP StoreOnce RMC-S for 3PAR	HA124A1#5ZB

HPE StoreOnce System Health Check Service

Proactive review of your HPE StoreOnce Storage solution or other HPE deduplication systems, including a review of operational, capacity, and performance data so you can rest assured that everything is operating effectively.

	Support	Per Event	Contractual
Description	Service SKU		
StoreOnce Backup System Health Check Service	HM006A1	HM006AE	HM006AC

HPE StoreOnce Firmware Analysis and Implementation Service

HPE Firmware Analysis and Update Implementation Services are technical services that provides the analysis and implementation of firmware updates, taking into account the relevant revision dependencies within the IT environment.

Technical Specifications

	Support	Per Event	Contractual
Description	**Service SKU**		
StoreOnce Firmware update analysis service	HM001A1	HM001AE	HM001AC
StoreOnce Firmware update implementation service	HM002A1	HM002AE	HM002AC

Remote Support Tools

Service Tools and Technical Support - HPE Remote Support monitors StoreOnce appliances and allows the appliance to proactively contact Hewlett Packard Enterprise if issues arise on the system. Site-specific data used both proactively and reactively with real-time monitoring and information extraction tools.
NOTE: Requires StoreOnce 3.11.X firmware as a minimum

For more information on HPE Services and Support

To learn more on HPE Storage Services, visit: **http://www.hpe.com/services/storage**

Or contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner
Or take a look at the following resources:

- HPE StoreOnce Replication Solution Service Sales Brief **http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-4540ENW.pdf**
- HPE StoreOnce Replication Solution Service data sheet **http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA4-3945ENW.pdf**
- HPE StoreOnce Catalyst Solution Service Sales Brief **http://h20195.www2.hpe.com/V2/GetPDF.aspx/4AA4-4480ENW.pdf**
- HPE StoreOnce Catalyst Solution Service data sheet **http://h20195.www2.hpe.com/v2/GetPDF.aspx/4AA4-4489ENW.pdf**

Summary of Changes

Date	Version History	Action	Description of Change
17-Dec-2015	From Version 11 to 12	Changed	Fixed some typos from last version.
01-Dec-2015	From Version 10 to 11	Changed	Changes made throughout the entire document
24-Jul-2015	From Version 9 to 10	Changed	Changes made throughout the entire document
19-Jun-2015	From Version 8 to 9	Changed	Changed made to the Storeonce VSA Backup and the Software Options Sections.
8-May-2015	From Version 7 to 8	Changed	Corrected some SKU numbers for the StoreOnce VSA and corrected some URLs
6-Apr-2015	From Version 6 to 7	Changed	Changed the version to 7 to match Product Bulletin.
30-Mar-2015	From Version 5 to 6	Changed	Changes made throughout the entire document
30-Jan-2015	From Version 4 to 5	Changed	Edits made to 4900 support shelf, 6500 what's in the box contents and 'What's new' June '14 date removal
9-Jan-2015	From Version 3 to 4	Changed	Changes to the HPE StoreOnce 6500 purchasing information table
15-Sep-2014	From Version 2 to 3	Changed	Update the firmware version number of the 6500 model.
18-Aug-2014	From Version 1 to 2	Changed	Changes were made throughout the Overview, Technical Specifications, and Software Options Sections. Product Descriptions Updated.

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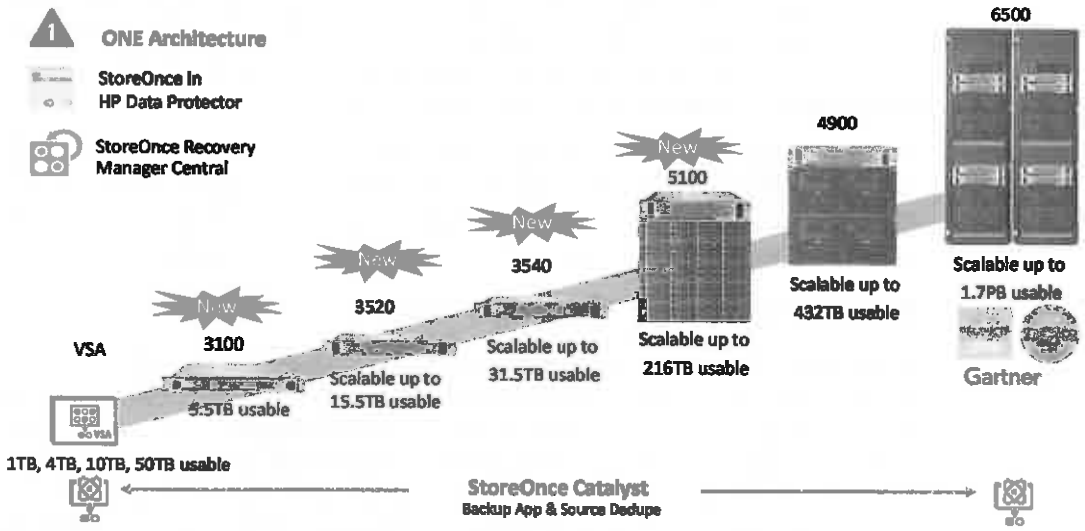
Hewlett Packard Enterprise

HPE StoreOnce Backup Family

Data growth can lead to complex, distributed, and costly data protection. In some cases, data is not being protected because backup windows are not long enough or backup jobs fail. Protect The West Virginia Information Services and Communication's (herein after WV IS&C) data with the HPE StoreOnce Backup Family—disk-based, deduplicating, backup systems available in a range of scalable, dedicated appliances and flexible virtual appliances. Use HPE StoreOnce deduplication with your choice of backup and recovery software to deliver robust enterprise-wide data protection.

HPE StoreOnce Backup systems can reduce the amount of backup data WV IS&C needs to store by up to 95 percent (with the HPE StoreOnce Get Protected Guarantee Program). With Hewlett Packard Enterprise's scale-out architecture, you can "pay-as-you-grow" to retain up to 34 petabytes of data in a single pool. HPE StoreOnce Backup systems provide automated backup and disaster recovery operations, together with secure data retention with built-in data encryption for Data-at-Rest and Data-in-Flight.

HPE StoreOnce Backup Family



HPE StoreOnce Backup Family at a Glance

HPE StoreOnce Backup	Form Factor	Total Capacity (Raw)	Usable Capacity	Maximum Catalyst Performance
HPE StoreOnce 6500	Provided in a 42U rack	Up to 2240 TB	Up to 1728 TB	139 TB/hour
HPE StoreOnce 5100	2U scalable rack	Up to 288 TB	Up to 216 TB	26.7 TB/Hour
HPE StoreOnce 4900	7 to 12U rack	Up to 560 TB	Up to 432 TB	22 TB/hour
HPE StoreOnce 3540	2U scalable rack	Up to 48 TB	Up to 31.5 TB	12.7 TB/hour

HPE StoreOnce Backup	Form Factor	Total Capacity (Raw)	Usable Capacity	Maximum Catalyst Performance
HPE StoreOnce 3520	2U scalable rack	Up to 24 TB	Up to 15.5 TB	12.7 TB/hour
HPE StoreOnce 3100	1U rack	8 TB	5.5 TB	6.4 TB/hour
HPE StoreOnce VSA	Virtual Appliance	Not applicable	4 TB (VSA 4 TB), 10 TB (VSA 10 TB), 50 TB (VSA 50 TB)	1 TB/hour (VSA 4 TB), 2 TB/hour (VSA 10 TB), 6 TB/hour (VSA 50 TB)

Features

Scaling out Capacity Across the Enterprise

Keeping pace with data growth, HPE StoreOnce Backup offers a scale-out architecture that allows The WV IS&C agency to "pay as you grow". Choose from dedicated backup appliances to match the capacity and performance requirements of larger offices and data center deployments. For virtualized environments and smaller and remote offices, HPE StoreOnce Backup is also available as a virtual appliance for virtualized data protection that utilizes an existing infrastructure.

Choose capacity points that start small and scale-out. Configure for a higher capacity (with HPE StoreOnce VSA), use upgrade kits with expansion licenses or shelves (HPE StoreOnce 3520, 3540, or 5100), or simply add more disks (HPE StoreOnce 4900 and 6500) or additional nodes (HPE StoreOnce 6500 only).

Reduced Backup Storage Needs

HPE StoreOnce deduplication reduces the disk space required to store backup data sets by up to 20 times without impacting backup performance. Retaining more backup data on disk for longer enables greater backup data accessibility for rapid restore of lost or corrupt files. This reduces impact on business productivity while providing cost savings in disk storage, IT resources, physical space, and power requirements. For example, using HPE StoreOnce deduplication with a fully configured HPE StoreOnce 6500 can provide extended data retention on the same disk footprint for up to 34 PB of backup data.

Industry-Leading Performance to Meet Shrinking Backup Windows

Protect large amounts of data within short backup windows with HPE StoreOnce high performance multi-streaming capability. Choose Ethernet (to Catalyst, iSCSI VTL, or NAS targets) or Fibre Channel (to Catalyst or VTL targets) to integrate into your network environment. Catalyst over Fibre Channel provides all the ISV control and source side deduplication benefits of current HPE StoreOnce Catalyst, but via your Fibre Channel fabric.

Consolidate multiple parallel backup streams via standard Ethernet or Fibre Channel network to a single disk-based system to achieve industry-leading aggregate backup speeds of up to 139 TB per hour with the top-of-the-range HPE StoreOnce 6500 and HPE StoreOnce Catalyst.

Federated Deduplication Across the Enterprise

Enhance performance by deduplicating anywhere: at the application source, at the backup server, or at the target HPE StoreOnce Backup appliance. Federated Deduplication means you can deduplicate where it makes sense for WV IS&C's business, not where technology vendor limitations mandate. Federated Deduplication is available across all new HPE StoreOnce Backup systems in conjunction with all applications that support HPE StoreOnce Catalyst.

Reduced Time to Restore Data

HPE StoreOnce Backup offers industry-leading restore speeds of up to 119 percent of ingest performance in the high end system. This helps ensure that if WV IS&C has a system failure, you can restore your data in the shortest time possible and minimize downtime.

Ability to Free Up IT Resources

Reduce the complexity of your backup environment by consolidating and automating all of your backup processes using a single HPE StoreOnce Backup system. This reduces the time spent managing multiple data protection devices and processes, lowering costs and simplifying your data protection environment. In addition, for organizations that have branch and sales offices, using HPE StoreOnce VSA Backup with supported backup software helps you automatically protect the data at these sites without the need for trained staff or dedicated hardware, reducing the risk of important data loss.

With HPE StoreOnce Catalyst, movement of deduplicated data across the enterprise is even easier. There is no need to deduplicate and rehydrate at each step. Data can be replicated from these sites to a central data center or disaster recovery site in deduplicated form, reducing network bandwidth requirements. All backup and replication jobs can be seamlessly managed by the backup application at your central data center.

Lowered Cost of Data Protection

With a typical deduplication ratio of up to 20:1, more backup data can be stored in a smaller footprint. This means that less capacity needs to be purchased. HPE StoreOnce deduplication also enables network-efficient, off-site data replication. All HPE StoreOnce Backup systems use HPE StoreOnce Federated deduplication to significantly reduce the amount of data that needs to be replicated, enabling the use of lower bandwidth and lower cost links to transmit data off-site.

Remote Office Data Protection

HPE StoreOnce Backup provides a local backup target and an efficient deduplicated local data repository. If WV IS&C is running a virtual server environment, you can use the flexibility and simplicity of the HPE StoreOnce VSA or choose dedicated appliances such as the HPE StoreOnce 3100, depending on the infrastructure, performance, and management requirements of your remote office deployments. HPE StoreOnce Backup also enables a Federated Deduplication solution for replication of backup to other sites, including the consolidation of backup and disaster recovery from multiple remote offices to the data center. Multiple HPE StoreOnce Backup appliances and virtual machines can replicate to a single, central HPE StoreOnce 6500 target at the data center.

For small remote offices without a need for a local store for fast recovery, HPE StoreOnce Catalyst may be installed on a local server at no cost. HPE StoreOnce Catalyst performs

deduplication of new or changed data and sends the data over the WAN for disaster recovery.

With HPE StoreOnce Catalyst, the movement of data between sites is configured and controlled using your backup application as a single interface for the data protection solution. HPE StoreOnce Catalyst supports a range of flexible configurations that enable the concurrent movement of data from one site to multiple sites and the ability to cascade data around the enterprise (sometimes referred to as "multi-hop").

Reduced Risk of Unauthorized Access to Data

With high profile reports of data loss and increasing levels of government legislation concerning data security, companies are seeking to encrypt their data. HPE StoreOnce Security Pack provides for Data-at-Rest and Data-in-Flight encryption, which prevents unauthorized access to data on disk that has been lost, stolen, or discarded as well as data being transmitted between devices. The HPE StoreOnce Security Pack also offers secure erase functionality. These functions can be configured on an application or store basis because they are not restricted to the whole appliance. HPE StoreOnce Security Pack is available for all HPE StoreOnce Backup systems. Data-in-Flight encryption via IPSec is supported on HPE StoreOnce Catalyst only.

Seamless Integration Into Your Environment

HPE StoreOnce Backup systems offer flexibility with NAS (NFS and CIFS), iSCSI, FC virtual tape libraries (VTL), and HPE StoreOnce Catalyst targets for backup applications. This means that WV IS&C can easily integrate HPE StoreOnce Backup into your existing IT environment with minimal disruption. Supported by all leading backup applications, each backup system can be installed and used without additional investment in software.

The HPE StoreOnce Backup systems are easily rack-mounted in standard racks, while the leading performance HPE StoreOnce 6500 is pre-integrated into a Hewlett Packard Enterprise (HPE) standard depth 42U rack for efficient use of space in the data center.

Reliable Backup and Restore

HPE StoreOnce Backup systems can enhance reliability by automating and consolidating backups to reduce operator intervention and, consequently, user-generated errors. For highly reliable, highly available data protection, HPE StoreOnce Backup systems feature hardware RAID 6 (RAID 5 on HPE StoreOnce 3100) to reduce the risk of data loss due to disk failure. The high performance HPE StoreOnce 6500 extends this reliability with autonomic restart and no single-point-of-failure in WV IS&C's backup process by offering redundancy at every level.

In any storage system, it is essential to ensure that the integrity of the data stored is maintained so data can be recovered exactly as it was written. HPE StoreOnce Backup systems protect data throughout its lifecycle when stored on the HPE StoreOnce Backup system. HPE StoreOnce Integrity Plus has built-in protection that not only checks data at many stages both in the backup process and when recovered, but also continually checks the data when at rest, correcting errors if necessary.

Protection for HPE 3PAR StoreServ Primary Storage

HPE StoreOnce Recovery Manager Central facilitates automated, efficient, non-intrusive backup and disaster recovery. HPE StoreOnce Recovery Manager Central also provides converged data protection by integrating HPE 3PAR StoreServ primary storage and HPE StoreOnce Backup storage directly without the need for third-party ISVs. WV IS&C gets the simplicity and performance of snapshot-based protection to generate application-

consistent recovery points as well as the reliability and efficiency of deduplicated backups for guaranteed recovery.

Benefits

HPE StoreOnce Catalyst delivers industry-leading backup speeds of up to 139 TB/hr, enabling WV IS&C to meet shrinking backup windows, plus Federated Deduplication across the enterprise so you choose where to deduplicate data. Federated Catalyst allows catalyst stores to span nodes, simplifying backup management and optimizing available storage in large environments.

Seamlessly integrating with your current backup applications, HPE StoreOnce Backup systems provide flexible integration into both Fibre Channel (FC) and iSCSI SAN, GbE, 10 GbE, virtualized, and other environments. Catalyst over Fibre Channel provides all the ISV control and source side deduplication benefits of current HPE StoreOnce Catalyst, but via your Fibre Channel fabric.

Choose between powerful, dedicated HPE StoreOnce appliances for larger offices and data centers, and flexible virtual appliances for highly virtualized or smaller and remote offices. Use HPE Data Protector Software with HPE StoreOnce Federated Deduplication and HPE StoreOnce Catalyst when you do not want to use a dedicated deduplication appliance. With HPE's single HPE StoreOnce deduplication technology, managing the movement of data across the enterprise has never been easier.

Protect data from unauthorized access through Data-at-Rest and Data-in-Flight encryption and help ensure erase functionality for disks that are lost, stolen, or discarded.

HPE StoreOnce 6500 Backup

HPE StoreOnce 6500 Backup

HPE StoreOnce 6500 takes HPE StoreOnce to the enterprise, providing disk-based backup with deduplication for cost-effective, longer term on-site data retention, and off-site disaster recovery. The highest performance HPE StoreOnce Backup system, these highly scale-out solutions offer up to 72 TB to 1728 TB of usable capacity (120 to 2240 TB raw) and industry-leading aggregate speeds of up to 139 TB/hr with HPE StoreOnce Catalyst to match enterprise performance requirements and meet ever-shrinking backup windows.

HPE StoreOnce 5100 Backup

HPE StoreOnce 5100

HPE StoreOnce 5100 delivers cost-effective, scalable disk-based backup with deduplication for longer term on-site data retention and off-site disaster recovery for larger data centers or regional offices. The HPE StoreOnce 5100 also provides a replication target device for up to 50 remote or branch offices. HPE StoreOnce 5100 delivers a scalable 2U to 12U solution from 36 TB to 216 TB of usable capacity (48 TB to 288 TB RAW) and speeds of up to 26.7 TB/hour with HPE StoreOnce Catalyst for protection of over 106.8 TB of data in a four-hour window.

HPE StoreOnce 4900 Backup

HPE StoreOnce 4900 Backup

HPE StoreOnce 4900 delivers cost-effective, scalable disk-based backup with deduplication for longer term on-site data retention and off-site disaster recovery for large data centers or regional offices. The HPE StoreOnce 4900 also provides a replication target device for up to 50 remote or branch offices. The HPE StoreOnce 4900 delivers a scalable 7U to 12U solution from 36 TB to 432 TB of usable capacity (60 to 560 TB raw) and speeds of up to 22 TB/hour with HPE StoreOnce Catalyst for protection of 88 TB of data in a four-hour window.

HPE StoreOnce 3540 Backup

HPE StoreOnce 3540

HPE StoreOnce 3540 is designed for small- to mid-sized data centers and as a replication target device for up to 24 remote and branch offices. The HPE StoreOnce 3540 delivers a scalable 2U solution from 16 to 31.5 TB of usable capacity (24 to 48 TB RAW) using a simple and cost effective capacity upgrade. Meet backup windows with speeds of up to 12.7 TB/hour using HPE StoreOnce Catalyst for protection of up to 50.8 TB of data in a four-hour window.

HPE StoreOnce 3520 Backup

HPE StoreOnce 3520

HPE StoreOnce 3520 is designed for small- to mid-sized data centers and as a replication target device for up to remote and branch offices. The HPE StoreOnce 3520 delivers a

scalable 2U solution from 7.5 to 15.5 TB of usable capacity (12 to 24 TB RAW) using an upgrade license. Meet backup windows with speeds of up to 12.7 TB/hour using HPE StoreOnce Catalyst for protection of up to 50.8 TB of data in a four-hour window.

HPE StoreOnce 3100 Backup

HPE StoreOnce 3100

HPE StoreOnce 3100 delivers entry-level, disk-based backup and disaster recovery that is ideal for smaller remote or branch offices and data centers. This 1U backup system offers 5.5 TB of usable capacity (8 TB RAW) and speeds of up to 6.4 TB/hour with HPE StoreOnce Catalyst, allowing a full 25.6 TB of backup to be completed in just four hours.

HPE StoreOnce VSA Backup

The HPE StoreOnce Virtual Storage Appliance (VSA) extends the deployment options for HPE StoreOnce with the agility and flexibility of a virtual appliance. This removes the need to install dedicated hardware, and provides a flexible and cost-effective backup target for virtualized environments. HPE StoreOnce VSA can be used as part of a pure software-defined data protection solution or in conjunction with HPE StoreOnce purpose-built appliances. Operation and integration with backup software is the same for the HPE StoreOnce VSA and the purpose-built appliances.

HPE StoreOnce VSA Backup features and benefits:

- **Flexibility**—Fast deployment, fast expansion, and leverage of the hypervisor features for mobility and availability.
- **Easy to manage**— Has the same proven management interfaces as the purpose- built HPE StoreOnce appliances.
- **Exceptional value**—One license includes all product features (HPE StoreOnce Catalyst, HPE StoreOnce Replication, and HPE StoreOnce Security Package) and access to Hewlett Packard Enterprise support for the duration of the licensed term.
- **Scalability**—Capacity upgrade licenses scale from 4 TB to 50 TB.

  HPE offers a zero-cost 1 TB version of HPE StoreOnce VSA for protecting small amounts of data and for evaluating the product. For details, go to:

  www.hp.com/go/freebackup

HPE StoreOnce Software

HPE StoreOnce Catalyst

HPE StoreOnce Catalyst Software brings to fruition the HPE StoreOnce Backup vision of seamless movement of deduplicated data across the enterprise. This is enabled by the single, integrated enterprise-wide deduplication algorithm. HPE StoreOnce Catalyst offers the following benefits:

- **Span nodes**—Allows catalyst stores to span nodes. This simplifies backup management and optimizes available storage in large environments, yet continues to provide high resiliency and optimize performance.

- **Catalyst over Fibre Channel**—Provides all the ISV control and source side deduplication benefits of the current HPE StoreOnce Catalyst via WV IS&C's Fibre Channel fabric. This means you do not have to invest in additional infrastructure.
- **Simplified management of data movement from a single-pane-of-glass**— Tighter integration with your backup application to centrally manage file replication across the enterprise.
- **Seamless control across complex environments**—Support a range of flexible configurations that enable the concurrent movement of data from one site to multiple sites, and the ability to cascade data around the enterprise (sometimes referred to as "multi-hop").
- **Enhance performance**—Distributed deduplication processing using HPE StoreOnce Catalyst stores on the HPE StoreOnce Backup systems and on multiple servers; can optimize loading and utilization of backup hardware, network links, and backup servers for faster deduplication and backup performance.
- **Faster time to backup to meet shrinking backup windows**—Up to 139 TB/hour aggregate throughput. (Actual performance is dependent on configuration data set type, compression levels, number of data streams, number of devices emulated, and number of concurrent tasks.)

HPE StoreOnce Replication

HPE StoreOnce Backup's data replication feature includes replication bandwidth limiting functionality that constrains the amount of bandwidth being used when replicating data. Without replication bandwidth limiting, a replication job could use as much bandwidth as is available, potentially making other network activities unresponsive. Replication bandwidth limiting is customer-configurable at the appliance level via the graphical user interface and is set as a percentage of the available network bandwidth.

HPE StoreOnce Reporting Central and Enterprise Manager

Monitor multiple HPE StoreOnce appliances through a single interface with HPE StoreOnce Reporting Central, a default feature shipped with all HPE StoreOnce Systems within the HPE StoreOnce GUI. Reporting Central provides a rolled-up status of up to 20 registered HPE StoreOnce appliances in a single-pane-of-glass and allows drill-down reporting into areas of interest such as deduplication ratio, capacity usage for HPE StoreOnce Catalyst stores, VTL libraries, NAS shares, read/write throughput, replication throughput, stream count, CPU, memory, disk I/O and networking, and FC channel utilization. Reports for a desired timeframe can be exported to a CSV or PNG format file.

For larger installations, HPE StoreOnce Enterprise Manager (SEM) is a centralized management console to analyze up to 400 physical and virtual HPE StoreOnce devices across multiple sites. SEM provides advanced monitoring, reporting, forecasting, and trend analysis in NAS, VTL, and HPE StoreOnce Catalyst environments. SEM also integrates with the HPE StoreOnce GUI for single-pane-of-glass management for both physical appliances and the HPE StoreOnce VSA.

Specifically, SEM provides granular reporting and trends analysis of vital parameters, such as disk capacity utilization, deduplication ratios, and performance. SEM will help WV IS&C plan ahead by providing forecasts of disk usage and replication duration. All reports and graphs can be exported in CSV or PNG formats for further analysis. WV IS&C can also schedule email reports for alerts and notifications, such as when pre-set capacity thresholds are crossed. SEM is supported on 64-bit machines only.

HPE StoreOnce Security Package

The HPE StoreOnce Security Package delivers a Data-at-Rest and Data-in-Flight encryption solution and secure data shredding features for data privacy, confidentiality, and integrity of your critical business data while supporting compliance requirements. These are configurable on a by-application or by-store basis, helping to ensure WV IS&C has maximum control over the data you are protecting.

The HPE StoreOnce Data-at-Rest encryption feature is a software-based solution which provides protection against unauthorized access to data through a stolen, discarded, or replaced disk. Encryption occurs after data has been deduplicated and prior to writing the data onto disk.

Warranty

Hewlett Packard Enterprise provides a one year parts exchange, one year labor, one year on-site, normal business hours, next business day response for HPE StoreOnce 3100, HPE StoreOnce 3520, HPE StoreOnce 3540, HPE StoreOnce 5100, HPE StoreOnce 4900, and HPE StoreOnce 6500 Backup systems, plus 9x5 phone support for the duration of the warranty.

Why HPE StoreOnce Backup?

HPE StoreOnce Backup is:

- **Fast**—Rapid backup and recovery of data; five times faster RTO.
- **Flexible**—Scale as your business dictates, configure by application, and utilize your existing infrastructure.
- **Federated**—Single solution from Remote Office and Branch Office (ROBO) to data center; centrally managed.
- **Risk-free**—Highly-resilient architecture and up to 95 percent reduction in capacity.

In addition, HPE StoreOnce Backup has earned industry-recognized accolades, such as:

- Ranked as an industry leader by Gartner, Inc., July 2014.
- Awarded the "Best in Class" in DCIG, LLC's *2014-2015 Deduplicating Backup Appliance Buyer's Guide.*
- Awarded "Product of the Year" in the backup hardware category by TechTarget, 2014.

Technical data

HP 3PAR StoreServ 8000 and 20000 Storage Installation and Startup Service

HP Care Pack Services

Designed to provide a smooth startup, HP 3PAR StoreServ 8000 and 20000 Storage Installation and Startup Service provides deployment of your HP 3PAR StoreServ 8000 and 20000 Storage, helping to ensure proper installation in your storage environment as well as helping you increase the benefit from your storage investment.

The service provides activities required to help you deploy your HP 3PAR StoreServ 8000 and 20000 Storage into operation. With the assistance of your designated IT storage administrator, an HP service specialist deploys your array as more fully described in the Service Feature table below.

When ordered with hardware upgrade products, the service also provides deployment of hardware upgrades to your existing HP 3PAR StoreServ 8000 and 20000 Storage.

The service includes the following:

- For new arrays, configuration and presentation of a test virtual volume using non-production date for up to two hosts
- For array upgrades, installation and configuration of the array upgrade products as further detailed below.

Reconfiguration of your existing array—for example, Virtual Volumes, hosts, or a SAN—is excluded from this service.

For installation of the array into a rack you supply, assembly, configuration, and positioning of the rack are excluded from this service. Please refer to additional exclusions in the Service Limitations section below.

Service benefits

- Allows your IT resources to stay focused on their core tasks and priorities
- Can help reduce implementation time, as well as the impact on and risk to your storage environment
- Designed to help ensure a successful implementation by providing HP installation planning and coordination
- Provides service delivered by a trained specialist and based upon HP recommended configurations and industry best practices
- Helps you more effectively utilize your HP 3PAR StoreServ Storage, thanks to the knowledge you gain from the service specialist during onsite delivery of the service

Service feature highlights

- Service planning and coordination
- Service deployment
- Installation verification tests (IVT)
- Customer orientation session

Specifications

Table 1. Service features

Feature	Delivery specifications
Service planning and coordination	An HP service specialist will plan all the necessary activities, including the identification of any prerequisites (see the 'Service eligibility' section), and schedule the delivery of the service at a time mutually agreed upon by HP and the Customer, which shall be during local HP standard business hours excluding HP holidays, unless otherwise agreed by HP. Any services provided outside of HP standard business hours may be subject to additional charges. The service specialist will provide the planning and coordination activities detailed below either remotely or onsite, at HP's discretion. The service specialist will perform the following installation planning and coordination activities:

	• Communicate with the Customer, including handling Customer queries regarding service delivery or requests for information needed from the Customer • Verify, using a predelivery checklist, that all service prerequisites have been met, including that the Customer has completed verification that their host and SAN environment is compatible with any required HP 3PAR Operating System upgrades or patches prior to delivery of the installation services • Schedule the array deployment at a mutually agreed-upon time • Provide a brief consultation to guide the Customer in defining the array configuration objectives based on application performance, availability needs, virtual volume layout, and HP best practices • Create a written installation plan, which will serve as a guide for the coordination of the installation and startup deliverables
Service deployment	The service specialist will perform the following array deployment activities: • Coordinate the installation plan • Confirm appropriate operating system patch levels on up to two hosts identified in the installation plan • Install HP 3PAR StoreServ Storage hardware and upgrades according to the product specifications • Upgrade to the latest release of HP 3PAR Operating System and confirm that HP 3PAR Operating System is at a supported and appropriate version • Initialize the array • Assist the Customer with installation of HP 3PAR Management Console software on a Customer-provided server, if requested by Customer and agreed in the installation plan • Verify that the license keys for the purchased HP 3PAR Operating System Software Suite array-based features are installed, that the Customer has access to appropriate product documentation, and that the Customer understands how to obtain additional optional integration assistance if required • For initial installation of an array, create and present a test virtual volume using non-production data for up to two hosts • For hardware performance, capacity, and functionality upgrades, as applicable, verify that the required HP 3PAR Operating System version or patches are installed; if they are not installed and the Customer is entitled to updates, install the required HP 3PAR Operating System updates or patches, and install and initialize any purchased upgrade components based on the agreed-upon upgrade installation plan • For HP 3PAR software beyond the HP 3PAR Operating System Software Suite, provide the Customer with instructions on how to access appropriate product documentation and how to obtain additional optional integration assistance if required • As applicable, provide limited integration of up to two hosts (physical or virtual) running a single OS into a preexisting operational SAN/network consisting of switch technologies that meet the supportability standards of the HP SAN Design Guide or other HP supported configuration; integration of a host is defined as performance of the following essential tasks necessary to establish and confirm visibility of a test virtual volume to the intended host: – Advise the Customer of zoning and multipathing requirements based on the host implementation guides – Verify that the Customer has read/write access to virtual volumes from the target hosts – Confirm that the Customer has path failover and failback functionality to the target hosts • For the HP 3PAR StoreServ Service Processor: – For the HP 3PAR StoreServ 8000 Storage, install and configure Virtual Service Processor software on a supported host provided by the Customer, or – For the HP 3PAR StoreServ 8000 and 20000 Storage, install the HP 3PAR StoreServ Service Processor host into the same rack with the HP 3PAR StoreServ Storage product and configure the Service Processor software • Configure the appropriate supported HP remote support and monitoring solution
Installation verification tests (IVT)	The service specialist will perform the appropriate installation verification tests to confirm product functionality, including verification that: • The event logs are accumulating data • Confirming visibility of a test virtual volume using non-production data for up to two hosts, as applicable • Installation of remote support and monitoring , as applicable
Customer orientation session	For installation of a new array, the service specialist will conduct an orientation session of up to one hour in duration for the HP 3PAR StoreServ 8000 Storage and up to four hours in duration for HP 3PAR StoreServ 20000 Storage, with the goal of reviewing the configuration information and demonstrating basic operation of the installed HP 3PAR StoreServ Storage product. During the orientation session, the service specialist may cover the following topics: • Provide the Customer with information about how to obtain array configuration information • Demonstrate the creation of a virtual volume • Highlight the basic operation of the virtual service processor, array hardware, and HP 3PAR Operating System • Verify that the Customer understands how to gain access to product documentation • Provide an overview of the system architecture • Inform the Customer how to contact HP for support • Hold a brief question and answer forum with the Customer For upgrade installation, the service specialist will conduct an orientation session of up to one hour in duration, with the goal of reviewing the configuration following service delivery. The orientation session is informal, provided on the same day as installation and is typically conducted at a management console with selected members of the Customer's staff, and is not intended as a classroom activity or substitute for formal product training.

Service limitations

Unless specified in this document or in a separate Statement of Work, activities such as, but not limited to, the following are excluded from this service:

- A full site inspection, such as a comprehensive analysis of the Customer's power, cooling and humidity, airborne contaminant, and vibration levels, and determination of whether the data center's raised floor has sufficient structural capacity to accommodate the weight of the array to be installed; separate services are available for these tasks
- Integration with any hardware or software components not supported by the HP 3PAR StoreServ Storage product
- Implementation of software revisions, including hot fixes, patches, service packs, or upgrades from prior versions, on the Customer's existing SAN and host environment
- Implementation of major revisions to the HP 3PAR StoreServ Storage factory configuration; if needed, such revisions may require additional services
- Compatibility planning to ensure that required HP 3PAR Operating System upgrades or patches are compatible with the Customer's host and SAN environment
- Configuration, consulting, customer orientation, and training for optional HP 3PAR software such as HP 3PAR Replication Software Suite, HP 3PAR Data Optimization Software Suite, HP 3PAR File Persona Software Suite, HP 3PAR Security Software Suite, HP 3PAR Application Software Suite, HP 3PAR Reporting Software, HP 3PAR Adaptive Optimization Software, HP 3PAR Dynamic Optimization Software, HP 3PAR Peer Motion Software, HP 3PAR Virtual Copy Software, HP 3PAR Security Software Suite, and multipath I/O (MPIO); separate services are available for these products
- Redesign or reconfiguration of the existing array for hardware upgrades or software add-ons, including hardware reconfiguration
- Extensive racking, re-racking, or cabling activities, including cabling activities involving conduits, raceways, patch panels, and movement/configuration of computer room floor panels
- Software downgrades to HP 3PAR Operating System; downgrades are limited to currently supported versions compatible with the HP 3PAR StoreServ Storage hardware configuration only
- Reconfiguration of existing environments, such as removal or movement of array disk drives and adapter cards, conversion and reformatting of existing storage between RAID levels or emulation types, or installation of extensive Fibre Channel and/or SAS cabling
- Design or implementation of high-availability and other complex configurations, such as host clustering
- Design or implementation of host-based logical volumes and associated file system structures
- Deployment activities, including planning, design, assessment, and configuration of switch technology related to the implementation of a new SAN or the redeployment or extension of an existing SAN
- Performance testing or modeling
- Installation or configuration of any hardware or software products external to the array subsystem that include, but are not limited to, servers, host operating systems, host agent software, multipathing software, tape libraries, host bus adapters, network, SAN fabric, and Enterprise Backup software
- Migration of existing data to the new array or to a new configuration within an existing array, such as the migration of existing data to thin provisioned virtual volumes
- Loading, management, or manipulation of the Customer's data
- Operational testing of applications or troubleshooting of interconnectivity, network, compatibility, or problems not related to the HP 3PAR StoreServ Storage product
- Assembly, configuration, and positioning of the customer-supplied rack for the rackmount version of the array product; this limitation is applicable to any rack (including generic HP racks)
- For the HP 3PAR StoreServ 8000 Virtual Service Processor software; assembly, configuration, and racking of the customer-supplied host
- Design or implementation of seismic bracing or supports
- Relocation services; relocation is available as a separate service that is scheduled separately

For installation of the HP 3PAR StoreServ Storage product, additional activities such as, but not limited to, the following are excluded from this service:

- Integration of more than two hosts (physical or virtual) into a preexisting operational SAN, consisting of switch technologies that meet the supportability standards of the HP SAN Design Guide or other HP supported configuration

- Virtual volume design or implementation, beyond validating for up to two hosts that a test virtual volume is visible; if a virtual volume or host implementation is required, the HP Virtual Volume Design and Implementation Service is available separately

For installation of HP 3PAR StoreServ Storage upgrades, additional activities such as, but not limited to, the following are excluded from this service:

- Physical movement of existing drives or data movement between drives within the array to rebalance data; HP 3PAR Rebalance Service is available separately for this purpose
- Integration of hosts (physical or virtual) into a preexisting operational SAN
- SAN reconfiguration activities, including migration of hosts from host bus adapters (HBAs) replaced during a node upgrade process; SAN services are available separately

Service eligibility

The Customer must meet certain hardware and software prerequisites prior to onsite delivery of the service. These prerequisites include, but are not limited to, the following:

- The Customer's existing computing operating system platform(s) must be supported by and be compatible with the HP 3PAR StoreServ Storage product being installed.
- The Customer's SAN environment must be fully operational in a configuration supported by HP, and connectivity must be available and operational in the location where the array will be installed.
- The Customer must provide and verify a suitable physical operating environment for the array product, including implementation of any power, cooling, and other environmental requirements.
- For the rackmount version of the array product, the Customer is responsible for assembling and configuring the customer-supplied rack and positioning it in the location where the array will be installed. This requirement is applicable to any rack (including generic HP racks).
- For array upgrade installation, the HP 3PAR StoreServ Storage product must be fully operational, in a supported configuration, and physically located where the upgrade will be installed.
- The Customer is responsible for determining and installing any HP required host- or SAN-based software upgrades, patches, device drivers, or multipathing software.
- The Customer is responsible for providing servers/workstations and network provisioning that meet the requirements for software products as applicable, such as Virtual Service Processor and HP 3PAR Management Console software.
- The Customer must provide appropriate network provisioning to enable the HP remote support and monitoring solution.

Customer responsibilities

The Customer will:

- Contact an HP service specialist within 90 days of date of purchase to schedule the delivery of the service
- Coordinate service deployment on third-party-maintained products (if applicable) with HP
- Ensure that all service prerequisites as identified in the 'Service eligibility' section have been met prior to service delivery
- Complete and return the prerequisite HP predelivery checklist to the service specialist at least two weeks prior to the start of the service, including array configuration information for upgrade installations, as necessary
- Assign a designated person from the Customer's staff who, on behalf of the Customer, will grant all approvals, provide information, and otherwise be available to assist HP in facilitating the delivery of this service
- Ensure that all hardware, firmware, and software that the service specialist will need in order to deliver this service are available and that software products are properly licensed
- Ensure the availability, at all times during service delivery, of one or more individuals who will provide administrator-level access to the systems where the work is to be performed
- Provide all necessary network and administration assistance to enable connectivity to the HP 3PAR StoreServ Storage product to allow HP remote monitoring and support tools to communicate with the HP Support Center
- Provide all necessary administration to enable end-to-end connectivity of the HP 3PAR StoreServ Storage product, including network, SAN fabric, and host
- Provide server and network provisioning that meet the requirements for additional software products, such as HP 3PAR Management Console
- Ensure that any and all prerequisite firmware or driver dependencies for the environment are handled before onsite service delivery begins

- Place HP 3PAR StoreServ Storage products in the immediate location where the installation service will take place; HP will unpack products to be installed in a customer-supplied rack
- Assemble and configure the customer-supplied rack for the rackmount version of the array product and position it in the location where the array will be installed; this requirement is applicable to any rack (including generic HP racks) other than the enclosure that is factory integrated with the array
- Ensure that for the HP 3PAR StoreServ 8000 Virtual Service Processor software, the customer-supplied host is fully assembled, configured, is installed in the same rack as the HP 3PAR 8000 storage product, and is ready for HP to install and configure the HP Virtual Service Processor software
- Adhere to licensing terms and conditions regarding the use of any HP service tools used to facilitate the delivery of this service or support tools used to provide ongoing remote monitoring, if applicable
- Prior to upgrade installation by HP and installation of any required HP 3PAR Operating System upgrades or patches, ensure that HP 3PAR Operating System upgrades or patches are compatible with the Customer's host and SAN environment
- Be responsible for all data backup and restore operations
- Provide a suitable work area for delivery of the service, including access to an outside telephone line, power, and any network connections required
- Allow HP full and unrestricted access to all locations where the service is to be performed
- Perform other reasonable activities to help HP identify or resolve problems, as requested by HP

General provisions/Other exclusions

- The on-site service is delivered on a single 3PAR StoreServ Storage product at one physical site.
- HP reserves the right to re-price this service if the Customer does not schedule and provide for subsequent delivery within 90 days of purchase.
- HP reserves the right to charge, on a time and materials basis, for any additional work over and above the service package pricing that may result from work required to address service prerequisites or other requirements that are not met by the Customer.
- HP's ability to deliver this service is dependent upon the Customer's full and timely cooperation with HP, as well as the accuracy and completeness of any information and data the Customer provides to HP.
- The service is delivered during local HP standard business days and hours, excluding HP holidays. Service delivery outside these hours is available and subject to additional charges.
- This service is delivered as a single, contiguous event. If Customer resource availability or other Customer restrictions delay installation or require additional visits beyond the defined scope of the service, additional charges may apply.
- Portions of the service are delivered remotely or onsite, at HP's discretion.
- Travel charges may apply; please consult a local HP office.

Activities such as, but not limited to, the following are excluded from this service:

- Service deployment on hardware not covered by an HP warranty or service maintenance contract
- Service deployment on hardware covered by an unauthorized third-party maintenance contract
- Services that, in the opinion of HP, are required due to unauthorized attempts by non-HP personnel to install, repair, maintain, or modify hardware, firmware, or software
- Service required due to causes external to the HP maintained hardware or software
- Any services not clearly specified in this document

Ordering information

To obtain further information or to order HP 3PAR StoreServ 8000 and 20000 Storage Installation and Startup Service, contact a local HP sales representative and reference the following product numbers:

- HA114A1#5XN for HP 3PAR 8200 2-Node Storage Centric Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XP for HP 3PAR 8200 2-Node Storage Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XQ for HP 3PAR 84XX 2-Node Storage Centric Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XR for HP 3PAR 84XX 2-Node Storage Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XS for HP 3PAR 84XX 4-Node Storage Centric Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XT for HP 3PAR 84XX 4-Node Storage Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XU for HP 3PAR 8200 2-Node Field Integrated Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XV for HP 3PAR 84XX 2-Node Field Integrated Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XW for HP 3PAR 84XX 4-Node Field Integrated Base Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XX for HP 3PAR 84XX Upgrade Node Pair Installation and Startup Service (see Note 1 for more information)
- HA114A1#5XZ for HP 3PAR 8000 Field Integrated Drive Enclosure Installation and Startup Service (see Note 1 for more information)
- HA124A1#5XY for HP 3PAR 8000 Adapter Installation and Startup Service
- HA124A1#5Y0 for HP 3PAR 8000 HDD-SDD Drive Installation and Startup Service (see Note 2 for more information)
- HA124A1#5X0 for HP 3PAR 20000 4-Node Base Factory Integrated Installation and Startup Service
- HA124A1#5WZ for HP 3PAR 20000 8-Node Base Factory Integrated Installation and Startup Service
- HA124A1#5X1 for HP 3PAR 20000 Expansion Rack Factory Integrated Installation and Startup Service
- HA124A1#5X4 for HP 3PAR 20000 4-Node Base Field Integrated Installation and Startup Service
- HA124A1#5X3 for HP 3PAR 20000 8-Node Base Field Integrated Installation and Startup Service
- HA124A1#5X5 for HP 3PAR 20000 Drive Enclosure Field Integrated Installation and Startup Service
- HA124A1#5X7 for HP 3PAR 20000 Upgrade Unit of Service Installation and Startup Service (see Note 3 for more information)

Notes:

1) Excludes field integration of drives into a storage base or drive enclosure. For field integration of drives, order the appropriate quantity of HP 3PAR 8000 HDD-SDD Drive Installation and Startup Service HA124A1#5Y0.

2) Includes field integration of up to 12 drives in a storage base, upgrade node pair, or drive enclosure. Order an increment of service HA124A1#5Y0 for each quantity of 12 drives that require field integration into a single HP 3PAR StoreServ 8000 Storage array.

3) For HP 3PAR 20000 hardware upgrades, order the appropriate quantity of HP 3PAR 20000 Upgrade Unit of Service Installation and Startup Service (HA124A1#5X7).

For more information

For more information on HP Services, contact any of our worldwide sales offices or visit our website at:
www.hp.com/services/support

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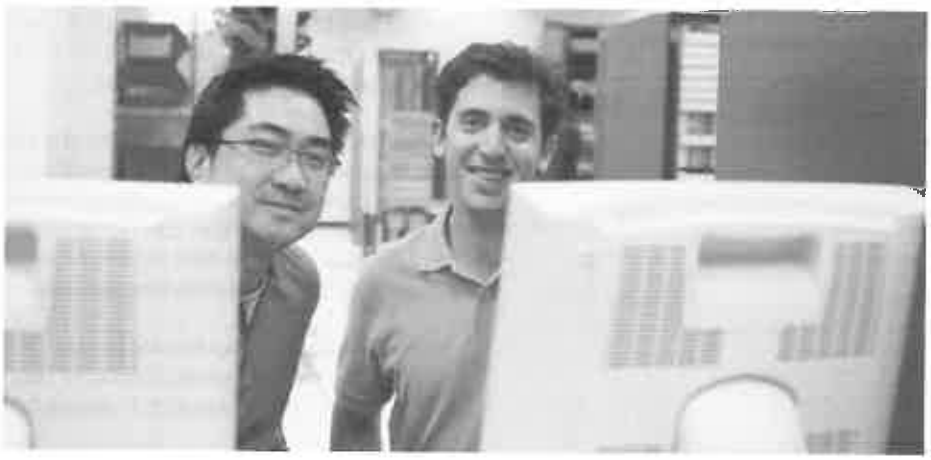
Hewlett Packard Enterprise

Data sheet

HPE Proactive Care Service

Support Services



Service benefits

HPE Proactive Care Service can help you to improve the return on your investment in a converged infrastructure with features designed to help provide:

- Faster resolution from specially trained, solution-oriented advanced resources who manage the incident from start to finish
- Recommendations for firmware version and software patching on supported products to help prevent problems[1]
- Identification of risks and issues through regular device-based proactive scans that help ensure that configurations are consistent with Hewlett Packard Enterprise best practices[1]
- Access to a remote HPE Technical Account Manager, who can provide advice and guidance on issues, risks, and recommendations identified by Remote Support Technology[2]

[1] Requires the Customer to install and operate Remote Support Technology with the data collections function enabled for delivery.

[2] Remote Support Technology refers to Hewlett Packard Enterprise proprietary service tools used to connect HPE products to HPE for service delivery, including HPE Insight Remote Support, HPE 3PAR StoreServ Remote Service and Support, and HPE Direct Connect.

Service overview

HPE Proactive Care offers an integrated set of reactive and proactive services designed to help you improve the stability and operation of your converged infrastructure to achieve better business outcomes. In a complex converged and virtualized environment, many components need to work together effectively. HPE Proactive Care has been specifically designed to support devices in these environments, providing enhanced support that covers servers, operating systems, hypervisors, storage, storage area networks (SANs), and networks.

In the event of a service incident, HPE Proactive Care provides you with an enhanced call experience with access to advanced technical solution specialists, who will manage your case from start to finish with the goal of reducing the impact to your business while helping you resolve critical issues more quickly. Hewlett Packard Enterprise employs enhanced incident management procedures intended to provide rapid resolution of complex incidents. In addition, the technical solution specialists providing your HPE Proactive Care support are equipped with automation technologies and tools designed to help reduce downtime and increase productivity.

Should an incident occur, HPE Proactive Care includes onsite hardware repair if it is required to resolve the issue. You can choose from a range of hardware reactive support levels to meet your business and operational needs.

HPE Proactive Care includes firmware and software version analysis for supported devices, providing you with a list of recommendations to keep your HPE Proactive Care covered infrastructure at the recommended revision levels. You will receive a regular proactive scan of your HPE Proactive Care covered devices, which can help you to identify and resolve configuration problems. HPE Proactive Care also provides quarterly incident reporting intended to help you identify problem trends and prevent repeat problems.

HPE Proactive Care uses Remote Support Technology to enable faster delivery of services by collecting technical configuration and fault data. Running the current version of Remote Support Technology is required to receive full delivery and benefits from this support service.

Table 1. Service features overview

FEATURE	DESCRIPTION
HPE support resources (see table 2 for details)	• HPE Technical Account Manager (TAM) • HPE Technical Solution Specialist (TSS)
Problem prevention (see table 3 for details)	• Firmware and Software Version Report and Recommendations[3] • Proactive Scan Report and Recommendations[3] • Incident Report • Report distribution to HPE Support Center • Review with TAM • Remote Support Technology installation assistance
Incident management (see table 4 for details)	• Enhanced call handling • Automatic call logging capability[3] • Basic Software Support and Collaborative Call Management for selected non-HPE software on eligible HPE hardware products • Knowledge database and HPE Support Center access • Replacement parts and materials • Access to firmware updates (for eligible products)

[3] Requires the Customer to install and operate Remote Support Technology with the data collections function enabled for delivery.

Table 1. Service features overview (continued)

FEATURE	DESCRIPTION
Incident management service levels (see table 4 for details)	• Hardware reactive support choices at three levels: – HPE Next Business Day Proactive Care Service – HPE 4-hour 24x7 Proactive Care Service – HPE 6-hour Call-to-Repair Proactive Care Service • Software reactive support: – 24x7 software support – Software product and documentation updates – License to use software updates if purchased from Hewlett Packard Enterprise – Hewlett Packard Enterprise recommended software and documentation updates method
Optional services (see table 5 for details)	• Additional technical expertise • HPE Defective Media Retention (DMR) • HPE Comprehensive Defective Material Retention (CDMR)

Table 2. Specifications: HPE support resources

FEATURE	DELIVERY SPECIFICATIONS
Support resources	The Customer has access to the following trained technical specialists.
HPE Technical Account Manager (TAM)	Hewlett Packard Enterprise Technical Account Managers (TAMs) are a remotely located team of specialists providing proactive services. HPE employs Remote Support to provide the Customer with scheduled product-based proactive firmware and software version analysis, proactive scans, and incident reporting. TAMs are available during standard HPE business hours to discuss these reports and recommendations, on request.
HPE Technical Solution Specialist (TSS)	Hewlett Packard Enterprise Technical Solution Specialists (TSSs) provide remote incident support and handle cases from call receipt to call closure. A TSS may engage additional specialist resources, as required, to help achieve resolution. The TSS will remain engaged from case creation through to closure to help ensure a consistent end-to-end support experience for the Customer.

Table 3. Specifications: Problem prevention and personalized technical expertise

FEATURE	DELIVERY SPECIFICATIONS
	Hewlett Packard Enterprise will publish a set of reports that contain HPE's analysis and recommendations (where appropriate) covering the devices under the HPE Proactive Care support agreement. Remote Support Technology is used to capture the necessary revision and configuration data to enable analysis and report creation. These reports will be published to the HPE Support Center (HPESC) for the Customer to access. Once the report is reviewed by the Customer, a TAM can be contacted to remotely discuss the report content to gain a better understanding of the HPE recommendations and observations contained within the report.
Firmware and Software Version Report	IT reliability and stability can be impacted by the levels of the Customer's software and firmware revisions. Twice a year, Hewlett Packard Enterprise reviews the products under the HPE Proactive Care contract to verify that they are at HPE recommended revision levels. HPE provides the Customer with access to a report containing its recommendations for applicable software versions, patches, and firmware revisions for each covered device. HPE performs the following core deliverables using Remote Support Technology as part of the firmware and software version recommendation activity.[3] **Firmware version recommendations** The report will indicate the installed and Hewlett Packard Enterprise recommended firmware revisions for the devices covered by the HPE Proactive Care contract. The firmware analysis is limited to supported devices. Installation is also provided for firmware defined by HPE as non-customer installable. HPE will install these firmware updates, if requested by the Customer, during the related hardware device support coverage window at no additional charge to the Customer. If HPE determines that the firmware update is designed for remote installation, then additional charges may be applied for onsite installation of the non-customer-installable firmware updates. HPE can provide telephone support for firmware defined as customer installable during the related hardware device support coverage window. The Customer can purchase additional services to install customer-installable firmware. **Software version recommendations** Hewlett Packard Enterprise will provide the Customer with patch analysis and HPE's update recommendations for all covered operating systems, virtualization software, or software required to operate storage devices that are covered under HPE Proactive Care support.[4] Update recommendations are provided by comparing the Customer's current version information against the latest supported releases. HPE Proactive Care provides the Customer with HPE's general recommendations, which are intended to address critical gaps with individual devices or products. The Customer is responsible for installing all software patches and updates. HPE can provide telephone assistance, if requested, to help the Customer with the installation of software patches for supported software. The Customer can purchase additional services to have HPE install supported software revisions and patches. For select operating systems or virtualization software[4] that is not directly covered by an HPE Proactive Care agreement but is running on an underlying server covered by HPE Proactive Care support, HPE will provide an annual report indicating the latest software revisions available. Certain third-party products may not be covered under this service feature. Please consult a Hewlett Packard Enterprise representative or authorized Hewlett Packard Enterprise channel partner for more details.

[3] Requires the Customer to install and operate Remote Support Technology with the data collections function enabled for delivery.

[4] A list of HPE Proactive Care supported products with selected operating system and virtualization software can be found at hpe.com/services/proactivecaresupportedproducts.

Table 3. Specifications: Problem prevention and personalized technical expertise (continued)

FEATURE	DELIVERY SPECIFICATIONS
Proactive Scan Report	Twice a year, Hewlett Packard Enterprise performs a proactive scan of HPE Proactive Care supported devices in the Customer's computing environment. For HPE servers and certain storage and networking products, this service provides a technical device assessment that is designed to help identify potential system configuration problems. Remote Support Technology is used to collect, transport, and analyze configuration and revision data to identify trends, revisions, or parameters that may impact operation. This analysis uses diagnostic tools and processes to compare the devices to HPE management best practices or support advisories. HPE then prepares a report that details the findings and highlights potential risks and issues that require resolution or investigation, identifies deviations from HPE best practices, and recommends a possible course of action to address them.[5]
Incident Report	The Customer has access to a quarterly report that provides certain details regarding the Customer's case history and trends. The report captures Hewlett Packard Enterprise incidents logged over the reporting period for electronic and manually submitted cases for the devices covered by the Proactive Care service agreement. Details are provided for each case submitted, specifically call submission information, hardware part consumption (if applicable), and call closure summary.
Report distribution to the HPE Support Center (HPESC)	Firmware and Software Version Reports, Proactive Scan Reports, and Incident Reports are provided electronically as part of this service. Reports are distributed through the Hewlett Packard Enterprise Support Center (HPESC) portal using security features designed to maintain confidentiality. Reports are published to the Customer's HPE Support Center account for access by authorized Customer users. For more information about report access, visit hpe.com/services/proactivecarecentral.
Review with Technical Account Manager (TAM)	For Firmware and Software Version Reports, Proactive Scan Reports, and Incident Reports, a TAM is available remotely to discuss the report content and the potential implications to the Customer's operations. Once the report is available in the HPESC, a TAM is available (on request via HPESC or phone) during standard business hours to discuss with the Customer the report analysis, Hewlett Packard Enterprise's recommendations, and potential implications. Implementation of the recommendations is not included as part of this service, and is the Customer's responsibility; however, additional assistance can be purchased from HPE to implement the recommendations.

[5] Requires the Customer to install and operate Remote Support Technology with the data collections function enabled for delivery.

Table 3. Specifications: Problem prevention and personalized technical expertise (continued)

FEATURE	DELIVERY SPECIFICATIONS
Remote Support Technology installation assistance	Hewlett Packard Enterprise Proactive Care Service uses HPE proprietary service tools, which are referred to in this data sheet as Remote Support Technology. Remote Support Technology is the principal method for delivering device monitoring, automated case creation, and a variety of proactive reports. The current version of Remote Support Technology, with the data collections function enabled, is a prerequisite for delivery of HPE Proactive Care Service. If the Customer does not install and operate the current version of Remote Support Technology, HPE will not provide the Firmware and Software Version Report, Proactive Scan Report, hardware call-to-repair time commitment, remote monitoring, and automated call logging deliverables of Proactive Care Service. See further details in the **Service limitations** and **Service prerequisites** sections. **Remote Support Technology installation assistance** Hewlett Packard Enterprise Remote Support Technology is made available to HPE Support customers as a feature of Proactive Care Service. The Customer is responsible for installing Remote Support Technology. In order to help ensure a successful installation of Hewlett Packard Enterprise Remote Support Technology, HPE will provide remote technical advice and assistance on the installation and configuration of the initial Remote Support Technology installation upon the Customer's request. As part of this activity, Hewlett Packard Enterprise will explain the features and benefits of Remote Support Technology and recommend the appropriate configuration based on the type and number of devices supported in the Customer's HPE Proactive Care environment. To maintain ongoing eligibility for this service, the Customer is responsible for enabling data transfer to Hewlett Packard Enterprise, correctly adding devices to the configuration, installing future upgrades, and maintaining the Customer contact details configured in the Remote Support Technology solution. For more information about Remote Support Technology, visit hpe.com/services/proactivecarecentral.

Table 4. Specifications: Incident management

FEATURE	DELIVERY SPECIFICATIONS
Enhanced call handling	The Customer can contact Hewlett Packard Enterprise 24 hours a day, 7 days a week. When the Customer calls with a critical incident, HPE aims to either connect the Customer to a TSS or call the Customer back within 15 minutes. The TSS is trained to address issues in complex computing environments and has access to Hewlett Packard Enterprise's full array of technical knowledge and resources engaged with the goal to help rapidly diagnose and resolve issues. In the event that there is a hardware issue requiring onsite service, a Hewlett Packard Enterprise customer engineer is dispatched to the Customer's site in accordance with the purchased hardware onsite reactive service level for that affected device. In addition to providing troubleshooting, the TSS employs rigorous case management and escalation procedures and engages additional technical specialists as needed. Hardware support onsite response times and call-to-repair time commitments, as well as software support remote response times, differ depending on incident severity and the purchased onsite coverage level. The Customer determines the incident severity level when logging or confirming a case with Hewlett Packard Enterprise. Incident severity levels are defined in the **General provisions/Other exclusions** section. Once a service request has been placed and Hewlett Packard Enterprise has acknowledged[6] receipt of the case, HPE will work to isolate the hardware or software problem and to troubleshoot, remedy, and attempt to resolve the problem remotely with the Customer. Prior to any onsite assistance, HPE may initiate and perform remote diagnostic tests using innovative automation tools to access covered products, or HPE may use other means available to facilitate remote problem resolution. Incident cases for Hewlett Packard Enterprise connected products using Remote Support Technology can be automatically created 24x7, as described below. Customers may also report problems to HPE via a special access phone number or electronically via HPE Support Center. HPE retains the right to determine the final resolution of all reported problems.
Automatic call logging capability[6]	For supported devices, automatic call logging capabilities are enabled so that devices will submit hardware service incidents directly to Hewlett Packard Enterprise using Remote Support Technology.[7] Incidents are submitted with "failure data" 24x7 and are responded to within the service-level coverage timeframe for the associated device. Where configured, HPE Insight Online can provide a single point of visibility to incidents and resolution.

[6] Please see the "General provisions/Other exclusions" section for more details.

[7] Requires the Customer to install and operate Remote Support Technology with the data collections function enabled for delivery.

Table 4. Specifications: Incident management (continued)

FEATURE	DELIVERY SPECIFICATIONS
Basic Software Support and Collaborative Call Management for selected non-HPE software on eligible HPE hardware products[8]	Basic Software Support provides 24 hours per day, 7 days per week phone support for selected independent software vendor (ISV) software[8] that resides on hardware covered by Hewlett Packard Enterprise Proactive Care. For Basic Software Support, HPE will investigate and attempt to resolve problems by asking the Customer to apply fixes that have been made available or known to HPE. In some cases, support may be limited to communication of a known fix available through the installation of a software update or patch, and the Customer will be directed to available sources for the applicable updates or patches because access to the known fix requires additional service contracts with the respective software vendor. If the problem is still not resolved, then Collaborative Call Management can be initiated at the Customer's request. If Hewlett Packard Enterprise determines that a problem is caused by a selected ISV product and the problem is not resolved by the Customer applying known available fixes, HPE will, at the Customer's request, initiate Collaborative Call Management with the ISV. Collaborative Call Management can be provided only in cases where Customers have appropriate active support agreements in place with selected ISVs and the Customer has taken the steps necessary[9] to ensure that HPE can submit calls on the Customer's behalf for the limited purpose of placing a support call with the vendor. HPE will engage the ISV and provide information about the Customer's issue, as obtained during the Basic Software Support service call. Once the call has transitioned to the ISV, it is then the responsibility of the ISV to resolve the Customer issue, which will be subject to the support levels of the agreement between the Customer and that ISV. Once the ISV is engaged, HPE will close the HPE call, but the Customer or ISV can resume the service issue with HPE if needed by referencing the original call identification number. Basic Software Support and Collaborative Call Management applies only to select ISV Software[8] when that software is not under HPE support. When ISV Software is covered by HPE Software Support, support is provided as described in the "Hardware and software incident support" section of this table.
Knowledge database and HPE Support Center (HPESC) access	Hewlett Packard Enterprise provides access to the HPE Support Center (HPESC) as part of HPE Proactive Care Service. HPESC provides personalized access to HPE Insight Online (personalized dashboard), support forums, support case submittal, drivers, patch management, software updates, and warranty/contract coverage. HPESC access and functionality are enabled through the linking of the Customer's HPE Passport with Service Agreements, and must be done to enable all available features. For more information, visit hpe.com/services/proactivecarecentral. Through HPESC, the Customer has access to: • Published Proactive Care reports for the Customer • Subscription to hardware-related proactive service notifications, and participation in support forums for solving problems and sharing best practices with other registered users • Expanded Web-based searches of entitled technical support documents to facilitate faster problem-solving • Certain Hewlett Packard Enterprise proprietary service diagnostic tools with password access • A Web-based tool for submitting questions directly to Hewlett Packard Enterprise; the tool helps to resolve problems quickly with a prequalification process that routes the support or service request to the resource qualified to answer the question; the tool also allows the status of each support or service request submitted to be viewed, including cases submitted by telephone • Hewlett Packard Enterprise and available third-party hosted knowledge databases, which can be searched for certain third-party products in order to retrieve product information, get answers to support questions, and participate in support forums; this service may be limited by third-party access restrictions • Services, which the Customer can browse, select, and schedule using credits, and view the current balance of credits

[8] For a list of the non-HPE software products eligible for Basic Software Support and Collaborative Call Management, please refer to hpe.com/services/collaborativesupport. In addition to the products covered on this list, any additional ISV products and variations on these deliverables are noted at hpe.com/services/proactivecaresupportedproducts.

[9] See the "Customer responsibilities" section for steps required.

Table 4. Specifications: Incident management (continued)

FEATURE	DELIVERY SPECIFICATIONS
Replacement parts and materials	Hewlett Packard Enterprise will provide replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements. Replacement parts provided by HPE shall be new or functionally equivalent to new in performance. All replaced parts become the property of HPE unless optional defective material retention or comprehensive defective material retention service options have been purchased. Customers who wish to retain, degauss, or otherwise physically destroy replaced parts will be billed and required to pay the list price for the replacement part. Supplies and consumable parts are not supported and will not be provided as part of this service; standard warranty terms and conditions apply to supplies and consumable parts. The repair or replacement of any supplies or consumable parts is the responsibility of the Customer. Some exceptions may apply; contact Hewlett Packard Enterprise for more information. If a consumable part is eligible for coverage, as determined by HPE, call-to-repair time commitments and onsite response times do not apply to repair or replacement of the covered consumable part. **Maximum supported lifetime/maximum usage** Parts and components that have reached their maximum supported lifetime and/or the maximum usage limit as set forth in the manufacturer's operating manual, product QuickSpecs, or the technical product data sheet will not be provided, repaired, or replaced as part of this service.
Firmware updates for eligible products	As Hewlett Packard Enterprise releases entitled firmware updates to HPE hardware products, updates are only made available to Customers with an active agreement that entitles them to access these updates. HPE Proactive Care Customers will have the right to download, install, and use firmware updates for hardware products covered by this service, subject to all applicable license restrictions in HPE's current standard sales terms. Hewlett Packard Enterprise will verify entitlement to updates by reasonable means (such as an access code or other identifier), and the Customer is responsible for using any such access tools in accordance with the terms of this data sheet and other applicable agreements with HPE. Hewlett Packard Enterprise may take additional reasonable steps, including audits, to verify the Customer's adherence to terms of their agreements with HPE, including this data sheet. For Customers with licenses to firmware-based software products (features implemented in firmware activated by the purchase of a separate software license product), the Customer must also have, if available, an active HPE Software Support agreement to receive, download, install, and use related firmware updates. Hewlett Packard Enterprise will provide, install, or assist the Customer with the installation of firmware updates as previously described in this document only if the Customer has the license to use the related software updates for each system, socket, processor, processor core, or end-user software license as allowed by the original HPE or original manufacturer software license terms.

Table 4. Specifications: Incident management (continued)

FEATURE	DELIVERY SPECIFICATIONS
Incident management service-level choices	
Hardware and software incident support	Each HPE Proactive Care Service level includes problem prevention and incident management support for hardware and software products. For each HPE Proactive Care Service level, Hewlett Packard Enterprise provides all the core problem prevention service features noted in tables 2 and 3, as well as the related core incident management service features noted in this table. For hardware products, the HPE Proactive Care portfolio offers three distinct hardware service levels.[10] • HPE Next Business Day Proactive Care Service • HPE 4-hour 24x7 Proactive Care Service • HPE 6-hour Call-to-Repair Proactive Care Service The HPE Proactive Care portfolio also offers the same three service levels with the inclusion of hardware defective media retention (DMR) and comprehensive defective material retention (CDMR) as additional optional service features that the Customer may elect to purchase based upon their requirements. For eligible products, the DMR service feature option, if purchased, allows the Customer to retain a defective hard disk or eligible SSD/Flash Drive that the Customer does not want to relinquish due to sensitive data contained within the disk ('Disk or SSD/Flash Drive') covered under this service. All Disk or eligible SSD/Flash Drives on a covered system must participate in the DMR service option. In addition to DMR, the CDMR service feature option, if purchased, allows the Customer to retain additional components that have been designated by Hewlett Packard Enterprise as having data retentive capabilities, such as memory modules. All eligible data retentive components on a covered system must participate in the CDMR service option. See table 5 for more information. For software products, HPE Proactive Care Service provides software support 24 hours per day, 7 days per week including HPE holidays. Once a noncritical software service request (severity 3 or 4) is received, Hewlett Packard Enterprise will respond to the call within 2 hours after the service request has been logged. HPE provides corrective support to resolve identifiable and customer-reproducible software product problems. HPE also provides support to help the Customer identify problems that are difficult to reproduce. The Customer receives assistance with troubleshooting incidents and resolving configuration parameters. For critical software response (severity 1 or 2) situations, please refer to the 'Enhanced call handling' feature described earlier in this document. The variations in the HPE Proactive Care reactive hardware service levels are outlined in the section that follows. All coverage windows are subject to local availability. Contact a local Hewlett Packard Enterprise sales office for detailed information on service availability.

[10] All service levels may not be available on all products.

Table 4. Specifications: Incident management (continued)

FEATURE	DELIVERY SPECIFICATIONS
Hardware support options	
HPE Next Business Day Proactive Care Service	Hewlett Packard Enterprise provides the following reactive service levels for the specific devices covered under this option: **Hardware support coverage window:** • Standard business hours, standard business days (9x5): Onsite service is available 9 hours per day between 8:00 a.m. and 5:00 p.m. local time, Monday through Friday, excluding HPE holidays. **Hardware onsite support response time:** • Next Business Day onsite response: An Hewlett Packard Enterprise authorized representative (CE) will arrive at the Customer's site during the onsite coverage window to begin hardware maintenance service on the next coverage day after the call has been received and acknowledged by HPE. Service features are defined in the "Hardware onsite support" area of the **Service limitations** section. Availability of response times is dependent on the proximity of the Customer site to a HPE-designated support hub. See table 6 for more details. Please contact HPE for further information.
HPE 4-hour 24x7 Proactive Care Service	Hewlett Packard Enterprise provides the following reactive service levels for the specific devices covered under this option: **Hardware support coverage window:** • 24x7: Service is available 24 hours per day, 7 days per week including HPE holidays. **Hardware onsite support response time:** • 4-hour onsite response: An Hewlett Packard Enterprise authorized representative (CE) will arrive at the Customer's site during the onsite coverage window to begin hardware maintenance service within 4 hours after the call has been received and acknowledged by HPE. Service features are defined in the "Hardware onsite support" area of the **Service limitations** section. Availability of response times is dependent on the proximity of the Customer site to a HPE-designated support hub. See table 6 for more details. Please contact HPE for further information.
HPE 6-hour Call-to-Repair Proactive Care Service	Hewlett Packard Enterprise provides the following reactive service levels for the specific devices covered under this option: **Hardware support coverage window:** • 24x7: Service is available 24 hours per day, 7 days per week including HPE holidays. **Hardware call-to-repair time commitment:** For critical incidents (severity 1 and 2), HPE will use commercially reasonable efforts to return the covered hardware to operating condition within 6 hours after the call has been received and acknowledged by HPE. Service features are defined in the "Hardware onsite support" and "Hardware call-to-repair commitment" areas of the **Service limitations** section. Availability of response times and call-to-repair times is dependent on the proximity of the Customer site to a HPE-designated support hub. See table 6 for more details. Please contact HPE for further information. For noncritical incidents (severity 3 and 4) or at the Customer's request, HPE will work with the Customer to schedule an agreed-upon time for the remedial action to begin, and the call-to-repair time commitment will then start at that time. Incident severity levels are defined in the **General provisions/Other exclusions** section. Call-to-repair time refers to the period of time that begins when the initial hardware service request has been received and acknowledged by HPE or at the start time for work scheduled in agreement with the Customer, as specified in the **General provisions/Other exclusions** section. Call-to-repair time ends with HPE's determination that the hardware is repaired, or when the reported event is closed with the explanation that HPE has determined that it does not currently require onsite intervention.

Table 4. Specifications: Incident management (continued)

FEATURE	DELIVERY SPECIFICATIONS
HPE 6-hour Call-to-Repair Proactive Care Service (continued)	Repair is considered complete upon Hewlett Packard Enterprise verification that the hardware malfunction has been corrected or that the hardware has been replaced. HPE is not liable for any lost data, and the Customer is responsible for implementing appropriate backup procedures. Verification by HPE may be accomplished by the completion of a power-on self-test, standalone diagnostic, or visual verification of proper operation. At its sole discretion, HPE will determine the level of testing necessary to verify that the hardware is repaired. At its sole discretion, HPE may temporarily or permanently replace the product in order to meet the call-to-repair time commitment. Replacement products are new or functionally equivalent to new in performance. Replaced products become the property of HPE. It will take 30 days from the time this service is purchased to set up and perform necessary audits and processes so that the hardware call-to-repair time commitment can be put into effect. During this initial 30-day period and for up to 5 additional business days after the audit is completed, HPE will provide a 4-hour onsite response time. Enhanced parts inventory management (call-to-repair time commitment only) To support HPE call-to-repair time commitments, an inventory of critical replacement parts is maintained for Customers who have selected the call-to-repair option. This inventory is stored at an HPE-designated facility. These parts are managed to allow for increased inventory availability and are accessible to Hewlett Packard Enterprise authorized representatives responding to eligible calls.
Software support options	
Software product and documentation updates	As Hewlett Packard Enterprise releases updates to HPE software, the latest revisions of the software and reference manuals are made available to the Customer. For selected third-party software, HPE will provide software updates as such updates are made available from the third party, or HPE may provide instructions on how the Customer can obtain any software updates directly from the third party. A license key or access code, or instructions for obtaining a license key or access code, will also be provided to the Customer when they are required to download, install, or run the latest software revision. For most HPE software and selected HPE-supported third-party software, updates will be made available through the Software Updates and Licensing portal via the HPESC. The Software Updates and Licensing portal provides the Customer with electronic access to receive and proactively manage software product and documentation updates. For other HPE-supported third-party software, the Customer may be required to download updates directly from the vendor's website.
License to use software updates	The Customer receives the license to use software updates to HPE or HPE-supported third-party software for each system, socket, processor, processor core, or end-user software license covered by this service, as allowed by the HPE or original manufacturer software license terms. The license terms shall be as described in the HPE software licensing terms corresponding to the Customer's prerequisite underlying software license, or in accordance with the current licensing terms of the third-party software manufacturer, if applicable, including any additional software licensing terms that may accompany such software updates provided under this service.
HPE recommended software and documentation updates method	For HPE or HPE-supported third-party software and documentation updates, the recommended delivery method will be determined by HPE. The primary delivery method for software updates and documentation updates will be via download from the Software Updates and Licensing portal or a third-party hosted website.

Table 5. Specifications: Optional services

FEATURE	DELIVERY SPECIFICATIONS
Additional technical expertise	The provision of additional technical expertise is an optional feature and is a flexible way to augment and complement the Customer's own IT team skills, providing specialist capacity on an as-needed basis. If the Customer wishes to access technical services from HPE, such services can be provided through the per-event HPE Technical Services portfolio or by purchasing HPE Proactive Select credits. More information on HPE Proactive Select can be found at hpe.com/services/proactiveselect.
HPE Defective Media Retention	For eligible products, this service feature option allows the Customer to retain defective hard Disk or eligible SSD/Flash Drive components that the Customer does not want to relinquish due to sensitive data contained within the disk ('Disk or SSD/Flash Drive') covered under this service. All Disk or eligible SSD/Flash Drives on a covered system must participate in the defective media retention service option.
HPE Comprehensive Defective Material Retention	In addition to defective media retention, this service feature option allows the Customer to retain additional components that have been designated by Hewlett Packard Enterprise as having data retentive capabilities, such as memory modules. All eligible data retentive components on a covered system must participate in the comprehensive defective material retention service option. The components that can be retained under this service feature are outlined in the document located at hpe.com/services/cdmr.

Table 6. Specifications: Service travel zones

FEATURE	DELIVERY SPECIFICATIONS		
Geographic locations	Travel zones and charges, if applicable, may vary in some geographic locations.		
Travel zones table for hardware onsite response time	**Distance from HPE-designated support hub**	**4-hour hardware onsite response time**	**Next-day hardware onsite response time**
	0–100 miles (0–160 km)	4 hours	Next coverage day
	101–200 miles (161–320 km)	8 hours	1 additional coverage day
	201–300 miles (321–480 km)	Established at time of order and subject to availability	2 additional coverage days
	More than 300 miles (480+ km)	Established at time of order and subject to availability	Established at time of order and subject to availability
Hardware call-to-repair time commitment	A hardware call-to-repair time commitment is available for sites located within 50 miles (80 km) of a HPE-designated support hub. Travel zones and charges may vary in some geographic locations. The hardware call-to-repair time commitment is not available for sites located more than 100 miles (160 km) from a HPE-designated support hub. For sites that are located from 51 to 100 miles (81 to 160 km) of a HPE-designated support hub, an adjusted hardware call-to-repair time commitment applies, as shown in the table that follows.		

Table 6. Specifications: Service travel zones (continued)

FEATURE	DELIVERY SPECIFICATIONS	
Travel zone table for hardware call-to-repair time commitment	**Distance from HPE-designated support hub**	**6-hour hardware call-to-repair time**
	0–50 miles (0–80 km)	6 hours
	51–100 miles (81–160 km)	8 hours
	More than 100 miles (160+ km)	Not available

Service limitations

Services provided within the scope of one HPE Proactive Care support contract are restricted to the IT environment under the direct day-to-day management of one IT manager, in one country. Unless otherwise specified or arranged, proactive and consultative services are performed during standard local HPE business hours and days excluding HPE holidays. Except as otherwise noted in this document, the scope of HPE Proactive Care Service is limited to the products under the HPE Proactive Care support contract.

In cases where the Customer purchases additional HPE Proactive Care support, at the discretion of Hewlett Packard Enterprise, the proactive service deliverables for the additional devices will be delivered with the existing devices under contract.

The Firmware and Software Version Report and Proactive Scan Report require the installation of the current version of Remote Support Technology with the data collections function enabled. Should Remote Support Technology not currently support a device, the Customer will be requested to manually collect the data required to enable Hewlett Packard Enterprise to include that device in the reports listed above. In this event, HPE will provide the Customer with clear instructions on how and when to manually collect and transfer the necessary data. This data needs to be supplied to HPE within the required timelines in order for HPE to include it in the reports listed above; otherwise, HPE will be under no obligation to provide the reports listed above on these devices and there will be no reduction in fee charges for HPE Proactive Care Service as a result.

The current supported devices list is available as part of the release notes for Insight Remote Support, which can be found at hpe.com/services/getconnected.

Scope of products covered
This service is available for selected servers, software, storage devices, storage arrays, network devices, and storage area networks only, as noted a hpe.com/services/proactivecaresupportedproducts.

The features of this service may differ, or be limited, based on specific devices or software. Please check with a Hewlett Packard Enterprise sales office or Hewlett Packard Enterprise sales representative for specific limitations and local availability.

General limitations
Hewlett Packard Enterprise delivery staff will provide the required proactive deliverables defined in table 3 during standard local HPE business hours excluding HPE holidays, either remotely or onsite, at the discretion of HPE. If these deliverables are required outside of standard business hours, additional charges may apply and are subject to local availability.

Hewlett Packard Enterprise retains the right to determine the final resolution of all service requests.

Activities such as, but not limited to, the following are excluded from this service:

- Services required due to failure of the Customer to incorporate any system fix, repair, patch, or modification provided to the Customer by Hewlett Packard Enterprise
- Services that, in the opinion of Hewlett Packard Enterprise, are required due to unauthorized attempts by non-HPE personnel to install, repair, maintain, or modify hardware, firmware, or software
- Operational testing of applications, or additional tests requested or required by the Customer
- Services that, in Hewlett Packard Enterprise's opinion, are required due to improper treatment or use of the products or equipment
- Services required due to failure of the Customer to take avoidance action previously advised by Hewlett Packard Enterprise
- Backup and recovery of the operating system, other software, and data
- Implementation of any Hewlett Packard Enterprise recommendations provided as part of this service
- Installation of any customer-installable firmware and/or software updates

Hardware call-to-repair commitment
If an upfront audit is required by Hewlett Packard Enterprise, the hardware call-to-repair time commitment will not take effect until five (5) business days after the audit has been completed. In addition, HPE reserves the right to downgrade service to an onsite response time or cancel the service contract if critical audit suggestions are not followed or the audit is not performed within the specified timeframe.

Hardware call-to-repair time options are specified in the "HPE 6-hour Call-to-Repair Proactive Care Service" section (see table 4). All call-to-repair times are subject to local availability. Contact a local Hewlett Packard Enterprise sales office for detailed information on availability.

The hardware repair time commitment may vary for specific products.

A call-to-repair time commitment does not apply to software products or when the Customer chooses to have Hewlett Packard Enterprise prolong diagnosis rather than execute recommended server recovery procedures.

A call-to-repair time commitment does not apply if the Customer does not install and operate the current version of Remote Support Technology on all devices. A call-to-repair time commitment is also not available for devices that are not supported by Remote Support Technology. The Customer remains responsible for full payment of all fees associated with the provision of HPE Proactive Care Service.

Call-to-repair time commitments and onsite response times do not apply to the repair or replacement of defective or depleted batteries for selected enterprise storage arrays and enterprise tape products.

If the Customer requests scheduled service, the repair timeframe begins from the agreed-upon scheduled time.

At the discretion of Hewlett Packard Enterprise, service will be provided using a combination of remote diagnosis and support, services delivered onsite, and other service delivery methods. Other service delivery methods may include the delivery via a courier of customer-replaceable parts such as a keyboard, a mouse, certain hard disk drives, and other parts classified by HPE as Customer Self Repair (CSR) parts, or an entire replacement product. HPE will determine the appropriate delivery method required to provide effective and timely Customer support and meet the call-to-repair time commitment, if applicable.

If the Customer agrees to the recommended CSR and a CSR part is provided to return the system to operating condition, the onsite service level shall not apply. In such cases, Hewlett Packard Enterprise practice is to express ship to the Customer location the CSR parts that are critical to the product's operation. For more details on the CSR process and parts, please refer to hpe.com/info/csr.

The following activities or situations will suspend the call-to-repair time calculation (if applicable) until they are completed or resolved:

- Any Customer or third-party action or inaction impacting the repair process
- Any automated recovery processes triggered by the hardware malfunction, such as disk mechanism rebuild or sparing procedures
- Any other activities not specific to the hardware repair but required to verify that the hardware malfunction has been corrected, such as rebooting the operating system

Hewlett Packard Enterprise reserves the right to modify the call-to-repair time commitment as it applies to the Customer's specific product configuration, location, and environment. This is established at the time of the support agreement order and is subject to resource availability.

Hardware onsite support

At the discretion of Hewlett Packard Enterprise, service will be provided using a combination of remote diagnosis and support, services delivered onsite, and other service delivery methods. Other service delivery methods may include the delivery via a courier of customer-replaceable parts such as a keyboard, a mouse, other parts classified as CSR parts, or an entire replacement product. HPE will determine the appropriate delivery method required to provide effective and timely Customer support.

For hardware onsite response time options, Hewlett Packard Enterprise strongly recommends that the Customer install and operate the appropriate Remote Support solution, with a secure connection to HPE, in order to enable the delivery of the service. Response times are dependent on the location of the Customer's site in relation to a designated Hewlett Packard Enterprise support office. To check service availability, the Customer should contact their local Hewlett Packard Enterprise Services representative.

An onsite response time will not apply if the service can be delivered using remote diagnosis, remote support, or other service delivery methods previously described. For technical hardware issues that cannot, in HPE's judgment, be resolved remotely, an Hewlett Packard Enterprise authorized representative will provide onsite technical support on covered hardware products to return them to operating condition. For certain products, HPE may, at its sole discretion, elect to replace such products in lieu of repairing them. Replacement products are new or functionally equivalent to new in performance. Replaced products become the property of HPE.

Once an Hewlett Packard Enterprise authorized representative arrives at the Customer's site, the representative will continue to deliver the service, either onsite or remotely, at the discretion of HPE, until the products are repaired. Work may be temporarily suspended if parts or additional resources are required, but work will resume when they become available. Work to completion may not apply to onsite support provided for desktop, mobile, and consumer products. Repair is considered complete upon HPE verification that the hardware malfunction has been corrected or that the hardware has been replaced.

Notwithstanding anything to the contrary in this document or Hewlett Packard Enterprise's current standard sales terms, HPE will, for selected enterprise storage arrays and enterprise tape products, cover and replace defective or depleted batteries that are critical to the proper operation of the covered product.

For incidents with covered hardware that cannot be resolved remotely, Hewlett Packard Enterprise will use commercially reasonable efforts to respond onsite in accordance with the purchased hardware onsite reactive coverage level of the affected device.

Onsite response time specifies the period of time that begins when the initial call has been received and acknowledged by Hewlett Packard Enterprise, as described in the **General provisions/Other exclusions** section. The onsite response time ends when the Hewlett Packard Enterprise authorized representative arrives at the Customer's site, or when the reported event is closed with the explanation that HPE has determined it does not currently require onsite intervention.

Response times are measured during the coverage window only and may be carried over to the next day for which there exists a coverage window. Hardware response time options available for eligible products are specified in the Service-level options listed in table 4. All response times are subject to local availability. Contact a local Hewlett Packard Enterprise sales office for detailed information on service availability.

In the event that a CSR part is provided to return the system to operating condition, the onsite response time, if any, shall not apply. In such cases, Hewlett Packard Enterprise practice is to express ship to the Customer location the CSR parts that are critical to the product's operation. For more details on the CSR process and parts, please refer to hpe.com/info/csr.

Software

For a Customer with multiple systems at the same location, Hewlett Packard Enterprise may limit the number of physical media sets containing software product and documentation updates provided as part of this service.

Software updates are not available for all software products. When this service feature is not available, it will not be included in this service.

For some products, software updates include only minor improved features. New software versions must be purchased separately.

Limitations to the defective media retention and comprehensive defective material retention service feature options

The defective media retention and comprehensive defective material retention service feature options apply only to eligible data retentive components replaced by Hewlett Packard Enterprise due to malfunction. They do not apply to any exchange of data retentive components that have not failed.

Data retentive components that are specified by Hewlett Packard Enterprise as consumable parts and/or have reached the maximum supported lifetime and/or the maximum usage limit as set forth in the manufacturer's operating manual, the product QuickSpecs, or the technical data sheet are not covered by this service.

Defective media retention service and comprehensive defective material retention service coverage for options designated by Hewlett Packard Enterprise as requiring separate coverage, if available, must be configured and purchased separately.

Failure rates on these components are constantly monitored, and Hewlett Packard Enterprise reserves the right to cancel this service with 30 days' notice if HPE reasonably believes that the Customer is overusing the defective media retention or comprehensive defective material

retention service feature option (such as when replacement of defective data retentive components materially exceeds the standard failure rates for the system involved).

Service prerequisites

Hewlett Packard Enterprise, at its sole discretion, may require an audit on the covered products. If such an audit is required, a Hewlett Packard Enterprise authorized representative will contact the Customer, and the Customer will agree to arrange for an audit to be performed within the initial 30-day timeframe. During the audit, key system configuration information is collected and an inventory of the covered products is performed. The information gathered in the audit enables HPE to plan and maintain replacement part inventories at the appropriate level and location, and allows HPE to survey and troubleshoot possible future hardware incidents so that repairs can be completed as quickly and efficiently as possible. At the sole discretion of HPE, the audit may be performed onsite, via remote system access, via remote audit tools, or over the phone.

If an audit is required by Hewlett Packard Enterprise, it will take 30 days from the time this service is purchased to set up and perform the audits and processes that must be completed before the hardware call-to-repair time commitment can be put into effect. The hardware call-to-repair time commitment will not take effect until five (5) business days after the audit has been completed. Until such time, service for the covered hardware will be delivered at a 4-hour onsite response time service level.

In addition, Hewlett Packard Enterprise reserves the right to downgrade service to an onsite response time or cancel the service contract if critical audit suggestions are not followed or the audit is not performed within the specified timeframe, unless the delay is caused by HPE.

For hardware call-to-repair time commitments, Hewlett Packard Enterprise requires that all devices and configurations must be supported by Remote Support Technology, and the Customer must install and operate the current version of Remote Support Technology with a secure connection to HPE, in order to enable the delivery of the service.

The installation and use of Remote Support Technology, including the installation and enabling of any agents and data transfer to Hewlett Packard Enterprise, is required to deliver the Firmware and Software Version Report, Proactive Scan Report, hardware call-to-repair time commitment, remote device monitoring, and automated call logging deliverables of HPE Proactive Care Service. During any such time that the Customer has not deployed Remote Support Technology, or if Customer configurations or devices are not supported by Remote Support Technology and the Customer does not take the steps necessary to provide the data required to HPE, HPE is not obligated to provide any impacted deliverables, and the Customer remains responsible for full payment of all fees associated with the provision of HPE Proactive Care Service.

Installation of customer-installable firmware and software is the responsibility of the Customer. There will be additional charges if the Customer requests that Hewlett Packard Enterprise install customer-installable firmware and software updates. Any additional charges to the Customer will be on a time and materials basis, unless otherwise previously agreed to in writing by HPE and the Customer. To be eligible to purchase this service, the Customer must be properly licensed to use the revision of the software product that is current at the beginning of the support agreement period; otherwise, an additional charge may be applied to bring the Customer into service eligibility.

The Customer must have rightfully acquired the license for any underlying firmware that will be covered under these services.

Customer responsibilities

If the Customer does not act upon the specified Customer responsibilities, Hewlett Packard Enterprise or the Hewlett Packard Enterprise authorized service provider will, at HPE's discretion, i) not be obligated to deliver the services as described or ii) perform such service at the Customer's expense at the prevailing time and materials rates.

The Customer must provide accurate and complete information in a timely manner as required for Hewlett Packard Enterprise to perform the services.

For the proactive services provided by HPE Proactive Care Service, the Customer will provide HPE with the appropriate system manager contact information (name, email, and phone number) for the primary person responsible for the operational viability of the HPE Proactive Care covered infrastructure. The Customers system manager contact will be used as the primary point of communication for initial service setup and general communications.

The call-to-repair time commitment is subject to the Customer providing immediate and unrestricted access to the system, as requested by Hewlett Packard Enterprise. The call-to-repair time commitment does not apply when system access, including physical, remote troubleshooting, and hardware diagnostic assessments, is delayed or denied. If the Customer requests scheduled service, the call-to-repair time period begins at the agreed-upon scheduled time.

Upon Hewlett Packard Enterprise request, the Customer will be required to support HPE's remote problem resolution efforts as well as proactive deliverables.

The Customer will:

- Start self-tests and install and run other diagnostic tools and programs
- Install customer-installable firmware updates and patches
- Run data collection 'scripts' on behalf of Hewlett Packard Enterprise when they cannot be initiated from Remote Support Technology
- Provide all information necessary for Hewlett Packard Enterprise to deliver timely and professional remote support and to enable HPE to determine the level of support eligibility
- Perform other reasonable activities to help Hewlett Packard Enterprise identify or resolve problems, as requested by HPE

The Customer is responsible for installing and configuring all supported devices and maintaining the appropriate Remote Support Technology with a secure connection to Hewlett Packard Enterprise. The Customer is responsible for providing all necessary resources in accordance with the Remote Support Technology release notes in order to enable the delivery of the service and options. The Customer must also provide any hardware required to host Remote Support Technology. When an Remote Support solution is installed, the Customer must also maintain the contact details configured in the version of Remote Support Technology that HPE will use in responding to a device failure. To receive Proactive Care Service proactive deliverables, the Customer must link their HPE Passport to one or more valid Service Agreements and enable Remote Support Technology data collection as outlined at hpe.com/services/proactivecarecentral.

The Customer should contact a local Hewlett Packard Enterprise representative for further details on requirements, specifications, and exclusions. For scheduled calls, the Customer shall promptly make the equipment available to HPE for remedial activities at the agreed-upon time.

In cases where CSR parts or replacement products are shipped to resolve a problem, the Customer is responsible for returning the defective part or product within a time period designated by Hewlett Packard Enterprise. In the event that HPE does not receive the defective part or

product within the designated time period or if the part or product is degaussed or otherwise physically damaged upon receipt, the Customer will be required to pay the HPE list price for the defective part or product, as determined by HPE.

In order for Hewlett Packard Enterprise to provide Collaborative Call Management, the Customer must have an active support agreement with the software vendor that includes the required service level and features that allow the Customer to place calls and receive support from the vendor. If the vendor requires it, the Customer will take any steps necessary to ensure that HPE can submit calls on the Customer's behalf. In addition, the Customer must provide HPE with the appropriate information needed for HPE to initiate a service call with the software vendor on behalf of the Customer. If the Customer does not meet these requirements, HPE will not be able to transfer calls to the vendor and assumes no responsibility for failure to do so. HPE's obligations are limited to the placement of support calls only. Purchase of Collaborative Call Management does not assign the support agreement between the Customer and vendor to HPE. The Customer remains responsible for the performance of their obligations under such agreements, which include payment of all applicable fees, including any fees that may apply as a result of logging calls with the vendor. HPE is not liable for the performance or non-performance of third-party vendors, their products, or their support services.

The Customer is responsible for installing, in a timely manner, critical customer-installable firmware updates, as well as CSR parts and replacement products delivered to the Customer.

The Customer is responsible for testing any preventative recommendations prior to implementation into production to ensure and to confirm interoperability within their IT environment. Prior to the implementation of any recommendations, the Customer should read and understand any prerequisites, procedures, or requirements as specified in the supporting documentation of the update.

The Customer will:

- Take responsibility for registering to use the Hewlett Packard Enterprise or third-party vendor's electronic facility in order to access knowledge databases and obtain product information; HPE will provide registration information to the Customer as required; additionally, for certain products, the Customer may be required to accept vendor-specific terms for use of the electronic facility
- Maintain up-to-date and correct contact information within the Hewlett Packard Enterprise or third-party electronic facilities
- Retain and provide to Hewlett Packard Enterprise upon request all original software licenses, license agreements, license keys, and subscription service registration information, as applicable for this service
- Take responsibility for acting upon any hardcopy or email notification the Customer may receive in order to download the software update or to request the new software update on media, where this option is available
- Use all software products in accordance with current Hewlett Packard Enterprise software licensing terms corresponding to the Customer's prerequisite underlying software license, or in accordance with the current licensing terms of the third-party software manufacturer, if applicable, including any additional software licensing terms that may accompany such software updates provided under this service

If required by Hewlett Packard Enterprise, the Customer or Hewlett Packard Enterprise authorized representative must activate the hardware product to be supported within 10 days of purchase of this service, using the registration instructions within the packaged support services documentation or the email document provided by HPE, or as otherwise directed by HPE. In the event that a covered product changes location, activation and registration (or proper adjustment to existing HPE registration) is to occur within 10 days of the change.

The Customer is responsible for the security of the Customer's proprietary and confidential information. The Customer is responsible for properly sanitizing or removing data from products that may be replaced and returned to Hewlett Packard Enterprise as part of the repair process to ensure the safeguarding of the Customer's data. More information on Customer responsibilities, including those outlined in the HPE Media Sanitization Policy and Media Handling Policy for Healthcare Customers, can be found at hpe.com/mediahandling.

If the Customer chooses to retain repair parts covered under the defective media retention and/or comprehensive defective material retention service feature options, it is the Customer's responsibility to:

- Retain covered data retentive components that are replaced during support delivery by Hewlett Packard Enterprise
- Ensure that any Customer sensitive data on the retained covered data retentive component is destroyed or remains secure
- Have an authorized representative present to retain the defective data retentive component, accept the replacement component, provide Hewlett Packard Enterprise with identification information such as the serial number for each data retentive component retained hereunder, and, upon HPE request, execute a document provided by Hewlett Packard Enterprise acknowledging the retention of the data retentive component
- Destroy the retained data retentive component and/or ensure that is not put into use again
- Dispose of all retained data retentive components in compliance with applicable environmental laws and regulations

For data retentive components supplied by Hewlett Packard Enterprise to the Customer as loaner, rental, or lease products, the Customer will promptly return the replacement components at the expiration or termination of support with HPE. The Customer will be solely responsible for removing all sensitive data before returning any such loaned, rented, or leased components or products to HPE, and HPE shall not be responsible for maintaining the confidentiality or privacy of any sensitive data that remains on such components.

General provisions/Other exclusions

Hewlett Packard Enterprise will acknowledge a call by logging a case, communicating the case ID to the Customer, and confirming the Customer's incident severity and time requirements for the start of remedial action. Note: For events received via HPE electronic remote support solutions, HPE is required to contact the Customer, determine the incident severity with the Customer, and arrange access to the system before the hardware call-to-repair time or hardware onsite response time period can start.

Onsite hardware support response times and call-to-repair time commitments, as well as software support remote response times, may differ depending on incident severity. The Customer determines the incident severity level.

Incident severity levels are defined as follows:

Table 7. Incident severity levels

Severity 1	Critical Down	For example, the production environment is down; a production system or production application is down or at severe risk; data corruption, loss, or risk has occurred; business is severely affected; there are safety issues.
Severity 2	Critically Degraded	For example, the production environment is severely impaired; a production system or production application has been interrupted or compromised; there is risk of reoccurrence; there is significant impact on the business.
Severity 3	Normal	For example, a non-production system (e.g., test system) is down or degraded; a production system or production application has been degraded with a workaround in place; noncritical functionality has been lost; there is limited impact on the business.
Severity 4	Low	There is no business or user impact.

Ordering information

All units and options with individually sold support services must be ordered with the same service level as the product or enclosure that they are installed in, if that service level is available on those units.

HPE Proactive Care is not designed to be purchased on software-only configurations due to the integrated nature of the service deliverables. Thus, the software and hardware should be purchased with the same HPE Proactive Care service level.

Local availability: The Customer may order support from Hewlett Packard Enterprise's current support offerings. Some offerings, features, and coverage (and related products) may not be available in all countries or areas.

To order the service with the comprehensive defective material retention service feature, the defective media retention service feature must also be ordered.

To obtain further information or to order HPE Proactive Care Service, contact a local Hewlett Packard Enterprise sales representative or authorized Hewlett Packard Enterprise reseller and reference the following product numbers (x denotes the service length in years; options are 3, 4, or 5 years).

Table 8. HPE Proactive Care configurable/flexible packages support services

H1K90Ax	HPE Proactive Care NBD SVC
H1K91Ax	HPE Proactive Care NBD wDMR SVC
H1K92Ax	HPE Proactive Care 24x7 SVC
H1K93Ax	HPE Proactive Care 24x7 wDMR SVC
H1K94Ax	HPE Proactive Care CTR SVC
H1K95Ax	HPE Proactive Care CTR wDMR SVC

Table 9. HPE Proactive Care Contractual services

H1K90AC	HPE Proactive Care NBD SVC
H1K91AC	HPE Proactive Care NBD wDMR SVC
H1K92AC	HPE Proactive Care 24x7 SVC
H1K93AC	HPE Proactive Care 24x7 wDMR SVC
H1K94AC	HPE Proactive Care CTR SVC
H1K95AC	HPE Proactive Care CTR wDMR SVC

For the complete list of HPE Proactive Care non-configurable/fixed packaged support services, please contact your local Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise reseller.

For more information

For more information on HPE Proactive Care Service or other support services, contact any of our worldwide sales offices or visit the following website:

hpe.com/services/support

Resources

Insight Remote Support release notes:
hpe.com/services/getconnected

HPE Proactive Care supported products list:
hpe.com/services/proactivecaresupportedproducts

Software Product List Collaborative Support provided by HPE:
hpe.com/services/collaborativesupport

HPE Proactive Select Services:
hpe.com/services/proactiveselect

HPE Support Center:
hpe.com/support/hpesc

HPE Media Sanitization Policy and Media Handling Policy:
hpe.com/mediahandling

HPE Comprehensive Defective Material Retention:
hpe.com/services/cdmr

Customer Self-Repair information:
hpe.com/info/csr

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A Comparison of All-Flash Arrays from Enterprise Storage Providers

DCIG

2015-16 ALL-FLASH ARRAY BUYER'S GUIDE

By Chuck Cook and Ken Clipperton

DCIG

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2015-16 ALL-FLASH ARRAY BUYER'S GUIDE

A Comparison of All-Flash Arrays from Enterprise Storage Providers

Introduction

DCIG is pleased to present this fresh snapshot of the dynamic all-flash array (AFA) marketplace. This marketplace is dynamic both in terms of product evolution and in the rate of all-flash array adoption. Many businesses are realizing that the time has come to run all of their application workloads on flash. The *DCIG 2015-16 All-Flash Array Buyer's Guide* will help those businesses accelerate the all-flash array selection process.

We began covering this nascent storage array category in 2012. At that time, storage appliances that permanently store data on flash memory were commonly being referred to as either flash memory storage arrays or as all-flash arrays. In the time since the publication of the *DCIG 2014-15 Flash Memory Storage Array Buyer's Guide,* the storage industry has embraced the term all-flash array. For that reason this refresh of the buyer's guide is being called the *DCIG 2015-16 All-Flash Array Buyer's Guide.*

More than terminology has changed over the last eighteen (18) months. The fresh data DCIG compiled on forty-eight (48) arrays from eighteen (18) storage vendors shows that all-flash array vendors have substantially reduced the barriers to all-flash array adoption.

Consider the following facts drawn from comparing the 2014-15 and the 2015-16 data:

- *Flash capacity is up 2x to 4x.* Compared with the arrays in the 2014-15 edition, the average raw flash memory capacity nearly quadrupled from 117 TB to 445 TB. Median and maximum raw flash memory capacities more than doubled to 88 TB and 3.9 PB per array. Effective capacity after deduplication and compression is a multiple of these numbers.
- *Flash density is up 50%.* Average raw storage density rose 50%, from 14 TB/U to 21.5 TB/U. Median density is now 19.2 TB/U. Maximum density is 51 TB/U of high performance flash memory. Effective storage density (after deduplication and/or compression) is a multiple of these numbers. This combination of all-flash performance and high storage density means that an AFA can meet performance and capacity requirements in 1/10th the space of legacy storage systems.
- *Entry prices are down 50% to less than $25,000.* The entry point list price is less than half what it was in 2014. Several all-flash arrays now carry a starting list price of less than $25,000, placing all-flash performance within the reach of many more businesses.
- *Majority of shipping configurations are under $250,000 list price.* Among vendors that reported the list price of a typical configuration as ordered by customers, three (3) report a list price under $100,000; three (3) between $100,000 and $150,000; and fourteen (14) between $150,000 and $250,000.

Although $/GB is probably the least favorable way of evaluating flash memory costs, it is a metric familiar to many storage purchasers. Multiple vendors now claim a cost per GB—after deduplication and compression—of $2 or less. This compares favorably with traditional 15K hard disk drives (HDD) costs, though still a multiple of the cost for NL-SAS HDDs.

This Buyer's Guide includes data sheets for 28 arrays from 18 storage vendors. These 28 arrays represent the highest scoring array from each product series. Vendors with products included in this guide are AMI, Dell, EMC, Fujitsu, Hitachi Data Systems, HP, Huawei, IBM, iXsystems, Kaminario, NetApp, Nimbus Data, Oracle, Pure Storage, SolidFire, Tegile, Violin Memory and X-IO Technologies.

The first wave of all-flash arrays had limited capacity and limited data services. As a result, early adopters used these appliances to address specific storage-related pain points:

- Increasing the performance of business-critical database applications and enabling real-time applications (through ultra-low latency)
- Enabling successful and cost-effective virtual desktop deployments (ability to handle boot storms, high deduplication ratios make the cost per desktop reasonable)
- Solving virtual server application performance issues (ability to handle highly random I/O)

While these early drivers will continue to be important, we believe that a broad set of features will be important to the next wave of all-flash array purchasers including:

- Ability to manage multiple tiers of storage performance and endurance
- Comprehensive data services (thin provisioning, snapshots, replication, deduplication, compression)
- Ease of integration into existing data center environments
- Integration with key enterprise applications
- Granular performance monitoring
- Non-disruptive upgrades
- Provisioning automation
- Quality of service (QoS)
- Scalable capacity
- Storage density per rack unit
- Unified management and/or open management interfaces (SMI-S, OpenStack Cinder, etc)

This Buyer's Guide evaluates products on the comprehensive set of features expected of an enterprise storage array rather than expectations for a niche high-performance storage appliance. Some of the arrays in this guide intentionally eschew enterprise data services in order to attain the lowest possible I/O latencies. This lack of data services lowered their rankings in this Buyer's Guide. Consequently, enterprises focused on getting the absolute maximum performance from their critical database applications may find that a lower ranked array is a better fit than some of the higher ranked arrays.

The Value This DCIG Buyer's Guide Creates for Buyers

This introduction to the current state of the all-flash array market is only the tip of the iceberg. Like all prior DCIG Buyer's Guides, the *DCIG 2015-16 All-Flash Array Buyer's Guide* does the heavy lifting for organizations as they look to purchase an all-flash array by:

- Providing a succinct analysis of the AFA marketplace
- Delineating and normalizing array features, whether or not they are supported and where appropriate how they are implemented

- Weighting these features according to what end users consider most important in a primary storage array
- Ranking each model (or series)
- Creating a standardized one-page data sheet for each model (or series)

The end result is that the *DCIG 2015-16 All-Flash Array Buyer's Guide* drives time and cost out of the product selection process by enabling prospective buyers to do *"at-a-glance"* comparisons between many different arrays. By identifying a short list of products that meet their specific needs, prospective purchasers can focus their product evaluation energies on those selected arrays and move more quickly to the competitive bid process.

Note that this Buyer's Guide is not intended to be a substitute for bringing individual models in-house for testing. That function should still be done, if possible, since every array will perform differently under different application workloads and data center environments. We hope you find that this Buyer's Guide meets its intended purpose in your environment.

Chuck and Ken

Executive Summary

The marketplace for all-flash arrays is both rapidly growing and highly competitive. Many changes have taken place in the all-flash array marketplace in the 18 months since the release of the *DCIG 2014-15 Flash Memory Storage Array Buyer's Guide* in March of 2014. We have witnessed substantial increases in capacity, storage density and performance. Over this same period, AFA's have established a track record of dramatic application acceleration and proven reliability.

All-Flash Arrays Now Replacing Traditional Enterprise Arrays in Mainstream Businesses

When we prepared the previous edition of this Buyer's Guide, multiple vendors indicated that prospective customers were looking to move to an all-flash environment for their critical business applications. These same vendors report that enterprises are now looking to use flash memory not just for critical applications, but for *all active workloads* in the data center. In a recent study[1] by 451 Research, 22% of respondents have already implemented an all-flash array. Of those, 57% were using the array to speed up multiple applications and 26% had fully replaced legacy arrays.

The return on investment (ROI) of using flash for all active workloads already made sense in 2014. Subsequent improvements in all-flash performance and costs make the ROI of moving to all-flash storage compelling. As a result, enterprises will increasingly *replace* primary enterprise storage systems with all-flash arrays.

Enterprises wanting to change storage vendors will discover a robust and competitive marketplace. Multiple vendors have created new storage architectures designed from the ground up for flash memory and have created new expectations around ease-of-use and analytics-based proactive support.

Enterprises that are generally happy with their current storage vendor and storage system (performance issues aside) are likely to find an all-flash version of the storage system is available. Such businesses can realize some or all of the benefits of an AFA without the risk associated with migrating to a new storage architecture, and without having to re-implement data protection strategies.

A Systemic Opportunity to Speed Up the Business

The purchase of an all-flash array will be most easily justified—and have the greatest benefit—in businesses that think this through as a systemic data center and business opportunity. Many who do so will discover that "flash is free." That is, the return on investment within the IT budget is rapid, and the business impact of accelerating all enterprise applications is the speeding up of the entire business. As Eric Pearson, the CIO of InterContinental Hotels Group was quoted in Pat Gelsinger's VMworld 2015 keynote, *"It's no longer the big beating the small. It's the fast beating the slow."*[2]

Producing More, Spending Less

Every technology purchase must fulfill at least one of two objectives; it must enable the business to produce more, or it must reduce the cost of production. An AFA can fulfill both of

1. Coulter, Marco. "Flash Storage Outlook." Proc. of Flash Memory Summit 2015, Santa Clara, CA. Flash Memory Summit, 12 Aug. 2015. Web. 28 Aug. 2015. <http://www.flashmemorysummit.com/English/Collaterals/Proceedings/2015/20150812_S203D_Coulter.pdf>.
2. *Pat Gelsinger on Stage at VMworld 2015, 15:50.* YouTube. YouTube, 01 Sept. 2015. <https://www.youtube.com/watch?v=U6aFO0M0bZA&list=PLeFICm1Qq6vt484cUB6N1LhXZnOcc3VC7&index=3>

these business objectives simultaneously. Early AFA adopters have discovered multiple ways to leverage the AFA investment to produce more and spend less.

Impact #1: Accelerates Applications

Flash-based storage systems typically create a seven-fold improvement in application performance. This acceleration saves money across the business. For example, the installation of an AFA at one growing business was directly attributed with avoiding the need to hire between 10 and 40 additional employees. Flash storage enabled the company to grow their business without growing their head count.[3]

Impact #2: Enables New Revenue Opportunities through Real-time Applications

Flash memory enables real-time applications by eliminating storage latency. For example, eliminating disk-related latency has proven to be a key enabler for individualizing recommendations and tailoring content in online shopping experiences, leading to increased sales opportunities.

Impact #3: Creates Significant Savings in the Overall Data Center Budget

A flash-storage-enabled rethinking of the data center can generally achieve hard cost savings of over 30% in data center hardware and software, and realize an ROI of less than 11 months.[4] Some businesses have found that the total cost of the AFA was lower than the maintenance cost of the former SAN.

Impact #4: Multiplies Existing Data Center Capacity

Storage is traditionally one of the largest consumers of data center capacity. AFA's can achieve a 10x reduction in storage footprint. An AFA generally also enables a higher level of server consolidation; reducing server footprint as well. The resulting opportunity to consolidate data centers is real; eliminating current operating expenses and/or avoiding the expense and time lag associated with adding another data center.

Impact #5: Dramatically Reduces Storage Management Overhead, Increases IT Responsiveness

IT leaders tell us that all-flash arrays dramatically reduce the time IT staff spend managing storage. The performance of flash memory means less time is required for planning around the storage impact of adding another workload to the data center. Improved management interfaces and automation capabilities means less time is required for day-to-day management. As a result, the IT department is enabled to be more responsive to the business.

Impact #6: Eliminates Time and Stress of Diagnosing, Mitigating and Documenting Performance Problems

Many businesses start looking at AFA's because of poor application performance. AFA implementers tell us that they no longer have to spend time diagnosing and mitigating application performance issues; or explaining those issues to the rest of the business and to unhappy customers. These time and stress reductions ripple through the business: from customer support, to IT staff and business managers.

3. Floyer, David. "Case Study: The Hunting of the RARC." http://wikibon.org/wiki/v/Case_Study:_The_Hunting_of_the_RARC
4. Clipperton, Ken. "IBM Validates Systemic Data Center Savings Enabled by Flash Memory." http://www.dcig.com/2013/04/ibm-validates-systemic-data-center-savings-enabled-by-flash-memory.html.

Impact #7: Increases Software Developer Productivity

Many corporate software developers test their software against old and/or partial data using dedicated non-production storage systems. The zero-space clone capabilities of AFAs combined with AFA performance headroom enables developers to perform software testing against a full clone of the current data. Using the AFA makes testing better and faster, accelerating the path to successful software releases. It also enables the business to eliminate the non-production storage systems.

The Role of this Buyer's Guide

For all the reasons listed above, many businesses are considering all-flash arrays for their data centers. The *DCIG 2015-16 All-Flash Array Buyer's Guide* is pregnant with fresh information that will accelerate the research process for those businesses and increase their confidence in the results of that research.

As prior Buyer's Guides have done, this Buyer's Guide puts at the fingertips of organizations a comprehensive list of all-flash arrays and standardized data sheets that can assist them in this important buying decision. The use of this DCIG Buyer's Guide will enable an organization to formulate an exact opinion on features that are most important to them, then generate a short list of products to do further research and/or acquire.

This *DCIG 2015-16 All-flash Array Buyer's Guide* accomplishes the following objectives:

- Collects and standardizes data about the features of available AFA models
- Provides an objective, third party evaluation of features from an end user's viewpoint
- Provides insight into the current state of the marketplace and product features that may warrant particular attention
- Scores and ranks the features on each model based upon the criteria that matter most to end users so they can quickly know which models are the most appropriate for them to use and under what conditions
- Provides standardized data sheets for 28 all-flash arrays from 18 different storage providers so end users can do quick comparisons of 98 features that are supported or not supported on each model
- Gives any organization the ability to request competitive bids from different storage providers that are *apples-to-apples* comparisons

How to Use this Buyer's Guide

In determining how to best use the information contained in this DCIG Buyer's Guide, it is important to note that it is intended to help organizations in their purchase of an all-flash array by significantly reducing the time they must invest in researching product features and capabilities. The purpose of this Buyer's Guide is *NOT* to tell users exactly which all-flash array to purchase. Rather, it is to help guide them in coming up with a list of competitive products that have comparable features that may meet their specific needs.

It is also important for users to note that just because a product scored the highest in a particular category or is ranked a certain way does not automatically mean that it is the right product for their organization. If anything, because of the scope of all-flash array models evaluated and analyzed, higher ranked models may have features that are too robust for the needs of an individual department or organization.

However, this Buyer's Guide does give users some sense of how each array compares to others classified as "all-flash arrays," as well as offering additional insight into what product offerings are available on the market.

DCIG recommends that you use this *DCIG 2015-16 All-Flash Array Buyer's Guide* in the following six (6) ways:

1. ***Eliminate the painstaking research associated with coming up with a short list of all-flash arrays that meet their needs.*** This Buyer's Guide contains data sheets for 28 different models from eighteen (18) different providers. Each array is scored and then ranked as *Recommended, Excellent, Good* or *Basic* based upon its score. On each array, more than 100 different features were evaluated, weighted, scored and then ranked. All an organization has to do is look at the rankings and features of each product in order to come up with a short list of products for consideration.
2. ***Identify comparable apples-to-apples all-flash arrays from different storage providers.*** In today's crowded storage market, it behooves organizations to get competitive bids from multiple storage providers. After all, when they compete, you win! But that tactic only works well when organizations know that they are receiving competitive bids on products that are roughly comparable. Using this *DCIG 2015-16 All-Flash Array Buyer's Guide,* organizations can do a better job of accomplishing that objective.
3. ***Separate the apples from the oranges.*** Just as important as doing apples-to-apples comparisons is identifying when an orange is thrown into the mix. Sometimes it is very difficult for an organization to know if it is truly getting a good deal when bids come in from multiple storage providers that include different models. Now organizations can refer to the rankings of each all-flash array in this guide so they know when they are getting a good deal, a great deal or just an adequate one.
4. ***Gain perspective on how models from less well known storage providers compare against established and better known brands.***. Anyone involved with storage at all has at least heard of Dell, HP and other well-known storage vendors. This creates a certain built-in level of comfort when buying products from these companies and a corresponding built-in resistance to buying products from companies that are perceived as unknown quantities.

   This Buyer's Guide helps to remove some of that apprehension about buying from a less well known provider or even a less well known model from an established provider. Using this Buyer's Guide, organizations can see how these models from lesser known companies as well as lesser known models from established providers stack up.
5. ***Take advantage of normalized storage terminology.*** Every computing industry has a proclivity to adopt acronyms and jargon that is specific to its lexicon, but the data storage industry seems to go out of its way to not only use unfamiliar terms but refer to the same technology in different ways. This Buyer's Guide sifts through the acronyms and storage jargon and terms and normalizes them. This minimizes or even eliminates the need for users to try to understand all of the industry terminology.
6. ***Do side-by-side comparisons.*** The product data sheets available from the different storage providers are rarely laid out in the same way or contain the same information. Some storage providers even have data sheet formats that vary from model to model within their own product portfolio. This Buyer's Guide tackles the problem by creating a standard, easy to read data sheet for each all-flash array. In this way, product data sheets for individual products can be printed out, laid down side by side and then quickly compared.

Disclosures

Over the last few years the general trend in the US has been for both large and boutique analyst firms to receive some or all of their revenue from storage providers. DCIG is no different in this respect as it also receives payment for the different services it performs for storage providers. The services that DCIG provides include blogging, customer validations, product reviews, executive white papers, full length white papers and special reports. For more information on DCIG, visit www.dcig.com.

In the interest of being fully transparent, a number of the storage providers included in this *DCIG 2015-16 All-Flash Array Buyer's Guide* are, or have been, DCIG clients. This is not to imply that they were given preferential treatment in the Buyer's Guide. All it meant was that DCIG was aware that they offered arrays that might qualify for inclusion in this Buyer's Guide and that DCIG had more initial knowledge of their arrays.

In that vein, there are a number of important facts to keep in mind when considering the information contained in this Buyer's Guide and its merit.

- No storage provider paid DCIG any fee to develop this Buyer's Guide.
- DCIG did not guarantee any storage provider that its array(s) would be included in this Buyer's Guide.
- DCIG did not imply or guarantee that a specific array model would receive a good ranking in this Buyer's Guide ahead of time.
- All research was based upon publicly available information, information provided by the storage provider and the expertise of those evaluating the information.
- Because of the number of features analyzed and how each of these features were weighted, there was no way for DCIG to predict at the outset how individual array models would end up ranking.

DCIG would like to emphasize that no storage provider was privy to how DCIG did the ranking of the arrays. In every case the storage providers only found out the rankings of its array model(s) after the analysis was complete.

Inclusion and Exclusion Criteria

The inclusion and exclusion of specific array models in this Buyer's Guide is based on the follow criteria:

- *Available as a rack-mountable appliance.*
- *Must be marketed as an all-flash array (AFA). The best evidence of meeting this criterion is the existence of a specific all-flash SKU.*
- *Must use flash memory as primary storage,* not merely as an extended cache.
- *May permit storage expansion with disk shelves that contain HDDs or the virtualization of external disk-based arrays*—essentially converting the all-flash array into a hybrid storage array.
- *Must support one or more of the following storage networking protocols:* iSCSI, Fibre Channel, InfiniBand, NFS.
- *There must be sufficient information available to DCIG to make meaningful decisions.* DCIG makes a good faith effort to reach out and obtain information from as many storage providers as possible. However, products may be excluded because of a lack of sufficient reliable data.
- *Must be formally announced and/or generally available for purchase as of June 19, 2015.* A cut-off date had to be put in place or this Buyer's Guide would never be published.

Ultimately, it is the professional judgment of the analysts working on each DCIG Buyer's Guide whether or not a particular model meets the inclusion criteria.

The 8-Step Process Used to Score and Rank the Arrays

To score and rank each array model, DCIG went through an eight (8) step process to come to the most objective conclusion possible.

1. *DCIG listed out all of the features available on all-flash arrays.* Prior to selecting the features that were included in the final evaluation in the Buyer's Guide, DCIG went through and quantified what features all-flash arrays possessed. As part of this process, DCIG *"normalized"* the list of available features such that a common name for each feature was established.
2. *DCIG established which features would be included in the Buyer's Guide and which ones would not.* One of

the goals of this Buyer's Guide was to try to only include features that could be objectively and authoritatively analyzed.

For example, *"Raw Flash Capacity per Appliance (Max)"* was evaluated as a feature instead of *"Useable Storage Capacity."* While useable storage capacity is what users ultimately care about, a consistent objective answer cannot be arrived at as most arrays offer multiple RAID options and differences in data compression and deduplication by type of data yield site-specific useable or effective storage capacity. Therefore, *"Raw Flash Capacity per Appliance (Max)"* was selected as the feature to be evaluated since an objective answer could be ascertained and supported.

3. *The features were broken down into four general categories.* The features included in this Buyer's Guide broke down into a total of four broad categories that are reflected on each all-flash array data sheet. These categories include Management & Software, Virtualization, Hardware and Support.

4. *Each feature had a weighting associated with it.* The weighting of each feature was done by a team of DCIG research analysts. The weightings were used to reflect if a feature was supported and potentially how valuable the feature is to an end-user compared to other options.

5. *DCIG completed a survey for each vendor's product(s) and then sent the survey(s) to each vendor for verification.* Each vendor was invited to review their data and respond with any corrections or edits to the DCIG-completed survey(s).

6. *All the features were scored based on the data captured in the surveys.* Scoring was finalized after the updates received from vendors had been entered into the survey system.

7. *All vendors were given the opportunity to review their data sheets shortly before the Buyer's Guide was published.* To ensure the information presented in this Buyer's Guide is as complete and up-to-date as possible, DCIG provided each vendor the opportunity to review a copy or copies of their filled-out surveys and the data sheets that appear in this Buyer's Guide *without the rankings on them.* In this way they had the opportunity to validate the information and correct it before it was publicly released.

8. *The arrays were ranked using standard scoring techniques.* One of the goals of this Buyer's Guide is to establish clear lines of differentiation with conclusions that are arrived at objectively. To accomplish this goal, the mean or average score for each classification was first determined and then the standard deviation.

   Using the mean of the scores from all of the arrays from which the standard deviation was calculated, DCIG developed a ranking for each array model based upon the following in each classification:

   - Those models that were .5 or greater standard deviations below the mean were given the rank of *Basic*.
   - Those models that were .5± standard deviations above or below the mean were ranked as *Good*.
   - Those models that were .5 – 1.5 standard deviations above the mean were ranked as *Excellent*.
   - Those models that were 1.5 or greater standard deviations above the mean were ranked as *Recommended*.
   - The model(s) with the highest score in each category were given the designation of *Best-in-Class*.

   It is for this reason that in each category the number of models that achieved a certain ranking varied.

DCIG Comments and Thoughts

Flash memory is transforming data center performance and economics. There are many possible paths to this flash-enabled transformation, including server-side flash cache, hyper-converged infrastructure, software-defined storage, hybrid storage arrays and all-flash arrays. AFA's are appealing because they are high-performance, space-efficient, direct replacements for legacy SANs.

AFA's Evaluated for General Purpose Enterprise Storage Requirements, Not Lowest Latency

Many people will be surprised to find some of the current market leading AFA's in the Basic group. The best explanation for this result may be that these products are focused on the needs of early adopters and use cases where ultra-low performance for high-value applications matters more than broad general purpose enterprise storage features. Because DCIG believes mainstream organizations are ready for AFA's to replace their legacy primary storage arrays, this Buyer's

Guide evaluates arrays on the breadth of features required of an organization's primary storage array.

While not apologizing for our focus on the AFA as the next-generation primary storage array, we recognize that other use cases are certainly valid. For example, even mainstream businesses may decide that achieving the absolute lowest latencies possible trumps a comprehensive feature set for business-critical database applications and real-time applications. Storage purchasers evaluating arrays for such use cases may find the feature data shown on the data sheets is more important to them than the rankings DCIG assigned.

Another explanation for these results is that some vendors did not respond to our requests for additional product information. As a result, our analysts were limited to data provided on the vendors' web sites or analysis the vendors had previously sponsored. DCIG's standard procedure is to only mark a feature as supported if our analysts find documentation indicating the feature is supported, or if we have firsthand knowledge that the feature is supported. That is why the legend on the data sheets interprets an "⊗" as "Unsupported/ Undetermined." In cases where the vendor did not provide any feedback, that fact is clearly indicated on the data sheet.

Some arrays covered in the 2014-15 edition of the Buyer's Guide are not included in this fresh snapshot of the AFA marketplace. Many arrays were replaced by newer models. To the best of our knowledge Astute Networks and IceWEB exited the AFA market. Avere Systems markets the FXT as an edge filer rather than AFA's. GreenBytes and Skyera were acquired and have yet to re-emerge as available products, and Whiptail products were discontinued by Cisco.

We had identified a number of other arrays for possible inclusion, but were not able to collect enough information about the arrays to include them, and the vendors did not respond to our requests for more information.

Best Practice Includes Reviewing All Performance Resources End-to-End

The performance resources of a data center are CPU, DRAM, network bandwidth and storage I/O. All actual application work occurs in the CPU of a server. The other performance resources are there to feed data to the CPU for processing, and then present or store the results of that processing. In a performance-optimized data center, CPU utilization routinely approaches 100%. Therefore, an AFA will not noticeably improve performance on a server that is already near 100% CPU utilization.

Getting the maximum performance benefit from an AFA may require more or faster network connections to application servers and/or the storage system, more server DRAM, adjusting cache sizes and adjusting other server and network configuration details. Therefore, it is important to review end-to-end performance from CPU to storage and eliminate any bottlenecks.

Some of these bottlenecks may go undetected until after an AFA is deployed. A proof of concept implementation in an organization's own data center provides an opportunity to uncover these bottlenecks and to validate how well a product implements the features that are important to a particular business. The performance monitoring utilities included with some AFA's ease this end-to-end review by showing how much latency is attributable to the server, the network and the storage system.

All-Flash Arrays Accelerate Random I/O, Not Sequential I/O

Any business running typical enterprise applications will benefit from replacing legacy HDD-based storage with an AFA. However, data centers with mostly sequential I/O will probably see little performance benefit from an AFA. Traditional arrays and HDDs handle sequential I/O very well. Random I/O is where AFA's shine.

Array Series vs. Individual Models

As noted in the introduction, this Buyer's Guide includes data sheets for 28 arrays from 18 storage vendors. These 28 arrays represent the highest scoring array from each product series. For example, HP produces 4 AFA arrays in the HP 3PAR StoreServ 7000c Series, including the 7200c, 7440c, 7450 and 7450c. Consolidating the data onto a single HP 3PAR StoreServ 7000c Series data sheet simplifies the Buyer's Guide and provides the most value to its users.

The statistics shown below are based on all 48 individual array models. Those models are listed in Appendix B, along with contact information for each vendor. Each of the 48 models has its own entry in the interactive edition of this Buyer's Guide to facilitate direct model-to-model comparisons. Data listed in the 2014-15 column of the charts is from the *DCIG 2014-15 Flash Memory Storage Array Buyer's Guide.*

The Barriers to AFA Adoption Substantially Reduced

As noted in the Introduction, AFA vendors have substantially reduced the barriers to AFA's replacing legacy arrays. Flash capacity is up 2x to 4x, now averaging 445 TB and maxing out at just under 4 PB. Flash density is up 50% to an average of 21.5 TB/U and a maximum of greater than 50TB/U. Among vendors that provided list price data, entry prices are down 50% to less than $25,000, and the majority of shipping configurations are under $250,000 list price.

Automated Storage Provisioning

Data center automation is an area of growing emphasis for many organizations because it facilitates efficient management of data center infrastructures and enables a more agile response from IT to changing business requirements. Automation is a key enabler of the shift toward an ITaaS (Information Technology as a Service) model. Ultimately, automation means more staff time can be spent addressing business requirements rather than managing routine tasks.

Organizations can implement automation in their environment through management interfaces that are scriptable, policy and/or template based and with API support for integration into 3rd party management tools. Vendors have clearly embraced this trend, with nearly all supporting at least one method for automated storage provisioning.

Automated Storage Provisioning and Reclamation

	2014-15	2015-16	Increase
Exposes APIs for use by 3rd party automation tools	45%	94%	49%
Automated Storage Reclamation	56%	87%	31%
Policy-based storage selection	30%	78%	48%
Storage templates to include SLA/QoS requirements	25%	57%	32%
Provisioning via server groups linked to storage templates	13%	45%	32%

Automated Storage Tiering

Automated storage tiering is essential in hybrid storage arrays, but can also be useful in an AFA by enabling the AFA to take advantage of different types of flash memory and/or by tiering infrequently used data to HDD or cloud-based storage.

Today flash memory is differentiated by latency and endurance characteristics. Flash memory latency tiers (lowest to highest) include NVDIMMs, PCIe/NVMe, SAS and SATA. Endurance is measured in warrantied full drive writes per day (DWPD), and ranges from less than 1 DWPD to more than 30 DWPD. Generally speaking, the lower the latency and the higher the endurance, the higher the $/GB.

Automated Storage Tiering

	2014-15	2015-16	Increase
Dynamic	28%	39%	11%
Scheduled	10%	30%	20%

Cloud Storage Integration

	2014-15	2015-16	Increase
Migrate Data to Cloud	25%	43%	18%
OpenStack	10%	35%	25%
Amazon S3	23%	20%	-3%
Azure	3%	10%	7%
Proprietary	8%	2%	-6%

Data Efficiency

Data efficiency features such as in-line deduplication and compression multiply the effective capacity and density of an AFA and drive down the cost of the storage system. These features are now supported by a majority of AFA arrays. Thin provisioning complements these data efficiency techniques, and is now nearly universal.

Vendors with arrays offering both deduplication and compression claim typical data reduction ratios of 3:1 to 5:1. Several vendors offer free tools that estimate the data efficiency results that a particular organization can expect to achieve.

Data Efficiency Features

	2014-15	2015-16	Increase
In-line Deduplication	33%	63%	30%
In-line Compression	38%	53%	15%
Thin Provisioning	90%	94%	4%

Encryption

Encryption of data is of growing importance to enterprises. In some industries, such as healthcare and financial institutions, encryption is a matter of regulatory compliance. Other businesses seek data encryption as a way of reducing the risk of accidental disclosure of sensitive customer information. The majority of AFA's now support encryption through array-based encryption (46%), the use of self-encrypting drives (63%), or both techniques.

Flash Optimization

Like all types of storage media, flash memory has both strengths and weaknesses. Flash memory's strengths include low latency and low power requirements, but weaknesses like low write endurance were initially a cause for skepticism about its use in enterprise storage systems. Storage vendors have successfully addressed flash memory's weaknesses through a variety of techniques, and many vendors now offer warranties of 5 years or more on flash media in the arrays.

Flash-specific optimization techniques vary by vendor. Wear leveling is used by 95% of the arrays, while buffering and/or coalescing of writes to match erasure block size is utilized by 83%. Forty-one arrays (85%) have implemented other proprietary flash optimization techniques.

Management Methods

AFA's substantially increased support for multiple array management interfaces. This change was driven by the increasing importance of automation, flexibility to assign storage management tasks to varied roles and multi-hypervisor adoption in the enterprise. VMware vCenter is the most widely supported management method, but support for open standards-based management grew more than support for VMware or Microsoft management tools.

Management Methods

	2014-15	2015-16	Increase
VMware vCenter	64%	90%	26%
OpenStack Cinder	46%	82%	36%
REST API	45%	76%	31%
SMI-S	21%	51%	30%
SCVMM SMAPI	21%	47%	26%

Microsoft Technologies Gaining Traction

VMware still dominates the enterprise virtualization space, but support for Microsoft virtualization technologies is gaining ground. The percentage of arrays that can be managed from within Microsoft's System Center Virtual Machine Manager more than doubled to 47%. Support for Microsoft Windows Offloaded Data Transfer (ODX), a Windows Server 2012 technology that reduces latency and enhances array throughput, is supported on 61% of the arrays.

Microsoft Technologies

	2014-15	2015-16	Increase
ODX	21%	61%	40%
SCVMM SMAPI	21%	47%	26%
SMB 3.0	13%	35%	22%

Integration with Key Enterprise Applications

Flash memory storage creates new opportunities for integration with key enterprise applications. These API-based integrations enable the passing of hints between applications and storage. Whether this is viewed as "application-aware storage" or "storage-aware applications", the results can include dramatic increases in application performance and/or data efficiency. Perhaps the best known of these integrations is Oracle's co-engineering of Oracle Database 12c and Oracle storage appliances to automate storage tiering and compression of Oracle Database 12c data via Automatic Data Optimization (ADO) with Hybrid Columnar Compression (HCC).

DCIG surveyed AFA vendors regarding application-specific integrations they currently support. Their responses indicate that 40% of the arrays go beyond the expected virtualization integrations to include one or more of the following applications: DB2, EPIC, MySQL, Oracle DB, SAP HANA, SAP LVM, SAS BI, XFS. This is an area of real and growing opportunity for storage vendors and enterprises.

Quality of Service (QoS)

Many organizations will find AFA performance dramatically exceeds the performance of their legacy storage systems. Nevertheless, the ability to prioritize some workloads above other workloads is important to some organizations. Quality of Service (QoS) features enable this capability. An increasing minority of AFA's now support at least some QoS features.

Quality of Service (QoS) Features

	2014-15	2015-16	Increase
User assigns to pre-defined service levels	20%	45%	25%
User-defined Maximums	25%	39%	14%
User-defined Minimums	13%	29%	16%
User-defined Targets	15%	27%	12%

vSphere 6 Features

vRealize Operations 6	51%
VMware Integrated OpenStack	47%
Vols	24%

New Enterprise Expectation: Proactive Remediation

The storage startups have created a new enterprise expectation for their storage systems—the availability of proactive remediation based on storage analytics. In most cases, both the vendor and the IT staff have access to the storage analytics data as an aid to problem remediation and capacity planning. Nine out of ten AFA's in this Buyer's Guide support this capability.

Support for VMware Storage Primitives

Support for VMware storage primitives for automating and optimizing storage operations saw strong growth. All three VAAI 4.1 features are now supported by 96% of the arrays, and other key API's also saw double-digit increases. Support for recently released vSphere 6 features is already strong.

VMware VAAI

	2014-15	2015-16	Increase
VAAI 4.1	67%	96%	29%
SCSI UNMAP	44%	86%	42%
Full File Clone	31%	59%	28%

VMware Storage API's

	2014-15	2015-16	Increase
Storage DRS	41%	83%	42%
VASRM	33%	75%	42%
VASA	49%	67%	18%
SIOC	51%	63%	12%
VADP	23%	55%	32%

Feature Areas Where DCIG Expects to See Improvement

Application-aware Storage / Storage-aware Applications

As noted above, flash memory storage creates new opportunities for integration with key enterprise applications. These API-based integrations enable the passing of hints between applications and storage. Whether this is viewed as "application-aware storage" or "storage-aware applications," the results can include dramatic increases in application performance and/or data efficiency. This is an area of real and growing opportunity for storage vendors and enterprises.

Use of NVDIMM, PCIe and NVMe to Enhance Performance

The current performance bottleneck within AFA's is generally the bus over which data passes and the use of disk-oriented serial protocols to pass that data. All the ecosystem elements are coming together to enable the use of NVDIMM, PCIe and NVMe in storage systems. These technologies will enable much lower latencies and higher bandwidth than SAS and SATA.

Smaller but still significant improvements in storage system performance will come from more vendors adopting 12 Gb SAS to connect to SSDs. Improvements in throughput will also be realized as more vendors transition to higher speed 16 Gb FC and 25, 40, 50 and 100 Gb Ethernet technologies for front-end connectivity.

Even Greater Capacity and Density

Multiple SSD vendors recently announced SSDs with capacities of up to 16TB per SSD. The transition to 3D NAND is a key enabler for increasing the capacity flash storage devices and the arrays that are built with them. AFA raw flash density will surely more than triple in the next 18 months, to more than 150 TB/U.

DCIG Observations & Recommendations

Best-in-Class Ranking

Observations

The HP 3PAR StoreServ 20000 Series earned the *Best-in-Class* ranking among the all-flash arrays evaluated. In comparison to its counterparts, the 3PAR StoreServ 20000 Series array stood out in the following ways:

- Achieved the *Best-in-Class* rank in 3 out of 4 categories.
- Multi-protocol SAN, NAS and Object access with support for data migration to OpenStack clouds.
- Robust VMware and Microsoft technology support including VMware VVols and Microsoft SCVMM, ODX and SMB3.

Recommendations

The HP 3PAR StoreServ product line is known for its scalability and highly available mesh-active controller architecture. The HP 3PAR StoreServ 20000 Series scales to 8 controllers, 896 GB cache and 4 PB of raw all-flash capacity. The 3PAR StoreServ 20000 packs 46 TB per rack unit (TB/U) making it one of the highest density arrays in this guide.

Designed for enterprise consolidation, 3PAR StoreServ 20000 claims 3M+ IOPS with sub-millisecond latencies. To attain this level of performance, the 3PAR StoreServ arrays utilize the HP 3PAR Gen5 Thin Express ASICs (Application Specific Integrated Circuit) specifically programmed to manage flash, including inline deduplication, and optimize its performance. This performance is available to every workload because the 3PAR StoreServ 20000 Series offers multi-protocol unified SAN, NAS and object access via 16Gb FC and 10Gb Ethernet host-facing ports.

The HP 3PAR StoreServ's wide-striping technology places small chunks of data across all drives in a system to harness their collective throughput.

The array also supports an extensive suite of automated policy-based provisioning capabilities. Storage templates can include SLA/QoS requirements or use policies to automatically select the appropriate storage location. Extensive QoS options include guaranteed minimum or maximum IOPS, bandwidth and system response time for each volume. Furthermore, APIs are available for use by 3rd party automation tools and a SDK is available for integrating with management software. These and other HP 3PAR StoreServ capabilities minimize or eliminate redundant tasks and free IT staff to focus on other business priorities.

Recommended Ranking

Observations

Recommended ranking was achieved by the HP 3PAR StoreServ 7000c series and the NetApp AFF8000 series arrays. Features that distinguish these arrays from many lower ranked arrays:

- A fabric-based or mesh-based scale-out architecture.
- Ranked *Recommended* in at least 2 scoring categories.
- Concurrent SAN & NAS support without separate filer head.

Recommendations

The HP 3PAR StoreServ 7000c Series arrays feature the same mesh-active controller architecture and software as the *Best-in-Class* 3PAR StoreServ 20000 Series. The 3PAR StoreServ 7000c boasts up to 32 CPU cores, 192 GB DRAM and 921 TB of raw flash capacity. The 7000c supports 10Gb Ethernet and 16Gb Fibre Channel interfaces.

HP released the 3PAR StoreServ 8000 Series as a replacement for the 7000c Series after scoring for this Buyer's Guide had concluded. The 8000 Series features twice the DRAM cache, twice the flash capacity, more CPU cores, and the HP 3PAR Gen5 Thin Express ASIC.

HP includes Performance Monitoring, Thin Deduplication and Thin Provisioning features with all HP 3PAR StoreServ arrays described in this Buyer's Guide. Replication (including Synchronous Replication), Automated Storage Tiering, Snapshots and Application-aware Snapshots are available through license key purchases.

NetApp AFF8000 Series (All Flash FAS) data services are provided by the full-featured Data ONTAP storage operating system. Clustered Data ONTAP enables up to twenty-four (24) AFF8000 series controllers to participate in a cluster in twelve (12) high-availability pairs. Data ONTAP FlashEssentials provides the flash-optimized technologies, such as inline compression and zero-based inline deduplication, which reduce latency and increase flash media endurance.

NetApp AFF8000 series arrays support data migration to a wide range of public cloud storage providers. This is due in part to the broad adoption of NetApp FAS by public storage providers. Enterprise data that is stored on NetApp arrays in public cloud provider data centers can be managed as part of a Clustered Data ONTAP storage system.

Although NetApp has generally taken an a-la-carte approach to licensing, these arrays include licenses for five of the six commonly licensed features that DCIG researched. Those features include Automated Storage Tiering, Performance Monitoring, Snapshots, Application-aware Snapshots and Thin Provisioning.

Excellent Ranking

Observations

Excellent rankings were achieved by (listed alphabetically): AMI StorTrends 3600i Series, Dell Compellent SC8000, Hitachi Data Systems HUS VM, IBM FlashSystem V9000, Pure Storage FlashArray//m Series, and Tegile IntelliFlash T3000 Series. Features that distinguish these arrays from many lower ranked arrays:

- Ranked *Excellent* or better in 2 scoring categories.
- More extensive virtualization feature support.

Recommendations

The AMI StorTrends 3600i Series led all vendors with a *Best-in-Class* rank for Support, which features a five-year standard warranty, remote monitoring and proactive remediation.

The StorTrends 3600i Series supports in-line deduplication and compression as well as lossless deduplication which helps eliminate silent data corruption by read verifying all potential duplicates rather than relying solely on hashes during deduplication.

The Dell Compellent SC8000 ranked *Excellent* in 3 of the 4 scoring categories. It scales to 1.8 PB of raw flash capacity. The SC8000 provides data center flexibility by its ability to be managed from various interfaces including OpenStack Cinder, REST API, SMI-S and VMware vCenter. File protocol support can be added through the purchase of Compellent FS8600 NAS filer heads. The separately licensed Live Volume software provides flexible synchronous and asynchronous replication features that are also key to its Non-Disruptive Operations capabilities.

Hitachi Data Systems HUS VM ranked *Excellent* in the Management and Virtualization categories. Topping out at 2 PB of raw all-flash capacity puts it in the top 5 in total capacity of all arrays in the Buyer's Guide. In addition, the HUS VM also supports data migration to OpenStack compatible and Amazon S3 clouds.

The HUS VM stores metadata in DRAM or NVRAM and separate from the primary data path. The separation of data optimizes functions such as deduplication, compression and snapshots, while simultaneously accelerating all I/O.

The IBM FlashSystem V9000 provides advanced data services, including replication, data protection, and higher storage efficiency with thin provisioning and compression. The array scales to 840 TB of raw flash capacity in custom-engineered flash modules, and offers an option for hardware-accelerated Real-time Compression.

Comprehensive virtualization support such as Microsoft ODX, VMware VASA, VAAI and SIOC ensures compatibility in almost any data center deployment scenario and non-disruptive upgrade options eliminate downtime during upgrades or component failures.

The Pure Storage FlashArray//m Series replaces the FA-400 series of products. This chassis-based design allows for modular expansion and non-disruptive upgrades. The FlashArray//m arrays integrate the latest innovations in NVDIMM and NVMe connected flash in pursuit of extra-low latency. Pure Storage arrays run the designed for flash Purity operating environment. According to the Pure Storage "Flash Reduce Ticker" their customers are achieving an average inline data reduction rate of 5.36:1.

Tegile's IntelliFlash architecture is at the heart of all of the T3000 series arrays. Tegile's IntelliFlash Metadata Accelerated technology separates metadata from the primary data path, storing the metadata on high-performance memory devices. This separation of data optimizes functions such as inline deduplication, inline compression and snapshots, while simultaneously accelerating all I/O.

Tegile is the only array in the *Excellent* category that supports integrated SAN and NAS protocol support

without a separate NAS filer head or the purchase of a separate feature license key to enable NAS protocols.

Good Ranking

Observations

The products that achieved an overall *Good* or even *Basic* ranking are all fine products that are rightly being selected by real businesses every day to meet diverse requirements. Nine arrays from nine different vendors achieved the *Good* ranking in this Buyer's Guide: Dell EqualLogic PS6210S, FUJITSU Storage ETERNUS DX200F, iXsystems TrueNAS Z50 TrueFlash, Kaminario K2 All-Flash Storage Array, Nimbus Data Gemini Series, Oracle FS1-2, Pure Storage FA-400 Series, SolidFire SF Series, Violin Memory Violin 7000 Flash Storage Platform Series (shown alphabetically). Arrays in the *Good* ranking are generally characterized by:

- A more limited feature set than higher scoring arrays, though six arrays achieved *Excellent* in at least one scoring category.
- Less robust virtualization support.
- Only two arrays support data migration to the cloud.

Recommendations

The Dell EqualLogic PS6210S ranked *Excellent* in Virtualization by supporting Microsoft ODX, VAAI API's, VASA, Virtual Volumes and others. The PS6210S provides up to 19.2TB of raw flash capacity per appliance. The PS6210S supports features such as policy-based storage selection and a self-service portal simplifying management and reducing the workload for IT staff.

The FUJITSU Storage ETERNUS DX200F is based on the high-performance standard architecture of the ETERNUS DX series. Although the ETERNUS DX200F only scales to 38.4TB of raw flash storage, it comes pre-configured for rapid installation. The DX200F supports a broad spectrum of virtualization features from both Microsoft and VMware earning it an *Excellent* rank in the Virtualization category.

iXsystems TrueNAS Z50 TrueFlash ranked *Excellent* in two scoring categories. It is one of only three arrays, ranked as *Good*, that offer unified SAN/NAS without a separate filer head. iXsystems provides remote monitoring and proactive remediation as part of their standard 3 year warranty.

Kaminario K2 is one of the few arrays that offers both scale-out capacity expansion and scale-up performance expansion. K2 currently offers up to sixteen rack-mountable scale-up controllers. Kaminario supports non-disruptive controller and storage shelf additions, controller replacement and firmware upgrades enhancing its overall availability. Kaminario recently announced an upgrade to the K2 that will increase storage density by more than 2x and reduce effective cost to $1/GB.

The Nimbus Data Gemini Series ranked *Good* across all scoring categories. Nimbus supports unified management and data center flexibility as it can be managed from OpenStack Cinder, REST API and VMware vCenter.

Oracle FS1-2 is a scale-out SAN with robust QoS and Automated Storage Tiering options. The FS1 offers up to two tiers of flash with an optional, additional two tiers of disk to provide a *four-tier* storage architecture with data intelligently and automatically moved between tiers. Although marketed as a SAN, the FS1-2 is a unified platform in reality because it also supports NAS protocols—and that without a separate filer head. The FS1-2 can scale to 16 nodes, each with up to 912TB of raw flash capacity.

In addition to support for industry standard virtualization, the system supports specialized integrations with Oracle databases (HCC and ADO). These proprietary Oracle API's enable the FS1-2 to optimize Oracle Database 12c capacity and performance in ways that non-Oracle storage systems do not.

The Pure Storage FA-400 Series is being replaced by the new FlashArray//m. The FA-400 Series is included in this guide since the products were still orderable and was the primary product when DCIG concluded our research.

The SolidFire SF Series is a shared-nothing scale-out storage system that scales out to 100 nodes. SolidFire is one of three arrays in this Buyer's Guide that utilize erasure coding; which provides redundancy and resiliency by breaking data into smaller fragments and storing those fragments in different locations. SolidFire initially focused on cloud service providers and is gaining traction in enterprises adopting an ITaaS approach.

Violin Memory Violin 7000 Flash Storage Platform Series arrays are performance focused; featuring modular, custom-designed flash modules. The Flash Storage

Platform arrays scale to 700 TB and feature large DRAM cache of up to 512GB and up to 32 CPU cores. The new FSP arrays feature much more complete enterprise data services than the earlier 6100 series arrays including in-line deduplication and compression, and thin provisioning.

Basic Ranking

Observations

Ten arrays earned a *Basic* ranking. Arrays in this ranking generally have the following characteristics:

- Have a less comprehensive feature set overall, as most achieve only a *Basic* ranking in two or more categories.
- Most of these arrays have only limited virtualization functionality.
- Most offer no or minimal QoS or automated provisioning features.

Recommendations

When considering an array ranked as *Basic*, an organization should have a solid grasp on its particular business requirements and then let those needs determine which solution is the best fit. A *Basic* array may be perfectly suitable to address the need that prompted the organization to begin looking at all-flash arrays in the first place. For example, applications that require extremely low latency may benefit from a *Basic* array that intentionally excludes certain software-driven features which add latency to the I/O path.

Dell targets the Dell Storage SC4020 for small to medium sized businesses. It shares in nearly all the SC8000's software and management capabilities, but in a much less scalable hardware platform. As such, it may not surprising that it scored lower than arrays targeting the large enterprise market.

The EMC VNXe3200 is EMC's unified all-flash array. With limited scalability, it is targeted for small to midsize businesses. However, the VNXe3200 inherits mature VNX software features.

EMC XtremeIO X-Brick delivers essential VMware VAAI integrations and some data efficiency technologies including thin provisioning, in-line deduplication and compression. Metadata is stored in DRAM rather than NVRAM or DRAM backed by flash, so uninterruptible power supplies are required in order to protect critical metadata from loss.

The Huawei OceanStor 18800F ranked *Good* in the Hardware category offering 57 TB per appliance.

The IBM FlashSystem 900 uses an all-hardware data path—eliminating software from the data path in order to achieve the lowest possible latency. This focus on hardware is reflected in the *Excellent* rank achieved by the array in that category. The FlashSystem 900 purposefully eschews a richer set of data services in order to achieve maximum performance. Enterprises requiring a full set of data services should look to the FlashSystem V9000, which shares the same storage hardware but adds IBM SVC capabilities.

The NetApp EF-Series is a SAN-only array supporting up to 192 TB of raw capacity. The EF-Series does not support data services such as deduplication or compression but did rank *Good* in virtualization support.

Violin Memory Violin Windows Flash Array (WFA) is the only Microsoft Windows based array in this Buyer's Guide. Unsurprisingly, the WFA is tightly integrated with everything Microsoft—Hyper-V, MS SQL and Azure.

Violin Memory Violin 6264 is one of the arrays that targets the requirements of early AFA adopters. The 6264 lacks many of DCIG's surveyed virtualization features. Violin Memory also offers a 'Pay as You Grow' licensing option to reduce the initial cost barrier.

Violin Memory Violin 6100 Series is a value-based array targeted at the small to midsize organization. Like its big brother, the 6100 has near identical software and management capabilities, but with half the raw flash capacity of the 6264 series.

The X-IO Technologies ISE 860 G3 is a FC and iSCSI SAN appliance scaling to 51.2TB of raw flash storage. The array supports an active-active controller configuration and can be managed from within vSphere, Microsoft SCVMM or OpenStack. The array is distinguished by a 5-year hardware warranty.

ALL-FLASH ARRAY RANKINGS

OVERALL RANKINGS

Products Listed Alphabetically in Each Category

BEST-IN-CLASS	HP 3PAR StoreServ 20000 Series
RECOMMENDED	HP 3PAR StoreServ 7000c Series NetApp AFF8000 Series
EXCELLENT	AMI StorTrends 3600i Series Dell Compellent SC8000 Hitachi Data Systems HUS VM IBM FlashSystem V9000 Pure Storage FlashArray//m Series Tegile IntelliFlash T3000 Series
GOOD	Dell EqualLogic PS6210S FUJITSU Storage ETERNUS DX200F iXsystems TrueNAS Z50 TrueFlash Kaminario K2 All-Flash Storage Array Nimbus Data Gemini Series Oracle FS1-2 Pure Storage FA-400 Series SolidFire SF Series Violin Memory Violin 7000 Flash Storage Platform Series
BASIC	Dell Storage SC4020 EMC VNXe3200 Unified All-Flash Array EMC XtremIO X-Brick Huawei OceanStor 18800F IBM FlashSystem 900 NetApp EF-Series Violin Memory Violin 6100 Series Violin Memory Violin 6264 Violin Memory Windows Flash Array X-IO Technologies ISE 860 G3 All Flash Array

ALL-FLASH ARRAY PRODUCTS

AMI StorTrends 3600i Series

Approximate Starting List Price: $42,999

2015-16 DCIG BUYER'S GUIDE ALL-FLASH ARRAY

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
EXCELLENT	GOOD	EXCELLENT	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✗ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✓
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✗ / ✗
IPMI / SMI-S (SCVMM)	✓ / ✗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✗
Encryption (Array-based / Self-encrypting Drives)	✓ / ✓

Flash Memory Optimization	
Write Coalescing / Variable Stripe Size	✗ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	11
VASA / SIOC	✗ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✗ / ✓
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	256 TB
Raw Flash Capacity per Cluster ***MAX***	256 TB
Raw Flash Storage Density ***MAX***	18.6 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	192 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	32
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✗ / ✓
Storage Networking Ports ***MAX***	12
Ethernet Ports 1/10 Gb ***MAX***	12 / 8
FC Ports 8/16 Gb ***MAX***	✗ / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	5 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Dell Compellent SC8000

Approximate Starting List Price: $50,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✗ / ✓
Compression (In-line / Post-process)	✗ / ✓
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✓
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✓

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	9
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	1,834 TB
Raw Flash Capacity per Cluster ***MAX***	1,843 TB
Raw Flash Storage Density ***MAX***	11.52 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	128 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	4 GB
Controller Config (Active-Active / Dual-Active)	✗ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	24
Scale-out Rack Mount Controllers ***MAX***	2
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	48
Ethernet Ports 1/10 Gb ***MAX***	24 / 24
FC Ports 8/16 Gb ***MAX***	48 / 24

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Dell EqualLogic PS6210S

Approximate Starting List Price: $90,100

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	GOOD	EXCELLENT	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✗ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✗
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✓
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✓
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✗
IPMI / SMI-S (SCVMM)	✗ / ✗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI *TOTAL #*	6
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✓ / ✓

HARDWARE

Raw Flash Capacity per Appliance *MAX*	19.2 TB
Raw Flash Capacity per Cluster *MAX*	307 TB
Raw Flash Storage Density *MAX*	9.6 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache *MAX, 2 CONTROLLERS*	32 GB
NVRAM Cache *MAX, 2 CONTROLLERS*	✗
Controller Config (Active-Active / Dual-Active)	✗ / ✗
CPU Cores *MAX, 2 CONTROLLERS*	8
Scale-out Rack Mount Controllers *MAX*	16
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✗ / ✓
Storage Networking Ports *MAX*	4
Ethernet Ports 1/10 Gb *MAX*	4 / 4
FC Ports 8/16 Gb *MAX*	✗ / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Dell Storage SC4020

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	GOOD	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✗ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✓
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✓
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✗
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✗ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✗

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	5
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	504 TB
Raw Flash Capacity per Cluster ***MAX***	504 TB
Raw Flash Storage Density ***MAX***	23.04 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	32 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✗ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	8
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	12
Ethernet Ports 1/10 Gb ***MAX***	4 / 4
FC Ports 8/16 Gb ***MAX***	8 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✗
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, bu which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

EMC VNXe3200 Unified All-Flash Array

Approximate Starting List Price: $12,480

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	GOOD	GOOD	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✓ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✗
Thin Provisioning / Zero Page Reclamation	✓ / ✗
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✗ / ✓
Compression (In-line / Post-process)	✗ / ✓
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✓
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✗
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✗
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✗
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✗
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✓ / ✓
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✗

Flash Memory Optimization	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✗

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	6
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	20 TB
Raw Flash Capacity per Cluster ***MAX***	120 TB
Raw Flash Storage Density ***MAX***	10 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	48 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✗ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	8
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	16
Ethernet Ports 1/10 Gb ***MAX***	8 / 16
FC Ports 8/16 Gb ***MAX***	8 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✗
Controller Code Upgrades / Data Migration	✗ / ✗
Storage Shelf or Node Addition	✗

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ **Supported** ✗ **Unsupported / Undetermined**

All information on this data sheet is based entirely on publicly available information and DCIG's own knowledge of the product. This information reflects DCIG's opinion about this product as no information was provided by the vendor.

EMC XtremIO X-Brick

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	BASIC	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✓ / ✗
Asynchronous Replication (Continuous / Periodic)	✗ / ✗
Synchronous Replication	✗
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✗
Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✗
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✓
QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗
Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✗
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✗
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓
Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	4
VASA / SIOC	✗ / ✗
VASRM / PSA	✗ / ✗
Storage DRS / ALUA	✗ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	40 TB
Raw Flash Capacity per Cluster ***MAX***	320 TB
Raw Flash Storage Density ***MAX***	7.44 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	128 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	32
Scale-out Rack Mount Controllers ***MAX***	8
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	8
Ethernet Ports 1/10 Gb ***MAX***	4 / 4
FC Ports 8/16 Gb ***MAX***	4 / ✗
Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✗

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✗
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

All information on this data sheet is based entirely on publicly available information and DCIG's own knowledge of the product. This information reflects DCIG's opinion about this product as no information was provided by the vendor.

FUJITSU Storage ETERNUS DX200F

Approximate Starting List Price: $53,200

2015-16 DCIG ALL-FLASH BUYER'S GUIDE ARRAY

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	GOOD	EXCELLENT	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✓ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✗
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✗

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✗ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✗
Encryption (Array-based / Self-encrypting Drives)	✓ / ✓

Flash Memory Optimization	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✓ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	4
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✓ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	38.4 TB
Raw Flash Capacity per Cluster ***MAX***	38.4 TB
Raw Flash Storage Density ***MAX***	19.2 TB/U
Information Dispersal Algorithms (Erasure Coding)	✓
DRAM Cache ***MAX, 2 CONTROLLERS***	16 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	12
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	8
Ethernet Ports 1/10 Gb ***MAX***	8 / 8
FC Ports 8/16 Gb ***MAX***	8 / 8

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Hitachi Data Systems HUS VM

Approximate Starting List Price: $150,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
EXCELLENT	EXCELLENT	EXCELLENT	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✗ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✗ / ✓
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✓
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✓

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✓ / ✓
NFS / SMB	✗ / ✗
REST API for Object Storage	✓
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✗
Hardware Accelerated Compression / Proprietary	✓ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	10
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✓ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	2,000 TB
Raw Flash Capacity per Cluster ***MAX***	2,000 TB
Raw Flash Storage Density ***MAX***	16 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	256 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	108 GB
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	16
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	48
Ethernet Ports 1/10 Gb ***MAX***	4 / 4
FC Ports 8/16 Gb ***MAX***	48 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

HP 3PAR StoreServ 7000c Series

Approximate Starting List Price: $40,000

2015-16 DCIG BUYER'S GUIDE ALL-FLASH ARRAY

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
RECOMMENDED	RECOMMENDED	BEST-IN-CLASS	RECOMMENDED

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✗ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✗
Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓
QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✓ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✓
Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✓ / ✗
NFS / SMB	✓ / ✓
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓
Flash Memory Optimization	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	10
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✓ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	921.6 TB
Raw Flash Capacity per Cluster ***MAX***	921.6 TB
Raw Flash Storage Density ***MAX***	46.08 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	192 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	16
Scale-out Rack Mount Controllers ***MAX***	4 controllers in 2 appliances
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	24
Ethernet Ports 1/10 Gb ***MAX***	16 / 8
FC Ports 8/16 Gb ***MAX***	24 / 8
Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

HP 3PAR StoreServ 8000 Series

Approximate Starting List Price: $40,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware

HP released the 3PAR StoreServ 8000 Series as a replacement to the 7000c Series after scoring for this Buyer's Guide had concluded. Therefore no rankings were assigned.

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✗ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✓ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✓ / ✗
NFS / SMB	✓ / ✓
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	10
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✓ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	1,843 TB
Raw Flash Capacity per Cluster ***MAX***	1,843 TB
Raw Flash Storage Density ***MAX***	46.08 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	384 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	18
Scale-out Rack Mount Controllers ***MAX***	4 controllers in 2 appliance
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	24
Ethernet Ports 1/10 Gb ***MAX***	0 / 16
FC Ports 8/16 Gb ***MAX***	0 / 24

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

HP 3PAR StoreServ 20000 Series

Approximate Starting List Price: $400,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BEST-IN-CLASS	BEST-IN-CLASS	BEST-IN-CLASS	BEST-IN-CLASS

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✗ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✓ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✓ / ✗
NFS / SMB	✓ / ✓
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	10
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✓ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	3,932 TB
Raw Flash Capacity per Cluster ***MAX***	4,323 TB
Raw Flash Storage Density ***MAX***	46.08 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	896 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	32
Scale-out Rack Mount Controllers ***MAX***	8 controllers in 4 appliances
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	20
Ethernet Ports 1/10 Gb ***MAX***	0 / 10
FC Ports 8/16 Gb ***MAX***	0 / 20

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Huawei OceanStor 18800F

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	BASIC	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✗ / ✓
Snapshots / Application-aware Snapshots	✓ / ✗
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✗
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✗

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✓ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✗ / ✗
IPMI / SMI-S (SCVMM)	✗ / ✗
vCenter / Web-based	✗ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✗
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✗ / ✗
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✗
Encryption (Array-based / Self-encrypting Drives)	✗ / ✗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✗

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✗ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✗
VMware VAAI ***TOTAL #***	4
VASA / SIOC	✓ / ✗
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✗ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	57 TB
Raw Flash Capacity per Cluster ***MAX***	921 TB
Raw Flash Storage Density ***MAX***	✗ TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	192 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	16
Scale-out Rack Mount Controllers ***MAX***	8
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	16
Ethernet Ports 1/10 Gb ***MAX***	16 / 16
FC Ports 8/16 Gb ***MAX***	16 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✗ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✗ / ✗
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

All information on this data sheet is based entirely on publicly available information and DCIG's own knowledge of the product. This information reflects DCIG's opinion about this product as no information was provided by the vendor.

IBM FlashSystem 900

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	BASIC	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✗
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✗ / ✗
Asynchronous Replicabon (Continuous / Periodic)	✗ / ✗
Synchronous Replication	✗
Thin Provisioning / Zero Page Reclamation	✗ / ✗
Automated Storage Reclamation (Native / Symantec)	✗ / ✗
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✓
Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓
QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗
Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✗
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓
Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✗
VMware VAAI ***TOTAL #***	1
VASA / SIOC	✓ / ✗
VASRM / PSA	✗ / ✓
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	105 TB
Raw Flash Capacity per Cluster ***MAX***	105 TB
Raw Flash Storage Density ***MAX***	52 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	✗
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	✗
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	16
Ethernet Ports 1/10 Gb ***MAX***	16 / 16
FC Ports 8/16 Gb ***MAX***	16 / 8
Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

IBM FlashSystem V9000

Approximate Starting List Price: $231,796

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
EXCELLENT	EXCELLENT	EXCELLENT	RECOMMENDED

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✗ / ✗
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✓
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✓ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✗
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✓ / ✓
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✓ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	7
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✗ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	525 TB
Raw Flash Capacity per Cluster ***MAX***	840 TB
Raw Flash Storage Density ***MAX***	37.5 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	128 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	32
Scale-out Rack Mount Controllers ***MAX***	8
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	16
Ethernet Ports 1/10 Gb ***MAX***	8 / 8
FC Ports 8/16 Gb ***MAX***	16 / 8

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

iXsystems TrueNAS Z50 TrueFlash

Approximate Starting List Price: $30,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	GOOD	GOOD	EXCELLENT

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	⊗
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ⊗
Deduplication (In-line / Post-process)	✓ / ⊗
Compression (In-line / Post-process)	✓ / ⊗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	⊗ / ✓
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ⊗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	⊗
Self-service Portal	⊗
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	⊗ / ⊗
User Assigns LUN/VM to Pre-defined Service Levels	⊗

Management Methods	
OpenStack Cinder / REST API	⊗ / ✓
IPMI / SMI-S (SCVMM)	✓ / ⊗
vCenter / Web-based	⊗ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	⊗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	⊗ / ⊗
NFS / SMB	✓ / ✓
REST API for Object Storage	⊗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ⊗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	⊗ / ⊗
Hardware Accelerated Compression / Proprietary	⊗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	6
VASA / SIOC	⊗ / ⊗
VASRM / PSA	⊗ / ⊗
Storage DRS / ALUA	⊗ / ⊗
Virtual Volumes / vRealize Operations 6	⊗ / ⊗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	30 TB
Raw Flash Capacity per Cluster ***MAX***	30 TB
Raw Flash Storage Density ***MAX***	10 TB/U
Information Dispersal Algorithms (Erasure Coding)	⊗
DRAM Cache ***MAX, 2 CONTROLLERS***	512 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	30,016 GB
Controller Config (Active-Active / Dual-Active)	⊗ / ⊗
CPU Cores ***MAX, 2 CONTROLLERS***	32
Scale-out Rack Mount Controllers ***MAX***	⊗
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	10
Ethernet Ports 1/10 Gb ***MAX***	10 / 8
FC Ports 8/16 Gb ***MAX***	4 / 0

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	⊗

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ⊗ Unsupported / Undetermined

Kaminario K2 All-Flash Storage Array

Approximate Starting List Price: $70,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	GOOD	BASIC	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✗
Encryption (Array-based / Self-encrypting Drives)	✓ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✗ / ✓
RHEV / VMware ESX/ESXi	✗ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	7
VASA / SIOC	✗ / ✗
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	92.16 TB
Raw Flash Capacity per Cluster ***MAX***	737.28 TB
Raw Flash Storage Density ***MAX***	15.36 TB/U
Information Dispersal Algorithms (Erasure Coding)	✓
DRAM Cache ***MAX, 2 CONTROLLERS***	256 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	512 GB
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	8
Scale-out Rack Mount Controllers ***MAX***	16
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	32
Ethernet Ports 1/10 Gb ***MAX***	32 / 32
FC Ports 8/16 Gb ***MAX***	16 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

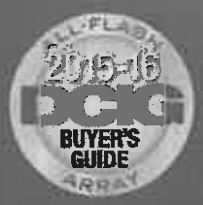
Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	1 Year

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

NetApp AFF8000 Series

Approximate Starting List Price: $156,000



DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
RECOMMENDED	RECOMMENDED	RECOMMENDED	EXCELLENT

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✗ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✗ / ✓
Compression (In-line / Post-process)	✓ / ✓
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✓ / ✓

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✗
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✓ / ✓
NFS / SMB	✓ / ✓
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	7
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✓ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	384 TB
Raw Flash Capacity per Cluster ***MAX***	4,608 TB
Raw Flash Storage Density ***MAX***	19.2 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	256 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	32 GB
Controller Config (Active-Active / Dual-Active)	✓ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	40
Scale-out Rack Mount Controllers ***MAX***	24
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	72
Ethernet Ports 1/10 Gb ***MAX***	72 / 64
FC Ports 8/16 Gb ***MAX***	64 / 64

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

NetApp EF-Series

Approximate Starting List Price: Over $100,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	GOOD	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✗
Asynchronous Replication (Continuous / Periodic)	✗ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✗
Automated Storage Reclamation (Native / Symantec)	✗ / ✗
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✓
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✗
vCenter / Web-based	✓ / ✗

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✗
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✗
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✓
Authentication Methods (LDAP / ADS)	✗ / ✗
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✗ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	3
VASA / SIOC	✓ / ✗
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	192 TB
Raw Flash Capacity per Cluster ***MAX***	192 TB
Raw Flash Storage Density ***MAX***	19.2 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	24 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✗ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	12
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	8
Ethernet Ports 1/10 Gb ***MAX***	8 / 8
FC Ports 8/16 Gb ***MAX***	8 / 8

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

All information on this data sheet is based entirely on publicly available information and DCIG's own knowledge of the product. This information reflects DCIG's opinion about this product as no information was provided by the vendor.

Nimbus Data Gemini Series

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	GOOD	GOOD	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✓ / ✓
REST API for Object Storage	✓
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✓ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	9
VASA / SIOC	✓ / ✓
VASRM / PSA	✗ / ✓
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	48 TB
Raw Flash Capacity per Cluster ***MAX***	1,000 TB
Raw Flash Storage Density ***MAX***	24 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	128 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	24
Scale-out Rack Mount Controllers ***MAX***	4
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✗ / ✓
Storage Networking Ports ***MAX***	8
Ethernet Ports 1/10 Gb ***MAX***	8 / 8
FC Ports 8/16 Gb ***MAX***	0 / 0

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	1 Year

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Oracle FS1-2

Approximate Starting List Price: $90,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	GOOD	GOOD	EXCELLENT

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✗
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✗
Automated Storage Reclamation (Native / Symantec)	✗ / ✗
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✓ / ✓
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗
Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓
QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✓
Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✗
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓
Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✗ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✗
VMware VAAI ***TOTAL #***	7
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	912 TB
Raw Flash Capacity per Cluster ***MAX***	912 TB
Raw Flash Storage Density ***MAX***	14.25 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	416 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	32 GB
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	24
Scale-out Rack Mount Controllers ***MAX***	16
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✗
Storage Networking Ports ***MAX***	16
Ethernet Ports 1/10 Gb ***MAX***	16 / 116
FC Ports 8/16 Gb ***MAX***	12 / 12
Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	1 Year

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Pure Storage FA-400 Series

Approximate Starting List Price: Over $100,000

2015-16 DCIG BUYER'S GUIDE ALL-FLASH ARRAY

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	EXCELLENT	GOOD	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✗ / ✓
Synchronous Replication	✗
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✓ / ✓
Compression (In-line / Post-process)	✓ / ✓
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✗
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✗

Flash Memory Optimization	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✓ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	7
VASA / SIOC	✗ / ✓
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	70 TB
Raw Flash Capacity per Cluster ***MAX***	70 TB
Raw Flash Storage Density ***MAX***	11.6 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	1,024 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	8 GB
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	24
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	12
Ethernet Ports 1/10 Gb ***MAX***	12 / 12
FC Ports 8/16 Gb ***MAX***	12 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Pure Storage FlashArray//m Series

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
EXCELLENT	GOOD	GOOD	EXCELLENT

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	⊗ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ⊗
Asynchronous Replication (Continuous / Periodic)	⊗ / ✓
Synchronous Replication	⊗
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✓ / ⊗
Compression (In-line / Post-process)	✓ / ⊗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	⊗ / ⊗
Metadata Stored Separately	⊗
Metadata Stored in DRAM / NVRAM	⊗ / ⊗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	⊗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	⊗ / ⊗
User Assigns LUN/VM to Pre-defined Service Levels	⊗

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	⊗ / ⊗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	⊗ / ⊗
Unified Management	✓
Multi-tenancy	⊗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	⊗ / ⊗
NFS / SMB	⊗ / ⊗
REST API for Object Storage	⊗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ⊗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✓ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ⊗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	⊗
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	7
VASA / SIOC	⊗ / ✓
VASRM / PSA	✓ / ✓
Storage DRS / ALUA	✓ / ⊗
Virtual Volumes / vRealize Operations 6	⊗ / ✓

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	136 TB
Raw Flash Capacity per Cluster ***MAX***	136 TB
Raw Flash Storage Density ***MAX***	12.4 TB/U
Information Dispersal Algorithms (Erasure Coding)	⊗
DRAM Cache ***MAX, 2 CONTROLLERS***	1,000 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	32 GB
Controller Config (Active-Active / Dual-Active)	✓ / ⊗
CPU Cores ***MAX, 2 CONTROLLERS***	64
Scale-out Rack Mount Controllers ***MAX***	⊗
Concurrent SAN & NAS / without Separate Filer Head	⊗ / ⊗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	12
Ethernet Ports 1/10 Gb ***MAX***	12 / 12
FC Ports 8/16 Gb ***MAX***	12 / 12

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ⊗
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, bu which were not included in this data sheet.

✓ Supported ⊗ Unsupported / Undetermined

SolidFire SF Series

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	EXCELLENT	GOOD	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✓
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✓ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✗
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✓ / ✓
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✓

Flash Memory Optimization	
Write Coalescing / Variable Stripe Size	✓ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✗
VMware VAAI *TOTAL #*	4
VASA / SIOC	✓ / ✓
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✓

HARDWARE

Raw Flash Capacity per Appliance *MAX*	9.6 TB
Raw Flash Capacity per Cluster *MAX*	960 TB
Raw Flash Storage Density *MAX*	9.6 TB/U
Information Dispersal Algorithms (Erasure Coding)	✓
DRAM Cache *MAX, 2 CONTROLLERS*	256 GB
NVRAM Cache *MAX, 2 CONTROLLERS*	8 GB
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores *MAX, 2 CONTROLLERS*	16
Scale-out Rack Mount Controllers *MAX*	100
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports *MAX*	2
Ethernet Ports 1/10 Gb *MAX*	2 / 2
FC Ports 8/16 Gb *MAX*	4 / 4

Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	1 Year

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Tegile IntelliFlash T3000 Series

Approximate Starting List Price: $90,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
EXCELLENT	EXCELLENT	GOOD	EXCELLENT

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✓ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✗ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✓
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✓
Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✓
QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✓
Management Methods	
OpenStack Cinder / REST API	✗ / ✓
IPMI / SMI-S (SCVMM)	✓ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✓ / ✓
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓
Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✗

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✓
RHEV / VMware ESX/ESXi	✗ / ✓
Microsoft ODX	✓
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	11
VASA / SIOC	✗ / ✗
VASRM / PSA	✗ / ✗
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	336 TB
Raw Flash Capacity per Cluster ***MAX***	336 TB
Raw Flash Storage Density ***MAX***	33.6 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	192 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	32
Scale-out Rack Mount Controllers ***MAX***	✗
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	16
Ethernet Ports 1/10 Gb ***MAX***	16 / 8
FC Ports 8/16 Gb ***MAX***	8 / ✗
Non-Disruptive Operations	
Controller Addition / Replacement	✓ / ✓
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	90 days

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Violin Memory Violin 6100 Series All Flash Array

Approximate Starting List Price: $227,500

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	BASIC	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	⊗ / ⊗
Performance Monitoring / Replication	⊗ / ⊗
Snapshots / Application-aware Snapshots	⊗ / ⊗
Asynchronous Replication (Continuous / Periodic)	⊗ / ⊗
Synchronous Replication	⊗
Thin Provisioning / Zero Page Reclamation	⊗ / ⊗
Automated Storage Reclamation (Native / Symantec)	⊗ / ✓
Deduplication (In-line / Post-process)	⊗ / ⊗
Compression (In-line / Post-process)	⊗ / ⊗
Deduplication for Active Data / Lossless Deduplication	⊗ / ⊗
Automated Storage Tiering (Scheduled / Dynamic)	⊗ / ⊗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	⊗ / ⊗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	⊗
Storage Templates with QoS	⊗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	⊗ / ⊗
User Assigns LUN/VM to Pre-defined Service Levels	⊗

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	⊗ / ⊗
vCenter / Web-based	⊗ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	⊗ / ✓
Unified Management	✓
Multi-tenancy	⊗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	⊗ / ⊗
NFS / SMB	⊗ / ⊗
REST API for Object Storage	⊗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ⊗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	⊗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ⊗
RHEV / VMware ESX/ESXi	⊗ / ✓
Microsoft ODX	⊗
vSphere Snapshot Integration	✓
VMware VAAI *TOTAL #*	3
VASA / SIOC	⊗ / ⊗
VASRM / PSA	⊗ / ⊗
Storage DRS / ALUA	⊗ / ⊗
Virtual Volumes / vRealize Operations 6	⊗ / ⊗

HARDWARE

Raw Flash Capacity per Appliance *MAX*	35 TB
Raw Flash Capacity per Cluster *MAX*	35 TB
Raw Flash Storage Density *MAX*	11.67 TB/U
Information Dispersal Algorithms (Erasure Coding)	⊗
DRAM Cache *MAX, 2 CONTROLLERS*	96 GB
NVRAM Cache *MAX, 2 CONTROLLERS*	⊗ GB
Controller Config (Active-Active / Dual-Active)	✓ / ⊗
CPU Cores *MAX, 2 CONTROLLERS*	⊗
Scale-out Rack Mount Controllers *MAX*	1
Concurrent SAN & NAS / without Separate Filer Head	⊗ / ⊗
FC / iSCSI	✓ / ✓
Storage Networking Ports *MAX*	8
Ethernet Ports 1/10 Gb *MAX*	8 / 8
FC Ports 8/16 Gb *MAX*	8 / ⊗

Non-Disruptive Operations	
Controller Addition / Replacement	⊗ / ✓
Controller Code Upgrades / Data Migration	✓ / ⊗
Storage Shelf or Node Addition	⊗

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ⊗ Unsupported / Undetermined

Violin Memory Violin 6264

Approximate Starting List Price: $465,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	BASIC	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✗
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✗ / ✗
Asynchronous Replication (Continuous / Periodic)	✗ / ✗
Synchronous Replication	✗
Thin Provisioning / Zero Page Reclamation	✗ / ✗
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✗ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✗ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✓
VMware VAAI ***TOTAL #***	3
VASA / SIOC	✓ / ✗
VASRM / PSA	✗ / ✗
Storage DRS / ALUA	✗ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	70 TB
Raw Flash Capacity per Cluster ***MAX***	70 TB
Raw Flash Storage Density ***MAX***	23.3 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	1 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗ GB
Controller Config (Active-Active / Dual-Active)	✓ / ✓
CPU Cores ***MAX, 2 CONTROLLERS***	✗
Scale-out Rack Mount Controllers ***MAX***	1
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports ***MAX***	8
Ethernet Ports 1/10 Gb ***MAX***	8 / 8
FC Ports 8/16 Gb ***MAX***	8 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✗

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, bu which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Violin Memory Violin 7000 Flash Storage Platform Series

Approximate Starting List Price: $519,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
GOOD	GOOD	BASIC	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✓ / ✓
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✓
Deduplication (In-line / Post-process)	✓ / ✗
Compression (In-line / Post-process)	✓ / ✗
Deduplication for Active Data / Lossless Deduplication	✓ / ✓
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✗
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✓

Management Methods	
OpenStack Cinder / REST API	✓ / ✓
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✓
Multi-tenancy	✓
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✓ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✗ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✓
VMware VAAI *TOTAL #*	4
VASA / SIOC	✓ / ✗
VASRM / PSA	✓ / ✗
Storage DRS / ALUA	✓ / ✓
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance *MAX*	700 TB
Raw Flash Capacity per Cluster *MAX*	700 TB
Raw Flash Storage Density *MAX*	19.44 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache *MAX, 2 CONTROLLERS*	512 GB
NVRAM Cache *MAX, 2 CONTROLLERS*	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✓
CPU Cores *MAX, 2 CONTROLLERS*	32
Scale-out Rack Mount Controllers *MAX*	2
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports *MAX*	16
Ethernet Ports 1/10 Gb *MAX*	8 / 8
FC Ports 8/16 Gb *MAX*	8 / 8

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✓

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

Violin Memory Windows Flash Array

Approximate Starting List Price: $300,000

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	GOOD	BASIC	GOOD

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✗ / ✓
Snapshots / Application-aware Snapshots	✓ / ✓
Asynchronous Replication (Continuous / Periodic)	✗ / ✓
Synchronous Replication	✗
Thin Provisioning / Zero Page Reclamation	✓ / ✓
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✗ / ✓
Compression (In-line / Post-process)	✗ / ✓
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✗
Metadata Stored Separately	✓
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✗
Storage Templates with QoS	✗
Self-service Portal	✗
Exposes APIs for 3rd Party Automation	✗

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✗ / ✗
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✗ / ✗
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✗ / ✗

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✓ / ✓
Unified Management	✓
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✓ / ✓
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✓
Encryption (Array-based / Self-encrypting Drives)	✓ / ✗

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✓ / ✓
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✗ / ✗
Microsoft ODX	✓
vSphere Snapshot Integration	✗
VMware VAAI ***TOTAL #***	✗
VASA / SIOC	✗ / ✗
VASRM / PSA	✗ / ✗
Storage DRS / ALUA	✗ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance ***MAX***	70 TB
Raw Flash Capacity per Cluster ***MAX***	280 TB
Raw Flash Storage Density ***MAX***	23.33 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache ***MAX, 2 CONTROLLERS***	192 GB
NVRAM Cache ***MAX, 2 CONTROLLERS***	✗ GB
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores ***MAX, 2 CONTROLLERS***	32
Scale-out Rack Mount Controllers ***MAX***	8
Concurrent SAN & NAS / without Separate Filer Head	✓ / ✓
FC / iSCSI	✗ / ✓
Storage Networking Ports ***MAX***	8
Ethernet Ports 1/10 Gb ***MAX***	8 / 8
FC Ports 8/16 Gb ***MAX***	✗ / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✗
Storage Shelf or Node Addition	✗

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	3 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, bu which were not included in this data sheet.

✓ Supported ✗ Unsupported / Undetermined

X-IO Technologies ISE 860 G3

Approximate Starting List Price: N/A

DCIG Rankings

OVERALL RANK	Management & Software	Virtualization	Hardware
BASIC	BASIC	BASIC	BASIC

MANAGEMENT & SOFTWARE

Feature Licenses Included	
Automated Storage Tiering (AST) / Thin Provisioning	✗ / ✓
Performance Monitoring / Replication	✓ / ✗
Snapshots / Application-aware Snapshots	✓ / ✗
Asynchronous Replication (Continuous / Periodic)	✗ / ✗
Synchronous Replication	✓
Thin Provisioning / Zero Page Reclamation	✓ / ✗
Automated Storage Reclamation (Native / Symantec)	✓ / ✗
Deduplication (In-line / Post-process)	✗ / ✗
Compression (In-line / Post-process)	✗ / ✗
Deduplication for Active Data / Lossless Deduplication	✗ / ✗
Automated Storage Tiering (Scheduled / Dynamic)	✗ / ✓
Metadata Stored Separately	✗
Metadata Stored in DRAM / NVRAM	✗ / ✗

Automated/Policy-based Provisioning	
Policy-based Storage Selection	✓
Storage Templates with QoS	✓
Self-service Portal	✓
Exposes APIs for 3rd Party Automation	✓

QoS Workload Prioritization Options	
User-defined Minimums / Maximums	✓ / ✓
User Assigns LUN/VM to Pre-defined Service Levels	✗

Management Methods	
OpenStack Cinder / REST API	✓ / ✗
IPMI / SMI-S (SCVMM)	✗ / ✓
vCenter / Web-based	✓ / ✓

MANAGEMENT & SOFTWARE *CONT'D*

Quotas / Threshold Alerts	✗ / ✓
Unified Management	✗
Multi-tenancy	✗
Notification and Logging (Phone Home / SNMP)	✓ / ✓
Data Migration to OpenStack / S3	✗ / ✗
NFS / SMB	✗ / ✗
REST API for Object Storage	✗
Authentication Methods (LDAP / ADS)	✗ / ✓
Encryption (Array-based / Self-encrypting Drives)	✗ / ✓

Flash Memory Optimizations	
Write Coalescing / Variable Stripe Size	✗ / ✗
Hardware Accelerated Compression / Proprietary	✗ / ✓

VIRTUALIZATION

Microsoft Hyper-V / Oracle VM	✓ / ✗
RHEV / VMware ESX/ESXi	✓ / ✓
Microsoft ODX	✗
vSphere Snapshot Integration	✗
VMware VAAI *TOTAL #*	4
VASA / SIOC	✓ / ✓
VASRM / PSA	✗ / ✗
Storage DRS / ALUA	✓ / ✗
Virtual Volumes / vRealize Operations 6	✗ / ✗

HARDWARE

Raw Flash Capacity per Appliance *MAX*	51.2 TB
Raw Flash Capacity per Cluster *MAX*	51.2 TB
Raw Flash Storage Density *MAX*	17 TB/U
Information Dispersal Algorithms (Erasure Coding)	✗
DRAM Cache *MAX, 2 CONTROLLERS*	32 GB
NVRAM Cache *MAX, 2 CONTROLLERS*	✗
Controller Config (Active-Active / Dual-Active)	✓ / ✗
CPU Cores *MAX, 2 CONTROLLERS*	12
Scale-out Rack Mount Controllers *MAX*	✗
Concurrent SAN & NAS / without Separate Filer Head	✗ / ✗
FC / iSCSI	✓ / ✓
Storage Networking Ports *MAX*	8
Ethernet Ports 1/10 Gb *MAX*	✗ / 4
FC Ports 8/16 Gb *MAX*	4 / ✗

Non-Disruptive Operations	
Controller Addition / Replacement	✗ / ✓
Controller Code Upgrades / Data Migration	✓ / ✓
Storage Shelf or Node Addition	✗

SUPPORT

Remote Monitoring / Proactive Remediation	✓ / ✓
Hardware Warranty	5 Years

The DCIG Interactive Buyers Guide contains additional data elements that are reflected in the rankings for each array, but which were not included in this data sheet.

✓ **Supported** ✗ **Unsupported / Undetermined**

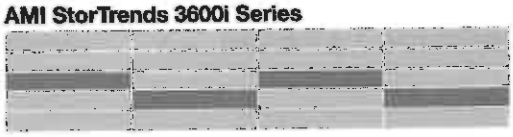
All information on this data sheet is based entirely on publicly available information and DCIG's own knowledge of the product. This information reflects DCIG's opinion about this product as no information was provided by the vendor.

Product Rankings Dashboard

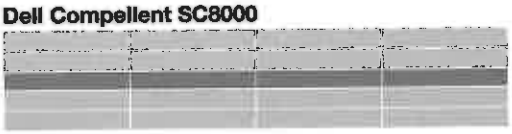
OVERALL RANK · MGMT & SOFTWARE · VIRTUALIZATION · HARDWARE

Best-In-Class
Recommended
Excellent
Good
Basic

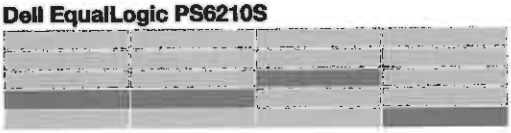
AMI StorTrends 3600i Series



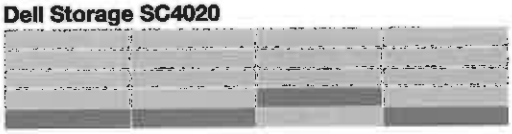
Dell Compellent SC8000



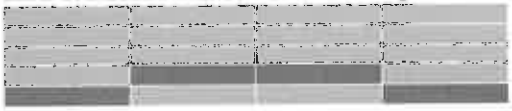
Dell EqualLogic PS6210S



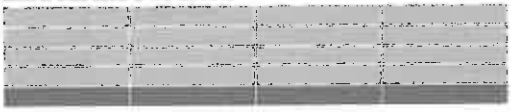
Dell Storage SC4020



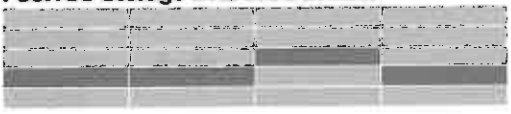
EMC VNXe3200 Unified All-Flash Array



EMC XtremIO X-Brick

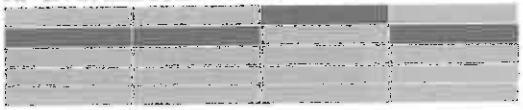


FUJITSU Storage ETERNUS DX200F



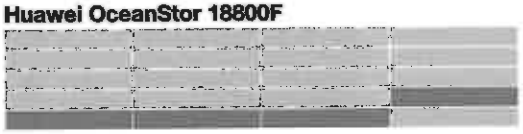
Hitachi Data Systems HUS VM

HP 3PAR StoreServ 7000c Series



HP 3PAR StoreServ 20000 Series

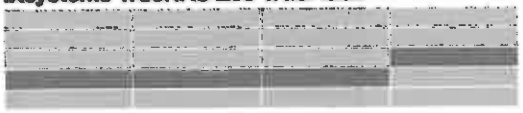
Huawei OceanStor 18800F



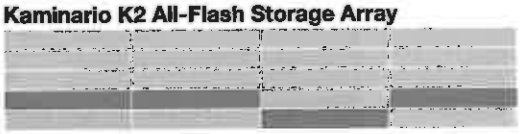
IBM FlashSystem 900

IBM FlashSystem V9000

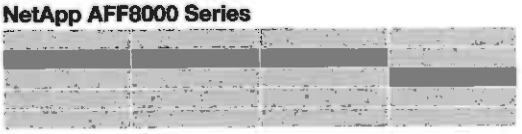
iXsystems TrueNAS Z50 TrueFlash



Kaminario K2 All-Flash Storage Array



NetApp AFF8000 Series



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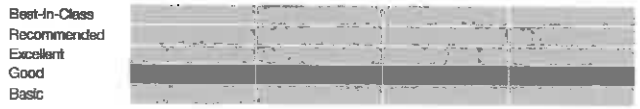
Product Rankings Dashboard (continued)

OVERALL RANK · MGMT & SOFTWARE · VIRTUALIZATION · HARDWARE

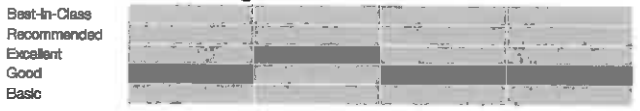
NetApp EF-Series

Nimbus Data Gemini Series

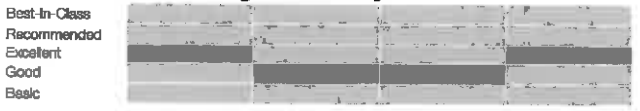


Oracle FS1-2

Pure Storage FA-400 Series

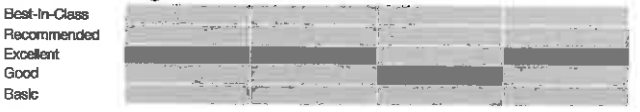


Pure Storage FlashArray//m Series



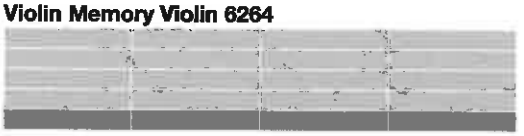
SolidFire SF Series

Tegile IntelliFlash T3000 Series

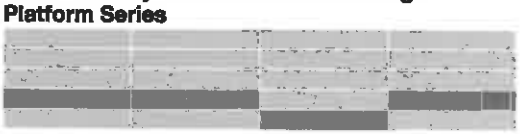


Violin Memory Violin 6100 Series All Flash Array

Violin Memory Violin 6264

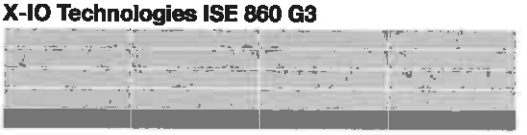


Violin Memory Violin 7000 Flash Storage Platform Series



Violin Memory Windows Flash Array

X-IO Technologies ISE 860 G3



APPENDICES

Definitions, Explanations and Terminology

This section contains brief definitions and/or explanations of the terms used and assumptions made when developing the data sheets found in the *DCIG 2015-16 All-Flash Array Buyer's Guide*. These terms are in the same order as they appear on the individual data sheets.

Management & Software

Feature Licenses Included

Indicates if the license for the listed features are included with the cost of the array when purchased (without an extra licensing fee).

Automated Storage Tiering (AST)/Thin Provisioning
Indicates if AST and/ or Thin Provisioning licenses are included in the purchase of the array.

Performance Monitoring/Replication
Indicates if Performance Monitoring and/ or Replication licenses are included in the purchase of the array.

Snapshots/Application-aware Snapshots
Indicates if Snapshots and/ or Application-aware Snapshots licenses are included in the purchase of the array.

Asynchronous Replication *(CONTINUOUS/PERIODIC)*

Indicates if the array can asynchronously replicate data to another storage array from the same storage provider. Asynchronous replication writes data first to a primary storage array, and then copies the data to replication targets. This process may be continuous or periodic.

Continuous: Every write I/O is copied, stored in a local disk cache and then replicated as soon as possible to a secondary array.

Periodic: A snapshot of one or more volumes is periodically taken and then replicated to a secondary array.

Synchronous Replication

Indicates if the array can synchronously replicate data to another array from the same storage provider. Write I/Os need to be received at the primary or source array and then copied and written to the secondary, or target array, with the write confirmed as complete by both arrays before processing can continue.

Thin Provisioning/Zero Page Reclamation

Thin provisioning is a storage optimization method where volume resources are allocated on the disk only when a particular user needs them. Zero page reclamation is a thin provisioning optimization method used primarily in virtualized environments where volume resources are pre-allocated on the disk, and the space is then filled with zeros. This is done to indicate that the space is unused and may be reclaimed. It is also a method to overwrite data on storage space that was previously used by another virtual machine.

Automated Storage Reclamation *(NATIVE/SYMANTEC)*

Automated storage reclamation is an optimization strategy that returns de-provisioned blocks to a storage system's pool of available capacity. This capability can either be supported natively by the array or by using a 3rd party tool, such as Symantec Storage Foundation.

Native: Indicates that this capability is supported natively by the array without the aid of 3rd party software.

Symantec: Indicates that the array is recognized by Symantec that can reclaim feed blocks of its thinly provisioned storage.

Deduplication *(IN-LINE/POST-PROCESS)*

Data deduplication saves disk space by storing only one copy of data when identical data is already stored on the array.

In-line: Data is deduplicated before it is stored to disk.

Post-process: Data is first stored to disk in its native or raw format and subsequently deduplicated, generally during off-peak hours.

Compression *(IN-LINE/POST-PROCESS)*

Compression is a feature that compresses data as it is written to storage systems.

In-line: Data is compressed before it is stored to disk.

Post-process: Data is first stored to a disk in its native or raw format and subsequently compressed, generally during off-peak hours.

Deduplication for Active Data/Lossless Deduplication

Deduplication for active data indicates if the array supports/ recommends deduplicating active data. Lossless deduplication support indicates if a read verifies all duplicates rather than relying solely on hashes.

Automated Storage Tiering *(SCHEDULED/DYNAMIC)*

Automated storage tiering places data on the appropriate tier of storage *(HDD, SSD, Flash memory, etc)* within the array based upon policies that are either built into the storage array, set by the storage administrator, or some combination of both. Moving data between tiers may occur at pre-scheduled times or dynamically.

Scheduled: Storage tiering occurs at scheduled times.

Dynamic: Indicates that the array monitors and adjusts tiering in real-time or near real-time.

Metadata Stored Separately

Indicates if metadata is stored separately from the data on the target media. Storing metadata separately enhances the overall performance of the array.

Metadata Stored in DRAM/NVRAM

DRAM: Indicates if metadata is stored in DRAM. DRAM is the highest performing storage media in a storage system, but the contents of DRAM are subject to loss during a power failure.

NVRAM: Indicates if metadata is stored in NVRAM. NVRAM (or DRAM backed by flash memory) provides a storage media that performs like DRAM but has the benefit of being a persistent data store.

Automated/Policy-based Provisioning

The ability to provision storage options by using pre-defined policies that are carried out automatically without requiring manual intervention. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

Policy-based storage selection: Indicates if the array supports administrators creating storage profiles for requirements like performance and availability that can then automatically assigned.

Storage templates with QoS: Indicates if the array supports templates can be used during provisioning tasks to assign Quality of Service (QoS) parameters.

Self-service Portal: Indicates if the array allows users to perform various storage management functions without the involvement of a storage administrator.

Exposes APIs for 3rd Party Automation: Indicates if the array supports application programming interfaces (APIs) that can provide and support third-party storage automation tools.

QoS Workload Prioritization Options

The QoS Workload Prioritization Options box indicates the workload prioritization methods supported by the array. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

User-defined Minimums/Maximums: Indicates if the array supports QoS options in which the users determine the minimum and maximum performance of a LUN/VM/Volume.

User Assigns LUN/VM to Pre-defined Service Levels: Indicates if the array supports the assignment of LUN/VM/Volumes to pre-defined service levels (gold, silver, bronze).

Management Methods

The Management Methods supported by the array.

OpenStack Cinder/REST API: Indicates if the array supports OpenStack Cinder's software and/or REST API's to centrally manage storage resources.

IPMI/SMI-S (SCVMM): Indicates if the array supports an Intelligent Platform Management Interface (IPMI). It also indicates if the array supports a Storage Management Initiative Specification (SMI-S), including System Center Virtual Machine Manager (SCVMM), to manage storage devices.

vCenter/Web-based: Indicates if the array supports vCenter and/or a web-based storage management interface.

Quotas/Threshold Alerts

Indicates if the array supports the assigning and enforcing of storage quotas and/or support of threshold alerting when certain conditions are met.

Unified Management

Indicates if similar storage devices within the same logical environment can be managed from a single interface.

Multi-tenancy

Indicates if the array has the capability to provide discrete storage, management, and functionality to multiple user-groups (tenants).

Notification and Logging *(PHONE HOME/SNMP)*

Indicates if the array supports notification and logging via phone home data and/or SNMP traps. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

Data Migration to OpenStack/S3

Indicates if the array supports data migration to/from OpenStack compatible and/or Amazon S3 cloud environments. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

NFS/SMB

Indicates support of NFS and/or SMB. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

REST API for Object Storage

Indicates if the array supports REST API for an object storage architecture.

Authentication Methods *(LDAP/ADS)*

Indicates array support for Lightweight Directory Access Protocol (LDAP) and/or Active Directory Services (ADS) authentication. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

Encryption *(ARRAY-BASED/SELF-ENCRYPTING DRIVES)*

Indicates if model support data encryption, and whether encryption is array-based encryption or through the use of self-encrypting drives.

Flash Memory Optimizations

The Flash Memory Optimizations indicates the optimizations available for the array. Various optimization techniques may be employed to address flash memory weaknesses and extend the life of a flash module or SSD. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

Write Coalescing/Variable Stripe Size: Indicates if the array supports write coalescing and/or variable stripe size. Write coalescing involves the buffering and/or coalescing of writes to match erasure block size (EBS) of the underlying flash media. This technique enhances both the long-term performance and the life expectancy of flash memory. Variable stripe size, on the other hand, matches the redundant array of inexpensive disc (RAID) stripe sizes to the underlying EBS.

Hardware Accelerated Compression/Proprietary: Hardware accelerated compression is the use of processing hardware to perform some functions faster than is possible by software. Proprietary techniques are other techniques implemented by the vendor to extend the life of the flash memory.

Virtualization

Microsoft Hyper-V/Oracle VM

Indicates if the array supports Microsoft Hyper-V and/or Oracle VM hypervisors.

RHEV/VMware ESX/ESXi

Indicates if the array supports Red Hat Enterprise Virtualization (RHEV) and/or VMware ESX/ESXi hypervisors.

Microsoft ODX

Indicates if the array supports Windows offloaded data transfers. Offloaded data transfers enable direct data transfers within or between compatible storage devices without transferring data through a host computer.

vSphere Snapshot Integration

Indicates if the array supports vSphere Snapshot Integration.

VMware VAAI *(TOTAL #)*

VAAI is a group of proprietary application programming interfaces (APIs) provided by VMWare's vSphere platform which allows certain I/O tasks to be offloaded to array hardware. VAAI first appeared in vSphere 4.1 and was expanded in 5.0. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

VASA

vSphere Storage APIs for Storage Awareness (VASA) is a set of APIs that permit storage products to integrate with vCenter for management functionality. Storage Awareness collects configuration, capability and storage health information from storage products, allowing the administrator to build storage profiles based on capabilities.

SIOC

Storage I/O Control (SIOC) for VMware is a dynamic control mechanism for proportional allocation of shared storage resources to virtual machines running on multiple hosts.

VASRM

vStorage APIs for Site Recover Manager (VASRM) offers remote replication features enabling a device to failover to a recovery site. The PSA is an open modular framework that coordinates the simultaneous operation of multiple multipathing plugins (MPPs).

PSA

PSA is a collection of VMkernel APIs that allow third party hardware vendors to insert code directly into the ESX

storage I/O path. This allows 3rd party software developers to design their own load balancing techniques and failover mechanisms for particular storage array. The PSA coordinates the operation of the NMP and any additional 3rd party MPP. *(Source: http://kb.vmware.com/ selfservice/ microsites/search. do?language=en_US&cmd= displayKC&externalId=1011375)*

Storage DRS

Storage Distributed Resource Scheduler (DRS) provides virtual machine placement and load balancing mechanisms based on I/O and space capacity.

ALUA

Asymmetrical Logical Unit Access (ALUA) is used to determine the optimal path for asymmetrical arrays.

Virtual Volumes

Indicates if the array supports VMware Virtual Volumes. Virtual Volumes is an integration and management framework giving precise control to virtual machines for external storage resources.

vRealize Operation 6

Indicates if the array supports vRealize Operation 6.

Hardware

Raw Flash Capacity per Appliance *(MAX)*

The number indicates the maximum amount of raw flash memory storage capacity in terabytes (TBs) that the array can have under its management. This number only includes the array's footprint and not the storage capacity of other systems it may have virtualized.

Raw Flash Capacity per Cluster *(MAX)*

The number indicates the maximum amount of raw flash memory storage capacity in terabytes (TB) that a fully configured cluster (scale-out) of arrays can have under its management. This number only includes the cluster's footprint and not the storage capacity of other systems it may have virtualized.

Raw Flash Storage Density *(MAX)*

The number indicates the maximum amount of flash memory that this product can provide per standard EIA rack unit. This measure of storage density is presented in terms of terabytes (TB) per rack unit (TB/U).

Information Dispersal Algorithms *(ERASURE CODING)*

Information dispersal algorithms/erasure coding allows an array to store data and erasure codes across multiple physical drives as a way to enhance redundancy and to protect against data loss.

DRAM Cache *(MAX, 2 CONTROLLERS)*

The maximum number of gigabytes (GB) of dynamic random access memory (DRAM) cache that each array controller can support in a two-controller configuration.

NVRAM Cache *(MAX, 2 CONTROLLERS)*

The maximum number of gigabytes (GB) of nonvolatile random access memory (NVRAM) cache that each array controller can support in a two-controller configuration.

Controller Config *(ACTIVE-ACTIVE, DUAL-ACTIVE)*

Indicates if the array supports an active-active and/or dual-active controller configuration.

Active-Active: The two controllers are configured with multipathing software and have concurrent access to the disk drives that are then presented as LUNs to attached hosts. In the event a controller fails or is taken offline, the attached host(s) may detect little or no interruption in service as the other controller takes over for the failed unit though a drop in performance may occur. This is considered an enterprise class feature.

Dual-Active: Both controllers are active and have concurrent access to the drives that are presented as LUNs to the attached hosts. The difference from active-active is that half of the storage array's LUNs are assigned to and controlled by one controller and the other half of the LUNs to the other. As a result, a LUN can only be accessed down one path through one controller at a time. If a controller should be taken offline or fail, the other controller assumes control for its LUNs.

CPU Cores *(MAX, 2 CONTROLLERS)*

Indicates the maximum number of central processing unit (CPU) cores the model supports in a two-controller configuration.

Scale-out Rack Mount Controllers *(MAX)*

The maximum number of rack-mountable controller appliances that the model can support in a scale-out configuration. A controller appliance may contain 1, 2 or more controllers.

Concurrent SAN & NAS/without Separate Filer Head

The ability for the storage array to communicate with applications using both block (SAN) and network file system (NAS) clients at the same time with or without separate hardware. Concurrent SAN & NAS without a separate filer head indicates array supports block (SAN)

and file (NAS) communication at the same time without the need for additional hardware (filer head).

FC/iSCSI

Indicates if the array supports Fibre Channel (FC) and/or Internet Small Computer System Interface (iSCSI). FC is used as a networking protocol to transmit data between computer devices, such as a server and a storage device. iSCSI is a block-based protocol for running SCSI commands over Internet Protocol (IP) on Ethernet to access storage resources.

Storage Networking Ports *(MAX)*

The maximum number of ports available in any configuration to connect the array to hosts or to a dedicated storage network. Ports for managing the array or interconnecting multiple storage controllers are not included in this count.

Ethernet Ports 1/10 Gb *(MAX)*

The maximum number of 1 Gb and/or 10 Gb Ethernet storage networking ports that can be supported by the array in any configuration.

FC Ports 8/16 Gb *(MAX)*

The maximum number of 8 Gb and/or 16 Gb Fibre Channel storage networking ports that can be supported by the array in any configuration.

Non-Disruptive Operations

Non-disruptive operations allow hardware and software to operate without service interruptions. The specific elements supported for each product are available by accessing the DCIG Analysis Portal.

Controller Addition/Replacement: The native array capability to add and/or replace a controller without disrupting the availability of the storage system.

Controller Code Upgrades/Data Migration: The native array capability to upgrade controller code without disrupting the availability of the storage system. Data migration indicates the native array capability to migrate data to/from a disparate storage array without disrupting availability of the primary storage system.

Storage Shelf or Node Addition: Indicates if a storage shelf or node can be added without disrupting the availability of the storage system.

Support

Remote Monitoring/Proactive Remediation

Indicates whether the vendor offers remote monitoring of the storage system and/or proactive resolution of problems discovered through remote monitoring and/or performance and fault data that has been automatically uploaded to the vendor.

Hardware Warranty

Indicates the length of standard warranty that is included with the array at no extra cost.

Vendor Contact Information

AMI StorTrends
- StorTrends 3600i Series
- *StorTrends 3600i*
- *StorTrends 3610i*

5555 Oakbrook Parkway, Building 200
Norcross, GA 30093
Phone: +1.800.828.9264
Website: www.stortrends.com

Dell, Inc.
- Compellent SC8000
- EqualLogic PS6210S
- Storage SC4020

1 Dell Way
Round Rock, TX 78682
Phone: +1.800.671.3355
Website: www.dell.com

EMC Corporation
- VNXe3200 Unified All-Flash Array
- *VNX F-5000*
- *VNX F-7000*
- XtremIO X-Brick

176 South Street
Hopkinton, MA 01748
Phone: +1.866.438.3622
Website: www.emc.com

FUJITSU Storage
- ETERNUS DX200F

1250 East Arques Avenue
Sunnyvale, CA 94085
Phone: +1.800.831.3183
Website: www.fujitsu.com/us/

Hitachi Data Systems Corporation
- HUS VM

2845 Lafayette Street
Santa Clara, California 95050
Phone: +1.408.970.1000
Website: www.hds.com

Hewlett-Packard Corporation
- 3PAR StoreServ 7000c Series
- *3PAR StoreServ 7200c*
- *3PAR StoreServ 7440c*
- *3PAR StoreServ 7450*
- *3PAR StoreServ 7450c*
- 3PAR StoreServ 8000 Series
- *3PAR StoreServ 8440*
- 3PAR StoreServ 20000 Series
- *3PAR StoreServ 20800*
- *3PAR StoreServ 20850*

3000 Hanover Street
Palo Alto, CA 94304
Phone: +1.866.625.0242
Website: www.hp.com

Huawei
- OceanStor 18800F

5700 Tennyson Pkwy., Ste. 500
Plano, TX 75024
Phone: +1.214.919.6000
Website: www.huawei.com/us/

IBM Corporation
- FlashSystem 900
- FlashSystem V9000

1 New Orchard Rd
Armonk, NY 10504
Phone: +1.800.426.4968
Website: www.ibm.com/storage

IXSystems
- TrueNAS Z50 TrueFlash

2490 Kruse Dr
San Jose, CA 95131
Phone: +1.855.GREP.4IX
Website: www.ixsystems.com

Kaminario, Inc.
- K2 All-Flash Storage Array

75 Second Ave, Suite 620
Needham, MA 02494
Phone: +1.877.982.2555
Website: www.kaminario.com

Detailed data for models shown in italics can be found in the DCIG Analysis Portal.

Appendix B—Vendor Contact Information (continued)

NetApp
- AFF8000 Series
- *AFF8020*
- *AFF8040*
- *AFF8060*
- *AFF8080EX*
- EF Series
- *EF550*
- *EF560*

495 East Java Drive
Sunnyvale, CA 94089
Phone: +1.877.263.8277
Website: www.netapp.com

Nimbus Data Systems, Inc.
- Gemini Series
- *Gemini F400*
- *Gemini F600*

701 Gateway Blvd, Suite 100
South San Francisco, CA 94080
Phone: +1.877.664.6287
Website: www.nimbusdata.com

Oracle Corporation
- FS1-2

500 Oracle Parkway
Redwood Shores, CA 94065
Phone: +1.800.633.0738
Website: www.oracle.com

Pure Storage
- FA-400 Series
- *FA-405*
- *FA-420*
- *FA-450*
- FlashArray//m Series
- *FlashArray//m20*
- *FlashArray//m50*
- *FlashArray//m70*

650 Castro Street, Suite #260
Mountain View, CA 94041
Phone: +1.800.379.7873
Website: www.purestorage.com

SolidFire
- SF Series
- *SF2405*
- *SF4805*
- *SF9010*
- *SF9605*

1600 Pearl St, Suite 200
Boulder Colorado 80302
Phone: +1.720.523.3278
Website: www.solidfire.com

Tegile Systems, Inc.
- IntelliFlash T3000
- *IntelliFlash T3600*
- *IntelliFlash T3700*
- *IntelliFlash T3800*

7999 Gateway Blvd., #120
Newark, CA 94560
Phone: +1.510.791.7900
Website: www.tegile.com

Violin Memory, Inc.
- Violin 6100 Series All Flash Array
- Violin 6264
- Violin 7000 Flash Storage Platform Series
- *Violin 7300 Flash Storage Platform*
- *Violin 7300E Flash Storage Platform*
- *Violin 7700 Flash Storage Platform*
- Windows Flash Array

4555 Great America Parkway
Santa Clara, CA 95054
Phone: +1.650.396.1500
Website: www.violin-memory.com

X-IO Technologies
- ISE 860 G3

9950 Federal Drive, Suite 100
Colorado Springs, CO 80921
Phone: +1.866.472.6764
Website: www.xiostorage.com/

Detailed data for models shown in italics can be found in the DCIG Analysis Portal.

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