



State of West Virginia
Request For Quotation
Info Technology

Procurement Folder : 758612

Document Description : Addendum 3-Unity 480XT All-Flash DPE DS - AMER, or equal

Procurement Type : Agency Purchase Order

Date Issued	Solicitation Closes	Solicitation No		Version	Phase
2020-08-04	2020-08-06 11:30:00	ARFQ 0402	EDD2100000005	4	Final

SUBMIT RESPONSES TO:	VENDOR
PROCUREMENT OFFICER DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV 25305 US	Vendor Name, Address and Telephone Software Information Systems, LLC 165 Barr Street Lexington, KY 40507 859 977-4796

NetApp A300 with 24 960GB Drives

Bid "1"

Total: \$ 116,900.00

FOR INFORMATION CONTACT THE

Michelle L Childers
(304) 558-2686
michelle.childers@k12.wv.us

Signature *Karen Sandwood* FEIN # *61-1371685* DATE *8-5-2021*

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

ADDITIONAL INFORMATION:

Addendum 3 issued to modify the Solicitation Closes date & time to: 08/06/2020 at 11:30 AM EDT and publish vendor question and agency response.

*****End of Addendum 3 *****

Addendum 2 issued to publish additional vendor questions and agency responses.

*****End of Addendum 2*****

Addendum 1 issued to publish the vendor questions with agency responses and the pre-bid sign-in sheets.

*****End of Addendum *****

The West Virginia Department of Education, Office of Infrastructure and Network Operations is soliciting bids for the one-time purchase of installation of Unity 480XT All-Flash DPE DS-AMER, per the attached bid requirements, terms and conditions and specifications.

Note: Shipping, delivery and handling fees must be inclusive and must be incorporated in the item's price. Shipping, delivery and handling fees charged separately shall be the responsibility of the vendor and will not be paid by the agency.

INVOICE TO:		SHIP TO:	
DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV25305 US		SECRETARY DEPARTMENT OF EDUCATION OFFICE OF INFRASTRUCTURE & NETWORK OPERATIONS 1900 KANAWHA BLVD E, BLDG 6 RM 346 CHARLESTON WV 25305 US	

Line	Commodity Line Description	Qty	Unit Issue	Unit Price	Total Price
2	3.1.1 Unity 480F All-Flash DPE DS - AMER or equal	1.00000	EA	\$ 56,000	\$156,000

Commodity Code	Manufacturer	Model #	Specification
43211502	<i>NetApp All Flash A300 w. th 24 960GB - See cover letter</i>		

Extended Description
Unity 480F All-Flash DPE DS - AMER or equal

To be used in the United States, Only

Must be new out of the box.

Shipping, delivery and handling fees must be inclusive and must be incorporated in the item's price.

INVOICE TO:		SHIP TO:	
DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV25305 US		SECRETARY DEPARTMENT OF EDUCATION OFFICE OF INFRASTRUCTURE & NETWORK OPERATIONS 1900 KANAWHA BLVD E, BLDG 6 RM 346 CHARLESTON WV 25305 US	

Line	Commodity Line Description	Qty	Unit Issue	Unit Price	Total Price
3	3.1.2 Deployment Services or equal	1.00000	EA	\$ 12,000.00	\$ 12,000.00

Commodity Code	Manufacturer	Model #	Specification
43211502			

Extended Description
Deployment Services or equal

INVOICE TO	SHIP TO
DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV25305 US	SECRETARY DEPARTMENT OF EDUCATION OFFICE OF INFRASTRUCTURE & NETWORK OPERATIONS 1900 KANAWHA BLVD E, BLDG 6 RM 346 CHARLESTON WV 25305 US

Line	Commodity Line Description	Qty	Unit Issue	Unit Price	Total Price
5	3.1.3 Data Migration	1.00000	EA	\$ 23,000.00	\$ 23,000.00

Commodity Code	Manufacturer	Model #	Specification
43211502			

Extended Description
Data Migration

INVOICE TO	SHIP TO
DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV25305 US	SECRETARY DEPARTMENT OF EDUCATION OFFICE OF INFRASTRUCTURE & NETWORK OPERATIONS 1900 KANAWHA BLVD E, BLDG 6 RM 346 CHARLESTON WV 25305 US

Line	Commodity Line Description	Qty	Unit Issue	Unit Price	Total Price
9	3.1.4 MDS 9132T 32G FC Switch or equal	2.00000	EA	\$ 10,000.00	\$ 20,000.00

Commodity Code	Manufacturer	Model #	Specification
43000000			

Extended Description
MDS 9132T 32G FC Switch, DS-C9132T-8PMESK9, or equal
To be used in the United States, Only
Must be new out of the box. No used or refurbished items will be accepted.
Shipping, delivery and handling fees must be inclusive and must be incorporated in the item's price.

INVOICE TO		SHIP TO	
DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV25305 US		SECRETARY DEPARTMENT OF EDUCATION OFFICE OF INFRASTRUCTURE & NETWORK OPERATIONS 1900 KANAWHA BLVD E, BLDG 6 RM 346 CHARLESTON WV 25305 US	

Line	Commodity Line Description	Qty	Unit Issue	Unit Price	Total Price
12	3.1.5 AC PSU Port Side Exhaust, Spare, or equal	2.00000	EA	800.00	\$ 1600.00

Commodity Code	Manufacturer	Model #	Specification
43000000			

Extended Description

AC PSU Port Side Exhaust, Spare, DS-CAC-650W-E=, or equal

To be used in the United States, Only

Must be new out of the box. No used or refurbished items will be accepted.

Shipping, delivery and handling fees must be inclusive and must be incorporated in the item's price.

INVOICE TO		SHIP TO	
DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV25305 US		SECRETARY DEPARTMENT OF EDUCATION OFFICE OF INFRASTRUCTURE & NETWORK OPERATIONS 1900 KANAWHA BLVD E, BLDG 6 RM 346 CHARLESTON WV 25305 US	

Line	Commodity Line Description	Qty	Unit Issue	Unit Price	Total Price
14	3.1.6 SNTC 8x5xNBD MDS 9132T 32G FC Switch or equal	2.00000	EA	600.00	1200.00

Commodity Code	Manufacturer	Model #	Specification
43000000			

Extended Description

SNTC 8x5xNBD MDS 9132T 32G FC Switch, CON-SNT-91328PME, or equal

To be used in the United States, Only

Must be new out of the box.

Shipping, delivery and handling fees must be inclusive and must be incorporated in the item's price.

INVOICE TO		SHIP TO	
DEPARTMENT OF EDUCATION BLDG 6, RM 330 1900 KANAWHA BLVD E CHARLESTON WV25305 US		SECRETARY DEPARTMENT OF EDUCATION OFFICE OF INFRASTRUCTURE & NETWORK OPERATIONS 1900 KANAWHA BLVD E, BLDG 6 RM 346 CHARLESTON WV 25305 US	

Line	Commodity Line Description	Qty	Unit Issue	Unit Price	Total Price
15	3.1.7 Installation of MDS 9132T 32G FC Switch	1.00000	EA	3000.00	3000.00

Commodity Code	Manufacturer	Model #	Specification
43000000			

Extended Description

Installation of MDS 9132T 32G FC Switch

To be used in the United States, Only

Must be new out of the box.

Shipping, delivery and handling fees must be inclusive and must be incorporated in the item's price.

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Pre-Bid	2020-07-28
2	Question Deadline	2020-07-29

EDD2100000005	Document Phase Final	Document Description Addendum 3-Unity 480XT All-Flash DPE DS - AMER, or equal	Page 6 of 6
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ADDITIONAL TERMS AND CONDITIONS

See attached document(s) for additional Terms and Conditions



200 Association Drive
Charleston, WV 25311
304 768-1645
304 768-1671 (fax)

August 5, 2020

Ms. Michelle Childers
West Virginia Department of Education
Bldg. 6, Room 330
1900 Kanawha Blvd, East
Charleston, WV 25305

Dear Ms. Childers,

Please find attached the SIS response for ARFQ 0402 EDD2100000005 due August 5, 2020. SIS understands the requirements of the RFQ. As our solution, we are proposing the "or equal" NetApp All Flash A300 which exceed the specifications of the bid. We are including two configurations one with 12 x 3.8 TB drives which exceeds the 7 drives required as 12 drives are the minimum supported with the A300 system. This yields 29.64TB in formatted capacity and an estimated 88.92TB of capacity at a guaranteed 3:1 deduplication and compression ratio. Although this configuration considerably exceeds the specifications of the bid, we included it so as not to be disqualified for not providing 3.8TB drives. This is the bid spec solution.

As an alternative, we are also proposing the NetApp All Flash A300 with 24 x 960GB drives which equate to 15.1TB of formatted capacity and an estimated 45.3TB of capacity at a guaranteed 3:1 deduplication and compression ratio. This is our recommended configuration as it more closely aligns with, but still exceeds the capacity requirements of the bid while providing a lower cost. Additionally, the 24 drives will provide more than 3x the performance of the 7 x 3.8TB drives specified in the bid request. This is our recommended solution.

Note that both A300 solutions considerably exceed the specifications of the bid for performance, scalability, and feature set. Additionally, we are providing RAID-DP, NetApp's version of RAID-6 which also exceeds the requirements of RAID-5 as specified in the bid and brings the solution up to Six-9's of availability. Additional detail on the A300 and its ONTAP 9 feature set are included in the addendum of this response.

In terms of support we have provided the requested support but have also added at no additional charge NetApp SAM Support Account Manager support. The NetApp SAM is a personal concierge for West Virginia Department of Education and owns the case management for your support so that you have a singular contact dedicated to ownership of the support for your account. This not only includes priority handing of support cases, but quarterly reviews of your environment to review any cases, verify your code levels are up today and make you aware of bug fixes or any outstanding support items that may be of interest. We are including this feature at no additional charge. Also included at no additional charge is a one-year subscription to Cloud Volumes ONTAP. This provides the feature set and functional equivalent of the A300 on premise solution in any of the "big

3" cloud service providers AWS, Azure and Google. While not required for the solution, this would give you the ability to test and evaluate this feature set in the cloud should that become a requirement for disaster recovery, backup, testing, application development or archive. This cloud instance is the analog of the proposed A300 system in the cloud and all features available in your local data center would be available in the cloud as well including deduplication, compression, and encryption. If you are currently AWS, Azure or Google cloud customer the deduplication and compression could potentially be utilized to cut your cloud capacity bill in half. Additional information on this feature included at no additional charge is included in the PDF addendum.

NetApp also includes free online self-paced training for your products. As such no cost online training is available for both the A300 hardware solution and the ONTAP operating system. If additional instructor led training is desired, that can be quoted as an additional fee.

Lastly, we have included the Cisco switch solution as specified. As this is proposed exactly as specified in the bid request, we have no additional verbiage or addendums for that portion of the solution.

Sincerely,



Charles D. Arnett
Senior Client Executive
carnett@thinksis.com

Enclosures

REQUEST FOR QUOTATION
ARFQ_EDD2100005 – Unity 480XT All-Flash DPE DS – AMER

9.1 The following shall be considered a vendor default under this Contract.

9.1.1 Failure to provide Contract Items in accordance with the requirements contained herein.

9.1.2 Failure to comply with other specifications and requirements contained herein.

9.1.3 Failure to comply with any laws, rules, and ordinances applicable to the Contract Services provided under this Contract.

9.1.4 Failure to remedy deficient performance upon request.

9.2 The following remedies shall be available to Agency upon default.

9.2.1 Immediate cancellation of the Contract.

9.2.2 Immediate cancellation of one or more release orders issued under this Contract.

9.2.3 Any other remedies available in law or equity.

10 MISCELLANEOUS:

10.1 **Contract Manager:** During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: Karen Smallwood

Vendor's Address: 165 Barr Street

Lexington, KY 40507

Telephone Number: 859.977.4796

Fax Number: _____

Email Address: ksmallwood@thinksis.com

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Karen Smallwood, Director of Contracts & Compliance
(Name, Title)

(Printed Name and Title)

165 Barr Street, Lexington, KY 40507

(Address)

859.977.4796

(Phone Number) / (Fax Number)

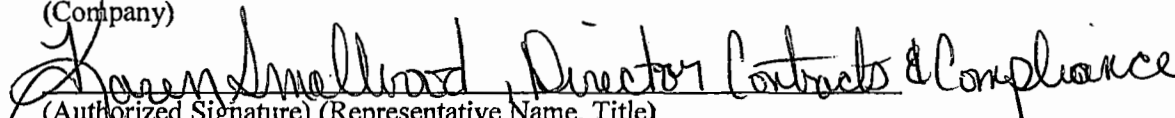
ksmallwood@thinksis.com

(E-mail address)

CERTIFICATION AND SIGNATURE: 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.

Software Information Systems, LLC

(Company)

 Karen Smallwood, Director Contracts & Compliance
(Authorized Signature) (Representative Name, Title)

Karen Smallwood, Director of Contracts & Compliance

(Printed Name and Title of Authorized Representative)

July 28, 2020

(Date)

859.977.4796 304 262-1631

(Phone Number) (Fax Number)

ARFQ_EDD2100000005_Unity 480F All-Flash DPE DS - AMER, or equal

VENDOR: (Please submit with your bid)

Contract Manager: During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

Contract Manager: Karen Smallwood

Company Name: Software Information Systems, LLC

Vendor's FEIN: 61-1371685

Vendor's Address: 165 Barr Street

Lexington, KY 40507

Telephone Number: 859.977.4796

Fax Number: 304 768 1671

Email Address: ksmallwood@thinksis.com

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

CONSTRUCTION CONTRACTS: Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

ALL CONTRACTS: 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 exceeds 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: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, 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: Software Information Systems, LLC

Authorized Signature: [Signature] Date: 7/28/2020

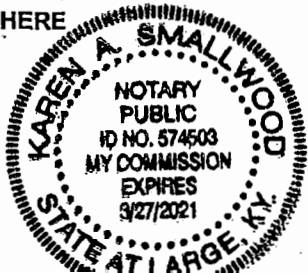
State of Kentucky

County of Fayette, to-wit:

Taken, subscribed, and sworn to before me this 28 day of July, 2020.

My Commission expires March 27, 2021.

AFFIX SEAL HERE



NOTARY PUBLIC

[Signature]
Purchasing Affidavit (Revised 01/19/2018)

**STATE OF WEST VIRGINIA
ADDENDUM TO VENDOR'S STANDARD CONTRACTUAL FORMS**

State Agency, Board, or Commission (the "State"): West Virginia Department of Education

Vendor:

Contract/Lease Number ("Contract"): ARFQ_0402_EDD2100000005

Commodity/Service: Unity 480XT All-Flash DPE DS-AMER and Installation

The State and the Vendor are entering into the Contract identified above. The Vendor desires to incorporate one or more forms it created into the Contract. Vendor's form(s), however, include(s) one or more contractual terms and conditions that the State cannot or will not accept. In consideration for the State's incorporating Vendor's form(s) into the Contract, the Vendor enters into this Addendum which specifically eliminates or alters the legal enforceability of certain terms and conditions contained in Vendor's form(s). Therefore, on the date shown below each signature line, the parties agree to the following contractual terms and conditions in this Addendum are dominate over any competing terms made a part of the Contract:

1. **ORDER OF PRECEDENCE:** This Addendum modifies and supersedes anything contained on Vendor's form(s) whether or not they are submitted before or after the signing of this Addendum. **IN THE EVENT OF ANY CONFLICT BETWEEN VENDOR'S FORM(S) AND THIS ADDENDUM, THIS ADDENDUM SHALL CONTROL.**
2. **PAYMENT** – Payments for goods/services will be made in arrears only upon receipt of a proper invoice, detailing the goods/services provided or receipt of the goods/services, whichever is later. Notwithstanding the foregoing, payments for software licenses, subscriptions, or maintenance may be paid annually in advance.
Any language imposing any interest or charges due to late payment is deleted.
3. **FISCAL YEAR FUNDING** – Performance of this Contract is contingent upon funds being appropriated by the WV Legislature or otherwise being available for this Contract. In the event funds are not appropriated or otherwise available, the Contract becomes of no effect and is null and void after June 30 of the current fiscal year. If that occurs, the State may notify the Vendor that an alternative source of funding has been obtained and thereby avoid the automatic termination. Non-appropriation or non-funding shall not be considered an event of default.
4. **RIGHT TO TERMINATE** – The State reserves the right to terminate this Contract upon thirty (30) days written notice to the Vendor. If this right is exercised, the State agrees to pay the Vendor only for all undisputed services rendered or goods received before the termination's effective date. All provisions are deleted that seek to require the State to (1) compensate Vendor, in whole or in part, for lost profit, (2) pay a termination fee, or (3) pay liquidated damages if the Contract is terminated early.
Any language seeking to accelerate payments in the event of Contract termination, default, or non-funding is hereby deleted.
5. **DISPUTES** – Any language binding the State to any arbitration or to the decision of any arbitration board, commission, panel or other entity is deleted; as is any requirement to waive a jury trial.
Any language requiring or permitting disputes under this Contract to be resolved in the courts of any state other than the State of West Virginia is deleted. All legal actions for damages brought by Vendor against the State shall be brought in the West Virginia Claims Commission. Other causes of action must be brought in the West Virginia court authorized by statute to exercise jurisdiction over it.
Any language requiring the State to agree to, or be subject to, any form of equitable relief not authorized by the Constitution or laws of State of West Virginia is deleted.
6. **FEES OR COSTS:** Any language obligating the State to pay costs of collection, court costs, or attorney's fees, unless ordered by a court of competent jurisdiction is deleted.
7. **GOVERNING LAW** – Any language requiring the application of the law of any state other than the State of West Virginia in interpreting or enforcing the Contract is deleted. The Contract shall be governed by the laws of the State of West Virginia.
8. **RISK SHIFTING** – Any provision requiring the State to bear the costs of all or a majority of business/legal risks associated with this Contract, to indemnify the Vendor, or hold the Vendor or a third party harmless for any act or omission is hereby deleted.
9. **LIMITING LIABILITY** – Any language limiting the Vendor's liability for direct damages to person or property is deleted.
10. **TAXES** – Any provisions requiring the State to pay Federal, State or local taxes or file tax returns or reports on behalf of Vendor are deleted. The State will, upon request, provide a tax exempt certificate to confirm its tax exempt status.
11. **NO WAIVER** – Any provision requiring the State to waive any rights, claims or defenses is hereby deleted.

12. **STATUTE OF LIMITATIONS** – Any clauses limiting the time in which the State may bring suit against the Vendor or any other third party are deleted.
13. **ASSIGNMENT** – The Vendor agrees not to assign the Contract to any person or entity without the State's prior written consent, which will not be unreasonably delayed or denied. The State reserves the right to assign this Contract to another State agency, board or commission upon thirty (30) days written notice to the Vendor. These restrictions do not apply to the payments made by the State. Any assignment will not become effective and binding upon the State until the State is notified of the assignment, and the State and Vendor execute a change order to the Contract.
14. **RENEWAL** – Any language that seeks to automatically renew, modify, or extend the Contract beyond the initial term or automatically continue the Contract period from term to term is deleted. The Contract may be renewed or continued only upon mutual written agreement of the Parties.
15. **INSURANCE** – Any provision requiring the State to maintain any type of insurance for either its or the Vendor's benefit is deleted.
16. **RIGHT TO REPOSSESSION NOTICE** – Any provision for repossession of equipment without notice is hereby deleted. However, the State does recognize a right of repossession with notice.
17. **DELIVERY** – All deliveries under the Contract will be FOB destination unless the State expressly and knowingly agrees otherwise. Any contrary delivery terms are hereby deleted.
18. **CONFIDENTIALITY** – Any provisions regarding confidential treatment or non-disclosure of the terms and conditions of the Contract are hereby deleted. State contracts are public records under the West Virginia Freedom of Information Act ("FOIA") (W. Va. Code §29B-a-1, et seq.) and public procurement laws. This Contract and other public records may be disclosed without notice to the vendor at the State's sole discretion.

Any provisions regarding confidentiality or non-disclosure related to contract performance are only effective to the extent they are consistent with FOIA and incorporated into the Contract through a separately approved and signed non-disclosure agreement.

19. **THIRD-PARTY SOFTWARE** – If this Contract contemplates or requires the use of third-party software, the vendor represents that none of the mandatory click-through, unsigned, or web-linked terms and conditions presented or required before using such third-party software conflict with any term of this Addendum or that it has the authority to modify such third-party software's terms and conditions to be subordinate to this Addendum. The Vendor shall indemnify and defend the State against all claims resulting from an assertion that such third-party terms and conditions are not in accord with, or subordinate to, this Addendum.
20. **AMENDMENTS** – The parties agree that all amendments, modifications, alterations or changes to the Contract shall be by mutual agreement, in writing, and signed by both parties. Any language to the contrary is deleted.

Notwithstanding the foregoing, this Addendum can only be amended by (1) identifying the alterations to this form by using *Italics* to identify language being added and ~~strikethrough~~ for language being deleted (do not use track-changes) and (2) having the Office of the West Virginia Attorney General's authorized representative expressly agree to and knowingly approve those alterations.

State: _____

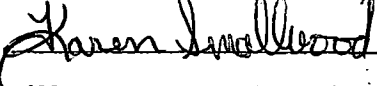
By: _____

Printed Name: _____

Title: _____

Date: _____

Vendor: Software Information Systems, LLC

By: 

Printed Name: Karen Smallwood

Title: Director, Contracts & Compliance

Date: 7/28/2020

Third Party Terms Indemnification Agreement

Pursuant to this Third Party Terms Indemnification Agreement, Ahead, LLC and the State of West Virginia Department of Education ("State") agree that the contract resulting from the solicitation identified as: ARFQ 0402 EDD2100000005, shall be modified as follows to include an indemnification obligation on the part of Software Information Systems, LLC (Vendor) for third party terms and conditions.

Third Party Terms and Conditions Indemnification: The Parties agree that all third party terms and conditions are modified by the terms of the WV-96 Addendum to Vendors's Standard Contractual Forms, signed by Ahead, LLC (the "WV-96 Addendum"). The intent of the parties is that the WV-96 Addendum will prevail in the event of any conflicts. Software Information Systems, LLC Vendor shall indemnify the State for claims brought by a vendor asserting third party terms and conditions prevail over the WV-96 Addendum.

Vendor Software Information Systems, LLC

State Agency: West Virginia Department of Education

By: *Karen Smallwood*

By: _____

Name: Karen Smallwood

Name: _____

Title: Director, Contracts & Compliance

Title: _____

Attorney General Approved As To Form

By: _____

Title: _____

Date: _____

ADDENDUM ACKNOWLEDGEMENT FORM

SOLICITATION NO.:

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)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input checked="" type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input checked="" type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> 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.

Sotware Information Systems, LLC
Company

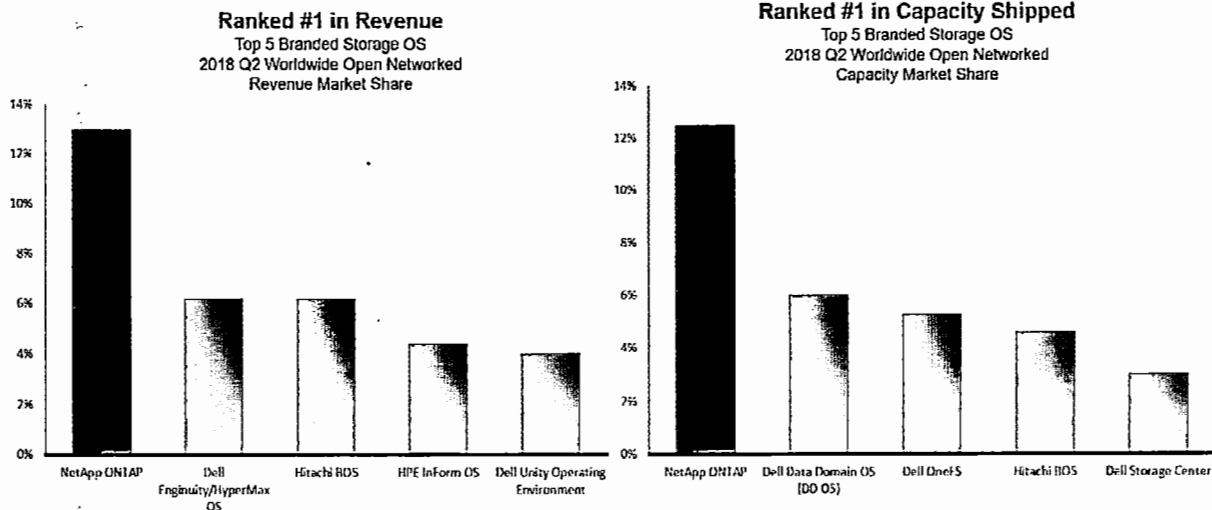
Karen Smallwood
Authorized Signature

0-4-2020
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.

Why NetApp?

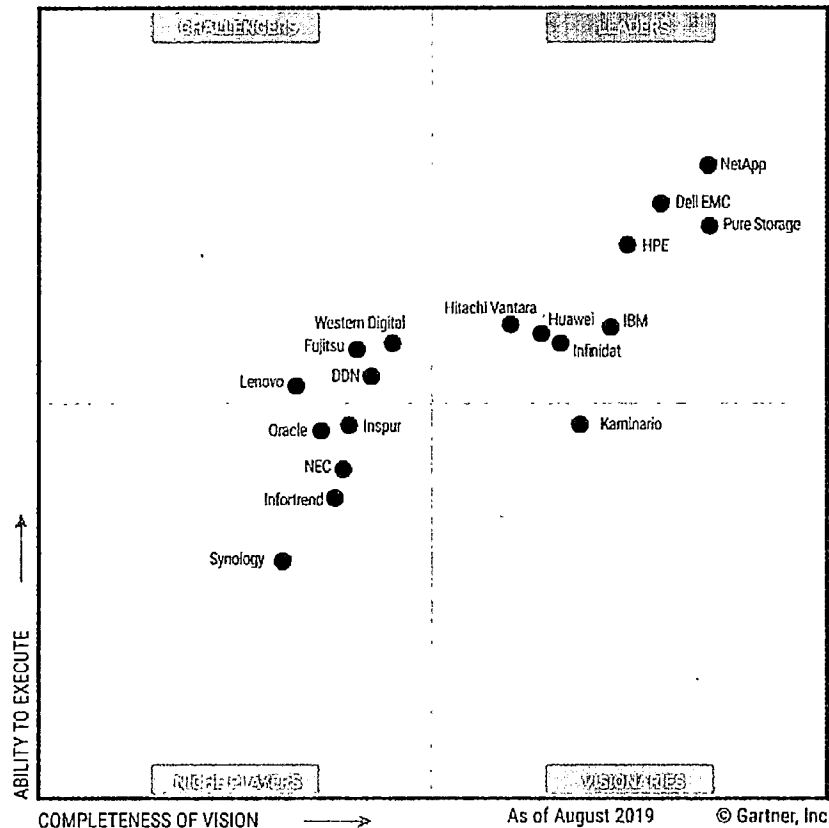
- NetApp Efficiency:** On average, NetApp customers require 50% less storage than their current storage solution. NetApp guarantees 3:1 efficiency on Flash
- NetApp Longevity:** NetApp, the largest publicly traded data management company in the world, is not a startup, and has been in business since 1992. You can rest assured that we will not only be here to support your business now, but in the future.
- #1 Federal Government Market Share:** NetApp is the largest provider of storage to the US Federal Government with an estimated 50% market share in Civilian Federal and an estimated 70% share in Secure Federal, more than all other data storage vendors combined. This is mainly due to NetApp's unique security capabilities which are utilized to protect sensitive government data.
- #1 Storage OS Market Share:** International Data Corporation (IDC) Storage Hardware and Software Market Share shows that NetApp Data ONTAP® is the world's number one storage operating system.



- #1 Converged Infrastructure, FlexPod:** NetApp, in partnership with Cisco created FlexPod, the world's #1 converged infrastructure solution. IDC ranks FlexPod #1 in their latest quarterly Tracker on the Worldwide Integrated Infrastructure and Platforms market. FlexPod is also ranked #1 in customer satisfaction per 451 independent research.
- #1 NetApp is the worlds fastest growing HyperConverged solution provider.**
- #1 NetApp E-Series:** E-Series is the world's #1 deployed storage hardware product in history. With over 1 Million controllers shipped, there is no other SAN storage product that has sold more. NetApp E-Series powers the world's largest data warehouse, the world's largest contiguous file system at Lawrence Livermore National Labs, powers 5 of the top 10 most powerful supercomputers in the world and is used in many of the worlds largest video surveillance and backup infrastructures.
- #1 In Flash Growth:** NetApp's AFF product achieved NetApp grew 300.6% Year over Year 3.2x faster than the market growth of 94.5% Year over Year.
- #1 Gartner Storage Product:** Gartner's latest magic quadrant for primary storage has NetApp positioned in the highest section of the leaders quadrant.
- #1 Cloud Storage Option provider.** NetApp partners with all major cloud providers and has more cloud compatible storage options than any other vendor. Compare the search results of NetApp and any other storage provider in your favorite cloud providers catalog and see for yourself.
- #1 Object Store.** NetApp StorageGrid is the top featured Object Store according to Gartner.
- #1 NVIDIA - NetApp is NVIDIA's worlds largest storage partner for AI/ML Computing.**

IDC Also shows NetApp AFF/FAS was #1 in scale-out NAS
 IDC WW Quarterly Enterprise Storage Systems Tracker, 2019 Q1, June 6, 2019 – Vendor Revenue

Figure 1. Magic Quadrant for Primary Storage



Source: Gartner (September 2019)

NetApp recognized as a Leader in 2019 Gartner Magic Quadrant for Primary Storage

This Magic Quadrant was published as part of a larger research note and should be evaluated in the context of the entire report. The full report is available from NetApp.

<https://www.netapp.com/us/campaigns/gmq-primary-storage-report/index.aspx>

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NetApp AFF A-Series

NetApp® All Flash FAS (AFF) is an all-flash array that delivers high performance, flexibility, low latency, and superior data management without sacrificing enterprise capabilities. AFF enables a smooth transition to flash for your data center, built on NetApp ONTAP® data management software.

As businesses go through digital transformation, they must modernize their IT infrastructure to improve speed and responsiveness to support critical business operations. Although all-flash storage systems have been widely adopted to accelerate typical enterprise applications, newer workloads such as data analytics, artificial intelligence (AI), and deep learning—demand higher performance that first-generation flash systems cannot deliver.

In addition, as more organizations adopt a “cloud first” strategy, it is critical to offer enterprise-grade data management capabilities for a shared environment across on-premise data centers and the cloud. Many all-flash array solutions available today lack robust data management, integrated data protection, seamless scalability, new levels of performance, deep application, and cloud integration. NetApp is at the forefront of helping customers to modernize their data center and has been recognized as a storage leader¹.

Cloud-Connected All-Flash Storage Powered by ONTAP

NetApp® All Flash FAS (AFF) is a robust scale-out platform built for virtualized environments, combining low-latency performance with comprehensive data management, built-in efficiencies, integrated data protection, multiprotocol support, and nondisruptive operations.

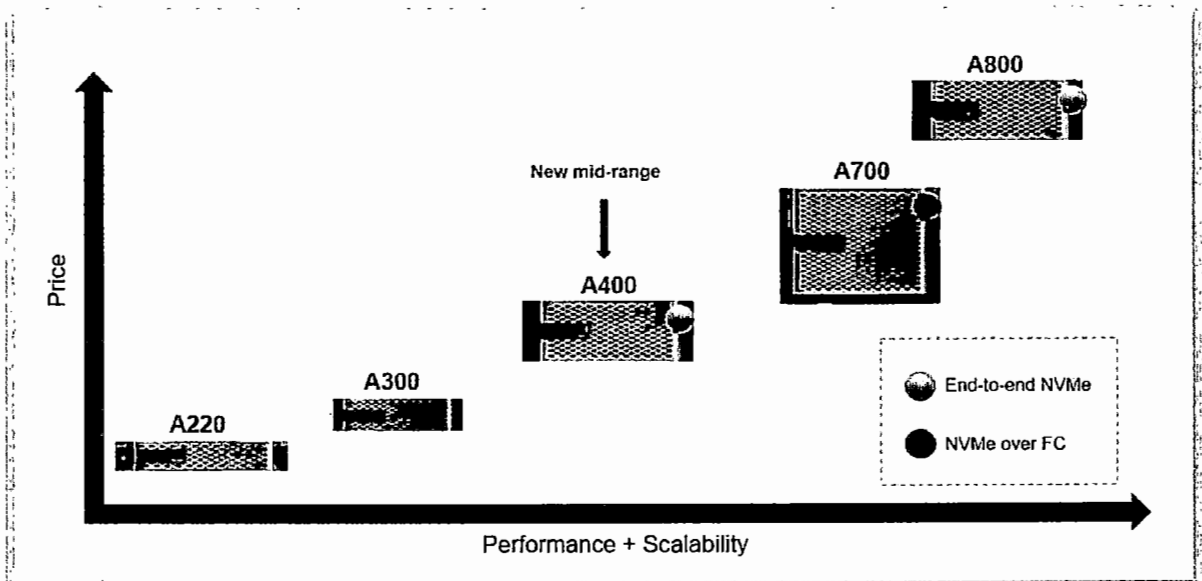


Figure 1: AFF portfolio – Modernize with cloud connected flash; provides solutions to modernize IT for small to large enterprises.

¹ Gartner Magic Quadrant for Primary Storage, September 17, 2019. The Magic Quadrant for Primary Storage replaces the Magic Quadrant for Solid-State Arrays and the Magic Quadrant for General-Purpose Storage Arrays.

NetApp AFF A-Series systems are designed to help businesses accelerate infrastructure transformation and fuel data-driven strategies. Powered by NetApp ONTAP® data management software, AFF systems accelerate, manage, and protect business-critical data and give you an easy and smooth transition to flash for your digital transformation in the hybrid cloud. With AFF systems, you can:

- Increase operational efficiency
- Accelerate applications and future-proof your infrastructure
- Keep business-critical data available, protected, and secure

Increase Operational Efficiency

AFF systems offer support and deep integration for enterprise applications, virtual desktop infrastructure (VDI), database, and server virtualization—supporting Oracle, Microsoft SQL Server, VMware, SAP, MySQL, and more. You can quickly provision storage in less than 10 minutes with NetApp ONTAP System Manager.

- Provision and rebalance workloads by monitoring clusters and nodes
- Use one-click automation and self-service for provisioning and data protection
- Import LUNs from third-party storage arrays directly into an AFF system to seamlessly migrate data

In addition, with the NetApp Active IQ® intelligence engine you can optimize your NetApp systems with predictive analytics and proactive support tool, provide real-time insights and recommendations to prevent problems and optimize your data infrastructure.

“With the NetApp solution, we can slash the time needed to create an environment from 6 hours to 5 minutes regardless of scale, while provisioning additional environments simultaneously. That translates to a time savings of 70% for each product line.”

— Sandrine Kalk, Director of Global DevOps and Operations, Verint

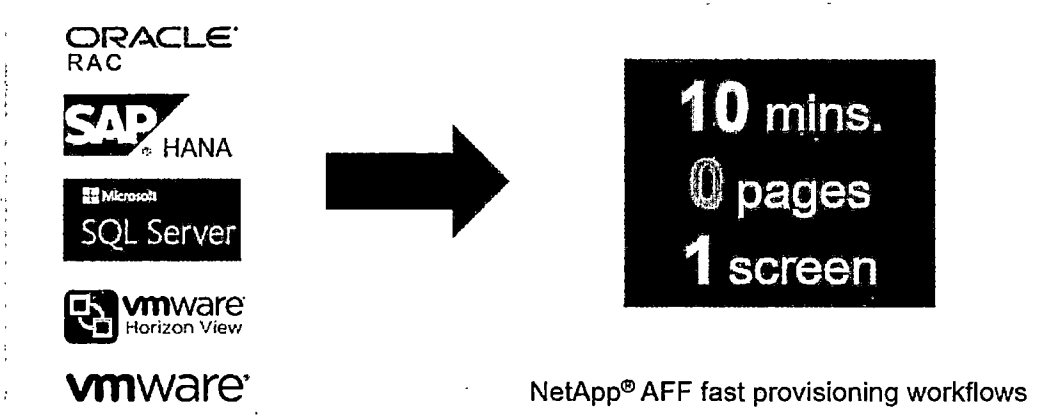


Figure 2: Application-aware data management – Deploy key workloads in less than 10 minutes with ONTAP System Manager.

Achieve Storage Savings, Backed by the Industry's Most Effective Guarantee

AFF systems support solid-state drives (SSDs) with multi stream write technology, combined with advanced SSD partitioning, providing a maximum usable capacity. Thin provisioning, NetApp Snapshot™ copies, and inline data reduction features, such as deduplication, compression, and compaction provide additional space savings—without affecting performance—so you purchase the least amount of storage capacity possible.

With AFF, reduce your data center costs with the best effective capacity for any workload, backed by the industry's most effective guarantee. We guarantee workload efficiencies in writing:

- 3:1 guarantee across all workloads
- 4:1 for VVOL and 8:1 for VDI
- Use snapshots and get 10x higher efficiency

Build your Hybrid Cloud with Ease

The data fabric powered by NetApp helps you simplify and integrate data management across cloud and on the premises to meet business demands and gain a competitive edge. With AFF, you connect to more clouds for more data services, data tiering, caching, and disaster recovery. FabricPool gives you the ability to maximize performance and reduce overall storage costs by automatically tiering cold data to the cloud and the read performance for data that is shared throughout your organization and across hybrid cloud deployments.

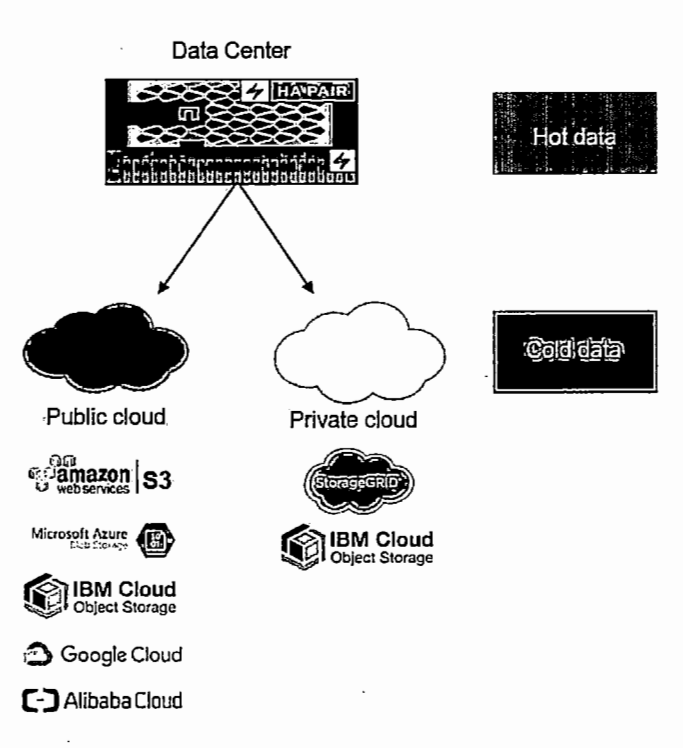


Figure 3: Automatic cloud tiering of cold data – FabricPool: Keep only hot data on your flash system.

Accelerate Applications and Future-Proof Your Infrastructure

NetApp AFF systems deliver industry-leading performance proven by SPC-1² and SPEC SFS industry benchmarks, making them ideal for demanding, highly transactional applications such as Oracle, Microsoft SQL Server, MongoDB databases, VDI, and server virtualization. With the power of front-end NVMe/FC host connectivity combined with backend NVMe-attached SSDs, the AFF systems delivery latency as low as 100µs, making them an optimal fit for the most demanding workloads.

Accelerate Demanding Workloads

The new AFF A400 supports NVMe/RoCE connectivity on the back end to the NVMe drive shelf and NVMe/FC on the front end to the host. AFF A400 offers advanced host network connectivity to support a wide variety of deployments; the hardware acceleration enhances performance and storage efficiency and also enables you to:

- Consolidate all workloads on AFF systems, which deliver up to 11.4 million IOPS at 1ms latency in a cluster with a truly unified scale-out architecture
- Manage a scalable NAS container of up to 20PB and 400 billion files with a single namespace
- Improve the speed and productivity of collaboration across multiple locations and increase data throughput for read-intensive applications with NetApp FlexCache software

Modernize with Advanced NVMe

Designed specifically for flash, the AFF A-Series all-flash systems deliver industry-leading performance, capacity density, scalability, security, and network. All midrange and high-end AFF A-Series systems support NVMe/FC host connectivity, so you get twice the IOPS while applications response time cuts in half compared with traditional FC. These systems support a range of ecosystems, including VMware, Microsoft Windows 10, and Linux, with storage path failover. For most customers, integrating NVMe/FC into an existing SAN is a simple, nondisruptive software upgrade.

In addition, integrate new technologies and private or public cloud into your infrastructure nondisruptively. AFF is the only all-flash array where you can combine different controllers, SSD sizes, and new technologies—protecting your investment. The newer NVMe-based AFF systems also support SAS SSDs, maximizing the flexibility and cost effectiveness of your upgrade.

Keep Important Data Available, Protected, and Secure

The more data driven your organization becomes, the more costly is the business impact of data loss. Ensuring data availability, eliminating maintenance disruptions, and quickly recovering from failures are imperatives. AFF systems come with a full suite of NetApp integrated and applications-consistent data protection software for integrated data protection, business continuity, fast disaster recovery, and security. Key capabilities and benefits include:

- Reduced data management costs with native space efficiency with cloning and NetApp Snapshot copies. Up to 1,023 copies are supported.

² Link to SPC-1 report: <http://spcresults.org/benchmarks/results/spc1-spc1e#A32007>.

- Unified, scalable platform and plug-in suite for application-consistent data protection and clone management with NetApp SnapCenter®.
- Reduced overall system costs with NetApp SnapMirror® replication software, which replicates to any type of FAS/AFF system: all-flash, hybrid, or HDD, on the premises or in the cloud.
- Protect your entire system with NetApp MetroCluster™ synchronous replication software. In addition, NetApp SnapMirror Synchronous provides more granular replication of selected critical data.

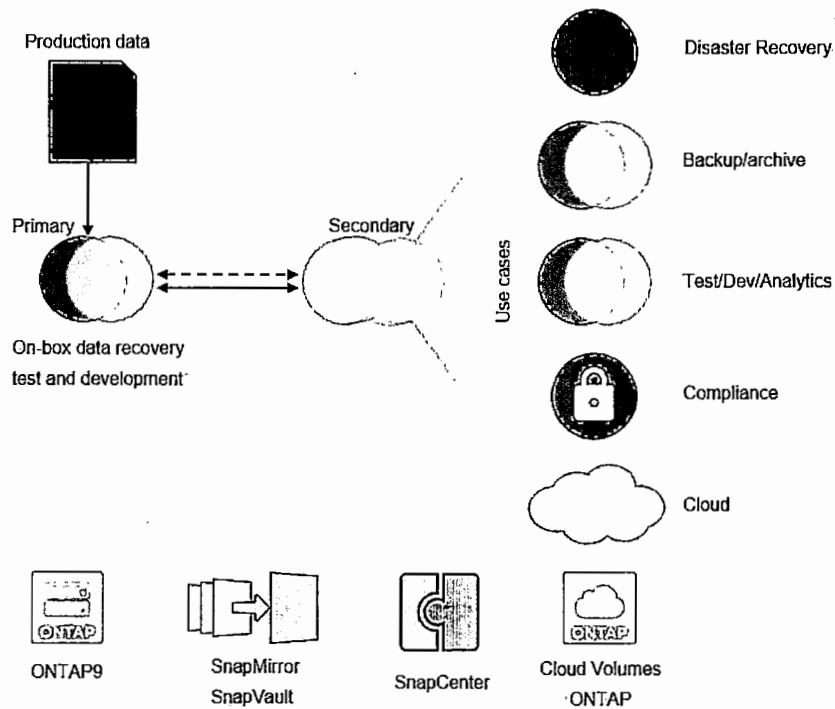


Figure 4: NetApp integrated data protection – Offers one data management flexible platform that provides data availability to keep applications running, mitigate risk, control costs, and improve data protection processes.

In addition, flexible encryption and key management help guard sensitive data on premises, in the cloud, and in transit. With the simple and efficient security solutions, you can:

- Achieve FIPS 140-2 compliance (Level 1 and Level 2) with self-encrypting drives and use any type of drives with software-based encryption.
- Meet governance, risk, and compliance requirements with security features such as secure purge; logging and auditing monitors; and write once, read many (WORM) file locking.
- Protect against threats with multifactor authentication, role-based access control, secure multitenancy, and storage-level file security.

"NetApp's multiprotocol capability was a major draw for our colleges. With NetApp, we can enable our colleges to retain their skillsets. They don't have to learn something new or put in a mix of products just to accommodate their protocols."

— Daniel Black, Director of Engineering, Technical College System of Georgia

Future-Proof Your Investment with Maximum Flexibility

NetApp solutions establish a seamless, well-integrated hybrid cloud architecture or Data Fabric that easily ties together private cloud, service providers, and hyperscale cloud providers along with their data management environments. This Data Fabric gives you the ability to implement the hybrid cloud on its own terms. Move data and applications to an AFF system, on commodity hardware with software-defined storage, or in the cloud. The Data Fabric offers a broad set of application ecosystem integration for database, VDI, and server virtualization.

With AFF, and the data fabric powered by NetApp, your investment is protected as performance and capacity needs change or your cloud strategy evolves:

- AFF systems eliminate performance silos. Seamless integration with hybrid FAS systems means that workloads can transparently move between high-performance tiers and low-cost capacity tiers.
- Seamlessly adapt to changing needs with the only all-flash array that offers the ability to intermix different controllers, SSD sizes, and next-generation technologies.
- AFF is data fabric ready, with proven cloud connectivity. FabricPool enables you to move data automatically between AFF and the cloud storage tiers to maximize performance and reduce overall data management cost.
- Optimize data management for enterprise workload environments with leading application integration with Oracle, Microsoft, VMware, SAP, OpenStack, and many more.

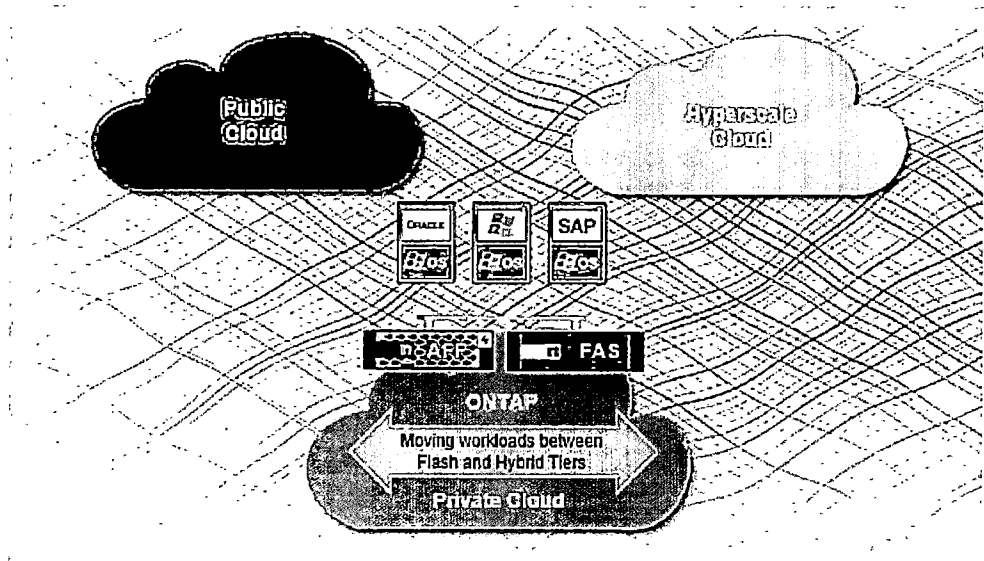


Figure 5: AFF is data fabric ready—moving data between tiers and different clouds.

"With NetApp All Flash FAS, we can improve the quality of healthcare in our own hospitals and others throughout the region by offering high-performing electronic patient records and virtual desktops to healthcare providers."

— Reinoud Reynders, IT Manager, Infrastructure and Operations at UZ Leuven

All-Flash Performance Powered by End-to-End NVMe Technology

AFF systems are excellent for performance-demanding applications and mixed-workload environments that consist of, for example, Oracle, Microsoft SQL Server, MongoDB databases, VDI, and server virtualization. With NVMe-based AFF A800, AFF is also a great choice for AI and deep-learning environments:

- Combined with ONTAP cloud integration and software-defined capabilities, AFF enables the full range of the data pipeline that spans the edge, the core, and the cloud for AI and deep learning, leveraging the same ONTAP data management.
- The end-to-end NVMe-based AFF A800 delivers 1.3 million IOPS at below 500 μ s latency.
- Built-in adaptive QoS safeguards SLAs in multiworkload and multitenant environments. It optimizes performance control dynamically with superior scalability of up to 40,000 workloads per cluster at LUN, file, and VVol levels.
- With the latest ONTAP release, AFF delivers up to 90% performance increase for Microsoft SQL Server with multichannel SMB.

Storage Efficiency Technologies

NetApp is known for its superior storage efficiency technologies, such as inline deduplication, inline compression, thin provisioning, and space-efficient Snapshot copies. These technologies apply to AFF systems and further reduce your total cost of ownership by lowering cost per effective gigabyte of storage:

- Performance-efficient inline data reduction technologies provide an average of 5 to 10 times space savings for a typical use case.
- Space-saving inline data compaction technology places multiple logical data blocks from the same volume into a single 4KB block. Space savings as high as 67:1 from this feature have been observed when using inline data compaction and inline compression with an Oracle database.
- There is a near-zero performance impact with inline compression. Incompressible data detection eliminates wasted cycles.
- You can increase space savings by eliminating redundant blocks using inline deduplication—effective for operations such as VDI OS patches in which this deduplication can achieve 70:1 reduction rates.
- As the first all-flash array to support SSDs with MSW technology, and combined with advanced SSD partitioning in ONTAP, AFF further increases usable capacity by up to 42%.

"We're able to fit a whole lot more in a smaller amount of space and still provide more performance than we had before."

— CI Engineer, financial services firm

NetApp Simplifies Management

NetApp management software provides automated tools to further simplify management of storage operations:

- Set up and configure AFF quick and easy with preconfigured systems for SAN and NAS deployments. It takes less than 10 minutes with ONTAP System Manager.
- OnCommand Workflow Automation automates common storage tasks such as provisioning and data protection. It provides fast one-click automation and self-service.
- Import LUNs from storage arrays that are not based on ONTAP software directly into an AFF system to seamlessly migrate data from older storage arrays.

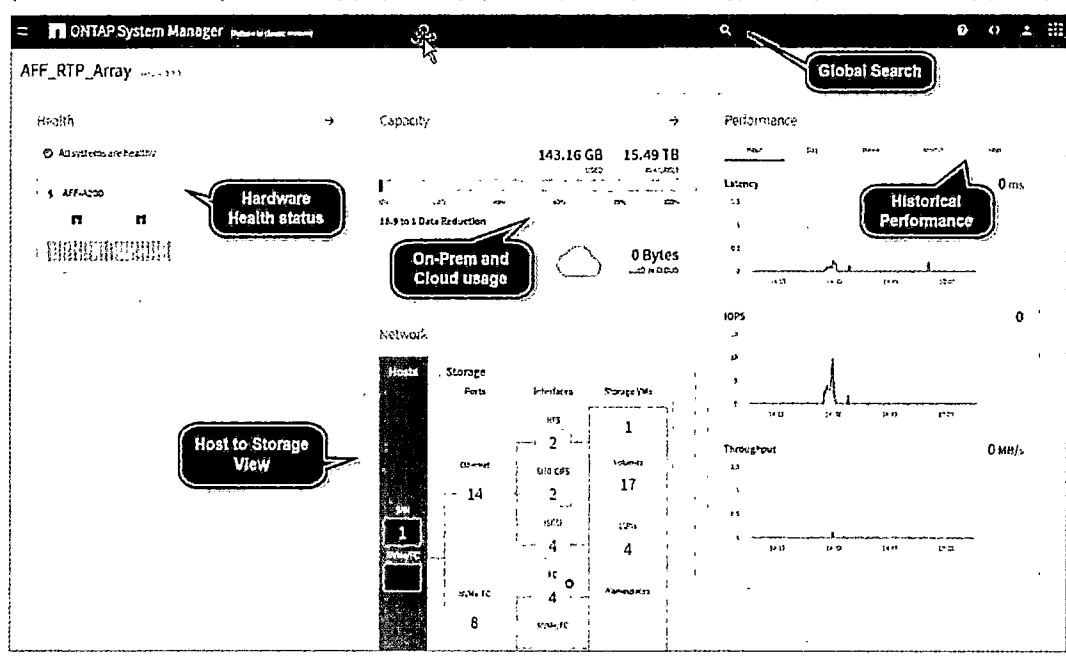


Figure 6: Intuitive ONTAP System Manager—Based on REST APIs, the new System Manager dashboard is more intuitive and displays richer information in a more actionable view.

Get More Business Value with Services

To help you fully realize the benefits of NetApp solutions, NetApp Services and our NetApp certified services partners will collaborate with you through a full portfolio of services that covers the company's IT lifecycle. NetApp offers:

- Assessment services to evaluate the performance and efficiency of workloads across heterogeneous environments
- Advisory services to determine the best workload candidates to move to flash
- Deployment and optimization services to prepare your environment and deliver continuous operation of AFF systems

- Managed upgrade services to secure your storage environment and to protect your investment by ensuring your ONTAP software is the most current version

NetApp Support offerings, such as the NetApp Active IQ® cloud-based predictive analytics and proactive support tool, provide real-time insights and recommendations to prevent issues from happening and optimize your data infrastructure. The AFF A400 systems come with new NetApp SupportEdge services to help you plan your budget by offering flat and predictable pricing across the lifecycle. Learn more at netapp.com/services.

AFF A-Series Systems

NetApp AFF systems help you meet your enterprise storage requirements with the following AFF A-Series systems:

AFF A800

The AFF A800 is designed for the most demanding workloads requiring ultra-low latency and is the first flash array on the market to support NVMe SSDs and NVMe over Fabrics (NVMe-oF). It provides end-to-end NVMe connectivity between storage arrays and host servers for maximum bandwidth, high IOPS, and the lowest possible latency. Each 4U chassis accommodates dual controllers for high availability (HA) and includes 48 slots for NVMe SSDs. In addition to 32Gb and 16Gb FC, network options include the storage industry's first 100GbE connectivity, as well as 40GbE and 10GbE. An NVMe-powered SAN scale-out cluster supports up to 12 nodes (6 HA pairs) with 1,440 drives and nearly 160PB of effective capacity. NAS scale-out clusters support up to 24 nodes (12 HA pairs). The AFF A800 future-proofs your data infrastructure with NetApp ONTAP 9 the industry's leading data management software.

"NetApp once again hits it out of the park with the enterprise focused A800. The performance profile is very strong, taking its position at the top of the ONTAP family."

— *StorageReview Editors' Choice, May 2019*

AFF A700

The AFF A700 is a high-end NetApp storage controller designed for performance-driven workloads and data centers requiring a modular design. The AFF A700 can dramatically enhance performance and high-performance I/O density in a new 8U HA form factor and it includes options for 40GbE and 32Gb FC along with the latest in SAS connectivity, the SAS 3.0 standard with 12Gb speeds. This controller also provides the most versatile I/O interface available, the UTA2 connections that support 10GbE and 16Gb FC and that can be easily changed between these two protocols in the field. AFF A700 controllers support up to 12 nodes for SAN deployments and up to 24 nodes in NAS deployments.

AFF A700s

The AFF A700s is an integrated high-end all-flash array and best for performance-driven workloads and data centers requiring a small footprint. The AFF A700s comes in a compact form factor with dual controllers and 24 internal SSDs in a single 4U chassis. A700s provides data center efficiencies and excellent performance with reduced power and cooling. AFF A700s performance is comparable to that of AFF A700; however, they offer different connectivity and capacity options to address different solutions and customer requirements.

AFF A400

The AFF A400 merges the latest data acceleration technology with the ultralow latency of end-to-end NVMe storage. AFF A400 data acceleration capability offloads storage efficiency processing, thus delivering significantly higher performance. This capability enables you to capitalize on the exploding data growth from emerging technologies such as AI, machine learning (ML), and big data. AFF A400 gives you the ability to modernize SAN deployments with ultralow latency and end-to-end NVMe. You can achieve the performance, scale, and operational efficiency goals of emerging workloads with the front-end NVMe/FC. With self-encrypting disk (SED) technology you can easily incorporate data-at-rest encryption in all your deployments with either OKM or KMIP servers. The AFF A400 also provides investment protection for AFF customers who want to continue using existing SAS-attached SSD storage.

The AFF A400 combines NetApp's leadership in end-to-end NVMe storage performance with simple data management of the new ONTAP Systems Manager. This makes the A 400 a top choice for our customers as they upgrade their IT infrastructure of their critical workloads running in a hybrid multicloud world.

— Chad Stuart, Solutions Architect, World Wide Technology Solutions

AFF A320

The AFF A320 midrange end-to-end NVMe NetApp AFF storage controller is a modern NVMe Flash storage system. It provides application performance improvements with lower latencies compared to the AFF A300. For enterprise applications that require the best performance at value, the AFF A320 includes dense 2U form factor with two HA controllers, extreme bandwidth with 16 onboard 100GbE ports and four expansion slots in an HA pair, adapter support includes 100GbE, 32Gb FC, 25GbE, and 10GbE support, NVDIMMs for persistent write cache of data received but not yet committed to flash media, and host-side NVMe/FC support for low-latency, high-performance remote direct memory access (RDMA) connectivity to the NVMe SSDs.

AFF A300

The A300 firmly targets enterprise applications that require best balance of performance and cost. It is more powerful than the AFA A220 for users that need additional capacity and performance. The AFF A300 is easy to set up and runs the latest version of ONTAP and supports SSDs up to 30TB. It requires just 12 SSDs to start but scales to over 140PB raw (560PB effective) in NAS config and 70PB raw (280PB effective) as SAN. The A300 supports 10GbE, 40GbE as well as Fibre Channel up to 32Gb and NVMe/FC with the 32Gb FC adapter.

The midrange AFF A300 recently won the Editor's Choice Award from StorageReview, which bestows this award for "performance in excess of competitive offerings, a feature set that is innovative and sets a new bar for competitive offerings or for defining a new category or space within enterprise IT". Through Storage Review's independent testing with Oracle, SQL, VDI workloads, AFF A300 stands out with its impressive performance and feature set.

— StorageReview Editors' Choice, November 2018

AFF A220

The AFF A220 is ideal for mid-size business and small enterprises that require simplicity and best value. With the AFF A220 you can accelerate business insights and demanding workloads. This 2U array enables enhanced storage efficiency based on the types of workloads. With a potential maximum raw capacity of up to 48.3 PB and maximum memory of 768 GB, NetApp ensures the effectiveness of its inline data reduction technologies, including compression, deduplication and data compaction. It offers 4x 10 GbE cluster interconnect channels for distribution of the processing across an array of nodes in the clusters, and high-data rate and low-latency communication between node processes.

Table 1: All Flash FAS A-Series systems technical specifications.

AFF Technical Specifications							
	AFF A800	AFF A700s	AFF A700	AFF 400	AFF A320	AFF A300	AFF A220
Maximum scale-out	2–24 nodes (12 HA pairs)						
Maximum SSD	2,880	2,529	5,760	5760	2304	4,608	1,728
Max effective capacity ³	316.3PB	316.3PB	702.7PB	702.7PB	35PB	562.2PB	193.3PB
Per-System Specifications (Active-Active Dual Controller)							
Controller form factor	4U with 48 SSD slots	4U with 48 SSD slots	8U	4U	2U	3U	2U with two 24 SSD slots

Table 2: AFF A-Series software.

AFF A-Series Software	
Features and software included with ONTAP software	<p>Efficiency: NetApp FlexVol®, inline deduplication, inline compression, inline compaction, and thin provisioning</p> <p>Availability: Multipath I/O and active-active HA pair</p> <p>Data protection: NetApp RAID DP®, NetApp RAID TEC®, and Snapshot technology</p> <p>Whole cluster synchronous replication: MetroCluster</p> <p>Performance control: Adaptive QoS and balanced replacement</p> <p>Management: OnCommand Workflow Automation, ONTAP System Manager, and Active IQ Unified Manager</p> <p>Scalable NAS container: NetApp ONTAP FlexGroup</p> <p>Storage protocols supported: NVMe/FC, FC, FCoE, iSCSI, NFS, pNFS, and SMB⁴</p>

³ Effective capacity is based on 5:1 storage efficiency ratios with the maximum number of SSDs installed. The actual ratio can be higher depending on workloads and use cases.

⁴ All SAN Array AFF A700 and AFF A220 systems are powered by ONTAP 9.7 and built on AFF A700 and AFF A220 arrays. These new point-of-sale systems are preconfigured at the factory to be deployed for dedicated all-block (FCP, iSCSI) workloads.

AFF A-Series Software

Flash bundle

NetApp SnapRestore® software: Restore entire Snapshot copies in seconds

NetApp SnapMirror software: Simple, flexible backup and replication for disaster recovery

NetApp FlexClone® technology: Instant virtual copies of files, LUNs, and volumes

NetApp SnapCenter®: Unified, scalable platform and plug-in suite for application-consistent data protection and clone management

NetApp SnapManager software: Application-consistent backup/recovery for enterprise applications

Go to NetApp.com for information on additional software available from NetApp.

Extended-value software (optional)

NetApp OnCommand Insight: Flexible, efficient resource management for heterogeneous environments

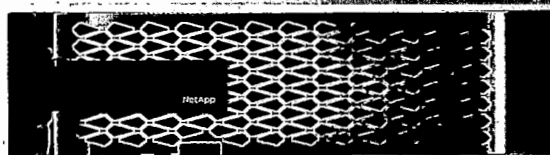
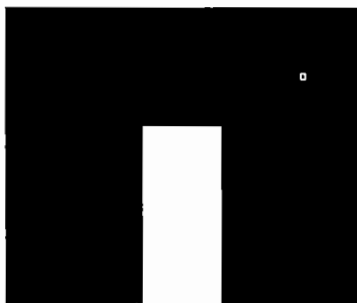
NetApp SnapLock: Compliance software for write once, read many (WORM) protected data

NetApp Volume Encryption (free license): Granular, volume-level, data-at-rest encryption

NetApp FabricPool feature: Automatic data tiering to the cloud

SnapMirror Synchronous: Synchronous data replication with zero recovery point objective

NetApp FlexCache: Acceleration for data access for single or multisite deployment



Datasheet

NetApp AFF A-Series

Leading the future of flash

Key Benefits

Accelerate Applications

- Speed up your critical applications with the industry's fastest end-to-end NVMe enterprise all-flash array.
- Accelerate artificial intelligence and machine learning applications with lowest latency.
- Support 2 times more workloads and cut application response time in half with a modern NVMe-based SAN infrastructure.

Reduce Data Center Costs

- Minimize your data center footprint by storing up to 2PB of data in a 4U compact system.
- Save SSD storage by 5 to 10 times with inline data reduction technologies.
- Reduce power and cooling, rack space, and support costs dramatically.

Simplify IT Operations

- Unify data services across SAN and NAS environments, both on the premises and in the cloud.
- Set up and configure a complete system and serve data within 10 minutes.
- Safeguard your data with best-in-class integrated data protection and seamless cloud backup and recovery.

Data driven organizations require an agile and efficient IT infrastructure to meet the demand for fast, secure, and continuous data access. A fundamental first step in undertaking an IT transformation is to modernize your infrastructure with all-flash storage to improve speed and responsiveness for critical business applications. New workloads, such as data analytics, artificial intelligence (AI), and deep learning (DL), demand extreme performance that first-generation flash systems cannot deliver. Additionally, more and more organizations are adopting a "cloud first" strategy, driving the need for enterprise-grade data services for a shared environment across on-premises data centers and the cloud. As a result, modern all-flash arrays must provide robust data services, integrated data protection, seamless scalability, and new levels of performance—plus deep application and cloud integration.

Cloud-Connected All-Flash Storage Powered by ONTAP

IT departments need smart, powerful, trusted solutions that take advantage of modern cloud technologies. NetApp® AFF A-Series systems are designed to help organizations accelerate their infrastructure transformation and fuel data-driven strategies. Powered by NetApp ONTAP® data management software, AFF systems deliver the industry's highest performance, superior flexibility, and best-in-class data services and cloud integration to help you accelerate, manage, and protect your business-critical data in the hybrid cloud.

A wide range of customers, from enterprise to midsize businesses, rely on AFF to:

- Simplify operations with seamless data management, on the premises and in the cloud.
- Accelerate traditional and new-generation applications.
- Keep business-critical data available, protected, and secure.

AFF A-Series systems support end-to-end NVMe technologies, from NVMe-attached SSDs to front-end NVMe over Fibre Channel (NVMe/FC) host connectivity. These systems deliver the industry's lowest latency for an enterprise all-flash array, making them a superior choice for driving the most demanding workloads and AI/DL applications. With a simple software upgrade to the modern NVMe/FC SAN infrastructure, you can drive more workloads with faster response times, without disruption or data migration.

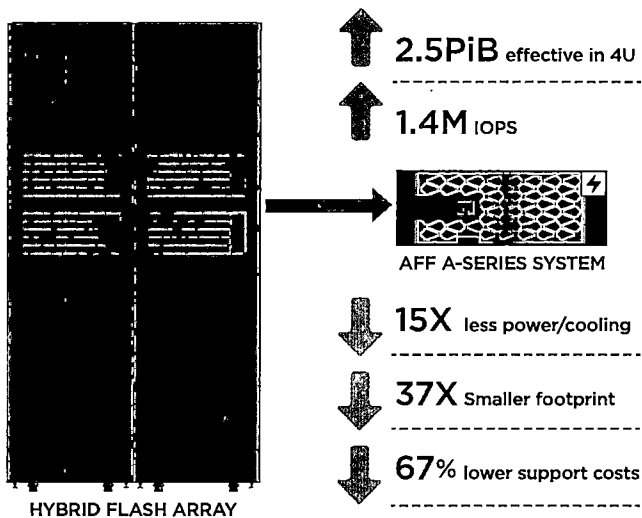


Figure 1) Benefits of Modernizing with All-Flash.

Increase Operational Efficiency for Your Business

IT departments are striving to make budgets go further and to allow IT staff to focus on new value-added projects rather than on day-to-day IT management.

Provision storage in minutes

NetApp AFF systems offer broad application ecosystem support and deep integration for enterprise applications, virtual desktop infrastructure (VDI), database, and server virtualization, supporting Oracle, Microsoft SQL Server, VMware, SAP, MySQL, and more. You can quickly provision storage in less than 10 minutes with NetApp ONTAP System Manager (formerly OnCommand® System Manager).

Infrastructure management tools simplify and automate common storage tasks so that you can:

- Easily provision and rebalance workloads by monitoring clusters and nodes.
- Use one-click automation and self-service for provisioning and data protection.
- Import LUNs from third-party storage arrays directly into an AFF system to seamlessly migrate data.

In addition, the NetApp Active IQ® intelligence engine enables you to optimize your NetApp systems with predictive analytics and proactive support. Fueled by NetApp's massive user base, AI and machine learning create actionable insights that help you prevent problems, optimize your configuration, save time, and make smarter decisions.

Achieve storage savings, backed by the industry's most effective guarantee

NetApp employs various capabilities to promote optimal capacity savings and to drive down your TCO. AFF system's support for solid-state drives (SSDs) with multistream write technology, combined with advanced SSD partitioning, provides maximum usable capacity, regardless of the type of data that you store. Thin provisioning; NetApp Snapshot™ copies; and inline data reduction features, such as deduplication, compression, and compaction, provide substantial additional space savings—without affecting performance—enabling you to purchase the least amount of storage capacity possible. With AFF, you can dramatically reduce your data center costs with the best effective capacity for any workload, backed by the industry's most effective guarantee.

Build your hybrid cloud with ease

The NetApp Data Fabric helps your organization simplify and integrate data management across cloud and on-premises to meet business demands and gain a competitive edge. With AFF, you can connect to more clouds for more data services, data tiering, caching, and disaster recovery. You can also:

- Maximize performance and reduce overall storage costs by automatically tiering cold data to the cloud with FabricPool.
- Greatly simplify hybrid cloud backup and recovery with cloud-resident NetApp Data Availability Services.
- Accelerate read performance for data that is shared widely throughout your organization and across hybrid cloud deployments.

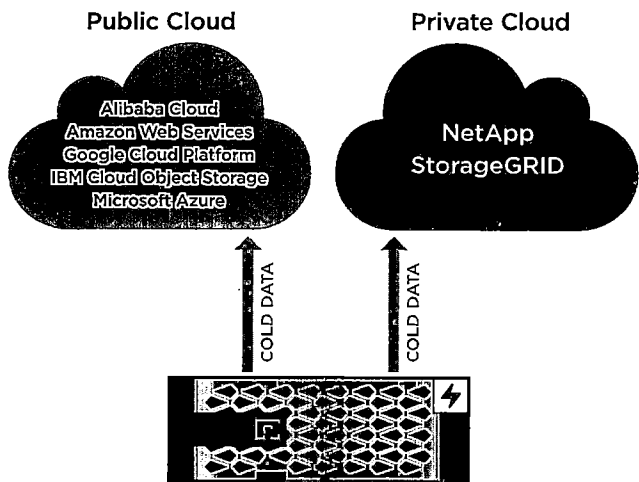


Figure 2) Automatic tiering to the cloud.

Accelerate Applications and Future-Proof Your Infrastructure

In the modern data center, IT is charged with driving maximum performance for business-critical workloads, scaling without disruption as the business grows, and enabling the business to take on new data-driven initiatives.

Get the best performance for your most demanding applications

NetApp AFF systems deliver industry-leading performance proven by SPC-1 and SPEC SFS industry benchmarks, making them ideal for demanding, highly transactional applications such as Oracle, Microsoft SQL Server, MongoDB databases, VDI, and server virtualization. With the power of front-end NVMe/FC host connectivity combined with back-end NVMe-attached SSDs, the AFF systems deliver latency as low as 100µs, making them an optimal fit for your most demanding workloads. The midrange AFF A400 system puts best performance within your budget. Supporting NVMe/RoCE connectivity on the back end to the NVMe drive shelf and NVMe/FC on the front end to the host, the AFF A400 leads the market with the most advanced host network connectivity to support a wide variety of deployments. The hardware acceleration significantly enhances performance and storage efficiency: You can also:

- Drive your mission-critical SAN workloads with symmetric active-active host connectivity that delivers continuous availability and instant failover.
- Consolidate workloads on AFF systems, which can deliver up to 11.4 million IOPS at 1ms latency in a cluster with a truly unified scale-out architecture. You also get built-in adaptive quality of service (QoS) that safeguards SLAs in multiworkload and multitenant environments.
- Manage massively scalable NAS containers of up to 20PB and 400 billion files with a single namespace.
- Improve the speed and productivity of collaboration across multiple locations and increase data throughput for read-intensive applications with NetApp FlexCache™ software.

Modernize with advanced NVMe

Designed specifically for flash, the AFF A-Series all-flash systems deliver industry-leading performance, density, scalability, security, and network connectivity. AFF A-Series systems support NVMe/FC host connectivity on all midrange and high-end systems, so you can get twice the IOPS and cut application response time in half compared with traditional FC. These systems support a range of ecosystems, including VMware, Microsoft Windows 10, and Linux, with storage path failover. For most customers, integrating NVMe/FC into an existing SAN is a simple, nondisruptive software upgrade.

Scale without disruption

You can integrate new technologies and private or public cloud into your infrastructure nondisruptively. AFF is the only all-flash array that enables you to combine different controllers, SSD sizes, and new technologies so that your investment is protected. The newer NVMe-based AFF systems also support SAS SSDs, maximizing the flexibility and cost effectiveness of your upgrade.

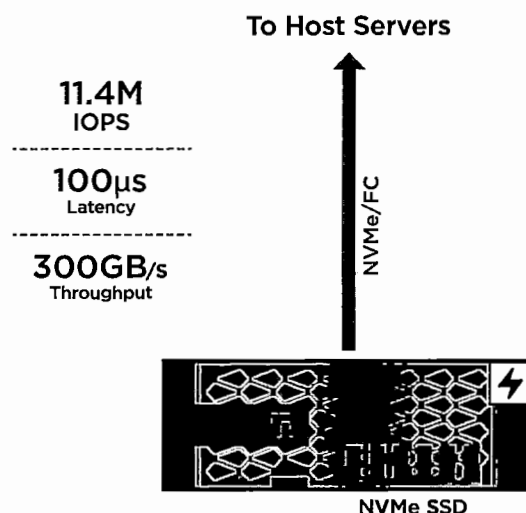


Figure 3) Industry-leading NVMe performance.

Keep Important Data Available, Protected, and Secure

As organizations become more data driven, the business impact of data loss can be increasingly dramatic—and costly. IT must protect data from both internal and external threats, ensure data availability, eliminate maintenance disruptions, and quickly recover from failures.

Integrated data protection

AFF systems come with a full suite of acclaimed NetApp integrated and application-consistent data protection software. Key capabilities include:

- Native space efficiency with cloning and NetApp Snapshot copies reduce storage costs and minimize performance impact. Up to 1,023 copies are supported.
- NetApp SnapCenter® software provides application-consistent data protection and clone management to simplify application management.
- NetApp SnapMirror® technology replicates to any NetApp FAS or AFF system on the premises or in the cloud, reducing overall system costs.

Business continuity and fast disaster recovery

With AFF, you can maintain constant data availability with zero data loss and zero downtime. NetApp MetroCluster™ software provides synchronous replication to protect your entire system, and NetApp SnapMirror Synchronous provides more granular replication of selected critical data.

Security everywhere

Flexible encryption and key management help guard your sensitive data on the premises, in the cloud, and in transit. With the simple and efficient security solutions, you can:

- Achieve FIPS 140-2 compliance (Level 1 and Level 2) with self-encrypting drives and use any type of drives with software-based encryption.
- Meet governance, risk, and compliance requirements with security features such as secure purge; logging and auditing monitors; and write once, read many (WORM) file locking.
- Protect against threats with multifactor authentication, role-based access control, secure multitenancy, and storage-level file security.

Get More Business Value with Services

NetApp Services and NetApp Services Certified Partners collaborate with you to enhance your IT capabilities through a full portfolio of services that cover your IT lifecycle. To help you get the most value from your flash technology investment, NetApp offers:

- Assessment services to help evaluate the performance and efficiency of workloads across your heterogeneous environments.

- Advisory services to help you determine the best workload candidates to move to flash.
- Deployment and optimization services to prepare your environment and to deliver continuous operation of your AFF systems.
- Managed upgrade services to secure your storage environment and to protect your investment by ensuring your ONTAP software is the most current version.

Learn more at netapp.com/services.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation and optimize their operations. For more information, visit www.netapp.com. #DataDriven

Table 1) AFF technical specifications.

	AFF A800	AFF A700	AFF A400	AFF A220
Maximum scale-out	2-24 nodes (12 HA pairs)	2-24 nodes (12 HA pairs)	2-24 nodes (12 HA pairs)	2-24 nodes (12 HA pairs)
Maximum SSDs	2,880	5,760	5,760	1,728
Maximum effective capacity ¹	316.3PB	702.7PB	702.7PB	193.3PB
Per-System Specifications (Active-Active Dual Controller)				
	AFF A800	AFF A700	AFF A400	AFF A220
Controller form factor	4U with 48 SSD slots	8U	4U	2U with 24 SSD slots
PCIe expansion slots	8	20	10	n/a
FC target ports (32Gb autoranging)	32	64	24	n/a
FC target ports (16Gb autoranging)	32	64	32 (with FC mezzanine card)	8
FCoE target ports, UTA2	n/a	64	n/a	8
100GbE ports (40GbE autoranging)	20	n/a	16	n/a
40GbE ports (10GbE autoranging)	n/a	32	n/a	n/a
25GbE ports	16	n/a	16	n/a
10GbE ports	32	64	32	12
10Gbase-T (1GbE autoranging)	n/a	64	16	n/a
12Gb/6Gb SAS ports	n/a	64	32	4
Storage networking supported	NVMe/FC, FC, iSCSI, NFS, pNFS, CIFS/SMB	NVMe/FC, FC, FCoE, iSCSI, NFS, pNFS, SMB	NVMe/FC, FC, iSCSI, NFS, pNFS, CIFS/SMB	FC, FCoE, iSCSI, NFS, pNFS, SMB
OS version	ONTAP 9.4 RC1 or later	ONTAP 9.1 RC1 or later	ONTAP 9.7RC1 or later	ONTAP 9.4 RC1 or later
Shelves and media	NVMe drive packs DS224C (2U; 24 drives, 2.5" SFF); DS2246 (2U; 24 drives, 2.5" SFF)	DS224C (2U; 24 drives, 2.5" SFF); DS2246 (2U; 24 drives, 2.5" SFF)	NS224 (2U; 24 drives, 2.5" SFF NVMe); DS224C (2U; 24 drives, 2.5" SFF), DS2246 (2U; 24 drives, 2.5" SFF)	DS224C (2U; 24 drives, 2.5" SFF); DS2246 (2U; 24 drives, 2.5" SFF)
Host/client OS supported	Microsoft Windows 2000, Windows Server 2003, Windows Server 2008, Windows Server 2012, Windows Server 2016, Linux, Oracle Solaris, AIX, HP-UX, Mac OS, VMware, ESX			

1. Effective capacity is based on 5:1 storage efficiency ratios with the maximum number of SSDs installed. The actual ratio can be higher depending on workloads and use cases.

Table 2) AFF A Series Software

Data access protocols	<ul style="list-style-type: none"> FC, iSCSI, NVMe/FC, FCoE, NFS, SMB
High availability	<ul style="list-style-type: none"> Active-active and symmetric active-active (SAN-only) host connectivity Nondisruptive maintenance, upgrade, and scale-out clustering Multisite resiliency for continuous data access
Storage efficiency	<ul style="list-style-type: none"> Inline data compression, deduplication, and compaction Space-efficient LUN, file, and volume cloning Automatic data tiering
Data management	<ul style="list-style-type: none"> Intuitive onboard GUI, REST APIs, and automation integration AI-informed predictive analytics and corrective action Quality of service (QoS) workload control Easily provision and manage data from market-leading host operating systems, hypervisors, and application software
Scalable NAS	<ul style="list-style-type: none"> Large-scale single namespace management with local and remote caching
Data protection	<ul style="list-style-type: none"> Application-consistent Snapshot copies and restore Integrated remote backup and disaster recovery Synchronous zero data loss replication
Security and compliance	<ul style="list-style-type: none"> Multifactor admin access Secure multitenant shared storage In-flight and data-at-rest encryption Regulatory-compliant data retention
Cloud integration	<ul style="list-style-type: none"> Seamlessly tier, back up, replicate, and cache data to private and public clouds Move data between major public cloud services

ONTAP 9: Harness the Power of the Hybrid Cloud

NetApp ONTAP simplifies data management for any application, anywhere. Accelerate and protect data across the hybrid cloud; and future-proof your data infrastructure. The latest version, ONTAP 9.7, offers a number of enhancements, including a new management user interface and synchronous mirroring with MetroCluster.

West Virginia Department of Education's transformation into a digital business brings with it pressures to be more efficient, respond quickly to new opportunities, and improve the customer experience. This might require modernizing your IT infrastructure, integrating new types and uses of data into your existing environment, and managing data on premises as well as in the cloud—yet operations must be simplified, costs reduced, and security increased.

NetApp® ONTAP 9® unifies data management across flash, disk, and cloud. It bridges current enterprise workloads and new emerging applications providing unmatched versatility, comprehensive data protection, and leading storage efficiency. NetApp ONTAP 9.7 is the latest generation of the leading data management software that delivers the performance, data resiliency, protection, and scalability that you need for your data infrastructure. ONTAP 9.7 continues to build the foundation for a modern data fabric. You can easily harness the power and agility of the hybrid cloud to get the most value from your data wherever you need it—at the edge, in the data center, or in the cloud. This latest release of ONTAP software is well suited for enterprise business applications and for artificial intelligence (AI) and real-time analytics.

Leverage ONTAP 9 to:

- Simplify operations and reduce cost
- Adapt to changing business needs
- Protect and secure data across the hybrid cloud

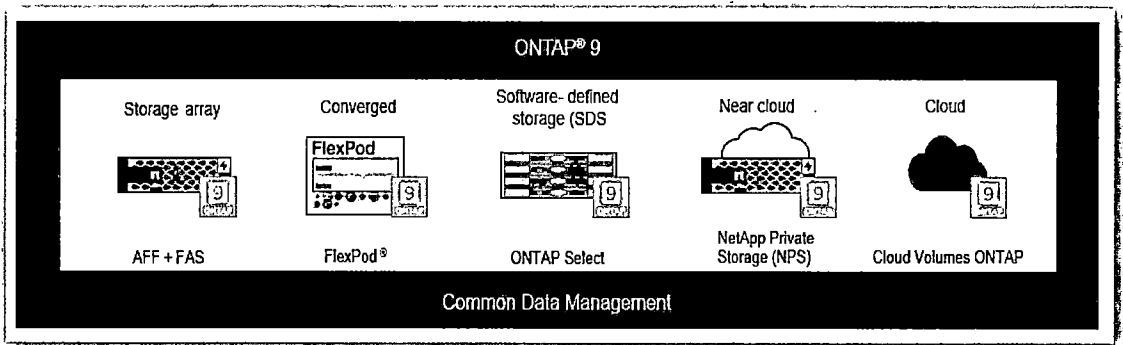


Figure 1: Standardize data management across architectures with a rich set of enterprise data services.

"Ease of use is the most valuable feature for us....With ONTAP we have more shelves, more disks, and aggregates."

— Peggy Baladera, Storage Tec, General Dynamics Mission Systems Inc.

Simplify Operations and Reduce Costs

Although storage might double in size, it no longer means there is twice as much work required. ONTAP has a common set of features across deployment architectures that simplify complex tasks so your staff can be more productive.

Receive Proven Storage Efficiency

With ONTAP, you can reduce costs with one of the most comprehensive storage efficiency offerings in the industry. You get NetApp Snapshot™ copies, thin provisioning, as well as replication and cloning technologies. You also get inline data compression, inline deduplication, and inline compaction that work together to reduce data management costs and maximize effective capacity. In addition, FabricPool automates the cost-efficient tiering of cold data to both public and private clouds.

Deploy Workloads in Less Than 10 Minutes

Fast provisioning workflows enable the deployment of key workloads such as Oracle, SQL Server, SAP HANA, VDI, and VMware in less than 10 minutes from power-on to serving data. Years of NetApp experience and best practices are integrated into the System Manager wizard and factory configurations, so you can quickly set up new configurations by answering a few questions. As new workloads are deployed, ONTAP 9 gives you the visibility to know which node has the most performance capacity available for optimal deployment.

Save Time with the New Management User Interface

ONTAP System Manager has been redesigned with new dashboard page views and simpler workflows that are based on REST APIs. The new management user interface gives you the ability to easily see the status of your cluster and to take quick actions to complete management tasks or mitigate risks before they become problems. ONTAP System Manager will save you time by showing key system information about capacity, hardware health, networking, and performance history with up to one year of data. Only one screen is needed for provisioning LUNs or NAS volumes.

Simplify Operations and Unify Data Management

Simplify your operations by unifying data management across a hybrid cloud that can span flash, disk, and cloud running SAN and NAS workloads. Increase the efficiency of your staff and easily move data between nodes to where it is most needed. ONTAP is the foundation for a data fabric that gives freedom, choice, and control across your storage environment.

Automatically Tier to Cloud

You can deliver high performance to your applications and reduce storage costs by automatically tiering cold data from the performance tier to a private or public cloud. FabricPool frees up space on your existing NetApp All Flash FAS (AFF) infrastructure, so you can consolidate more workloads.

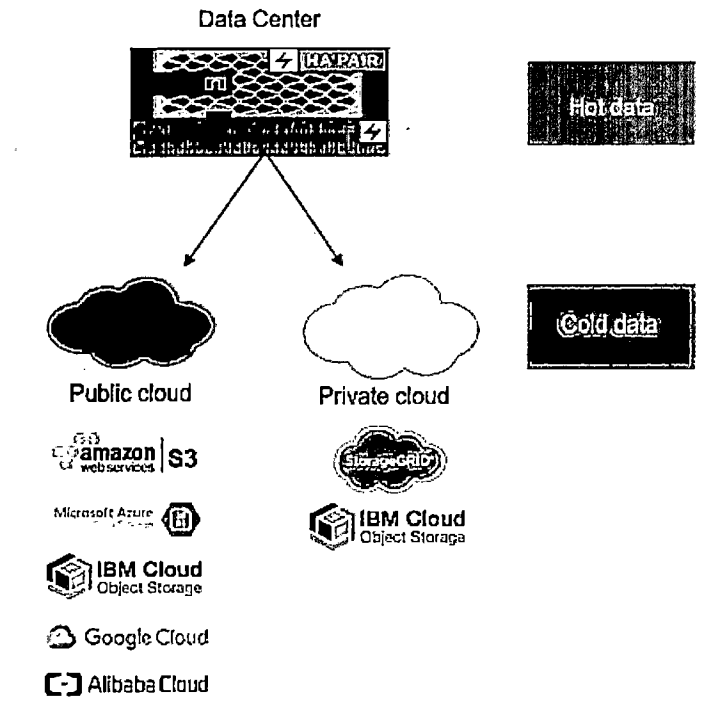


Figure 2: Automatic cloud tiering of cold data – ONTAP 9.7 enables mirroring of tiered, cold data to multiple cloud buckets, either in public clouds or in on the premises. This feature increases your flexibility to change cloud-tiering providers or locations and gives you an additional level of resiliency if one cloud tier location goes offline.

Maximize Investment Protection

ONTAP gives you the flexibility to create an integrated, scalable storage environment by clustering storage controllers from different families—AFF and FAS—as well as from different generations. Grow with the latest hardware and continue to use your older hardware. When it is time to retire a storage system, simply upgrade the controllers and keep data in place on the existing disk shelves.

Gain Simple, Powerful Management Capabilities

NetApp data management infrastructure software manages hybrid clouds. You can centrally monitor the health of your environment by viewing metrics on capacity utilization, performance, availability, and data protection. It can also help automate your storage processes and integrate them into your data center orchestration platform for end-to-end service delivery for your private and hybrid cloud services.

NetApp Active IQ® intelligence provides predictive analytics and actionable insights based on machine learning and artificial intelligence. This intelligence helps optimize your NetApp investment, simplify and automate operations, and achieve data center efficiencies.

“ONTAP has really reduced our costs because we learned that we could use our storage with fewer machines and drive down data center costs.”

— Oliver Fuckner, Systems Administrator, Strato AG

Adapt to Changing Business Needs

To support your critical applications, you need a storage environment that cost-effectively delivers high performance and availability that can also scale with business growth and protect your valuable data. ONTAP 9 delivers on all these requirements with highly efficient flash performance for scalable, nondisruptive operations.

Optimized for Flash

ONTAP 9 delivers the horsepower that critical applications require without compromising on rich data services. AFF systems running ONTAP 9 are optimized specifically for flash, including AFF systems with NVMe solid-state drives (SSDs) and NVMe over Fabrics, providing up to twice the performance compared to the same workloads running on prior ONTAP releases, while still delivering consistent submillisecond latency.

ONTAP 9 also enables FAS hybrid-flash systems to deliver flash-accelerated performance that is balanced with hard disk drives (HDD) economies. Hot data is automatically cached in flash to accelerate application performance.

Consistent Performance

Quality of service (QoS) workload management allows you to control the resources that each workload can consume, to better manage performance spikes and improve customer satisfaction. Adaptive QoS can be used to set both maximum and minimum resource levels, which is especially important for business-critical workloads, and it automatically adjusts storage resource levels to respond to changes in workloads and deliver consistent performance.

Seamless Scalability

Storage systems that run ONTAP can transparently scale from a few terabytes up to 176PB. You can scale up by adding capacity. Or scale out by adding additional storage controllers to seamlessly expand your cluster up to 24 nodes as your business needs grow. Rebalance capacity to improve service levels by redeploying workloads dynamically and avoiding hot spots. You can also isolate workloads and offer levels of service by using different controller technologies, storage tiers, and QoS policies.

In addition, ONTAP supports massive NAS containers that are easy to manage. With FlexGroup, a single namespace can grow to 20PB and 400 billion files while maintaining consistent high performance and resiliency.

Future-proof Your Data Infrastructure

ONTAP 9 provides the flexibility you need to design and deploy your storage environment across the widest range of architectures, so you can match the approach that is best for your evolving business needs:

- NetApp hardware systems: AFF all flash systems and FAS hybrid-flash systems
- Converged infrastructure: FlexPod®
- On commodity servers as software-defined storage (SDS): ONTAP Select
- Next to the cloud: NetApp Private Storage (NPS) for Cloud
- In the cloud: Cloud Volumes ONTAP

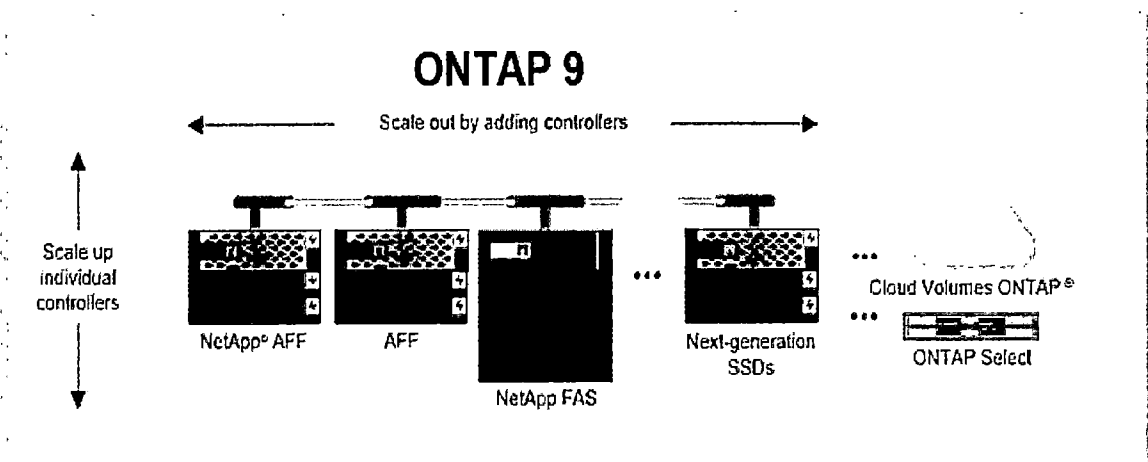


Figure 3: Scale seamlessly – Scale out by intermixing your choice of flash and hybrid-flash nodes, upgrade hardware/software or scale up without disrupting users, incorporate software-defined, cloud, and future-generation flash.

Flexibly consolidate both NAS and SAN workloads onto any ONTAP environment while delivering consistent data services. You can also seamlessly move your data between architectures to get your data onto the optimal environment for performance, capacity, and cost efficiency.

Protect and Secure Your Data Across the Hybrid Cloud

ONTAP provides comprehensive data protection so you can protect your data seamlessly across the hybrid cloud.

Integrated Data Protection and Nondisruptive Operations

NetApp offers a complete suite of Integrated Data Protection (IDP) to safeguard your operations and keep them running smoothly. You can:

- Meet your requirements for local backup with near-instant recovery by using space-efficient NetApp Snapshot copies. Application-created Snapshots that are used by third-party data protection software are replicated, as well as LUN clones.
- Achieve remote backup/recovery and disaster recovery with SnapMirror® asynchronous replication.
- Get zero data loss protection (RPO=0) for your NVMe environment with SnapMirror Synchronous replication.

NetApp MetroCluster™ technology delivers business continuity by synchronously mirroring between locations for continuous data availability. A MetroCluster storage array, leveraging FC or IP connectivity, can be deployed at a single site, across a metropolitan area, or in different cities. With the release of ONTAP 9.7, you can use your existing network infrastructure for synchronous mirroring with MetroCluster. Simultaneously mirror your tiered data out to multiple clouds. You get the flexibility to store your data at multiple cloud providers for added resiliency and it simplifies the process for changing cloud providers.

ONTAP gives you the ability to perform critical tasks without interrupting your business by dynamically assigning, promoting, and retiring storage resources without downtime over the lifecycle of an application. Data can be moved between controllers without application interruption, so you can get the data on the node that delivers the optimal combination of speed, latency, capacity, and cost.

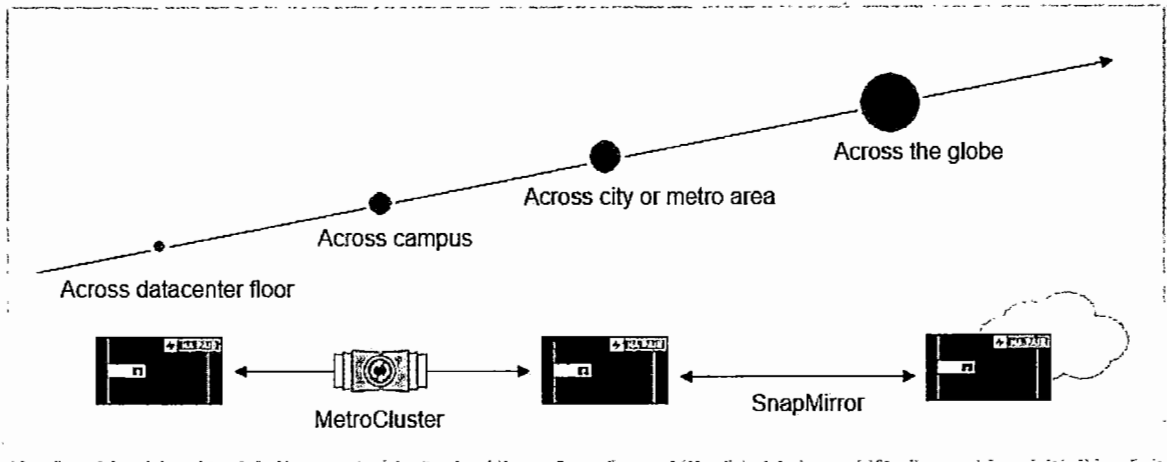


Figure 4: SnapMirror extends data protection across the globe.

"Since implementing NetApp® MetroCluster™ in 2009, Jack Wolfskin hasn't experienced a single second of downtime or any data loss. Another advantage of MetroCluster software is that we manage upgrades from anywhere instead of coming in on the weekends."

— Severin Canisius, Senior IT Manager

Robust Security

Security capabilities in ONTAP help you integrate data security across your hybrid cloud and avoid unauthorized data access. You can easily and efficiently protect at-rest data by encrypting any volume on an AFF or FAS system with NetApp Volume Encryption—a feature that is built in to ONTAP. It does not require special encrypting disks. In-flight encryption for backup and replication protects data in transit. Plus, other features such as multifactor authentication (MFA), role-based access control (RBAC), and onboard and external key management increase the security of your data. With ONTAP 9.7, it is simpler to protect your data by automatically enabling data at-rest encryption for new volumes when an encryption key manager is configured on the cluster. Included with ONTAP 9.7, Active IQ Unified Manager now provides a security dashboard that highlights where you can improve cluster-wide security based on best practices.

Secure Consolidation

ONTAP gives you the ability to save time and money by sharing the same consolidated infrastructure for workloads or tenants that have different performance, capacity, and security requirements without fear that the activity in one tenant partition will affect another. With multitenancy, a storage cluster can be subdivided into secure partitions governed by rights and permissions.

Rigorous Compliance

To meet stringent compliance and data retention policies, NetApp SnapLock® software enables write once, ready many (WORM) protected data for your ONTAP environment. NetApp also provides superior integration with enterprise backup vendors and leading applications. Our IDP solutions include integrated and unified disk-to-disk backup and disaster recovery in a single process for VMware and Microsoft virtualization. In addition, cryptographic shredding enables General Data Protection Regulation (GDPR) compliance.

“The secure multitenancy built into ONTAP is key to our cloud business model.”

— Frank Bounds, Senior Storage Engineer, TCDI

Simple, Straightforward Transition to ONTAP 9

No matter what your starting point, NetApp streamlines your move to ONTAP 9. You can:

- Upgrade from ONTAP 8.3 with a simple update of your ONTAP software—no disruption and zero downtime.
- Make a smooth transition from ONTAP 7-Mode with proven tools and best practices, including 7-Mode Transition Tool (7MTT) and Copy Free Transition (CFT).
- Use straightforward import processes from third-party storage to ONTAP 9.

Consult our experts to plan and implement your transition and gain the latest ONTAP advantages from day one. You can use either NetApp Services or NetApp Certified Services Partners, do it yourself using our proven tools and processes, or choose a combination of approaches.

“Using the brand-new copy-free transition process to achieve both the hardware refresh and upgrade to ONTAP with minimal business disruption was the perfect option. It reduced risk, slashed migration time, and cut costs and was something we were able to fully justify.”

— Andrew Bentley, Infrastructure Lead, Repsol Sinopec Resources UK

ONTAP Technical Highlights

The building blocks for ONTAP scale-out storage configurations are high-availability (HA) pairs in which two storage controllers are interconnected to the same set of disks. If one controller fails, the other takes over its storage and continues serving data.

With ONTAP, each storage controller is referred to as a cluster node. Nodes can be different models and sizes of AFF and FAS systems. Disks are made into aggregates, which are groups of disks of a type that are composed of one or more RAID groups protected by using NetApp RAID DP® and RAID TEC technology.

A key differentiator in an ONTAP environment is that numerous HA pairs are combined into a cluster to form a shared pool of physical resources that are available to applications, SAN hosts, and NAS clients. The shared pool appears as a single system image for management purposes. This means that there is a single common point of management, whether through the graphical user interface or command-line interface tools, for the entire cluster.

Although the members of each HA pair must be the same controller type, the cluster can consist of heterogeneous HA pairs of AFF all-flash arrays as well as FAS hybrid-flash arrays. Over time, as the cluster grows, and new controllers are released, it is likely to evolve into a combination of several different node types. All cluster capabilities are supported, regardless of the underlying controllers in the cluster.

To improve data access in NAS applications, NetApp virtualizes storage at the file-system level. This enables all client nodes to mount a single file system, access all stored data, and automatically accommodate physical storage changes that are fully transparent to the clients. Each client or server can access a huge pool of data residing across the ONTAP system through a single mount point.

Meet High-Availability Requirements

The proven reliability features in NetApp hardware and software result in data availability of more than 99.9999% as measured across the NetApp installed base. Backup and replication technologies integrated in the NetApp ONTAP data management software help keep your applications and data continuously available to users.

Nondisruptive Operations to Eliminate Downtime

Nondisruptive operations (NDO) are fundamental to the superior scale-out architecture of NetApp ONTAP. NDO is achieved as the storage infrastructure remains up and serving data throughout the execution of hardware and software maintenance operations as well as during other IT lifecycle operations. The goal of NDO is to eliminate downtime—whether it is preventable, planned, or unplanned—and to allow changes to your systems to occur at any time.

ONTAP allows you to transparently move data and network connections anywhere within the storage cluster. The capability to move individual data volumes or LUNs allows you to redistribute across a cluster at any time and for any reason. It's transparent and nondisruptive to NAS and SAN hosts, and it enables the storage infrastructure to continue to serve data throughout these changes. This is helpful to rebalance capacity usage, to optimize for changing performance requirements, or to isolate one or more controllers or storage components when it becomes necessary to execute maintenance or lifecycle operations.

Table 1: Hardware and software maintenance operations can be performed nondisruptively with ONTAP.

Operation	Details
Upgrade software	Upgrade from one version of ONTAP to another
Upgrade firmware	System, disk, switch firmware upgrade
Replace failed controller or component within a controller	Network interface cards (NICs), host bus adapters (HBAs), and power supplies
Replace failed storage components	Cables, drives, shelves, and I/O modules

Table 2: Lifecycle operations can be performed nondisruptively with ONTAP.

Operation	Details
Scale storage	Add storage (shelves or controllers) to a cluster and redistribute volumes for future growth
Scale hardware	Add hardware to controllers to increase scalability, performance, or capability (HBAs, NICs, NetApp Flash Cache™ or Flash Pool™ caching)
Refresh technology	Upgrade storage shelves, storage controllers, back-end switch
Rebalance controller performance and storage utilization	Redistribute data across controllers to improve performance
Rebalance capacity	Redistribute data across controllers to account for future capacity growth
Rebalance disk performance and utilization	Redistribute data across storage tiers within a cluster to optimize disk performance

On-Demand Scalability—Expand as you Build

The ONTAP architecture is key to delivering maximum on-demand scalability for your shared IT infrastructure, offering performance, price, and capacity options.

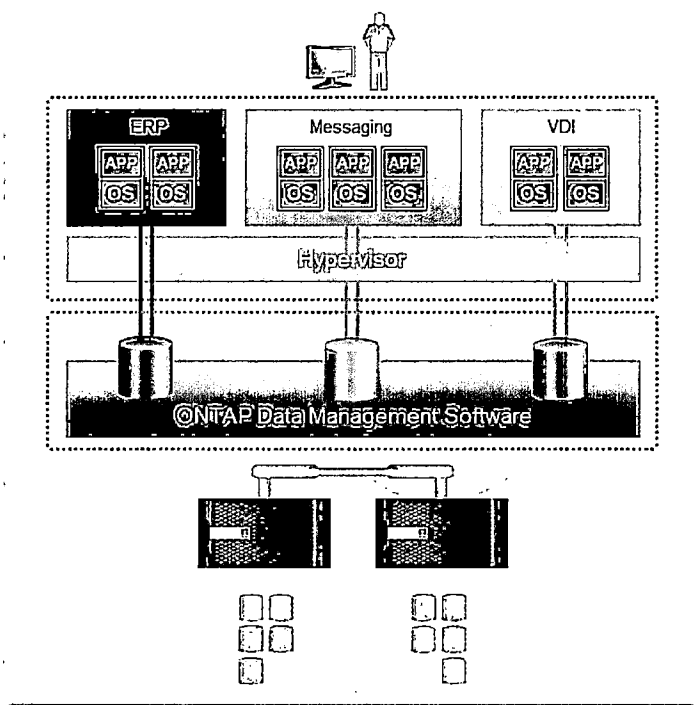


Figure 5: Expand as you build – Start with a two-node cluster and expand controllers and capacity when you need to, nondisruptively.

There are several approaches for leveraging flash in NetApp FAS hybrid-flash systems to accelerate workloads and reduce latency. Flash Cache can increase read performance for frequently accessed data. Plus, Flash Pool aggregates combine SSDs with traditional hard drives for delivering optimal performance and efficiency.

NetApp AFF all-flash systems offer the advantage of scalable performance with consistent low latency for SAN and NAS workloads. Customers can start with deploying AFF in an HA pair configuration to deliver enterprise-grade data management and high performance for a dedicated workload. If additional performance is required, AFF can scale out in a cluster—up to 24 nodes, delivering millions of IOPS at submillisecond latency and a total of over 88PB of SSD capacity.

The extra value of AFF shines when it is used as a high-performance node combined with hybrid-flash FAS systems in an ONTAP environment. This becomes a single storage repository for all workloads. And it enables nondisruptive movement of workloads to the node that best meets your performance and price/performance requirements at different points in time.

Multiprotocol Unified Architecture

A multiprotocol unified architecture provides the capability to support several data access protocols concurrently in the same overall storage system across a range of controller and disk storage types. ONTAP protocol support includes:

- SMB 1, 2, 2.1, 3, 3.1.1 (CIFS)
- NFS v3, v4, and v4.1, including pNFS
- iSCSI
- FCP (Fibre Channel Protocol)
- FCoE (Fibre Channel over Ethernet)
- NVMe over FC (NVMe/FC), starting with ONTAP 9.4

Data replication and storage efficiency features in ONTAP are seamlessly supported across all protocols.

SAN Data Services

With the supported SAN protocols (FC, FCoE, iSCSI, and NVMe/FC), ONTAP provides LUN services. This is the capability to create LUNs and make them available to attached hosts. Because the cluster consists of numerous controllers, there are several logical paths to any individual LUN. A best practice is to configure at least one path per node in the cluster. Asymmetric Logical Unit Access is used on the hosts so that the optimized path to a LUN is selected and made active for data transfer. Support for multipath I/O is also available from leading OS and third-party driver vendors.

NAS Data Services

ONTAP can provide a single namespace with the supported NAS protocols such as SMB [CIFS] and NFS (NAS clients can access a very large data container by using a single NFS mount point or CIFS share). Each client, therefore, needs only to mount a single NFS file system mount point or access a single CIFS share, requiring only the standard NFS and CIFS client code for each operating system.

The namespace of ONTAP is composed of potentially thousands of volumes joined by the cluster administrator. To the NAS clients, each volume appears as a folder or subdirectory,

nested off the root of the NFS file system mount point or CIFS share. Volumes can be added at any time and are immediately available to the clients, with no remount required for visibility to the new storage.

The clients have no awareness that they are crossing volume boundaries as they move about in the file system, because the underlying structure is completely transparent.

ONTAP can be architected to provide a single namespace, yet it also supports the concept of several securely partitioned namespaces, called Storage Virtual Machines or SVMs. This accommodates the requirement for multi-tenancy or isolation of particular sets of clients or applications.

Opex and Capex Efficiency—Grow Your Business, Not IT Expense

NetApp storage solutions operating with ONTAP 9 deliver the industry's leading storage efficiency capabilities with features such as inline compression, inline deduplication, inline data compaction, thin provisioning, and thin clones. With these features coupled with space-efficient NetApp Snapshot copies, RAID DP, and RAID TEC, you can enjoy significant reductions in required disk capacity (varies by workload) when compared with traditional storage technologies.

Table 3: ONTAP 9 offers a robust set of standard and optional features.

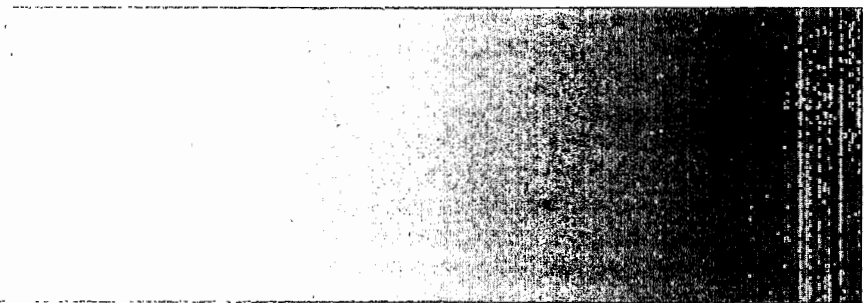
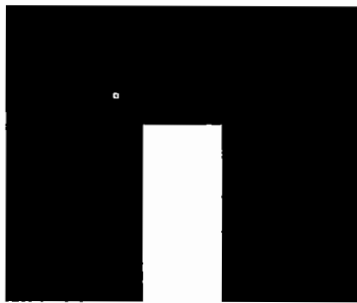
NetApp Software and Features		
	Function	Benefits
Data compaction	Packs more data into each storage block for greater data reduction.	Works with compression to reduce the amount of storage that you need to purchase and operate.
Data compression	Provides transparent inline and postprocess data compression for data reduction.	Reduces the amount of storage that you need to purchase and maintain.
Deduplication	Performs general-purpose deduplication for removal of redundant data.	Reduces the amount of storage that you need to purchase and maintain.
FabricPool	Automates data tiering to the cloud (public and private).	Decreases storage costs for cold data.
Flash Pool™ Caching	Creates a mixed-media storage pool by using SSDs and HDDs.	Increases the performance and efficiency of HDD pools with flash acceleration.
FlexCache®	Caches datasets within a cluster and at remote sites.	Accelerates read performance for hot datasets by increasing data throughput within a cluster and improves the speed and productivity of collaboration across multiple locations. FlexGroup volumes can now be cached with FlexCache, enabling data volumes larger than 100TB to be cached.

NetApp Software and Features

	Function	Benefits
FlexClone®	Instantaneously creates file, LUN, and volume clones without requiring additional storage.	Saves you time in testing and development and increases your storage capacity.
FlexGroup	Enables a single namespace to scale up to 20PB and 400 billion files.	Supports compute-intensive workloads and data repositories that require a massive NAS container while maintaining consistent high performance and resiliency. For enhanced security and locking, NFSv4.0 and NFSv4.1 are now supported.
FlexVol®	Creates flexibly sized volumes across a large pool of disks and one or more RAID groups.	Enables storage systems to be used at maximum efficiency and reduces hardware investment. To enable higher performance and to scale capacity, you can now convert a FlexVol volume to a single-member FlexGroup volume without copying data.
MetroCluster	Combines array-based clustering with synchronous mirroring to deliver continuous availability and zero data loss; up to 700km distance between nodes.	Maintains business continuity for critical enterprise applications and workloads if a data center disaster occurs.
Performance capacity	Provides visibility of performance capacity that is available for deploying new workloads on storage nodes.	Simplifies management and enables more effective provisioning of new workloads to the optimal node.
QoS (adaptive)	Simplifies setup of QoS policies and automatically adjusts storage resources to respond to workload changes (number of TB of data, priority of the workload, etc.).	Simplifies operations and maintains consistent workload performance within your prescribed minimum and maximum IOPS boundaries.
RAID-TEC™ and RAID DP® technologies	Provides triple parity or double-parity RAID 6 implementation that prevents data loss when three or two drives fail.	Protect your data without the performance impact of other RAID implementations; reduce risks during long rebuilds of large-capacity HDDs.
SnapCenter®	Provides host-based data management of NetApp storage for databases and business applications.	Offers application-aware backup and clone management; automates error-free data restores.

NetApp Software and Features

	Function	Benefits
SnapLock	Provides WORM file-level locking.	Supports regulatory compliance and organizational data retention requirements.
SnapMirror	Provides integrated remote backup/recovery and disaster recovery with incremental asynchronous data replication; preserves storage efficiency savings during and after data transfer.	Provides flexibility and efficiency when replicating data to support remote backup/recovery, disaster recovery, and data distribution.
SnapMirror Synchronous	Delivers incremental, volume-granular, synchronous data replication; preserves storage efficiency savings during and after data transfer.	Achieve zero data loss protection (RPO=0).
SnapRestore®	Rapidly restores single files, directories, or entire LUNs and volumes from any Snapshot copy.	Instantaneously recovers files, databases, and complete volumes from your point-in-time Snapshot copy.
Snapshot	Makes incremental data-in-place, point-in-time copies of a LUN or a volume with minimal performance impact.	Enables you to create frequent space-efficient backups with no disruption to data traffic.
Volume encryption	Provides data-at-rest encryption that is built into ONTAP.	Easily and efficiently protect your at-rest data by encrypting any volume on an AFF or FAS system; no special encrypting disks are required.



Datasheet

ONTAP 9 Data Management Software

Simplify your hybrid cloud. Unify your data.

Key Benefits

Smart: Simplify Operations and Reduce Costs

- Minimize capex and opex with leading storage efficiency.
- Provision storage in minutes for Oracle, SAP, Microsoft SQL, VMware, and other business apps.
- Tier your cold data to the cloud. Automatically.

Powerful: Respond to Changing Business Requirements

- Accelerate critical workloads with industry-leading performance.
- Scale capacity and performance without disruption.
- Deploy enterprise applications on NetApp storage systems, commodity servers, or in the cloud.

Trusted: Protect and Secure Your Data Across the Hybrid Cloud

- Guard against data loss and accelerate recovery with integrated data protection.
- Eliminate business disruptions due to failures, maintenance, and site disasters.
- Protect your sensitive company and customer information with built-in data security.

The Challenge

Businesses today are under pressure to become more efficient, respond quickly to new opportunities, and improve customer experience. During their digital transformation to address these challenges, they must modernize their IT infrastructure and integrate new types and uses of data into their existing environment. They also need to effectively manage and protect their data wherever it resides—on premises and in the cloud—while reducing costs, increasing security, and operating with existing IT staff.

The Solution

Create a storage infrastructure that is smart, powerful, and trusted. Simplify how you manage your data that is spread across your hybrid cloud environment. NetApp® ONTAP® 9, the industry's leading enterprise data management software, combines new levels of simplicity, flexibility, and security with powerful data management capabilities, proven storage efficiencies, and leading cloud integration.

With ONTAP 9, you can build an intelligent hybrid cloud that is the foundation of a NetApp Data Fabric that spans flash, disk, and cloud. Flexibly deploy storage on your choice of architectures—hardware storage systems, software-defined storage (SDS), and the cloud—while unifying data management across all of them. Accelerate your enterprise applications with flash, without compromising on the essential data services that you need. And seamlessly manage your data as it flows to wherever you need it most to help you make the best possible decisions for your organization.

Smart: Simplify Operations and Reduce Costs Get proven storage efficiency

With ONTAP, you get a comprehensive, industry-leading portfolio of storage efficiency capabilities. Inline data compression, deduplication, and compaction work together to reduce your storage costs and maximize the data you can store. Plus, you can multiply your savings with space-efficient NetApp Snapshot™ copies, thin provisioning, replication, and cloning technologies.

Deploy workloads in less than 10 minutes

Built-in application workflows enable you to quickly and confidently provision storage for key workloads in less than 10 minutes—from power-on to serving data. These workloads include Oracle, SAP, SQL Server, and virtual desktops and servers. Years of NetApp experience and best practices are integrated into the System Manager wizard and factory configurations, enabling you to quickly set up your new configuration just by answering a few questions.



Simplify operations and unify data management

Whether you're adding new workloads or managing your existing environment, it's important to simplify your processes to maximize the productivity and responsiveness of your staff. ONTAP gives you a common set of features across deployment architectures, which simplifies administrative operations so that your IT team can focus on strategic business priorities. Unify data management across a hybrid cloud that can span flash, disk, and cloud running SAN and NAS workloads. Easily move your data within or between storage clusters, or to the cloud—wherever it is most useful. ONTAP is the foundation for a Data Fabric that gives you flexibility, choice, and control across your storage environment.

Tier automatically to cloud

Deliver high performance to your applications and reduce storage costs by automatically tiering cold data from the performance tier to a private or public cloud. FabricPool frees up space on your existing NetApp AFF infrastructure, so you can consolidate more workloads. For new all-flash purchases, FabricPool enables you to buy a smaller initial AFF configuration.

Maximize investment protection

ONTAP gives you the flexibility to create an integrated, scalable storage environment by clustering storage controllers from different families—AFF all-flash and FAS hybrid-flash systems—and from different generations. You can grow your system with the latest hardware, continue to use your older hardware, and connect all of it to the cloud. When it's time to retire a storage system, you can simply upgrade the controllers and keep data in place on the existing disk shelves.

Get simple, powerful management capabilities

NetApp data management infrastructure software is designed to manage hybrid clouds. You can centrally monitor the health of your environment by viewing metrics on capacity utilization, performance, availability, and data protection. It can also help automate your storage processes and integrate them into your data center orchestration platform for end-to-end service delivery for your private and hybrid cloud services.

In addition, NetApp Active IQ® intelligence provides predictive analytics and actionable insights based on machine learning and artificial intelligence applied to the vast data lake from the installed base of ONTAP systems. This intelligence helps you optimize your NetApp investment, simplify and automate operations, and achieve data center efficiencies.

Powerful: Respond to Changing Business Requirements

To support your critical applications, you need a storage environment that delivers high performance and availability. But you also need the versatility to scale and adapt as your business changes. ONTAP 9 delivers on all these requirements with flash performance for scalable, nondisruptive operations.

Get flash optimization

ONTAP 9 delivers the high throughput and low latency that enterprise applications require, while providing comprehensive data services. ONTAP 9 is optimized for flash, including AFF systems with NVMe solid-state drives (SSDs) and NVMe over Fabrics. AFF running the most recent versions of ONTAP provide up to twice the throughput of the same workloads compared to running on prior ONTAP releases, while still delivering consistent submillisecond latency.

ONTAP 9 running on NetApp FAS hybrid-flash systems improves the performance of HDD storage by automatically caching hot read data in flash. This provides a balance between performance and cost that is appropriate for many workloads.

Deliver consistent performance

To maintain high customer satisfaction, adaptive quality of service (QoS) helps you deliver consistent performance by automatically adjusting storage resource levels to respond to changes in workloads (number of terabytes of data, priority of the workload, and so on). Adaptive QoS simplifies the implementation of policies to keep your workloads within prescribed minimum and maximum throughput targets.

Stay ahead of business changes with seamless scalability

You can start small and grow with your business by using high-capacity SSDs or HDDs to scale your storage environment. Storage systems that run ONTAP can handle SAN and NAS workloads that range from a few terabytes up to 176PB. You can scale by adding capacity to existing storage controllers or scale out by adding controllers to seamlessly expand your cluster up to 24 nodes.

ONTAP also supports massive NAS data containers that are easy to manage. With NetApp ONTAP FlexGroup, a single namespace can grow to 20PB or 400 billion files while delivering consistent high performance and resiliency.

Future-proof your data infrastructure

ONTAP 9 lets you design and deploy your storage environment across the widest range of architectures, so you can match the approach that's right for your evolving business needs:

- On NetApp hardware systems: AFF all-flash systems and FAS hybrid-flash systems
- Within a converged infrastructure: FlexPod® converged infrastructure solution from NetApp and Cisco
- As software-defined storage on commodity servers: ONTAP Select
- Next to the cloud: NetApp Private Storage (NPS) for Cloud
- In the cloud: Cloud Volumes ONTAP

You can move your data seamlessly between architectures to place it in the optimal environment for performance, capacity, and cost efficiency.

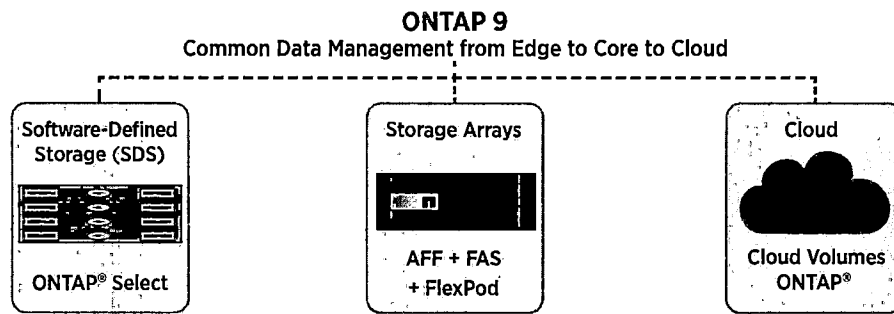


Figure 1) Standardize data management across architectures with a rich set of enterprise data services.

Trusted: Protect and Secure Your Data Across the Hybrid Cloud
Integrated data protection and nondisruptive operations

ONTAP provides NetApp integrated data protection (IDP) to safeguard your operations and keep them running smoothly. Meet your requirements for local backup with nearly instantaneous recovery by using space-efficient Snapshot copies. Achieve remote backup/recovery and disaster recovery with NetApp SnapMirror[®] asynchronous replication. Get zero data loss protection (RPO=0) with SnapMirror Synchronous replication.

NetApp MetroCluster[™] technology delivers business continuity by synchronously mirroring between locations for continuous data availability. A MetroCluster storage array, using FC or IP connectivity, can be deployed at a single site, across a metropolitan area, or in different cities.

With ONTAP, you can service and update your infrastructure during regular work hours without disrupting your business. Dynamically assign, promote, and retire storage resources without downtime over the lifecycle of an application. Data can be moved between controllers without application interruption, so you can get the data on the node that delivers the optimal combination of speed, latency, capacity, and cost.

Robust security

The leading portfolio of security capabilities in ONTAP helps you integrate data security across your hybrid cloud and avoid unauthorized data access. With the NetApp Volume Encryption feature that is built in to ONTAP, you can easily and efficiently protect your at-rest data by encrypting any volume on an AFF or FAS system. No special encrypting disks are required. In-flight encryption for backup and replication protects your data in transit. Plus, other features such as multifactor authentication, role-based access control (RBAC), and onboard and external key management increase the security of your data.

Secure consolidation

You can save time and money by sharing the same consolidated infrastructure for workloads or tenants that have different performance, capacity, and security requirements. And with ONTAP, you don't have to worry that the activity in one tenant partition will affect another. With multitenancy, a storage cluster can be subdivided into secure partitions that are governed by rights and permissions.

Rigorous compliance

To meet your stringent compliance and data retention policies, NetApp SnapLock[®] software enables write once, read many (WORM) protected data for your ONTAP environment. NetApp also provides superior integration with enterprise backup vendors and leading applications. Our IDP solutions also include integrated and unified disk-to-disk backup and disaster recovery in a single process for VMware and Microsoft virtualization. In addition, cryptographic shredding enables General Data Protection Regulation (GDPR) compliance.

Make a Simple, Straightforward Transition to ONTAP 9

No matter what your starting point is, NetApp streamlines your move to ONTAP 9:

- Upgrade from ONTAP 8.3 with a simple update of your ONTAP software—no disruption and zero downtime.
- Make a smooth transition from NetApp Data ONTAP operating in 7-Mode with proven tools and best practices, including the 7-Mode Transition Tool (7MTT) and copy-free transition (CFT).
- Use straightforward import processes from third-party storage to ONTAP 9.

Consult our experts to plan and implement your transition and gain the latest ONTAP advantages from day one. You can use NetApp Services or NetApp Services Certified Partners, you can do it yourself by using our proven tools and processes, or you can combine these approaches.

Plus, when you're running ONTAP, you can use the Managed Upgrade Service to get the most from your investment by ensuring that your ONTAP software is always up to date.

Make your move to ONTAP 9.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation and optimize their operations. For more information, visit www.netapp.com. #DataDriven

NetApp Software and Features

Table 1) ONTAP 9 offers a robust set of standard and optional features.

	Function	Benefits
Data compaction	Packs more data into each storage block for greater data reduction	Works with compression to reduce the amount of storage that you need to purchase and operate
Data compression	Provides transparent inline and postprocess data compression for data reduction	Reduces the amount of storage that you need to purchase and maintain
Deduplication	Performs general-purpose deduplication for removal of redundant data	Reduces the amount of storage that you need to purchase and maintain
FabricPool	Automates data tiering to the cloud (public and private)	Decreases storage costs for cold data
Flash Pool™ Caching	Creates a mixed-media storage pool by using SSDs and HDDs	Increases the performance and efficiency of HDD pools with flash acceleration
FlexCache®	Caches actively read datasets within a cluster and at remote sites	Accelerates read performance for hot datasets by increasing data throughput within a cluster, and improves the speed and productivity of collaboration across multiple locations
FlexClone®	Instantaneously creates file, LUN, and volume clones without requiring additional storage	Saves you time in testing and development and increases your storage capacity
FlexGroup	Enables a single namespace to scale up to 20PB and 400 billion files	Supports compute-intensive workloads and data repositories that require a massive NAS container while maintaining consistent high performance and resiliency
FlexVol®	Creates flexibly sized volumes across a large pool of disks and one or more RAID groups	Enables storage systems to be used at maximum efficiency and reduces hardware investment
MetroCluster	Combines array-based clustering with synchronous mirroring to deliver continuous availability and zero data loss; up to 700km distance between nodes	Maintains business continuity for critical enterprise applications and workloads if a data center disaster occurs
Performance capacity	Provides visibility of performance capacity that is available for deploying new workloads on storage nodes	Simplifies management and enables more effective provisioning of new workloads to the optimal node
QoS (adaptive)	Simplifies setup of QoS policies and automatically allocates storage resources to respond to workload changes (number of terabytes of data, priority of the workload, and so on)	Simplifies operations and maintains consistent workload performance within your prescribed minimum and maximum IOPS boundaries
RAID-TEC™ and RAID DP® technologies	Provides triple parity or double-parity RAID 6 implementation that prevents data loss when three or two drives fail	Protect your data without the performance impact of other RAID implementations; reduce risks during long rebuilds of large-capacity HDDs
SnapCenter®	Provides host-based data management of NetApp storage for databases and business applications	Offers application-aware backup and clone management; automates error-free data restores
SnapLock	Provides WORM file-level locking	Supports regulatory compliance and organizational data retention requirements
SnapMirror	Provides integrated remote backup/recovery and disaster recovery with incremental asynchronous data replication; preserves storage efficiency savings during and after data transfer	Provides flexibility and efficiency when replicating data to support remote backup/recovery, disaster recovery, and data distribution
SnapMirror Synchronous	Delivers incremental, volume-granular, synchronous data replication; preserves storage efficiency savings during and after data transfer	Achieve zero data loss protection (RPO=0)
SnapRestore®	Rapidly restores single files, directories, or entire LUNs and volumes from any Snapshot copy	Instantaneously recovers files, databases, and complete volumes from your point-in-time Snapshot copy
Snapshot	Makes incremental data-in-place, point-in-time copies of a LUN or a volume with minimal performance impact	Enables you to create frequent space-efficient backups with no disruption to data traffic
NetApp Volume Encryption	Provides data-at-rest encryption that is built into ON-TAP	Lets you easily and efficiently protect your at-rest data by encrypting any volume on an AFF or FAS system; no special encrypting disks are required

Cloud Volumes ONTAP

NetApp Cloud Volumes ONTAP is a software-only storage subscription running the NetApp ONTAP storage software. It delivers secure, proven storage management services for AWS, Azure, and Google Cloud storage. Building a cloud storage environment on Cloud Volumes ONTAP provides enterprise-class features for cloud storage.

In today's IT environment, businesses need the flexibility and efficiency that a cloud environment provides. For fast deployment of IT resources or for applications with varying usage needs, the cloud provides West Virginia Department of Education a level of flexibility unmatched by any on-premises solution. Use only what you need when you need it.

With virtual machines, the cloud has become a go-to deployment model for applications that have unpredictable cycles or variable usage patterns and need to be spun up or spun down on demand. However, when it comes to data, it is not as straightforward. Data used to be the enabler of business performance—now data IS the business. And how you use, manage, and consume data is also changing. Because data is difficult to pick up and move to a new location, there needs to be a simple, controlled solution that gives IT professionals the ability to manage their data with the same functionality that their own private environments offer. They need a single, cohesive data environment, or data fabric, to give them control of their data no matter where it is.

Managing Data in the Cloud

Public cloud providers such as Microsoft Azure, Amazon Web Services (AWS), and Google Cloud, offer many services, including infrastructure as a service, where raw server and storage resources are rapidly deployable. The raw server or virtual server environments can be used to run applications and the raw storage for storing data. To utilize the storage in a way that is consistent with your data center premises, it is important that your cloud data is managed and protected. Although hyperscale cloud providers offer many solutions and services for application data, consider the following questions:

- How do you validate that your data is secure, under control, and consuming the least amount of cloud resources to address your needs?
- Can you simply and easily get data in and out as you do in your own storage environments?
- Do your teams need to learn a new set of interfaces and tools?
- Does the storage have functionality such as file share services (SMB and NFS), data deduplication, or multiregion replication?

NetApp can help manage your data by:

- Controlling public cloud storage resources with NetApp® Cloud Volumes ONTAP® software.
- Providing rapid point-and-click from NetApp Cloud Manager so you can deploy advanced data management systems on your choice of cloud in minutes.
- Letting you deploy more applications in the cloud with multiple storage consumption models that provide the flexibility for you to use just what you need, when you need it.

Control Public Cloud Storage Resources

NetApp Cloud Volumes ONTAP data management software delivers control, protection, flexibility, and efficiency for your data on your choice of cloud. Cloud Volumes ONTAP is cloud-native data management software built on NetApp ONTAP storage software that provides a superior universal storage platform from your data center to the cloud. Having the same storage software in the cloud as you do on-premises maximizes the value of a data fabric, while saving you from the expense and time of training your IT staff all new storage management methods.

Cloud Volumes ONTAP provides a data storage solution that fits many different workloads including disaster recovery, development, and test environments to cloud-based applications that require highly available non-disruptive operation, such as production business applications and file services using NFS and SMB. It is deployed and managed from NetApp Cloud Manager as a software-only solution on cloud compute instances managing cloud storage. You can build a virtual storage environment directly on your choice of cloud resources.

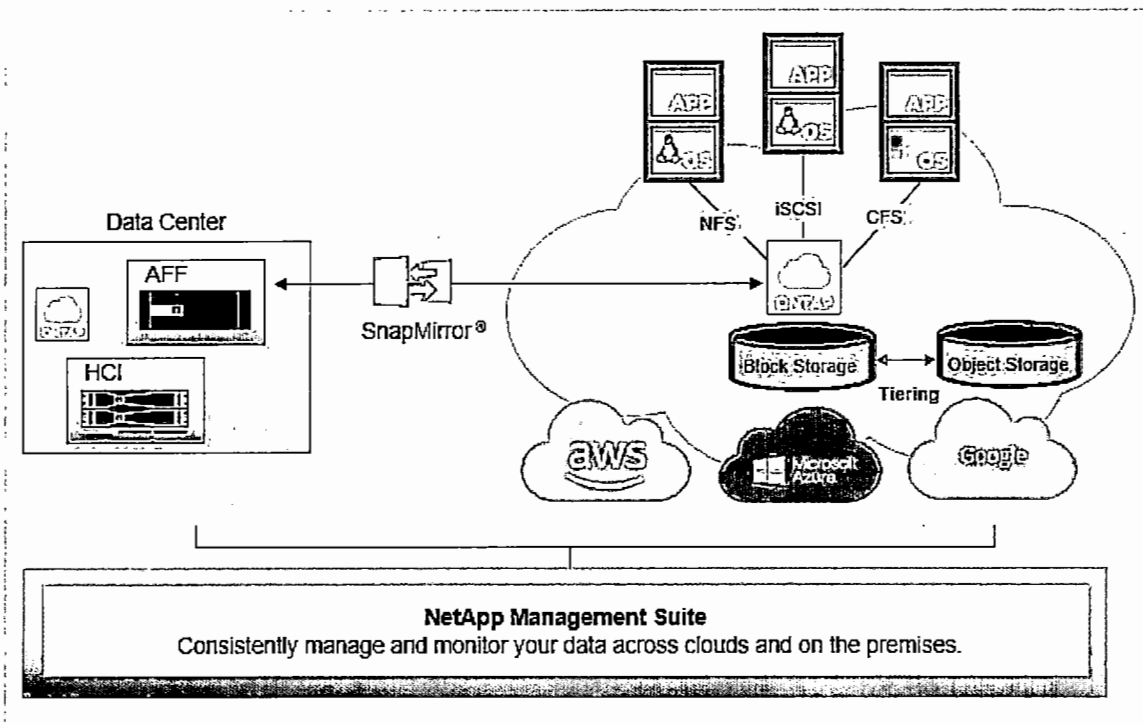


Figure 1: Cloud Volumes ONTAP – Delivering the world's leading storage software on your choice of cloud.

Building your cloud storage environment on Cloud Volumes ONTAP provides enterprise-class features for your cloud storage. With ONTAP you can:

- Minimize your cloud storage resources with efficiency features such as data deduplication, compression, compaction, and zero capacity snapshot copies—which can act on your primary data.
- Provision both NAS and SAN storage for your application environment with CIFS/SMB, NFS, and iSCSI support.

- Provide near-instantaneous point-in-time backups of your data with zero-impact NetApp Snapshot™ copies.
- Create application-consistent Snapshot copies with ONTAP SnapCenter® software.
- Leverage the storage replication SnapMirror® technology, which brings your hybrid cloud together by tying your on-premises NetApp AFF, FAS hybrid, and ONTAP Select software-defined storage, as well as NetApp HCI, to your Cloud Volumes ONTAP environment.

Deploy Advanced Data Management Systems

Cloud Manager software is a centralized management environment for your ONTAP software-based hybrid cloud storage environment, including the Cloud Volumes ONTAP, AFF, FAS, and ONTAP Select storage systems. Cloud Volumes ONTAP is deployed through NetApp Cloud Manager. It provides installation, resource assignment, and provisioning of data. Cloud Manager is used for day-to-day management activities of the cloud data resources.

Cloud Manager provides day-to-day management activities for your data fabric endpoints. It automates your data movement to and from the cloud. Cloud Manager ties into your cloud environment, so that you can use your cloud credentials to gather the necessary resources to meet your storage requirements. With visibility into the resources consumed by each Cloud Volumes ONTAP instance, Cloud Manager monitors and provides valuable feedback on the cost of resources. With this information you can identify and move workloads to the most cost-efficient environment. Cloud Manager key benefits include:

- Simplifies deployment and configuration of Cloud Volumes ONTAP
- Provides a central point of control for all Cloud Volumes ONTAP instances
- Automates data movement between your premises and the cloud
- Provides cost monitoring of your cloud storage resources
- Eases license, entitlement, and upgrade management
- Facilitates hybrid environments that include Cloud Volumes ONTAP, AFF, FAS, and ONTAP Select storage systems

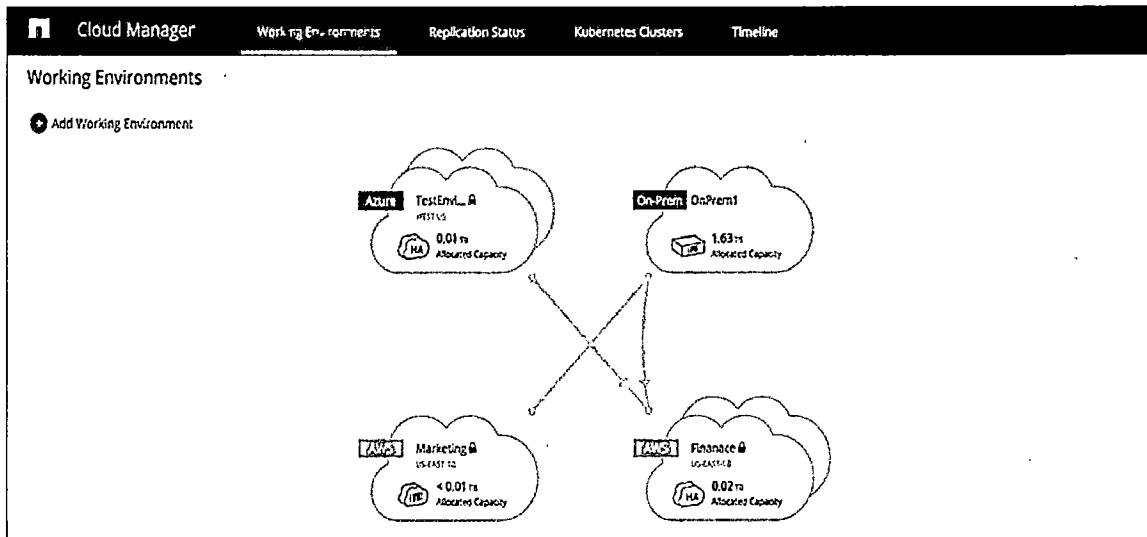


Figure 2: NetApp Cloud Manager.

Provide Multiple Storage Consumption Models

Cloud Volumes ONTAP provides two methods for consuming storage:

Pay as You Go

Pay as you go is purchased directly from your cloud provider marketplace and is charged on an hourly basis. For short-term application needs and/or for environments that must spin up or down on demand, the pay-as-you-go consumption model is the best fit.

Bring Your Own License

The bring your own license or BYOL model is a license purchased from NetApp. It is installed in your Cloud Volumes ONTAP instance. BYOL subscriptions can be purchased in 1-, 2-, or 3-year increments. If your application is more deterministic and/or will be used for longer periods of time, the subscription model may be utilized.

There are multiple solutions within each consumption model that range from the smaller pay-as-you-go solution at 2TB to the larger subscription model of up to 368TB of raw capacity.

Data Privacy and Compliance

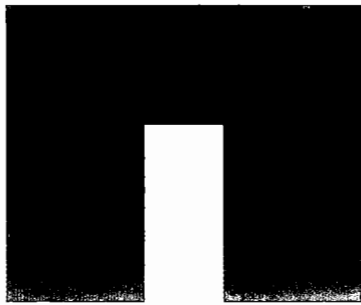
Cloud Volumes ONTAP includes a cloud compliance data privacy and compliance service. Using artificial intelligence (AI) driven technology, Cloud Compliance helps organizations understand data context and identify sensitive data across Cloud Volumes ONTAP systems. Cloud Compliance maps and identifies your data, in clouds managed by Cloud Volumes ONTAP, and automates the most challenging tasks introduced by GDPR, CCPA, PCI, HIPAA, and other data privacy regulations.

Cloud Compliance provides several tools that can help with your compliance efforts, including:

- Identify Personal Identifiable Information (PII)
- Map all Cloud Volumes ONTAP sensitive data
- Locate data privacy violations automatically
- Generate Data Subject Access Reports (SAR or DSAR) in seconds
- Generate Privacy Risk Analysis Reports
- Enforce restrictions to sensitive data migration

Using Natural Language Named Entity Recognition, Cloud Compliance is able to intelligently pinpoint data instances that may cause potential data privacy violations. Other data privacy solutions rely on simple search functions and pattern matching, which often results in large amounts of inaccurate information and false positives. The AI-based data mapping used by Cloud Compliance gives results based on a contextual understanding of the data. Reports are more accurate with less manual effort.

	Microsoft Azure		Google Cloud		Amazon Web Services	
Storage efficiency	Thin provisioning, data deduplication, compression, compaction					
NetApp SnapLock® file locking (WORM)	Yes	Yes	Yes	Yes	Yes	Yes
Data tiering to object storage	Yes	Yes	Yes	Yes	Yes	Yes
Region support	See the full list on the Cloud Volumes Global Regions page					
Disk/volume types	Standard HDD Standard SSD Premium SSD		Standard storage: pd-standard Premium storage: pd-ssd		GP2, ST1, SC1, and IO1	
Solution capabilities	Explore: up to 2TB Standard: up to 10TB Premium: up to 368TB	BYOL: up to 368TB	Explore: up to 2TB Standard: up to 10TB Premium: up to 64TB	BYOL: up to 64TB; up to 368TB when using data tiering	Explore: up to 2TB Standard: up to 10TB Premium: up to 368TB	BYOL: up to 368TB



Solution Brief

NetApp Cloud Volumes ONTAP

Simple and fast data management in the cloud

Key Benefits

- NetApp® Cloud Volumes ONTAP® software lets you control your public cloud storage resources with industry-leading data management.
- Multiple storage consumption models provide the flexibility that allows you to use just what you need, when you need it.
- Rapid point-and-click deployment from NetApp Cloud Manager enables you to deploy advanced data management systems on your choice of cloud in minutes.

The Challenge

In today's IT ecosystem, the cloud has become synonymous with flexibility and efficiency. When you deploy new services or run applications with varying usage needs, the cloud provides a level of infrastructure flexibility that allows you to pay for what you need, when you need it. With virtual machines, the cloud has become a go-to deployment model for applications that have unpredictable cycles or variable usage patterns and need to be spun up or spun down on demand.

Applications with fixed usage patterns often continue to be deployed in a more traditional fashion because of the economics in on-premises data centers. This situation creates a hybrid cloud environment, employing the model that best fits each application. In this hybrid cloud environment, data is at the center. It is the only thing of lasting value. It is the thing that needs to be shared and integrated across the hybrid cloud to deliver value. It is the thing that needs to be secured, protected, and managed.

You need to control what happens to your data no matter where it is. Although you can outsource infrastructure, applications, and services to the cloud, you can never outsource the responsibility you have for your data. You have spent years controlling and aligning the appropriate levels of data performance, protection, and security in the data center to support your applications. Now, as you seek to pull in a mix of public cloud resources, for infrastructure and apps, you need to maintain control of your data in this new hybrid cloud. You need a single, cohesive data environment, or data fabric, to give you control of your data no matter where it is.

Managing Data in the Cloud

Public cloud providers, such as Microsoft Azure, Amazon Web Services (AWS), and Google Cloud, offer many services, including infrastructure as a service, for which you can purchase raw compute and storage resources to use as you see fit. You can use cloud server environments to run your applications and raw storage services to store your data. If you want to utilize the storage in a way that is consistent with your on-premises data center, it is important that your data be controlled and protected.

Each cloud provider offers features and services that help with these issues. But how do you validate that your data is secure, under control, and consuming the least amount of cloud resources to address your needs? Can you simply get the data in and out of the cloud in a way that is consistent with your on-premises storage environments? Do your teams need to learn a new set of interfaces and tools? Does the storage have the functionality you need, such as file share services (SMB and NFS), data deduplication, or multiregion replication?

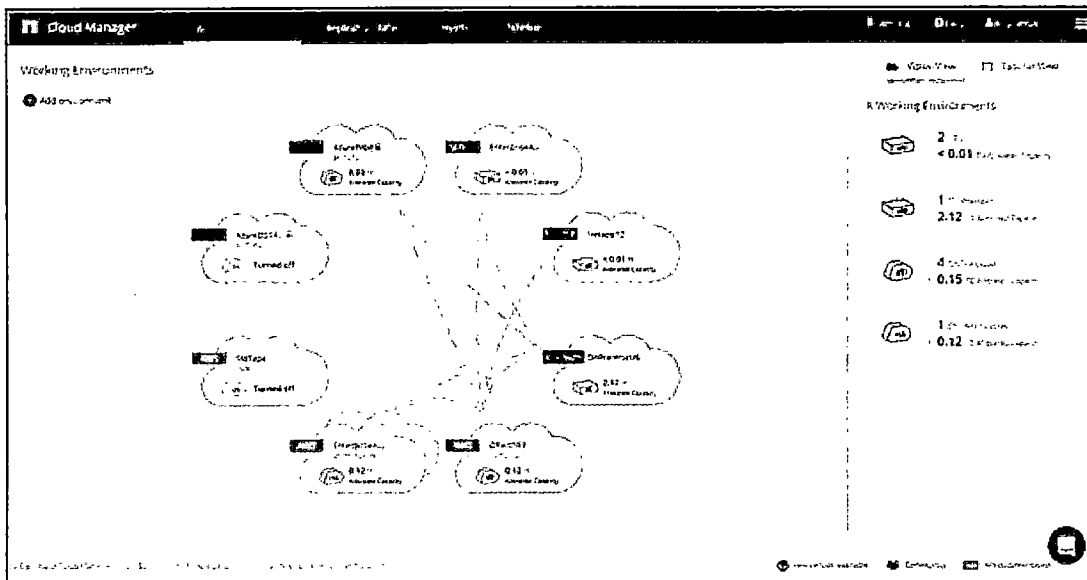


Figure 1) NetApp Cloud Manager.

NetApp Cloud Volumes ONTAP

NetApp Cloud Volumes ONTAP data management software delivers control, protection, flexibility, and efficiency to your data on your choice of cloud. Cloud Volumes ONTAP is cloud-native data management software built on NetApp ONTAP storage software, providing you with a superior universal storage platform that addresses your cloud data needs. Having the same storage software in the cloud and on your premises brings you the value of a data fabric without requiring that you train your IT staff in all-new methods to manage your data.

Cloud Volumes ONTAP provides a data storage solution that fits many different customer requirements. These requirements range from disaster recovery, development, and test environments to cloud-based applications that require highly available nondisruptive operation, such as production business applications and file services that use NFS and SMB. Cloud Volumes ONTAP is deployed and managed from NetApp Cloud Manager as a software-only solution on cloud compute instances managing cloud storage. This capability enables you to build a virtual storage environment directly on your choice of cloud resources.

Cloud Volumes ONTAP brings advanced NAS capabilities to your cloud environment, making your data transition to the cloud a seamless experience for your Windows and Linux applications. ONTAP gives you a unified data management experience across SMB, NFS, and iSCSI. With NetApp technology, you get zero-impact NetApp Snapshot™ copies, which provide near-instantaneous point-in-time copies of your data to enable rapid data recovery without consuming additional storage resources or affecting your application performance.

In addition, you minimize your storage footprint and cloud resource expenditures with storage efficiency features such as data deduplication and data compression, which can act on your primary data. With NetApp SnapCenter™ software, you get application consistency with those Snapshot copies. On top of all the local storage features, ONTAP provides industry-leading storage replication capabilities with NetApp SnapMirror® technology. This technology brings your hybrid cloud together by tying your on-premises NetApp AFF, FAS hybrid, and ONTAP Select software-defined storage, as well as NetApp HCI, to your Cloud Volumes ONTAP environment.

NetApp Cloud Manager

The cloud is a new environment for many enterprises, and as you find a way to simplify your cloud resource usage, it is important to have tools available to enhance the experience. Cloud Manager software is a centralized management environment for your ONTAP software-based hybrid cloud storage environment, including the Cloud Volumes ONTAP, AFF, FAS, and ONTAP Select storage systems. Cloud Manager is the deployment environment for Cloud Volumes ONTAP and provides installation, resource assignment, and provisioning of data.

Cloud Manager provides day-to-day management activities for your data fabric endpoints and can automate your data movement to and from the cloud. Cloud Manager integrates seamlessly with your cloud environment, so you can use your cloud credentials to deploy the resources you need to meet your storage requirements. With visibility into the resources consumed by each Cloud Volumes ONTAP instance, Cloud Manager lets you monitor resources and understand their cost over time. This feedback can help you decide when to move workloads to the most cost-efficient environment.

Cloud Manager Key Features

- Simplifies configuration and deployment of Cloud Volumes ONTAP
- Provides a central point of control for all Cloud Volumes ONTAP instances
- Automates data movement between your premises and the cloud
- Provides cost monitoring of your cloud storage resources
- Eases license, entitlement, and upgrade management
- Facilitates hybrid environments that include Cloud Volumes ONTAP, AFF, FAS, and ONTAP Select storage systems

Consumption Models

In addition to the features that Cloud Volumes ONTAP offers, there are two consumption methods: pay as you go and bring your own license (BYOL). Pay as you go is purchased directly from your cloud provider marketplace and is charged on an hourly basis. The BYOL model is a license, purchased from NetApp, that is installed in your Cloud Volumes ONTAP instance. BYOL subscriptions can be purchased in 1-, 2-, or 3-year increments.

For short-term application needs, or for environments that must spin up or down on demand, the hourly pay-as-you-go consumption model is appropriate. If your application is more deterministic or will be used for longer periods of time, the annual subscription might be better. Within each consumption model, there are multiple solutions that start at a single node with 2TB raw capacity and range up to two-node high-availability (HA) environments with up to 368TB of raw capacity.

A True Hybrid Cloud

To help you determine the infrastructure that best fits your application and economic needs, NetApp offers a wide variety of options from which to choose. These options range from on-premises AFF or FAS systems to ONTAP Select software-defined storage, NetApp HCI, and in-the-cloud Cloud Volumes ONTAP software.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation and optimize their operations. For more information, visit www.netapp.com. #DataDriven

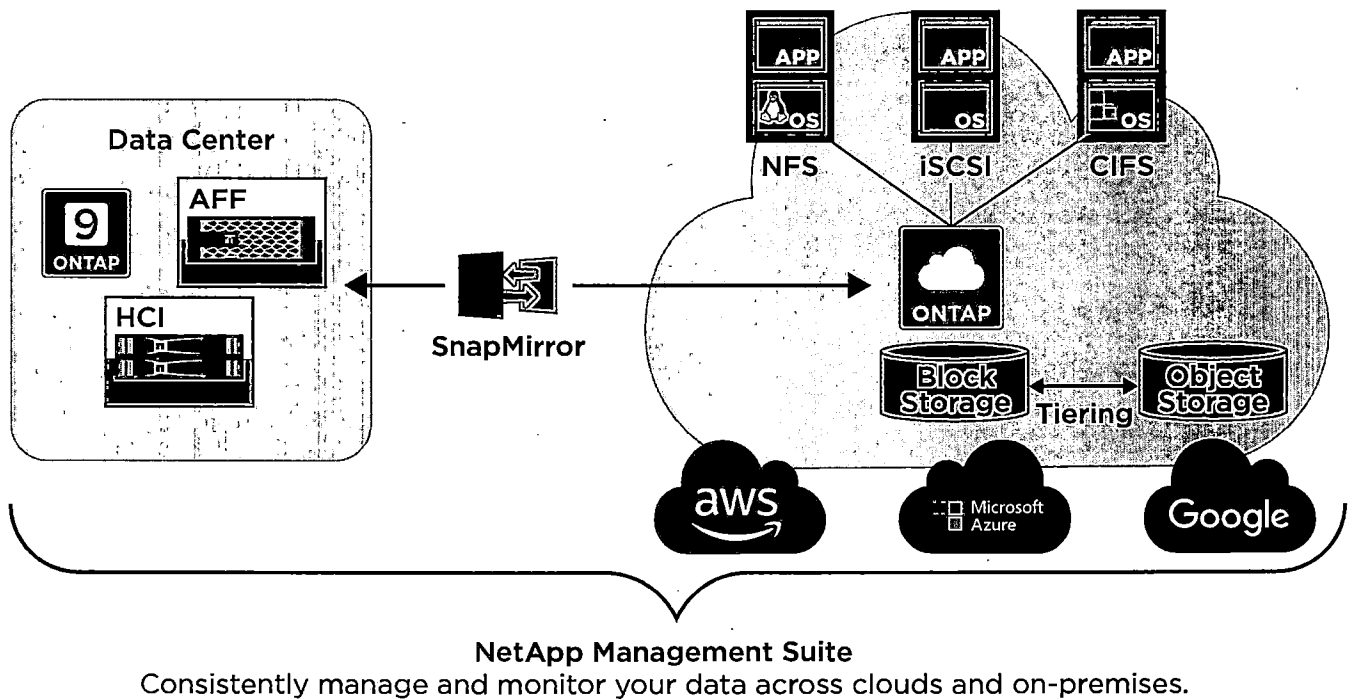
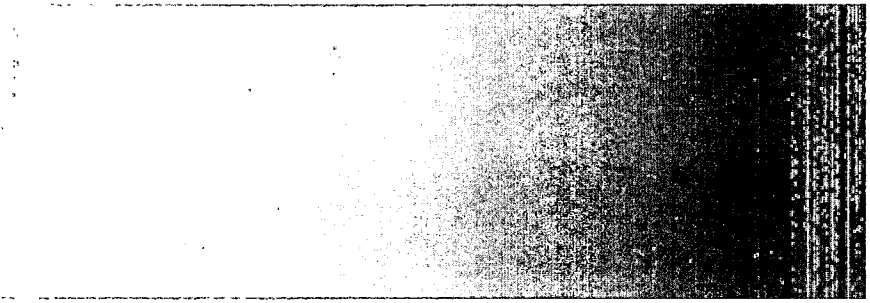


Figure 2) NetApp Cloud Volumes offers enterprise data management on your choice of cloud.

Licensing	MICROSOFT AZURE		GOOGLE CLOUD		AMAZON WEB SERVICES	
	Pay-as-you-go	BYOL	Pay-as-you-go	BYOL	Pay-as-you-go	BYOL
Available HA support	Yes	Yes	No (future)	No (future)	Yes	Yes
Protocol support	NFS, SMB, iSCSI		NFS, SMB, iSCSI		NFS, SMB, iSCSI	
Encryption at rest	NetApp Volume Encryption Azure Storage Service Encryption		NetApp Volume Encryption Google Cloud Platform default encryption		NetApp Volume Encryption AWS encryption with default key or external key	
Data protection	Snapshot copies, SnapMirror data replication for disaster recovery and backup, NetApp SnapRestore® data recovery					
NetApp FlexClone® volumes	Yes	Yes	Yes	Yes	Yes	Yes
Storage efficiency	Thin provisioning, data deduplication, compression, compaction					
NetApp SnapLock® file locking (WORM)	Yes	Yes	Yes	Yes	Yes	Yes
Data tiering to object storage	Yes	Yes	Yes	Yes	Yes	Yes
Region support	See the full list on the Cloud Volumes Global Regions page					
Disk/volume types	Standard HDD Standard SSD Premium SSD	Standard HDD Standard SSD Premium SSD	Standard storage: pd-standard Premium storage: pd-ssd	Standard storage: pd-standard Premium storage: pd-ssd	GP2, ST1, SC1, and IO1	GP2, ST1, SC1, and IO1
Solution capabilities	Explore: up to 2TB Standard: up to 10TB Premium: up to 368TB	BYOL: up to 368TB	Explore: up to 2TB Standard: up to 10TB Premium: up to 64TB	BYOL: up to 64TB; up to 368TB when using data tiering	Explore: up to 2TB Standard: up to 10TB Premium: up to 368TB	BYOL: up to 368TB

Table 1) Application environments and workload characteristics.



Datasheet

NetApp Support Account Manager

Improve storage operations and speed issue resolution with the help of a personal support advocate

KEY BENEFITS

Reduce Disruptions

- Preempt issues by continually assessing the health of your storage environment and identifying and predicting potential risks.
- Minimize risk and enable greater storage efficiency with NetApp® best practices, tools, and resources.

Maximize Uptime and Speed Resolution

- Enable the highest levels of storage efficiency and availability with 24/7 oversight and review of your NetApp support activity.
- Engage technical resources to expedite issue resolution: up to 33% shorter time to resolution for P1 cases.¹

Simplify Support

- Leverage the help of a knowledgeable support advocate to allow your IT staff to focus on expanding your company's capabilities and drive business success.
- Optimize storage system utilization, efficiency, and consistency with insightful storage best practices and upgrade advice.

The Challenge

The success of your business depends on how well your IT environment works for you. Resolving issues as they happen is not enough. To achieve maximum efficiency while minimizing risk, you need someone with a thorough understanding of your operations and goals: someone who can leverage years of knowledge and experience with NetApp technologies.

The Solution

Balance the reactive services provided by NetApp SupportEdge Premium or SupportEdge Secure for Government with personalized, proactive support from a NetApp Support Account Manager (SAM). With a deep knowledge of NetApp support processes and personnel and an in-depth understanding of your environment, a SAM helps you optimize your NetApp infrastructure and reduce risk when planning changes in your storage environment. With a SAM aligned to your business, you can reduce your operational costs and maximize the return on your storage infrastructure investments.

Reduce Disruptions

The Support Account Manager works directly with your team to develop deep knowledge of your NetApp environment, business goals, and service history. This knowledge, combined with regular assessment of the health of your storage environment, enables your SAM to identify, predict, and proactively address potential risks. Customers with a SAM report up to 57% fewer disruptions.²

The SAM also educates your IT team about the NetApp infrastructure best practices, tools, and resources needed to minimize risk and enable greater storage system efficiency. Because the SAM is an "insider" both in your company and in NetApp, your business objectives are well understood, and communication is streamlined.

Maximize Uptime and Speed Resolution

The Support Account Manager acts as a liaison with various NetApp groups and resources to assist in providing the highest level of risk management and support services. The SAM reviews and oversees all of your NetApp support activity and regularly advises your team on how to enable the highest levels of efficiency and availability in your NetApp storage environment. With 24/7 oversight, your SAM can quickly identify potential risks and engage the appropriate technical resources to expedite resolution, keeping you informed of progress every step of the way.



1. 2015 SAM Value Case Study.
2. Ibid.

TASK	DESCRIPTION
Account management	<ul style="list-style-type: none"> • Conduct monthly and quarterly review meetings • Develop lifecycle management reports • Create account documentation
Proactive support	<ul style="list-style-type: none"> • Conduct overall health assessment • Apply NetApp best practices using: <ul style="list-style-type: none"> - Standard analysis, supportability profile, case trending, and risk reports - Direct lines of communication
Upgrade advice	<ul style="list-style-type: none"> • Assist with quarterly upgrade planning • Create NetApp upgrade plan using the My AutoSupport® tool and Upgrade Advisor • Identify upgrade needs for NetApp ONTAP® software and firmware revisions • Assist with execution of upgrades on NetApp controllers • Review standard analysis report
Education	<ul style="list-style-type: none"> • Provide NetApp Support process overview • Coordinate appropriate resources for product demonstrations • Review patch and enhancement releases • Assess new employees' NetApp skills • Demonstrate NetApp's online support tools, including My AutoSupport, knowledge base, and new web-based support offerings
Reactive support	<ul style="list-style-type: none"> • Provide end-to-end case and escalation management, including support for customer P1 processes and oversight of P2 to P4 case escalations • Conduct process postmortem • Perform root-cause analysis • Solve entitlement issues • Provide installed base management assistance • Resolve Support site access issues • Assist with special projects

Table 1) NetApp Support Account Manager tasks.

Simplify Support

A SAM takes the complexity out of supporting your storage infrastructure, enabling you to free up valuable resources needed to drive your business success. With deep knowledge of NetApp and your IT environment, the SAM is strategically positioned to offer insightful storage best practices and upgrade advice that enable optimal storage system utilization, efficiency, and consistency, while minimizing risk in your environment.

About NetApp Services

Whether you are planning your next-generation storage system, need specialized know-how for a major storage deployment, or want to optimize the operational efficiency of your existing infrastructure, NetApp Services and our certified partners have the expertise to assist.

Get Started Today

Learn how your IT environment can help achieve the outcomes that matter most to you. Contact your local NetApp sales representative or visit www.netapp.com.

About NetApp

Leading organizations worldwide count on NetApp for software, systems and services to manage and store their data. Customers value our teamwork, expertise and passion for helping them succeed now and into the future.

www.netapp.com