



NetApp AFF A200 Review

StorageReview

StorageReview takes an in-depth look at features, management, and performance of NetApp's AFF A200 storage array

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Table of Contents

INTRODUCTION	4-6
USE-CASES & FEATURES	4
SPECIFICATIONS.....	5-6
BUILD AND DESIGN	7-8
MANAGEMENT	9-33
MAIN SCREEN	9
LUN	10
<i>Management</i>	10
<i>Initiator Groups</i>	11
SVMs.....	12
<i>Drill Down</i>	13
<i>Volumes</i>	14
<i>Edit Volumes</i>	15
<i>Storage Efficiency</i>	16
<i>Advanced</i>	17
<i>Application Provisioning</i>	18
LUNs	19
Settings	20
NETWORK	21
<i>Ethernet Ports</i>	22
<i>Broadcast Domain</i>	23
<i>FC/FoCE Adaptors</i>	24
HARDWARE & DIAGNOSTICS	25
<i>Aggregates</i>	26
<i>Nodes</i>	27
<i>Events</i>	28
PROTECTION.....	29
<i>Snapshot Policy</i>	30
CONFIGURATION	31
<i>Update Cluster</i>	32
MANAGEMENT SUMARY	33
PERFORMANCE	34-57
APPLICATION WORKLOAD ANALYSIS	34-41
<i>SQL Server</i>	34-37
<i>Sysbench</i>	38-41

VDBENCH..... 42-58
 4k Random..... 43-44
 64k Sequential..... 45-46
 Synthetic Database: SQL & Oracle..... 47-52
 VDI Full Clone & Linked Clone Traces..... 53-58

CONCLUSION **59**
 PROS & CONS..... 60
 THE BOTTOM LINE..... 61

The NetApp AFF A200 is a 2U all-flash storage array that provides an attractive entry point to NetApp's enterprise flash storage portfolio. The AFF A200 features 24 front-mounted 2.5-inch drives managed by dual controllers, and powered by six-core Intel Broadwell-DE processors. The A200 can be accessed with either SAN or NAS workloads (or both). The AFF A200 supports SSDs up to 15TB in capacity, allowing a single array to be outfitted with up to 367TB of raw storage, with additional space available via the DS224C expansion shelf.

When considering the total capacity of a NetApp AFF A200 configuration, it is important to bear in mind that NetApp guarantees the effectiveness of its inline data reduction technologies, including compression, deduplication, and data compaction. NetApp provides guaranteed storage efficiency based on the types of workloads. If clients don't realize the guaranteed efficiency, NetApp will make up the difference. This guarantee is valid in its current form through April 2018.

Evaluating the AFF A200's data reduction effectiveness falls outside the scope of our review process, but according to NetApp, the AFF A200 should reduce capacity requirements by 2 to 10 times. In brief, NetApp's data compaction technology places multiple logical data blocks from the same volume into a single 4KB block. According to NetApp, this functionality has a "near-zero" impact on performance--which is something that falls well within our review process to evaluate. The A200's architecture leverages the company's FAS2650 array (AFF A200's architecture is similar to that of the entry-FAS platform), although prior FAS2650 administrators should note that the A200 does not incorporate NVMe FlashCache and only works with SSDs.

Much has changed within the NetApp ecosystem during the three years since our last look at a Netapp product, the FAS2240-2. This includes the debut of the AFF all-flash lineup and the debut of the ONTAP 9 operating system (currently at version 9.2). The AFF A200 is part of the "AFF A" lineup, the second generation of the AFF family. Flash technology and the market for all-flash arrays have also evolved during the intervening time. So it's reasonable to consider the NetApp AFF A200 an indication of where NetApp sees the biggest opportunities for expanding into new markets and consolidating the customer base built in the past with offerings like the FAS2240.

This review takes a comprehensive look at this latest generation entry-level flash storage from NetApp, with a modestly equipped AFF A200 outfitted with 24 960GB SSDs.

NetApp AFF A200 Specifications

- Per HA Pair (active-active controller)
- Form Factor: 2U
- Memory: 64GB
- NVRAM: 8GB
- Storage
 - Onboard Bays: 24 2.5" slots
 - Maximum SSD: 144
 - Maximum Raw Capacity: 2.2PB
 - Effective Capacity: 8.8PB (base10)
 - SSDs Supported: 15.3TB, 7.6TB, 3.8TB, and 960GB. 3.8TB, and 800GB self-encrypting
 - Supported Storage Shelves: DS224C, DS2246
- SAN Scale-Out: 2-8 nodes
- RAID supported: RAID6, RAID4, RAID 6 + RAID 1 or RAID 4 + RAID 1 (SyncMirror)
- OS supported:
 - Windows 2000
 - Windows Server 2003
 - Windows Server 2008
 - Windows Server 2012
 - Windows Server 2016
 - Linux
 - Oracle Solaris
 - AIX
 - HP-UX
 - Mac OS
 - VMware
 - ESX
- Ports:
 - 8x UTA2 (16Gb FC, 10GbE/FCoE)
 - 4x 10GbE
 - 4x 12Gb SAS
- Storage Networking supported:
 - FC
 - FCoE
 - iSCSI
 - NFS
 - pNFS
 - CIFS/SMB
- OS version: ONTAP 9.1 RC2 or later

- Max number of LUNs: 4,096
- Number of supported SAN hosts: 512

Build and Design

The NetApp AFF A200 is built around a 24-bay chassis supporting 2.5-inch SAS SSDs. This architecture is based on NetApp's DS224C storage shelf, matched with Intel Broadwell-DE 6-core processors and 12Gbps SAS connectivity to internal and external drives. From a design perspective, Netapp over-built everything for the utmost level of redundancy. MP-HA (Multi-path High-Availability) SAS connections route internally and externally, so each controller can talk to every drive through multiple pathways, even if one link is detached or over-utilized. Additionally, the unit sports an NVMEM battery, which when fully charged is able to handle 25 separate power-fail events, giving each controller enough uptime to de-stage in-flight data to an onboard-boot device. Furthermore, even the de-staged data is fully encrypted to protect it, regardless of the event that caused the power failure in the first place. This same level of resilience shows itself in the design of the chassis cooling and power systems, where each power supply alone can fully cool and power the system indefinitely under normal operating conditions.



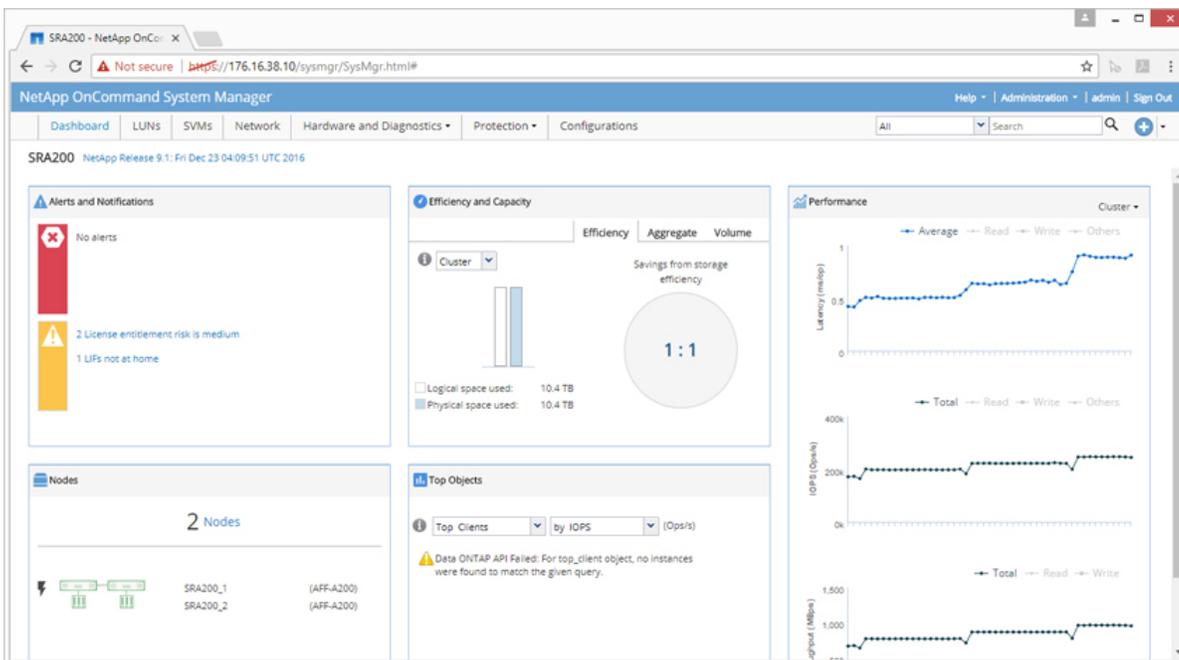
The front of the device is simple enough with a NetApp-branded bezel covering the drive bays. On the left-hand side is the power button, along with an LED display indicating faults and activity status.



The rear view has a bit more going on with various cable paths, but it's the connectivity that allows most of the redundant magic to happen. There are two nodes and the device is split down the middle with either side being identical to the other. On the left side of each controller are two SAS ports. These are used in conjunction with additional additional storage shelves, as well as also acting as an external redundant link between each controller for HA SAS connectivity. Next to the SAS ports are two 10GbE ports that allow node-to-node connectivity. In a single-pair deployment, both nodes are directly connected to one another, while in a larger cluster (Clustered Data ONTAP), these ports are connected to a dedicated switch for cluster traffic. Next are four UTA2 ports, which can be configured to operate in FC or Ethernet personalities for the primary data or network fabric. Above the UTA2 ports is a console micro-USB port. To the right of the UTA2 ports are a RJ-45 console port and USB port. And on the right-hand side is the management port. Beneath the ports listed are the dual power supplies.

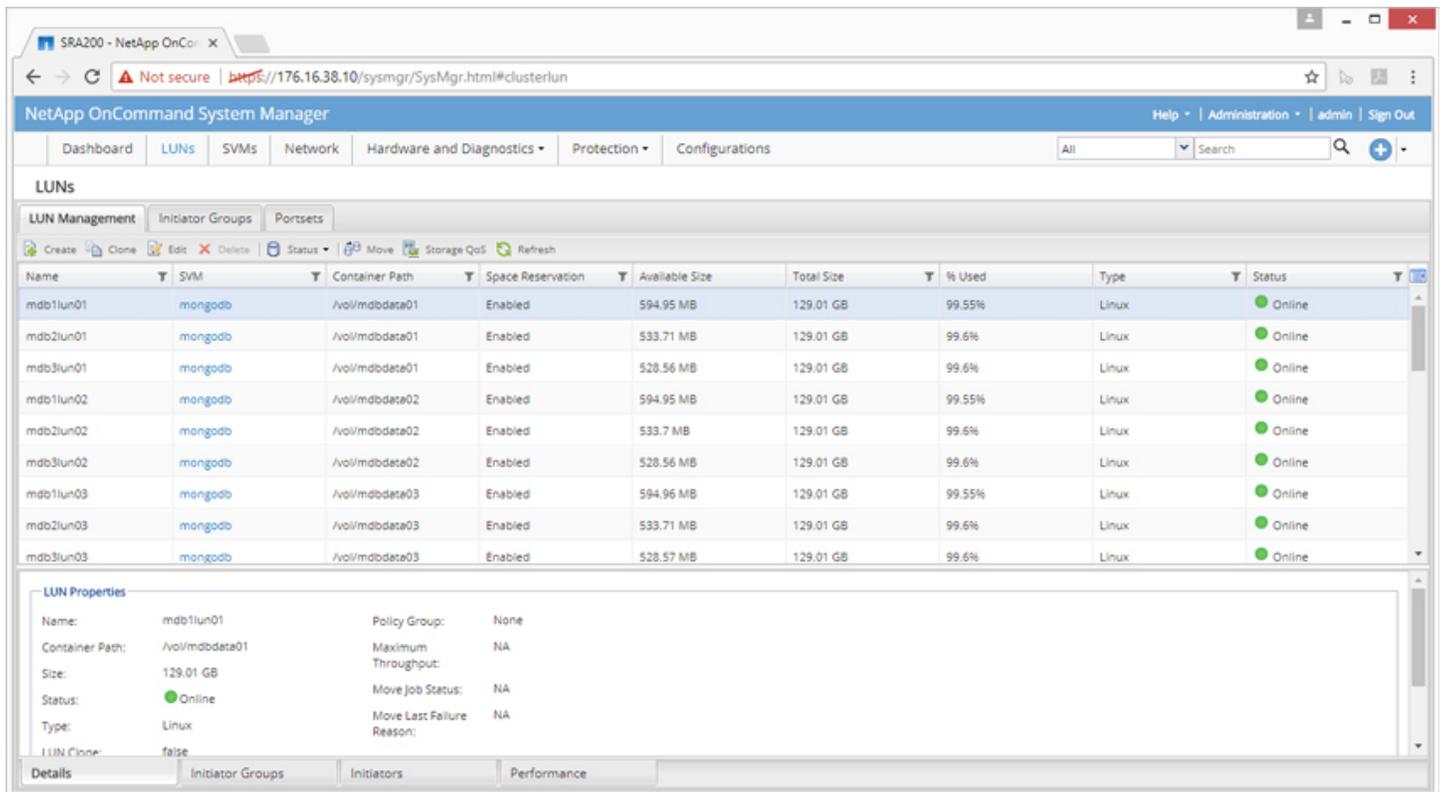
Management

The NetApp AFF A200 runs ONTAP 9.1 and up; 9.2 came out during our review. The UI is NetApp's OnCommand System Manager. Along the top are several main tabs including Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. Through the main dashboard, users are able to easily see alerts and notifications, how many nodes are currently being used (in our case 2), storage efficiency, Top Objects, and a read out on current performance in latency, IOPS, and bandwidth.



NetApp AFF A200 Review

Under the LUN tab, users can easily manage their LUNs as they are listed by name and clicking on one brings up the properties at the bottom of the screen.



The screenshot shows the NetApp OnCommand System Manager interface. The browser address bar indicates the URL is `https://176.16.38.10/sysmgr/SysMgr.html#clusterlun`. The main navigation bar includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The LUNs tab is active, displaying a table of LUNs and a detailed view for the selected LUN (mdb1lun01).

Name	SVM	Container Path	Space Reservation	Available Size	Total Size	% Used	Type	Status
mdb1lun01	mongodb	Av0/mdbdata01	Enabled	594.95 MB	129.01 GB	99.55%	Linux	Online
mdb2lun01	mongodb	Av0/mdbdata01	Enabled	533.71 MB	129.01 GB	99.6%	Linux	Online
mdb3lun01	mongodb	Av0/mdbdata01	Enabled	528.56 MB	129.01 GB	99.6%	Linux	Online
mdb1lun02	mongodb	Av0/mdbdata02	Enabled	594.95 MB	129.01 GB	99.55%	Linux	Online
mdb2lun02	mongodb	Av0/mdbdata02	Enabled	533.7 MB	129.01 GB	99.6%	Linux	Online
mdb3lun02	mongodb	Av0/mdbdata02	Enabled	528.56 MB	129.01 GB	99.6%	Linux	Online
mdb1lun03	mongodb	Av0/mdbdata03	Enabled	594.96 MB	129.01 GB	99.55%	Linux	Online
mdb2lun03	mongodb	Av0/mdbdata03	Enabled	533.71 MB	129.01 GB	99.6%	Linux	Online
mdb3lun03	mongodb	Av0/mdbdata03	Enabled	528.57 MB	129.01 GB	99.6%	Linux	Online

LUN Properties			
Name:	mdb1lun01	Policy Group:	None
Container Path:	Av0/mdbdata01	Maximum Throughput:	NA
Size:	129.01 GB	Move Job Status:	NA
Status:	Online	Move Last Failure Reason:	NA
Type:	Linux		
LUN Clone:	false		

Also under the LUN tab is the sub tab for Initiator groups. Here users can easily see and manage the name, SVM, type, OS, Portset, and count.

The screenshot displays the NetApp OnCommand System Manager interface. The browser address bar shows the URL `https://176.16.38.10/sysmgr/SysMgr.html#clusterlun`. The main navigation bar includes tabs for Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The LUNs section is active, and the Initiator Groups sub-tab is selected. Below the sub-tabs, there are icons for Create, Edit, Delete, and Refresh. A table lists the initiator groups with the following data:

Name	SVM	Type	Operating System	Portset	Initiator Count
ig_mdb1	mongodb	FC/FCoE	Linux	-NA-	1
ig_mdb2	mongodb	FC/FCoE	Linux	-NA-	1
ig_mdb3	mongodb	FC/FCoE	Linux	-NA-	1
ig2	svrserver	FC/FCoE	VMware	-NA-	11

Below the table, there is a section for Initiators, which currently shows the MAC address `10:00:00:90:fa:53:e9:9a`. At the bottom of the interface, there are buttons for Initiators and Mapped LUNs.

The next main tab is SVM (Storage Virtual Machines). Clicking on this tab gives users a list of SVMs, along with their details in the bottom left-hand corner.

The screenshot shows the NetApp OnCommand System Manager interface. The browser address bar indicates the URL is <https://176.16.38.10/systemgr/SysMgr.html#svmdashboard>. The main navigation bar includes tabs for Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The SVMs tab is active, displaying a table of Storage Virtual Machines.

Name	State	Subtype	Allowed Protocols	IPspace	Volume Type	Configuration State
mongodb	running	default	FC/FCoE	Default	FlexVol Volume	Unlocked
srvserver	running	default	FC/FCoE	Default	FlexVol Volume	Unlocked

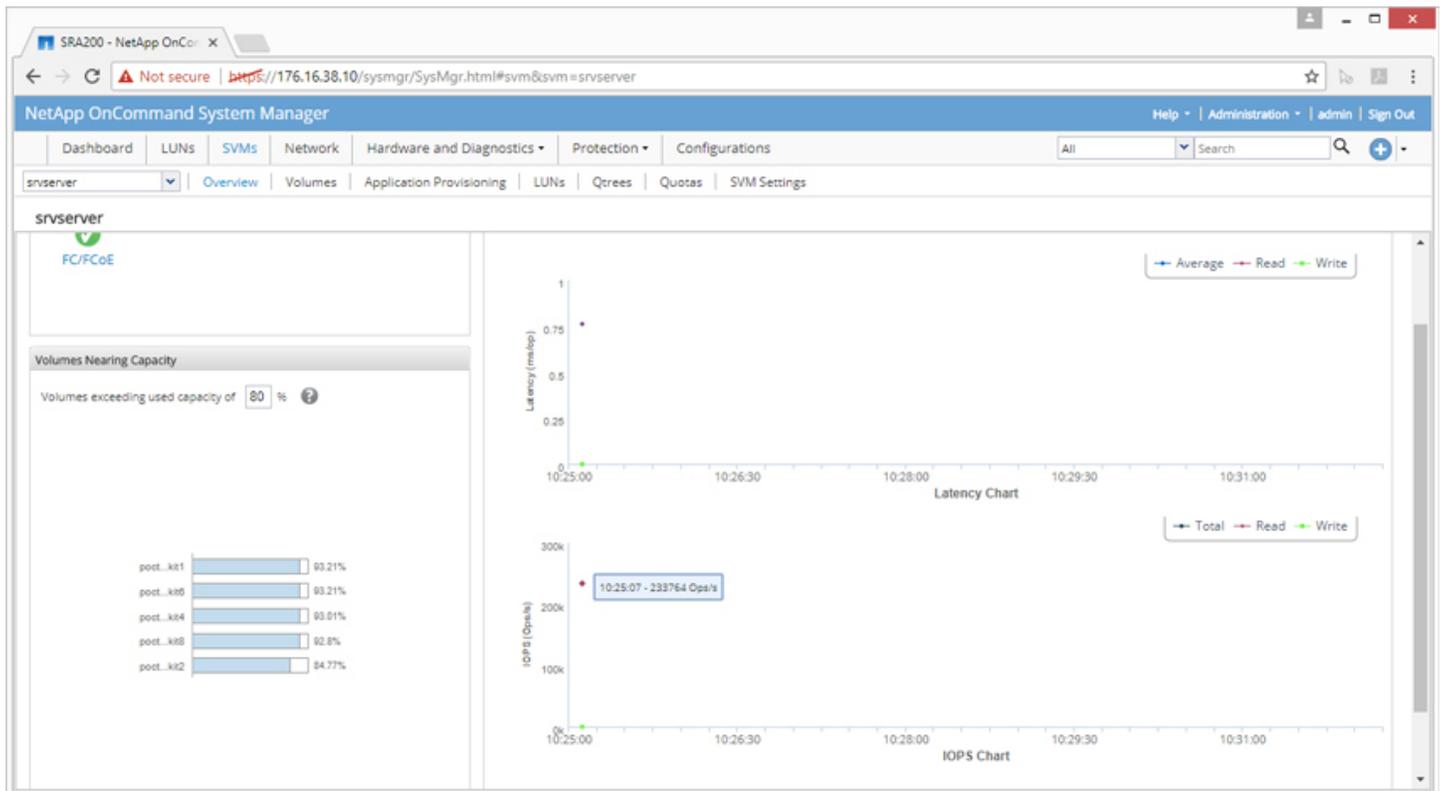
The bottom left panel shows the details for the selected SVM:

- Protocols: **FC/FCoE**
- Administrative User: vsadmin(Unlocked)
- Management Interface: [Add Interface](#)
- Snapshot policy: default
- NIS domain: -NA-
- LDAP client: -NA-
- Language: C.UTF-8
- Volume Type: FlexVol Volume

The bottom right panel shows the Peer Storage Virtual Machines table:

Name	Cluster	Status	Applications
------	---------	--------	--------------

Clicking on a specific SVM gives users several other options such as an overview that shows things such as connection, volumes nearing capacity, and performance of the SVMs.



When clicking on an SVM, there are several other sub-tabs including Volumes, Application Provisioning, LUNs, Qtrees, Quotas, and SVM Settings. Under the Volumes sub-tab, users can see the volumes set up, edit or remove them, take a snapshot, and adjust the QoS among other functions.

The screenshot shows the NetApp OnCommand System Manager interface. The browser address bar indicates the URL: `https://176.16.38.10/sysmgr/SysMgr.html#volume&svm=srvserver`. The page title is "NetApp OnCommand System Manager". The navigation menu includes "Dashboard", "LUNs", "SVMs", "Network", "Hardware and Diagnostics", "Protection", and "Configurations". The "SVMs" sub-tab is active, and the "Volumes" sub-tab is selected.

The "Volumes" section displays a table of volumes. The table has the following columns: Name, Aggregate, Status, Thin Provisioned, % Used, Available Space, Total Space, Storage Efficiency, Is Volume Moving, and Encrypted. The data is as follows:

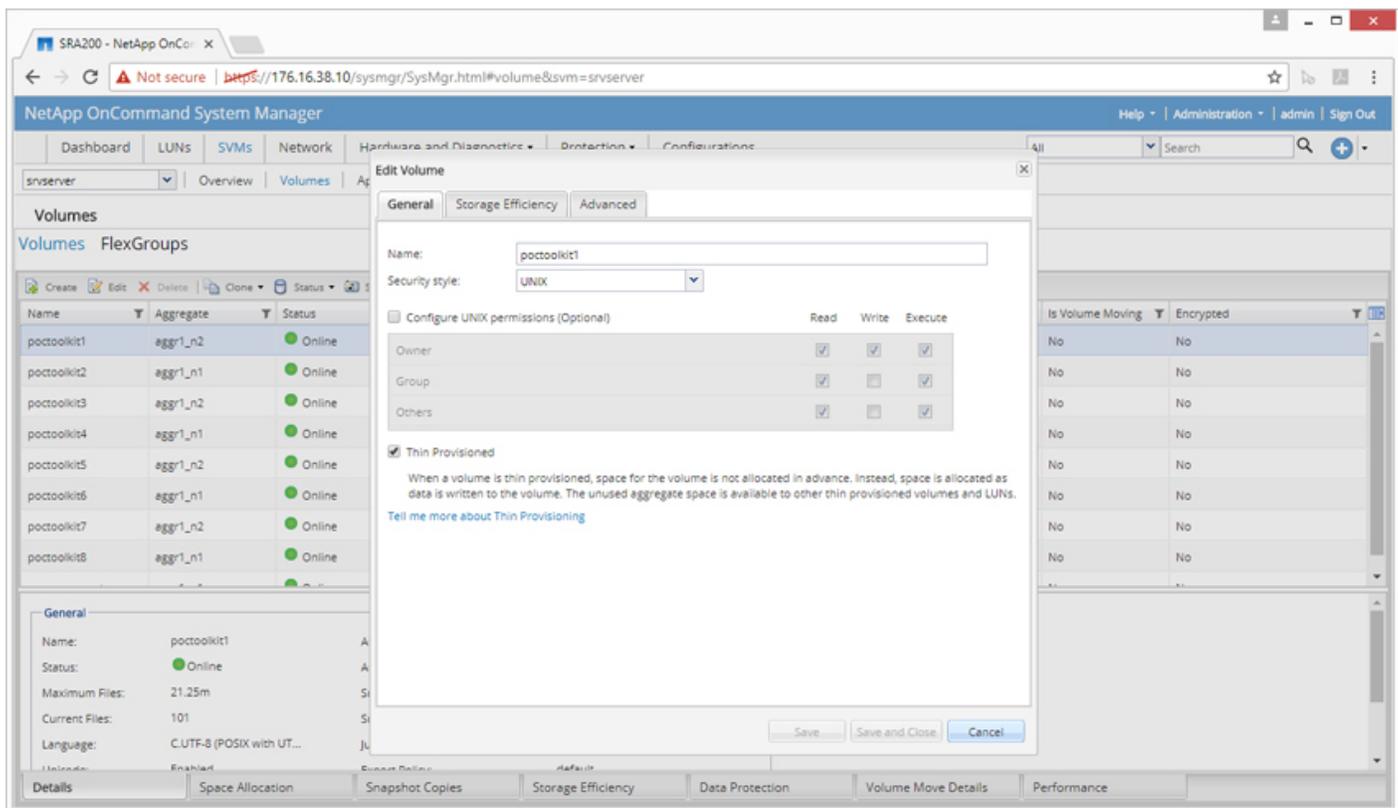
Name	Aggregate	Status	Thin Provisioned	% Used	Available Space	Total Space	Storage Efficiency	Is Volume Moving	Encrypted
poc toolkit1	aggr1_n2	Online	Yes	93	69.56 GB	1 TB	Enabled	No	No
poc toolkit2	aggr1_n1	Online	Yes	84	155.96 GB	1 TB	Enabled	No	No
poc toolkit3	aggr1_n2	Online	Yes	84	160.14 GB	1 TB	Enabled	No	No
poc toolkit4	aggr1_n1	Online	Yes	93	71.54 GB	1 TB	Enabled	No	No
poc toolkit5	aggr1_n2	Online	Yes	83	171.85 GB	1 TB	Enabled	No	No
poc toolkit6	aggr1_n1	Online	Yes	93	69.57 GB	1 TB	Enabled	No	No
poc toolkit7	aggr1_n2	Online	Yes	84	159.15 GB	1 TB	Enabled	No	No
poc toolkit8	aggr1_n1	Online	Yes	92	73.76 GB	1 TB	Enabled	No	No

Below the table, the "General" tab is selected, showing details for the volume "poc toolkit1":

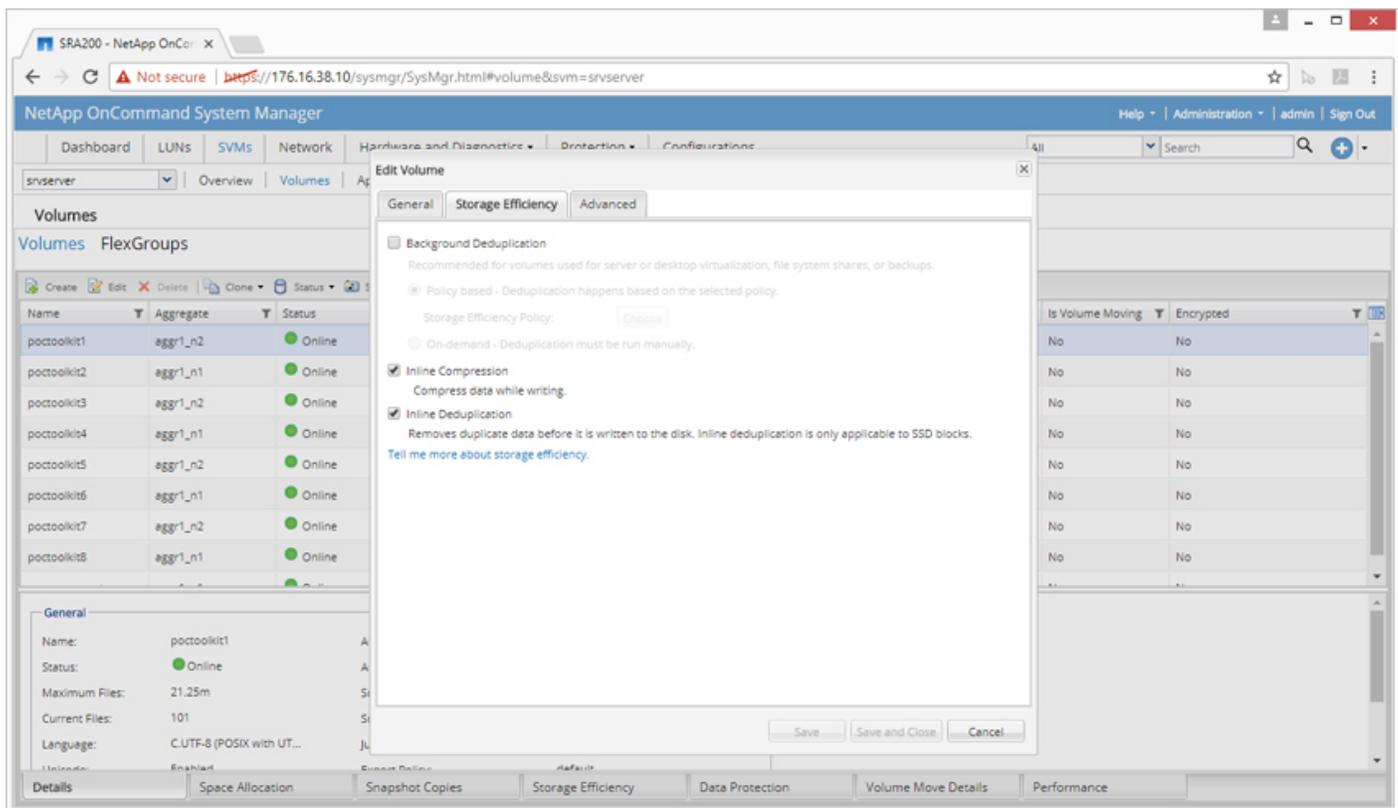
- Name: poc toolkit1
- Status: Online
- Maximum Files: 21,25m
- Current Files: 101
- Language: C.UTF-8 (POSIX with UT...)
- Autogrow Mode: grow_shrink
- Autogrow Maximum Size: 1.2 TB
- Snapshot Autodelete: Enabled
- Snapshot Autodelete Commitment: Try
- Junction Path:

At the bottom of the interface, there are several tabs: "Details", "Space Allocation", "Snapshot Copies", "Storage Efficiency", "Data Protection", "Volume Move Details", and "Performance".

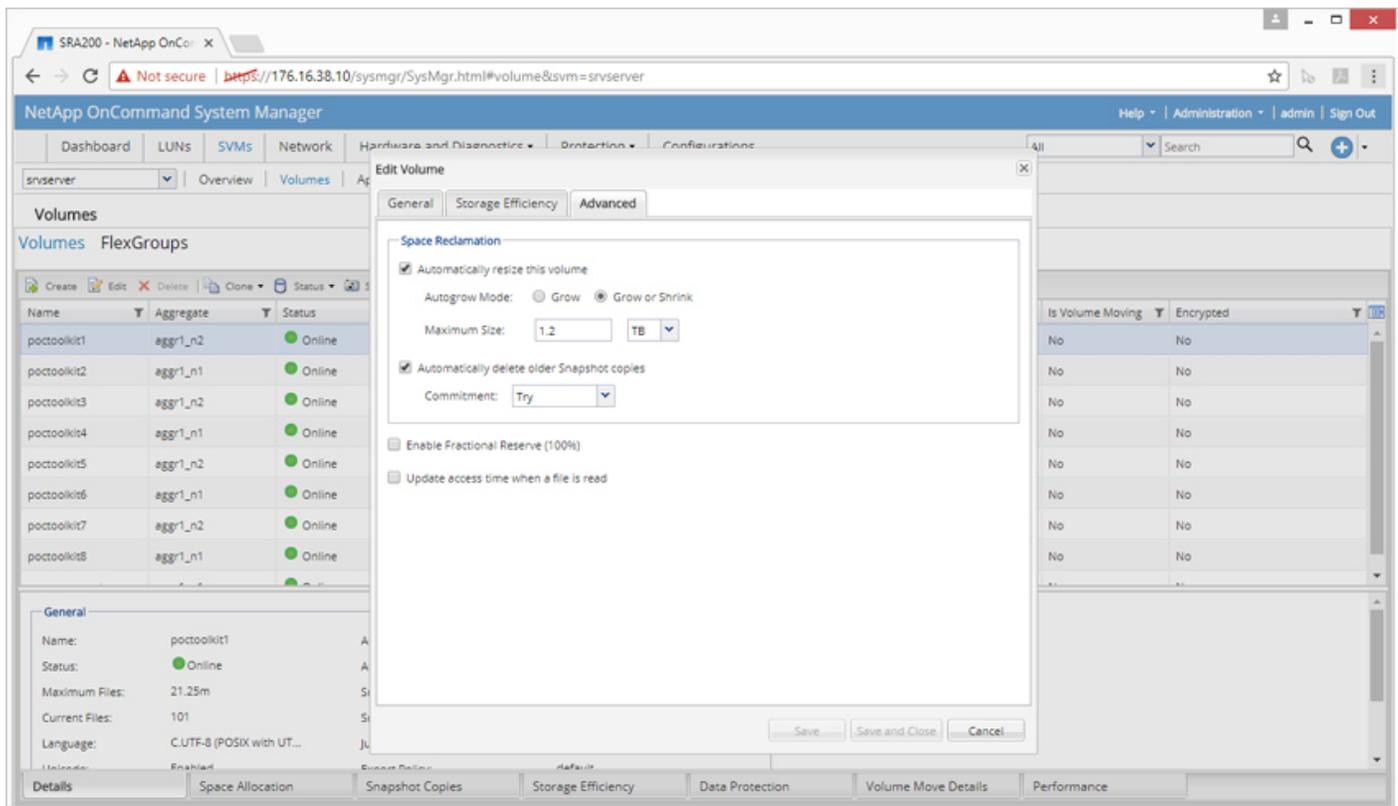
If users want to edit one of the volumes, they need only right click a volume and they are brought to the screen below. Here they are given three tabs to edit including General, Storage Efficiency, and Advanced. As the name implies, the General tab allows general information to be edited including the name, security style, and whether or not the volume is thin provisioned.



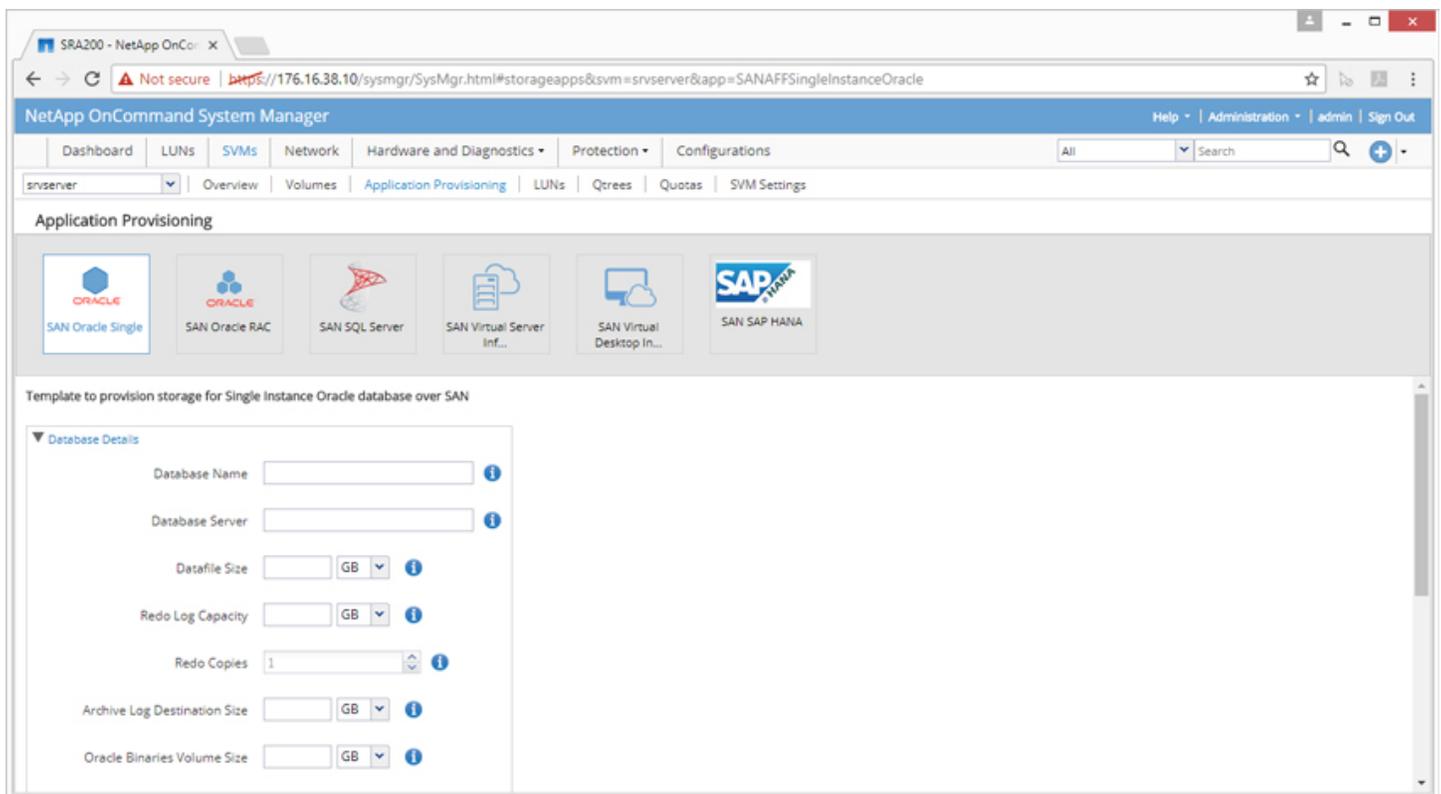
Storage Efficiency allows users to edit the data-reduction capabilities within the volume. This includes turning on or off background deduplication, inline compression, and inline deduplication.



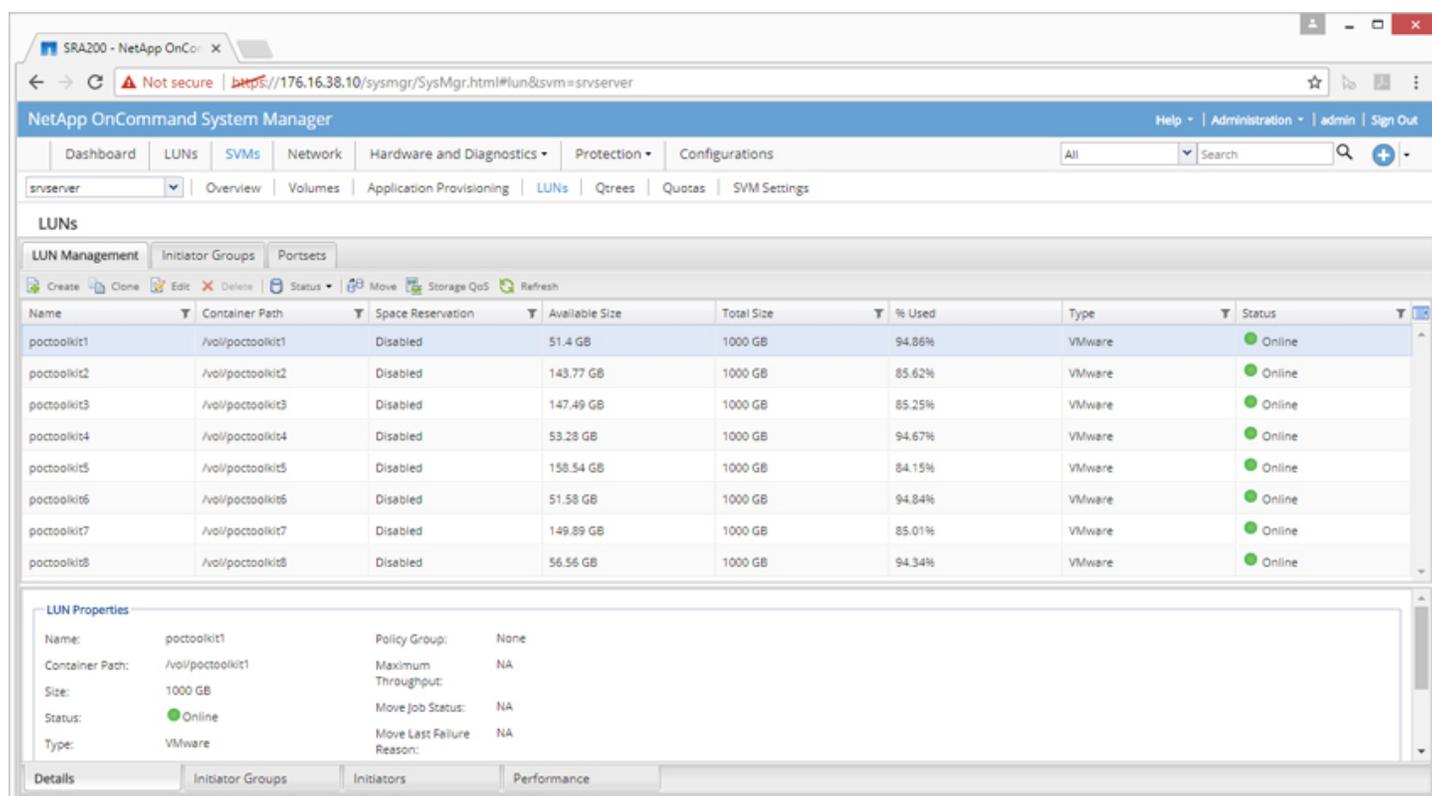
Advanced allows users to set space reclamation, including automatically resizing the volume and deleting old snapshots. Users can also enable fractional reserve and update access time when a file is read.



The next sub-tab is Application Provisioning. As the name implies, users are able to provision certain applications for SVMs under this tab. These applications (and their templates) include Oracle SAN Oracle Single, Oracle SAN Oracle RAC, SAN SQL Server, SAN Virtual Desktop Instance, and SAN SAP HANA.



The LUNs sub-tab for SVMs enables users the ability to see, manage, and edit the LUNs for each SVM. The LUNs are listed by name (though this can be adjusted) with general details for each. And if users click on one, they can see more advanced properties at the bottom.



The screenshot shows the NetApp OnCommand System Manager interface for LUN management. The browser address bar shows the URL: `https://176.16.38.10/sysmgr/SysMgr.html#lun&svm=svrserver`. The navigation menu includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The current view is for the 'svrserver' SVM, showing a list of LUNs under the 'LUNs' sub-tab.

Name	Container Path	Space Reservation	Available Size	Total Size	% Used	Type	Status
pocoolkit1	/vol/pocoolkit1	Disabled	51.4 GB	1000 GB	94.86%	VMware	Online
pocoolkit2	/vol/pocoolkit2	Disabled	143.77 GB	1000 GB	85.62%	VMware	Online
pocoolkit3	/vol/pocoolkit3	Disabled	147.49 GB	1000 GB	85.25%	VMware	Online
pocoolkit4	/vol/pocoolkit4	Disabled	53.28 GB	1000 GB	94.67%	VMware	Online
pocoolkit5	/vol/pocoolkit5	Disabled	158.54 GB	1000 GB	84.15%	VMware	Online
pocoolkit6	/vol/pocoolkit6	Disabled	51.58 GB	1000 GB	94.84%	VMware	Online
pocoolkit7	/vol/pocoolkit7	Disabled	149.89 GB	1000 GB	85.01%	VMware	Online
pocoolkit8	/vol/pocoolkit8	Disabled	56.56 GB	1000 GB	94.34%	VMware	Online

Below the table, the 'LUN Properties' section for 'pocoolkit1' is displayed:

- Name: pocoolkit1
- Container Path: /vol/pocoolkit1
- Size: 1000 GB
- Status: Online
- Type: VMware
- Policy Group: None
- Maximum Throughput: NA
- Move Job Status: NA
- Move Last Failure Reason: NA

The interface also includes tabs for 'Details', 'Initiator Groups', 'Initiators', and 'Performance' at the bottom.

An important sub-tab under SVMs is the Settings tab. This tab allows users to see things such as protocols, policies, services, user details, and the current statuses.

The screenshot displays the NetApp OnCommand System Manager interface. The browser address bar shows the URL `https://176.16.38.10/sysmgr/SysMgr.html#fccoe&svm=srvserver`. The navigation menu includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The current page is titled "SVM Settings" for the "srvserver" SVM. The left sidebar lists various settings categories: Protocols (FC/FCoE), Policies (Efficiency, Protection, Snapshot, QoS), Services (NIS, LDAP Client, LDAP Configuration, DNS/DDNS), and SVM User Details (Users, Roles). The main content area shows the FC/FCoE service status as "FC/FCoE service is running" with a WWNN of "20:00:00:a0:98:af:b5:e4". Below this is a table of FC/FCoE interfaces:

Network Interface	WWPN	Current Port	Status
fcif1	20:01:00:a0:98:af:b5:e4	SRA200_1:0c	Enabled
fcif2	20:02:00:a0:98:af:b5:e4	SRA200_1:0d	Enabled
fcif3	20:03:00:a0:98:af:b5:e4	SRA200_2:0c	Enabled
fcif4	20:04:00:a0:98:af:b5:e4	SRA200_2:0d	Enabled

NetApp AFF A200 Review

The next main tab we look at is the Network tab. This tab has several sub-tabs including Subnets, Network Interfaces, Ethernet Ports, Broadcast Domains, FC/FoE Adaptors, and IPspaces. The first sub-tab we'll look at is Network Interfaces. Here users are able to see the Interface name, the SVM, IP address, the current port, whether or not it is a home port, the type of data protocol access, management access, the subnet, and the role. Clicking on an interface also shows general and failover properties.

The screenshot displays the NetApp OnCommand System Manager interface. The main navigation bar includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The 'Network' sub-tab is active, showing a table of Network Interfaces. Below the table, two panels provide detailed properties for a selected interface.

Interface Name	Storage Virtual Machin...	IP Address/WWN	Current Port	Is Home Port	Data Protocol Access	Management Access	Subnet	Role
SRA200_1_fc_if_1	mongodb	20:05:00:a0:98:af:b5:e4	SRA200_1:0c	Yes	fc	No	-NA-	Data
SRA200_1_fc_if_2	mongodb	20:06:00:a0:98:af:b5:e4	SRA200_1:0d	Yes	fc	No	-NA-	Data
SRA200_2_fc_if_1	mongodb	20:07:00:a0:98:af:b5:e4	SRA200_2:0c	Yes	fc	No	-NA-	Data
SRA200_2_fc_if_2	mongodb	20:08:00:a0:98:af:b5:e4	SRA200_2:0d	Yes	fc	No	-NA-	Data
fcif1	svserver	20:01:00:a0:98:af:b5:e4	SRA200_1:0c	Yes	fc	No	-NA-	Data
fcif2	svserver	20:02:00:a0:98:af:b5:e4	SRA200_1:0d	Yes	fc	No	-NA-	Data
fcif3	svserver	20:03:00:a0:98:af:b5:e4	SRA200_2:0c	Yes	fc	No	-NA-	Data
fcif4	svserver	20:04:00:a0:98:af:b5:e4	SRA200_2:0d	Yes	fc	No	-NA-	Data

General Properties:

Network Address/WWN: 20:05:00:a0:98:af:b5:e4

Role: Data

IPspace: -NA-

Broadcast Domain: -NA-

Administrative Status: Enabled

DDNS Status: -NA-

Failover Properties:

Home Port: SRA200_1:0c(-NA-)

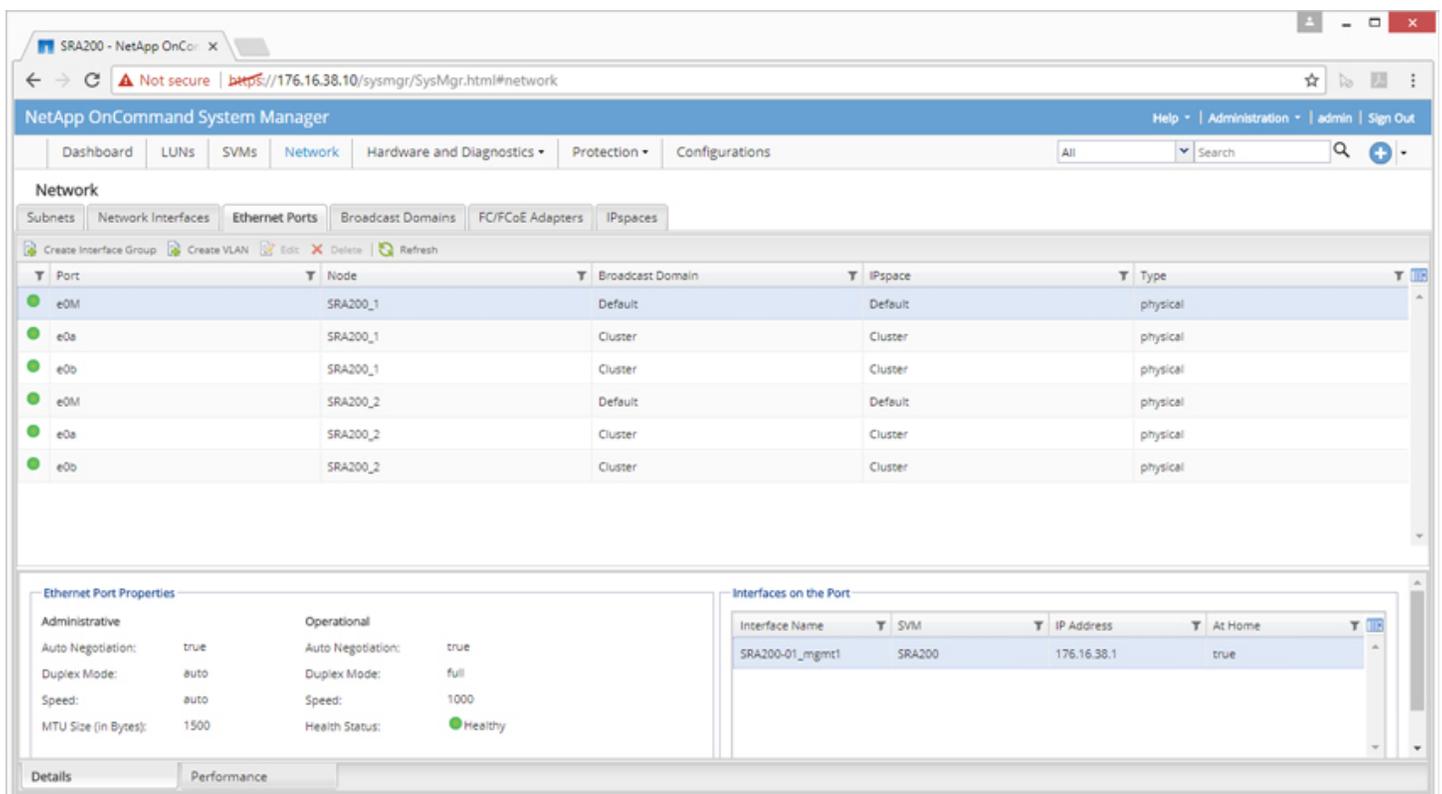
Current Port: SRA200_1:0c(-NA-)

Fallover Policy: disabled

Fallover Group: -NA-

Fallover State: -NA-

The Ethernet Ports sub-tab lists the different ports, what node they are on, their broadcast domain and IPspace, and what type they happen to be. Clicking on a port also gives users the properties and interfaces.



The screenshot shows the NetApp OnCommand System Manager interface. The main navigation bar includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The 'Network' section is active, and the 'Ethernet Ports' sub-tab is selected. Below the navigation, there are tabs for Subnets, Network Interfaces, Ethernet Ports, Broadcast Domains, FC/FCoE Adapters, and IPspaces. The 'Ethernet Ports' tab displays a table with the following data:

Port	Node	Broadcast Domain	IPspace	Type
e0M	SRA200_1	Default	Default	physical
e0a	SRA200_1	Cluster	Cluster	physical
e0b	SRA200_1	Cluster	Cluster	physical
e0M	SRA200_2	Default	Default	physical
e0a	SRA200_2	Cluster	Cluster	physical
e0b	SRA200_2	Cluster	Cluster	physical

Below the table, there are two panels: 'Ethernet Port Properties' and 'Interfaces on the Port'. The 'Ethernet Port Properties' panel shows the following details:

Administrative		Operational	
Auto Negotiation:	true	Auto Negotiation:	true
Duplex Mode:	auto	Duplex Mode:	full
Speed:	auto	Speed:	1000
MTU Size (in Bytes):	1500	Health Status:	Healthy

The 'Interfaces on the Port' panel shows a table with the following data:

Interface Name	SVM	IP Address	At Home
SRA200-01_rmgmt1	SRA200	176.16.38.1	true

At the bottom of the interface, there are tabs for 'Details' and 'Performance'.

The Broadcast Domain sub-tab tells users whether the broadcast domain is a cluster or default, its maximum transmission units (MTU), its IPspace, and its combined port update status.

The screenshot shows the NetApp OnCommand System Manager interface. The main navigation bar includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The 'Network' section is active, with sub-tabs for Subnets, Network Interfaces, Ethernet Ports, Broadcast Domains, FC/FCoE Adapters, and IPspaces. The 'Broadcast Domains' sub-tab is selected, displaying a table with the following data:

Broadcast Domain	MTU	IPspace	Combined Port Update Status
Cluster	9000	Cluster	complete
Default	1500	Default	complete

Below the table, the 'Port Details' section shows a table with the following data:

Port Name	SRA200_1	SRA200_2
e0e	●	●
e0o	●	●

The FC/FoE Adapters sub-tab shows information about the adapters such as its WWNN, which node it is on, which slot it is located in, its WWPN, its status, and its speed. Clicking on an adaptor gives users additional details such as media type, connection established, fabric established, speed, port address, and data link rate.

The screenshot shows the NetApp OnCommand System Manager interface. The 'Network' section is active, and the 'FC/FoE Adapters' sub-tab is selected. The table below displays the following data:

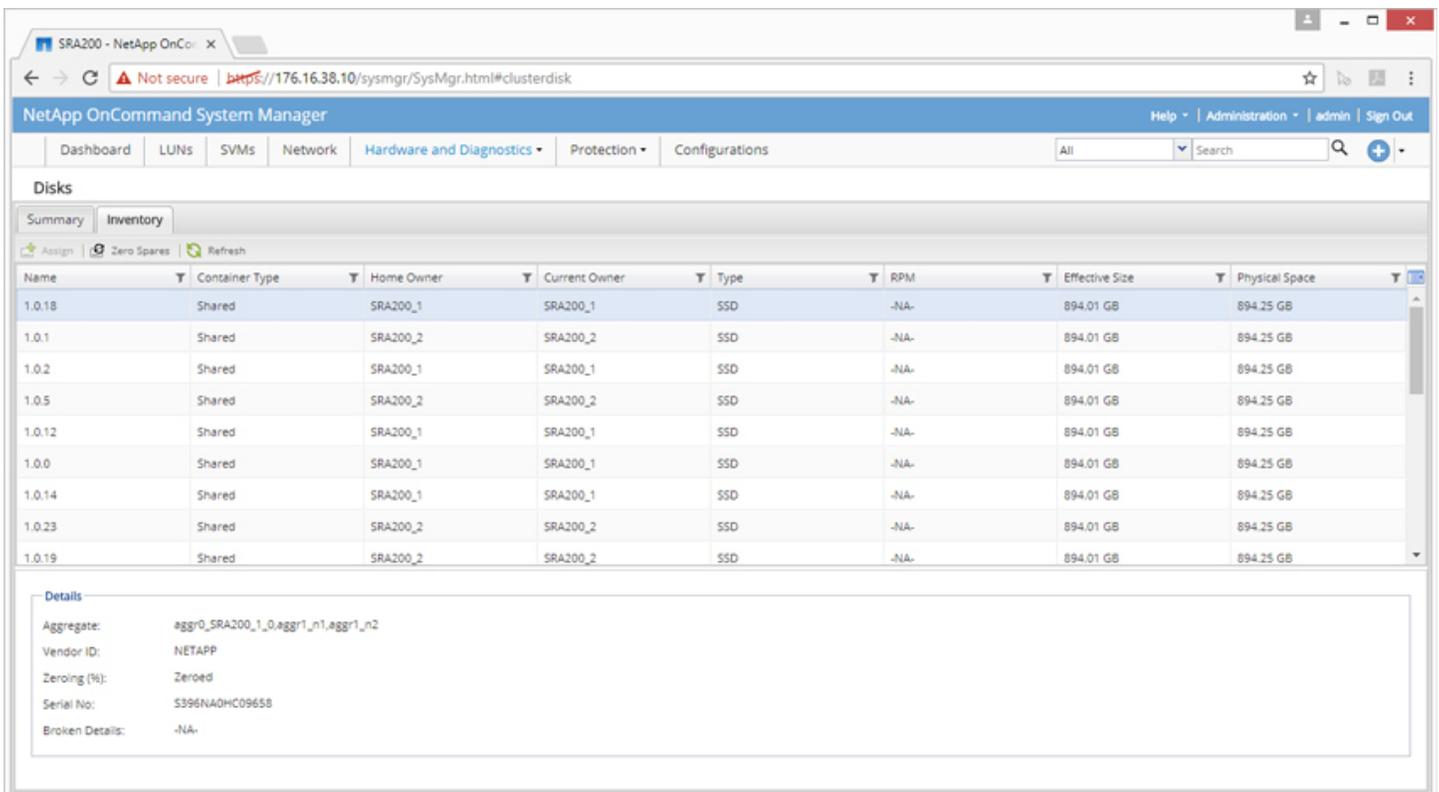
WWNN	Node Name	Slot	WWPN	Status	Speed
50:0a:09:80:80:53:3f:d0	SRA200_1	0c	50:0a:09:83:80:53:3f:d0	online	auto
50:0a:09:80:80:53:3f:d0	SRA200_1	0d	50:0a:09:84:80:53:3f:d0	online	auto
50:0a:09:80:80:53:3f:d0	SRA200_1	0e	50:0a:09:81:80:53:3f:d0	link not connected	auto
50:0a:09:80:80:53:3f:d0	SRA200_1	0f	50:0a:09:82:80:53:3f:d0	link not connected	auto
50:0a:09:80:80:c3:40:fb	SRA200_2	0c	50:0a:09:83:80:c3:40:fb	online	auto
50:0a:09:80:80:c3:40:fb	SRA200_2	0d	50:0a:09:84:80:c3:40:fb	online	auto
50:0a:09:80:80:c3:40:fb	SRA200_2	0e	50:0a:09:81:80:c3:40:fb	link not connected	auto
50:0a:09:80:80:c3:40:fb	SRA200_2	0f	50:0a:09:82:80:c3:40:fb	link not connected	auto

Below the table, the 'Adapter Details' section for a selected adapter shows the following information:

- Media Type: Point to Point
- Port Address: 71680
- Connection Established: ptp
- Data Link Rate: 16 Gb
- Fabric Established: true
- Speed: Automatic

NetApp AFF A200 Review

The next main tab is Hardware and Diagnostics. This tab gives user a drop-down menu with several options. One of the options is disk, with two sub-tabs, Summary and Inventory. Under Inventory, users are able to see all the disks in their cluster, the names, container type, home and current owner, type (in this case all SSD), RPM (in this case, none--as the disks are all SSDs), effective size, and physical space. Clicking on a disk also provides additional details such as aggregate, vendor ID, zeroing, serial numbers, and broken details.



The screenshot shows the NetApp OnCommand System Manager interface. The main navigation bar includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics (selected), Protection, and Configurations. The Disks section is active, showing an Inventory view. The table below lists the disks in the cluster.

Name	Container Type	Home Owner	Current Owner	Type	RPM	Effective Size	Physical Space
1.0.18	Shared	SRA200_1	SRA200_1	SSD	-NA-	894.01 GB	894.25 GB
1.0.1	Shared	SRA200_2	SRA200_2	SSD	-NA-	894.01 GB	894.25 GB
1.0.2	Shared	SRA200_1	SRA200_1	SSD	-NA-	894.01 GB	894.25 GB
1.0.5	Shared	SRA200_2	SRA200_2	SSD	-NA-	894.01 GB	894.25 GB
1.0.12	Shared	SRA200_1	SRA200_1	SSD	-NA-	894.01 GB	894.25 GB
1.0.0	Shared	SRA200_1	SRA200_1	SSD	-NA-	894.01 GB	894.25 GB
1.0.14	Shared	SRA200_1	SRA200_1	SSD	-NA-	894.01 GB	894.25 GB
1.0.23	Shared	SRA200_2	SRA200_2	SSD	-NA-	894.01 GB	894.25 GB
1.0.19	Shared	SRA200_2	SRA200_2	SSD	-NA-	894.01 GB	894.25 GB

The Details section for a selected disk shows the following information:

- Aggregate: agg0_SRA200_1_0.agg1_n1.agg1_n2
- Vendor ID: NETAPP
- Zeroing (%): Zeroed
- Serial No: S396NA0HC09658
- Broken Details: -NA-

NetApp AFF A200 Review

Users can look at aggregates in order to see information such as the name, which node they are on, the percentage used, available space, used space, total space, volume count, and disk count.

The screenshot shows the NetApp OnCommand System Manager interface. The main content area displays a table of aggregates. Below the table, there is a detailed view for the selected aggregate 'agg0_SRA200_1_0'.

Name	Node	Used (%)	Available Space	Used Space	Total Space	Volume Count	Disk Count
agg0_SRA200_1_0	SRA200_1	95	17.85 GB	350.57 GB	368.42 GB	1	10
agg0_SRA200_2_0	SRA200_2	95	17.85 GB	350.57 GB	368.42 GB	1	10
agg1_n1	SRA200_1	67	2.53 TB	5.23 TB	7.75 TB	9	23
agg1_n2	SRA200_2	65	2.71 TB	5.04 TB	7.75 TB	9	23

Name:	agg0_SRA200_1_0
Status:	online
RAID Type:	RAID-DP, normal
Root:	Yes
Files:	96
Maximum Files:	31136
Checksum:	block

Navigation tabs: Details | Volumes | Disk Layout | Performance | Efficiency

The Diagnostics for nodes gives some general information such as the name, status, up time, ONTAP version, model number, system ID, serial number, and whether or not the node is all-flash optimized.

The screenshot shows the NetApp OnCommand System Manager interface. The browser address bar indicates the URL is <https://176.16.38.10/sysmgr/SysMgr.html#controllerdashboard>. The page title is "NetApp OnCommand System Manager". The navigation menu includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics (selected), Protection, and Configurations. A search bar is present with the text "All" and a search icon.

The "Nodes" section is active, displaying a table with the following data:

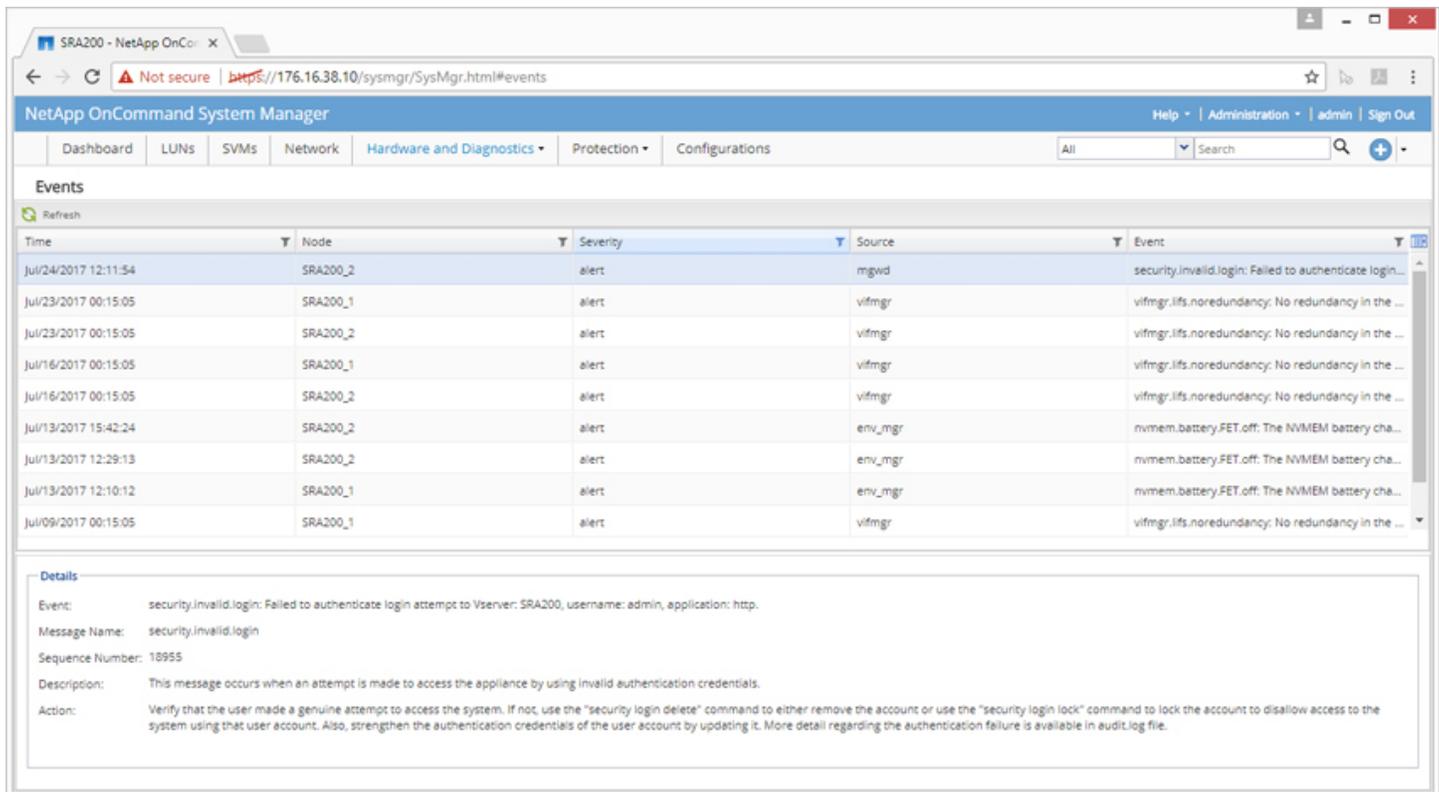
Name	State	Up Time	Data ONTAP Version	Model	System ID	Serial No	All Flash Optimized
SRA200_1	Up	54 day(s) 14:33:09	NetApp Release 9.1: Fri Dec ...	AFF-A200	0537083856	621708000117	Yes
SRA200_2	Up	131 day(s) 1:48:04	NetApp Release 9.1: Fri Dec ...	AFF-A200	0537084155	621708000116	Yes

Below the table, the "Details" tab is selected for node SRA200_1, showing the following information:

- Name: SRA200_1
- State: Up
- Up Time: 54 day(s) 14:33:09

The "Performance" tab is also visible at the bottom of the interface.

The Diagnostics for Events gives admins a fairly detailed message about events, their severity, where they originated, the node they happened in, the date and time, and other details of the event.



The screenshot shows the NetApp OnCommand System Manager interface. The top navigation bar includes 'Dashboard', 'LUNs', 'SVMs', 'Network', 'Hardware and Diagnostics', 'Protection', and 'Configurations'. The 'Events' section is active, displaying a table of system events. Below the table, a 'Details' section provides information for a selected event.

Time	Node	Severity	Source	Event
Jul/24/2017 12:11:54	SRA200_2	alert	mgwd	security.invalid.login: Failed to authenticate login...
Jul/23/2017 00:15:05	SRA200_1	alert	vifmgr	vifmgr.lifs.noredundancy: No redundancy in the ...
Jul/23/2017 00:15:05	SRA200_2	alert	vifmgr	vifmgr.lifs.noredundancy: No redundancy in the ...
Jul/16/2017 00:15:05	SRA200_1	alert	vifmgr	vifmgr.lifs.noredundancy: No redundancy in the ...
Jul/16/2017 00:15:05	SRA200_2	alert	vifmgr	vifmgr.lifs.noredundancy: No redundancy in the ...
Jul/13/2017 15:42:24	SRA200_2	alert	env_mgr	nvmem.battery.FET.off: The NVMEM battery cha...
Jul/13/2017 12:29:13	SRA200_2	alert	env_mgr	nvmem.battery.FET.off: The NVMEM battery cha...
Jul/13/2017 12:10:12	SRA200_1	alert	env_mgr	nvmem.battery.FET.off: The NVMEM battery cha...
Jul/09/2017 00:15:05	SRA200_1	alert	vifmgr	vifmgr.lifs.noredundancy: No redundancy in the ...

Details

Event: security.invalid.login: Failed to authenticate login attempt to Vserver: SRA200, username: admin, application: http.

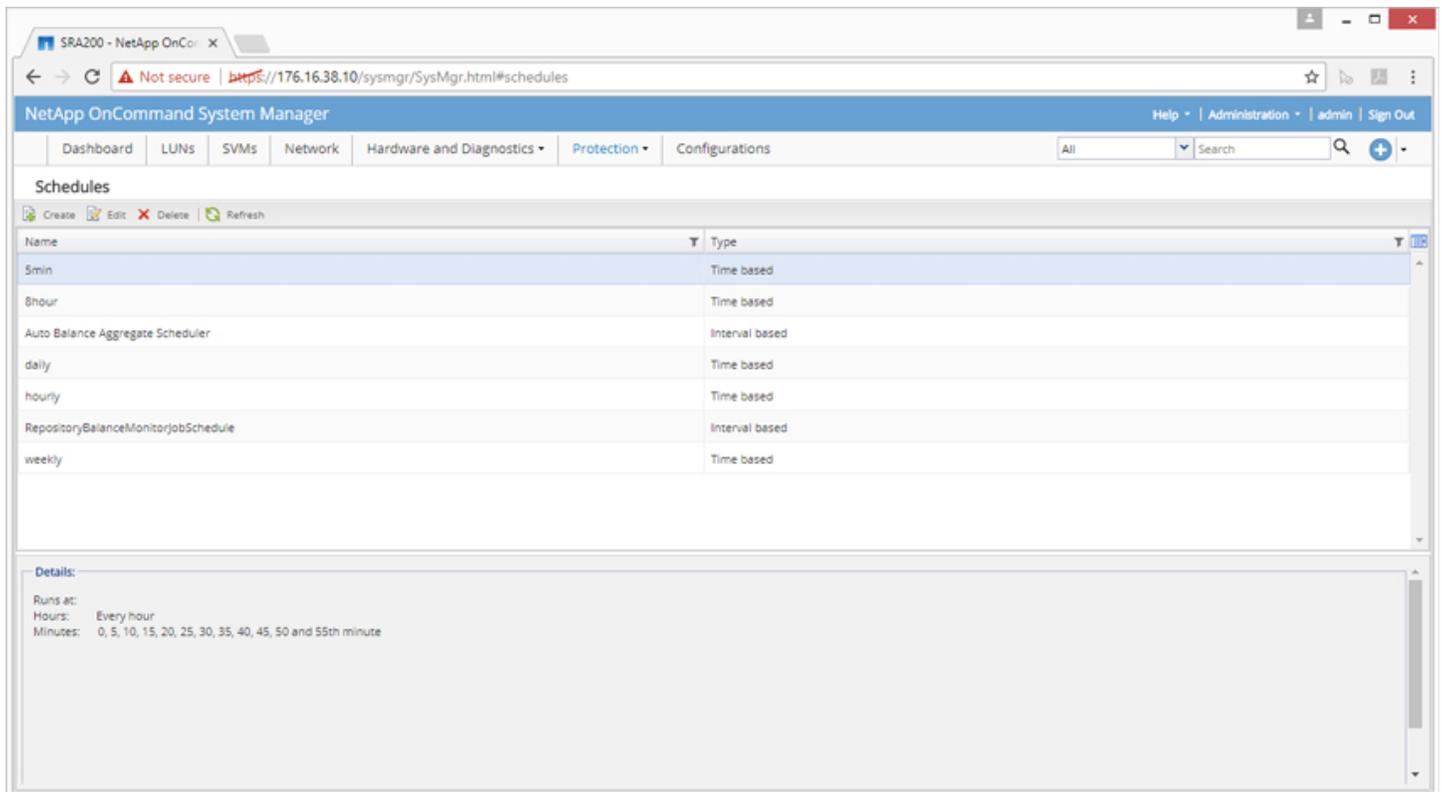
Message Name: security.invalid.login

Sequence Number: 18955

Description: This message occurs when an attempt is made to access the appliance by using invalid authentication credentials.

Action: Verify that the user made a genuine attempt to access the system. If not, use the "security login delete" command to either remove the account or use the "security login lock" command to lock the account to disallow access to the system using that user account. Also, strengthen the authentication credentials of the user account by updating it. More detail regarding the authentication failure is available in audit.log file.

The next main tab is Protection, which gives users a drop-down menu for snapshots. Users are given a screen for scheduling snapshots, with various options being time-based or interval-based.



The screenshot shows the NetApp OnCommand System Manager interface. The browser address bar indicates the URL `https://176.16.38.10/sysmgr/SysMgr.html#schedules`. The navigation menu includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection (selected), and Configurations. A search bar is present with the text "All" and a search icon.

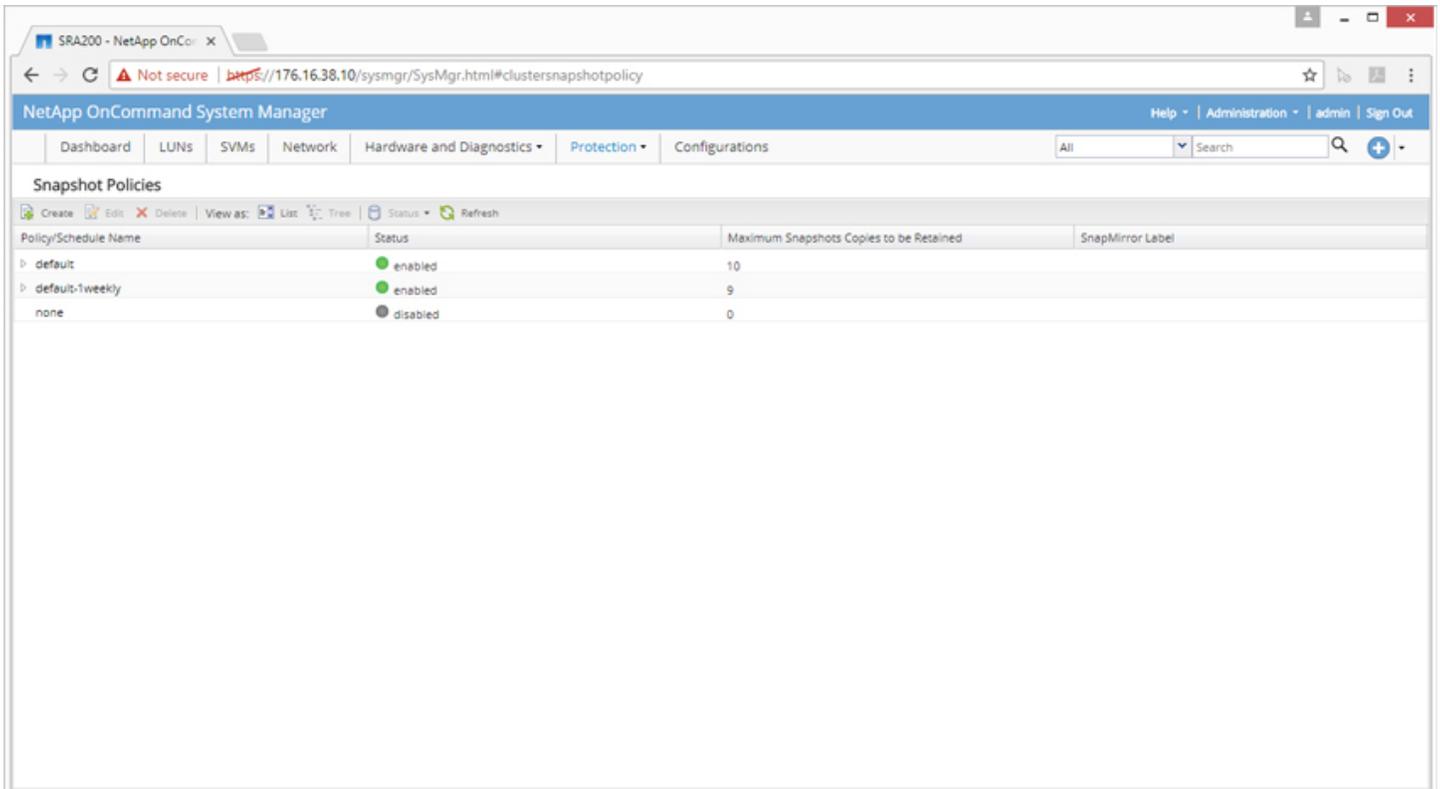
Schedules

Buttons: Create, Edit, Delete, Refresh

Name	Type
5min	Time based
8hour	Time based
Auto Balance Aggregate Scheduler	Interval based
daily	Time based
hourly	Time based
RepositoryBalanceMonitorJobSchedule	Interval based
weekly	Time based

Details:
Runs at: Every hour
Hours: Every hour
Minutes: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 and 55th minute

The other screen under the Protection tab allows users to set snapshot policies.



The screenshot displays the NetApp OnCommand System Manager interface. The browser address bar shows the URL `https://176.16.38.10/sysmgr/SysMgr.html#clustersnapshotpolicy`. The navigation menu includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The main content area is titled "Snapshot Policies" and contains a table with the following data:

Policy/Schedule Name	Status	Maximum Snapshots Copies to be Retained	SnapMirror Label
default	enabled	10	
default-1weekly	enabled	9	
none	disabled	0	

The final main tab is Configuration. The Configuration tab has many subsections on the left-hand side including Configuration Updates, Service Processor, Cluster Peers, High Availability, Licenses, Cluster Updates, Date and Time, SNMP, LDAP, Users, and Roles. Clicking on Service Processor, users see the nodes in the cluster, their IP addresses, status, and MAC address, as well as network and general details.

The screenshot shows the NetApp OnCommand System Manager web interface. The browser address bar indicates the URL is <https://176.16.38.10/sysmgr/SysMgr.html#serviceprocessor>. The page title is "NetApp OnCommand System Manager" and the user is logged in as "admin". The navigation menu includes Dashboard, LUNs, SVMs, Network, Hardware and Diagnostics, Protection, and Configurations. The left-hand side menu is expanded to show "Configurations" with sub-items: Cluster Settings, Configuration Updates, Service Processor, Cluster Peers, High Availability, Licenses, Cluster Update, Date and Time, Services (SNMP, LDAP), and Cluster User Details (Users, Roles). The main content area shows the "Service Processor" configuration page. At the top, there are buttons for "Edit", "Global Settings", and "Refresh". Below this is a table with columns for Node, IP Address, Status, and MAC Address. The table contains two rows of data:

Node	IP Address	Status	MAC Address
SRA200_1	176.16.38.12	Online	00:a0:98:af:9e:74
SRA200_2	176.16.38.13	Online	00:a0:98:af:b5:e6

Below the table, there are two panels: "Network Details" and "General Details".

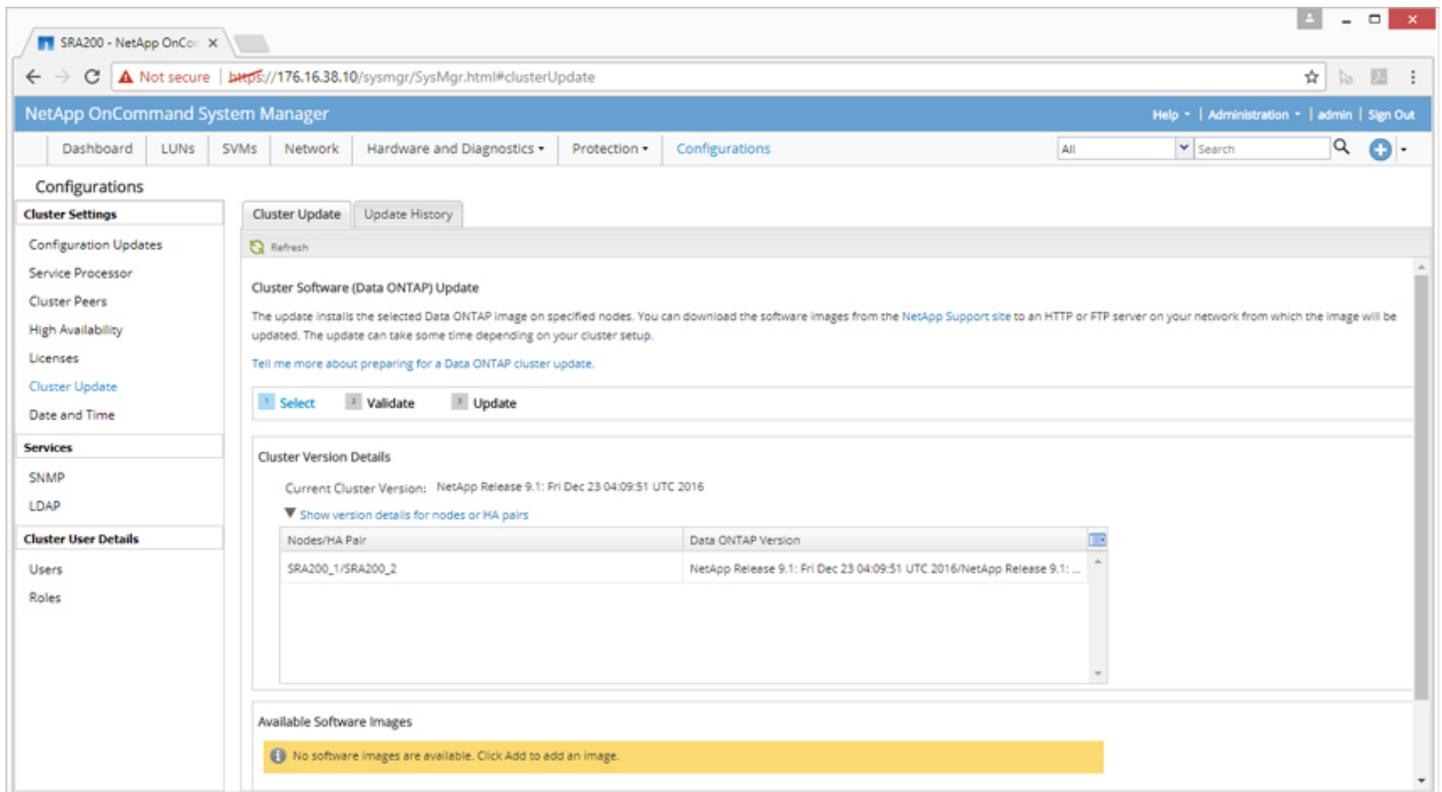
Network Details

- IP Address: 176.16.38.12
- Netmask: 255.255.0.0
- Gateway: 176.16.0.1
- IP Source: Manual Assignment
- MAC Address: 00:a0:98:af:9e:74

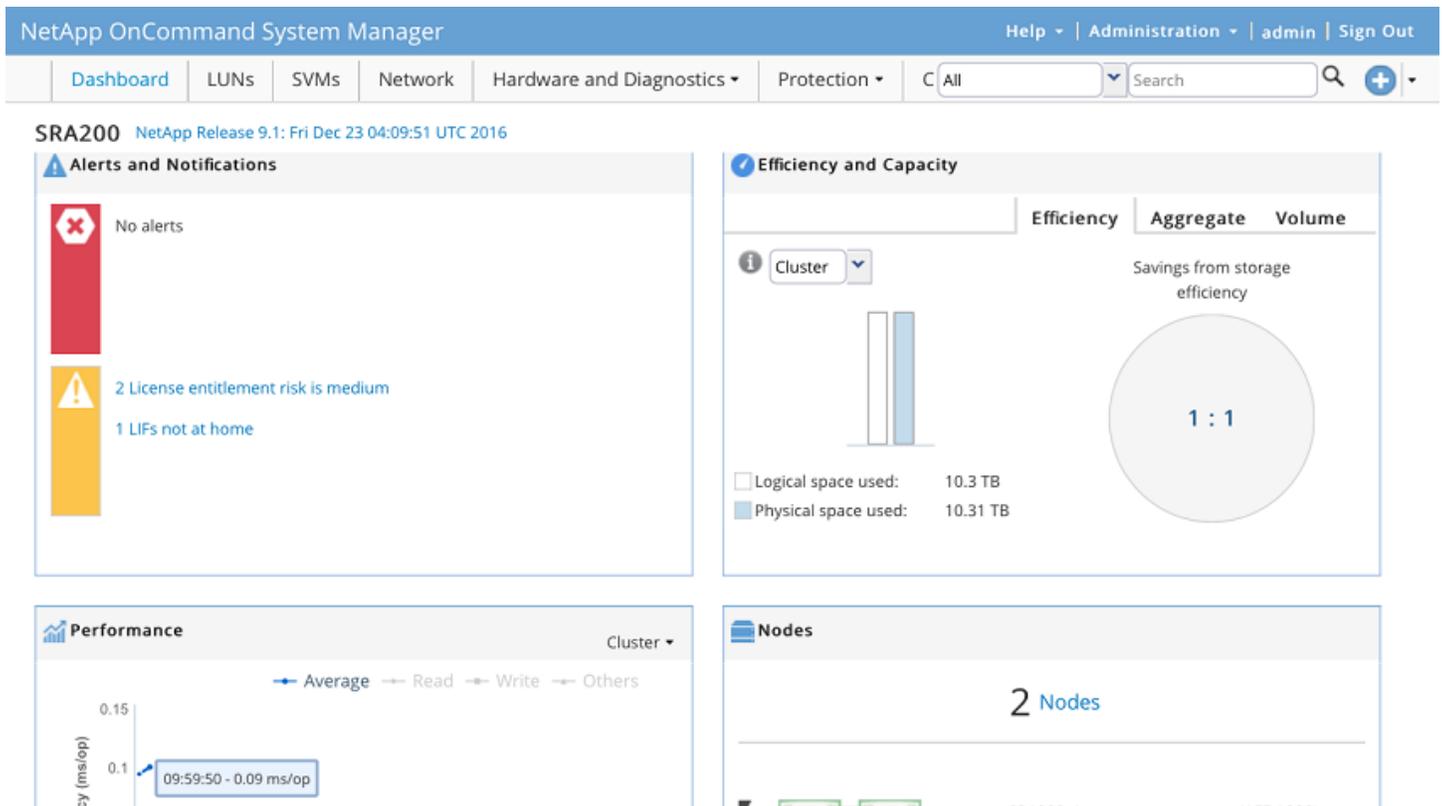
General Details

- Firmware Version: 5.1
- Firmware Enabled
- Autoupdate:

Under Cluster Update, users can see what updates are available through ONTAP for their cluster and what the update entails.



Overall, the management interface on the NetApp AFF A200 is pleasant to use and had no hiccups during our testing. It offers a browser and software-agnostic approach to work on really any type of platform, including an iPhone (screenshot included below). While the mobile interface wasn't the preferred way to manage the system, just the fact that you could if the need came up is impressive. The interface is clean and easy to follow, with all areas we interacted with simple to flow through to manage the array. While some interfaces might have a "newer" look or feel, the ONTAP WebGUI keeps clutter to a minimum, and best of all, is very responsive and easy to jump through.



Performance

Application Workload Analysis

The application workload benchmarks for the NetApp AFF A200 consist of the MySQL OLTP performance via SysBench and Microsoft SQL Server OLTP performance with a simulated TPC-C workload.

Testing was performed over FC using four 16Gb links, with two connections per controller.

SQL Server Performance

Each SQL Server VM is configured with two vDisks: 100GB volume for boot and a 500GB volume for the database and log files. From a system resource perspective, we configured each VM with 16 vCPUs, 64GB of DRAM and leveraged the LSI Logic SAS SCSI controller. While our Sysbench workloads tested previously saturated the platform in both storage I/O and capacity, the SQL test is looking for latency performance.

This test uses SQL Server 2014 running on Windows Server 2012 R2 guest VMs, and is stressed by Quest's Benchmark Factory for Databases. While our traditional usage of this benchmark has been to test large 3,000-scale databases on local or shared storage, in this iteration we focus on spreading out four 1,500-scale databases evenly across the A200 (two VMs per controller).

SQL Server Testing Configuration (per VM)

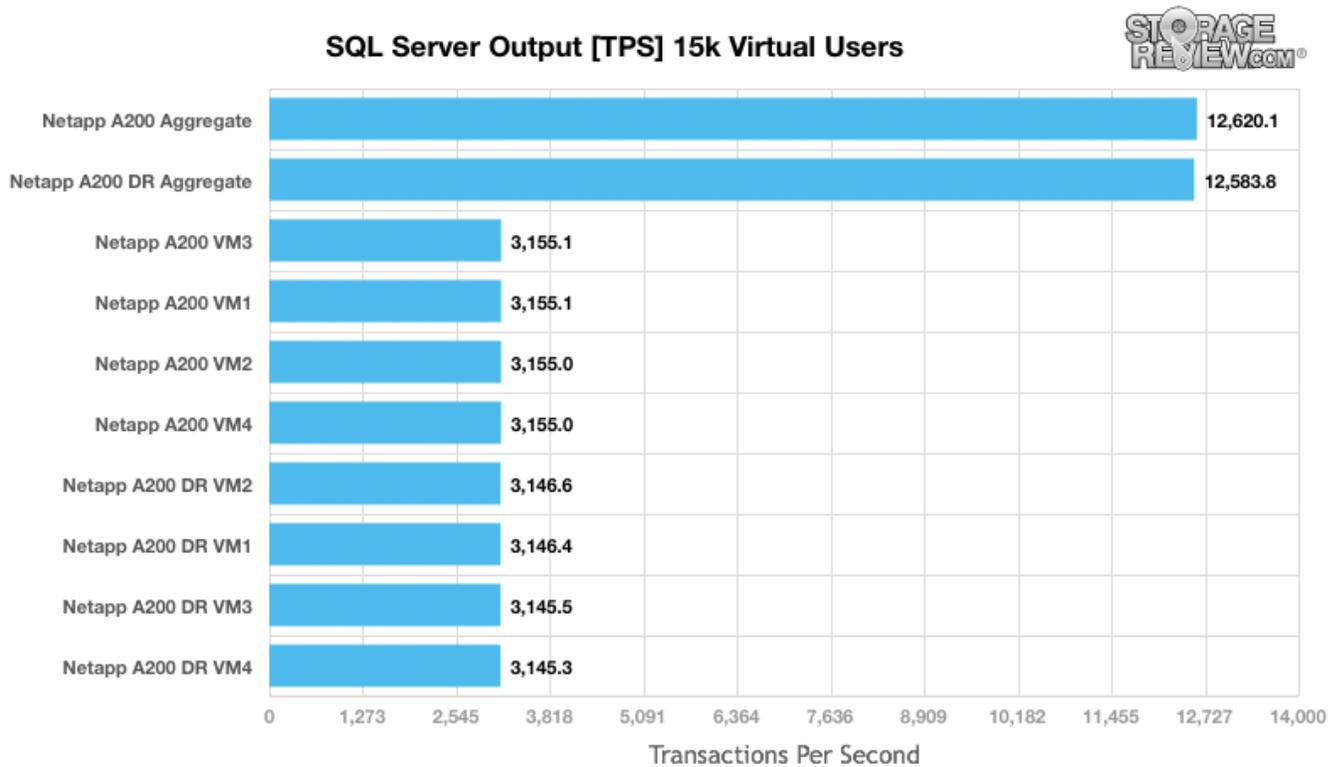
- Windows Server 2012 R2
- Storage Footprint: 600GB allocated, 500GB used
- SQL Server 2014
 - Database Size: 1,500 scale
 - Virtual Client Load: 15,000
 - RAM Buffer: 48GB
- Test Length: 3 hours
 - 2.5 hours preconditioning
 - 30 minutes sample period

SQL Server OLTP Benchmark Factory LoadGen Equipment

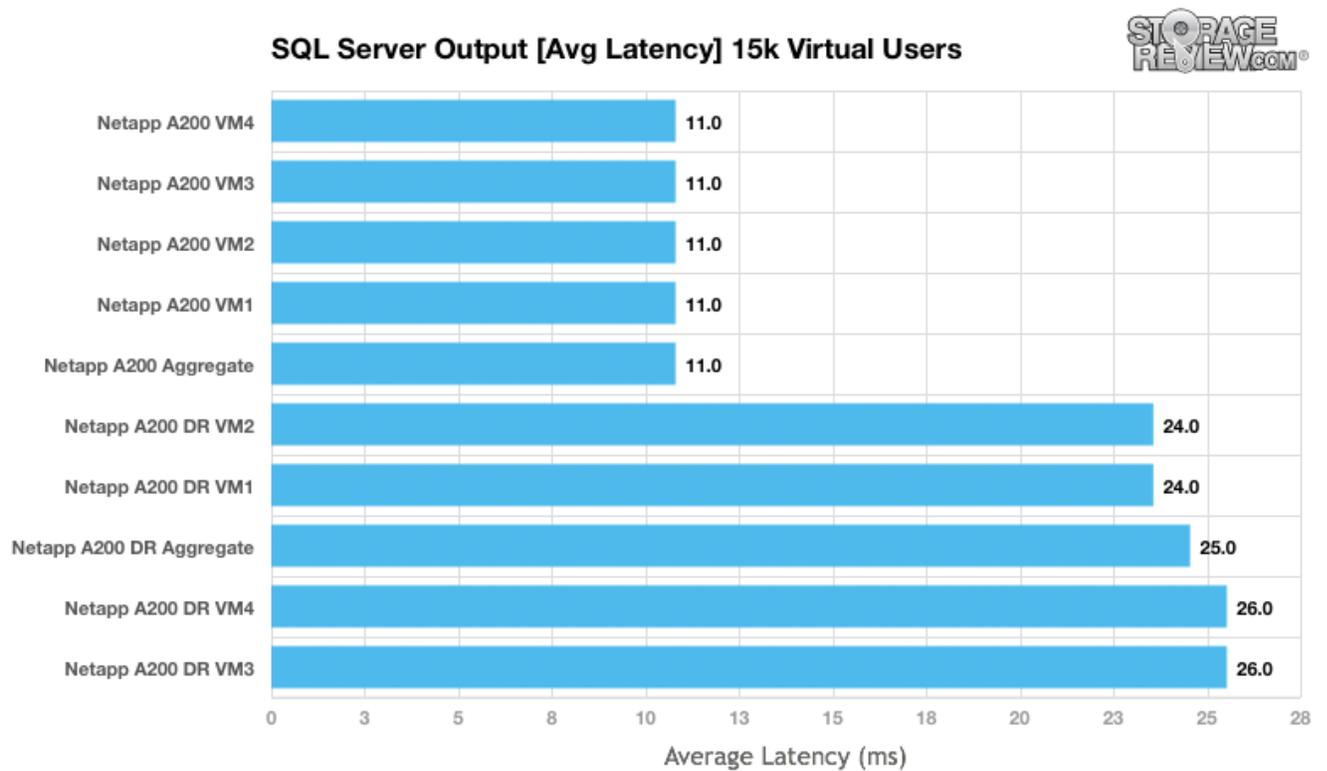
- Dell PowerEdge R730 Virtualized SQL 4-node Cluster
 - Eight Intel E5-2690 v3 CPUs for 249GHz in cluster (Two per node, 2.6GHz, 12-cores, 30MB Cache)
 - 1TB RAM (256GB per node, 16GB x 16 DDR4, 128GB per CPU)
 - 4 x Emulex 16GB dual-port FC HBA
 - 4 x Emulex 10GbE dual-port NIC
 - VMware ESXi vSphere 6.5 / Enterprise Plus 8-CPU

NetApp AFF A200 Review

Looking at transactional performance of the NetApp AFF A200 in our SQL Server test, the AFF A200 achieved results of 12,620.15 TPS with individual VMs ranging from 3,154.95 TPS to 3,155.113 TPS. In data reduction mode, we saw similar results with the NetApp A200 hitting an aggregate score of 12,583.81 TPS, with individual VMs ranging from 3,145.29 TPS to 3,146.43 TPS.



When looking at average latency, the A200 hit 11ms in all VMs, giving it an aggregate of 11ms as well. In DR mode, the latency went up some, though that is to be expected with individual VMs ranging from 24ms to 26ms, giving an aggregate score of 25ms.



Sysbench Performance

Each Sysbench VM is configured with three vDisks, one for boot (~92GB), one with the pre-built database (~447GB), and the third for the database under test (270GB). From a system resource perspective, we configured each VM with 16 vCPUs, 60GB of DRAM and leveraged the LSI Logic SAS SCSI controller. Load gen systems are Dell R730 servers; we range from four to eight in this review, scaling servers per 4VM group.

Dell PowerEdge R730 Virtualized MySQL 4-5 node Cluster

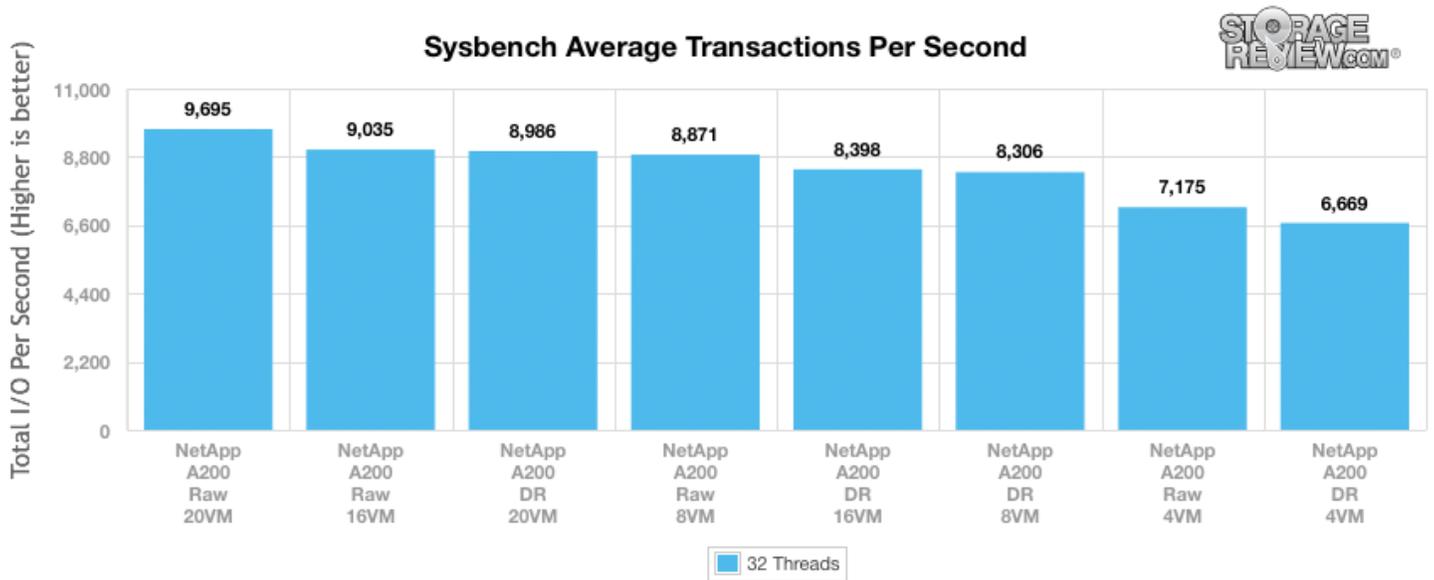
- 8-10 Intel E5-2690 v3 CPUs for 249GHz in cluster (Two per node, 2.6GHz, 12-cores, 30MB Cache)
- 1-1.25TB RAM (256GB per node, 16GB x 16 DDR4, 128GB per CPU)
- 4-5 x Emulex 16GB dual-port FC HBA
- 4-5 x Emulex 10GbE dual-port NIC
- VMware ESXi vSphere 6.5 / Enterprise Plus 8-CPU

Sysbench Testing Configuration (per VM)

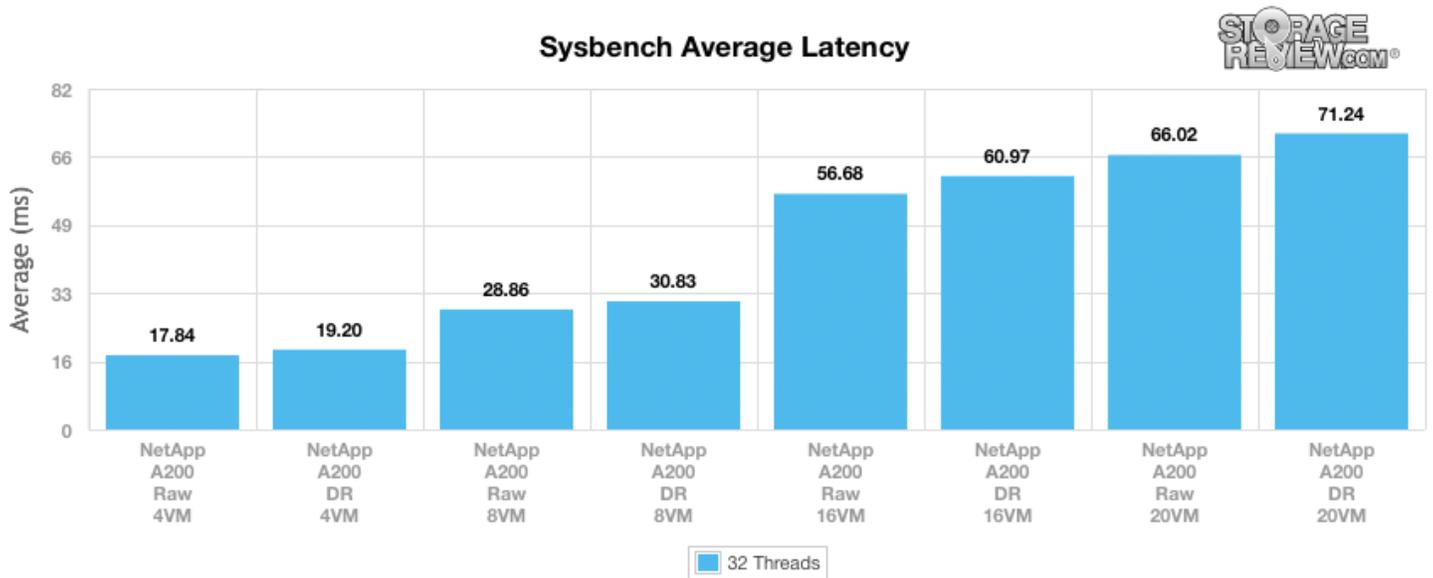
- CentOS 6.3 64-bit
- Storage Footprint: 1TB, 800GB used
- Percona XtraDB 5.5.30-rel30.1
 - Database Tables: 100
 - Database Size: 10,000,000
 - Database Threads: 32
 - RAM Buffer: 24GB
- Test Length: 3 hours
 - 2 hours preconditioning 32 threads
 - 1 hour 32 threads

NetApp AFF A200 Review

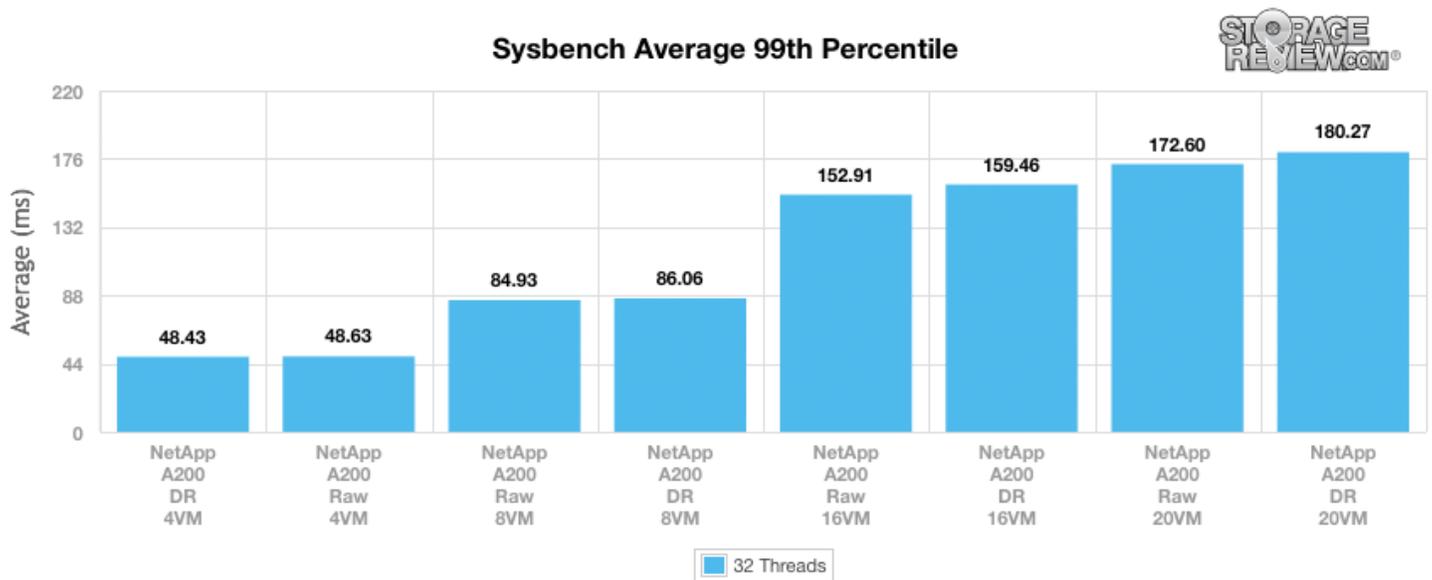
For Sysbench, we tested several sets of VMs including 4, 8, 16, and 20, and we ran Sysbench with both the data reduction "On" and in the "Raw" form. For transactional performance, the NetApp A200 showed its best performance with 20VMs and the data reduction off, resulting in 9,695 TPS. With the DR on, the A200 still hit 8,986 TPS at 20VMs.



As far as average latency goes, obviously it is lower with fewer VMs, so the 4VM benchmarks had 17.84ms for the Raw and only 19.2ms for the DR. What is interesting is that at 20VMs, the difference in the Raw and data reduction version was only about 5ms (66.02ms to 71.24ms).



In our worst-case scenario latency benchmark, the A200 also had strong performance with the data reduction version of 4VMs having the lowest latency at 48.43ms (though the Raw was only at 48.63ms). When raising the VM count to 20, the data reduction version only hit 180.27ms and the Raw hit 172.6ms.



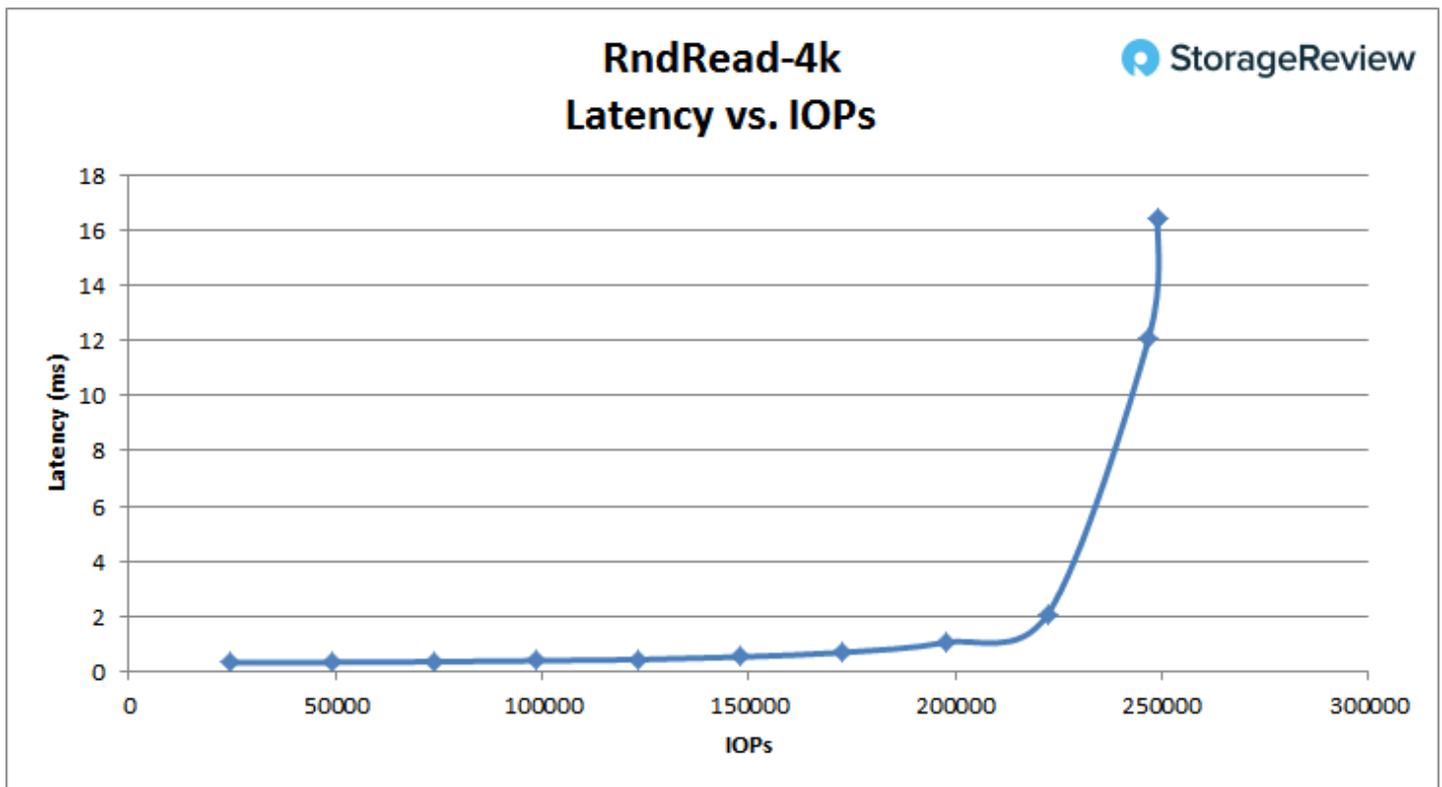
VDBench Workload Analysis

When it comes to benchmarking storage arrays, application testing is best, and synthetic testing comes in second place. While not a perfect representation of actual workloads, synthetic tests do help to baseline storage devices with a repeatability factor that makes it easy to do apples-to-apples comparison between competing solutions. NetApp shared their POC Toolkit with us during the review of the AFF A200, which offers a range of different testing profiles ranging from "four corners" tests, common database transfer size tests, as well as trace captures from different VDI environments. All of these tests leverage the common vdBench workload generator, with a scripting engine to automate and capture results over a large compute testing cluster. This allows us to repeat the same workloads across a wide range of storage devices, including flash arrays and individual storage devices. On the array side, we use our cluster of Dell PowerEdge R730 servers:

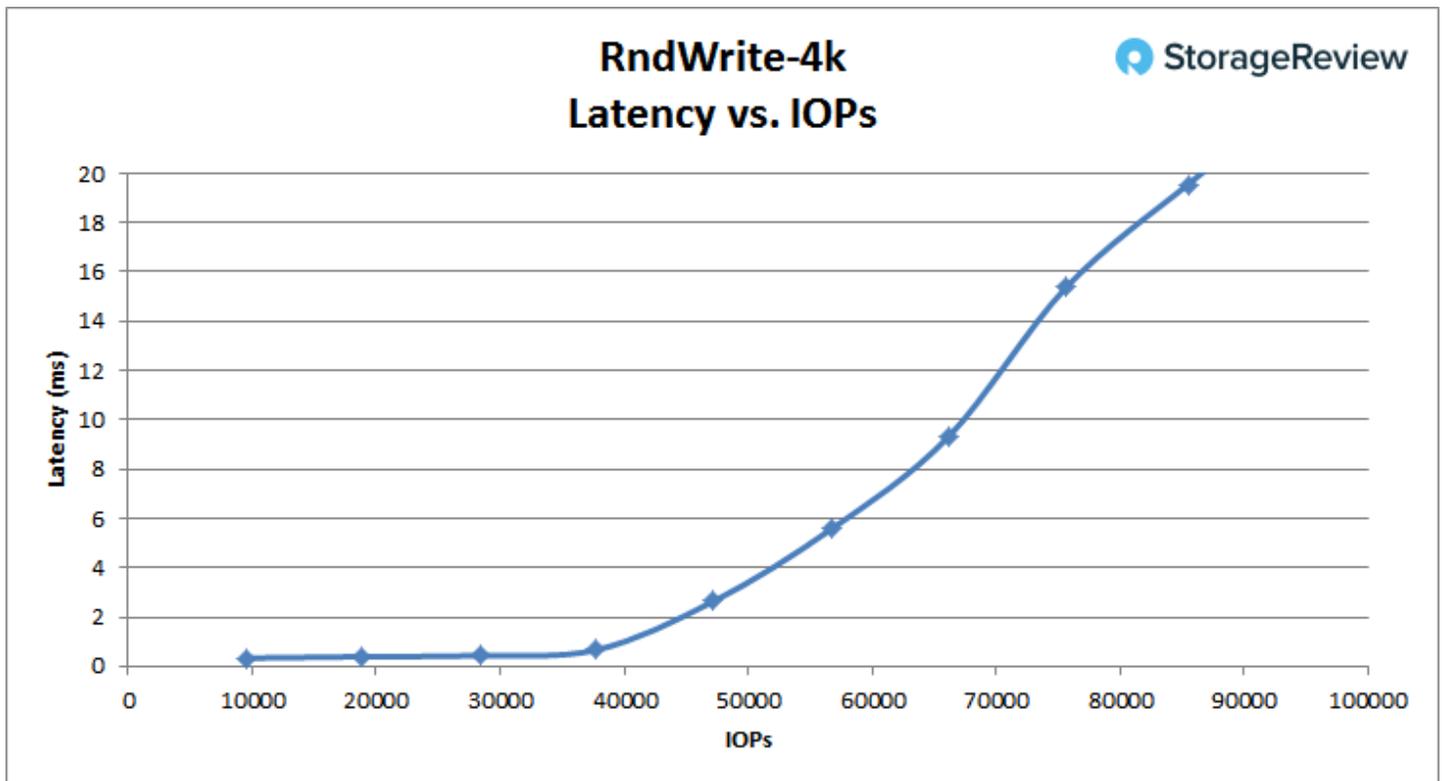
Profiles:

- 4k Random Read: 100% Read, 128 threads, 0-120% iorate
- 4k Random Write: 100% Write, 64 threads, 0-120% iorate
- 64k Sequential Read: 100% Read, 16 threads, 0-120% iorate
- 64k Sequential Write: 100% Write, 8 threads, 0-120% iorate
- Synthetic Database: SQL and Oracle
- VDI Full Clone and Linked Clone Traces

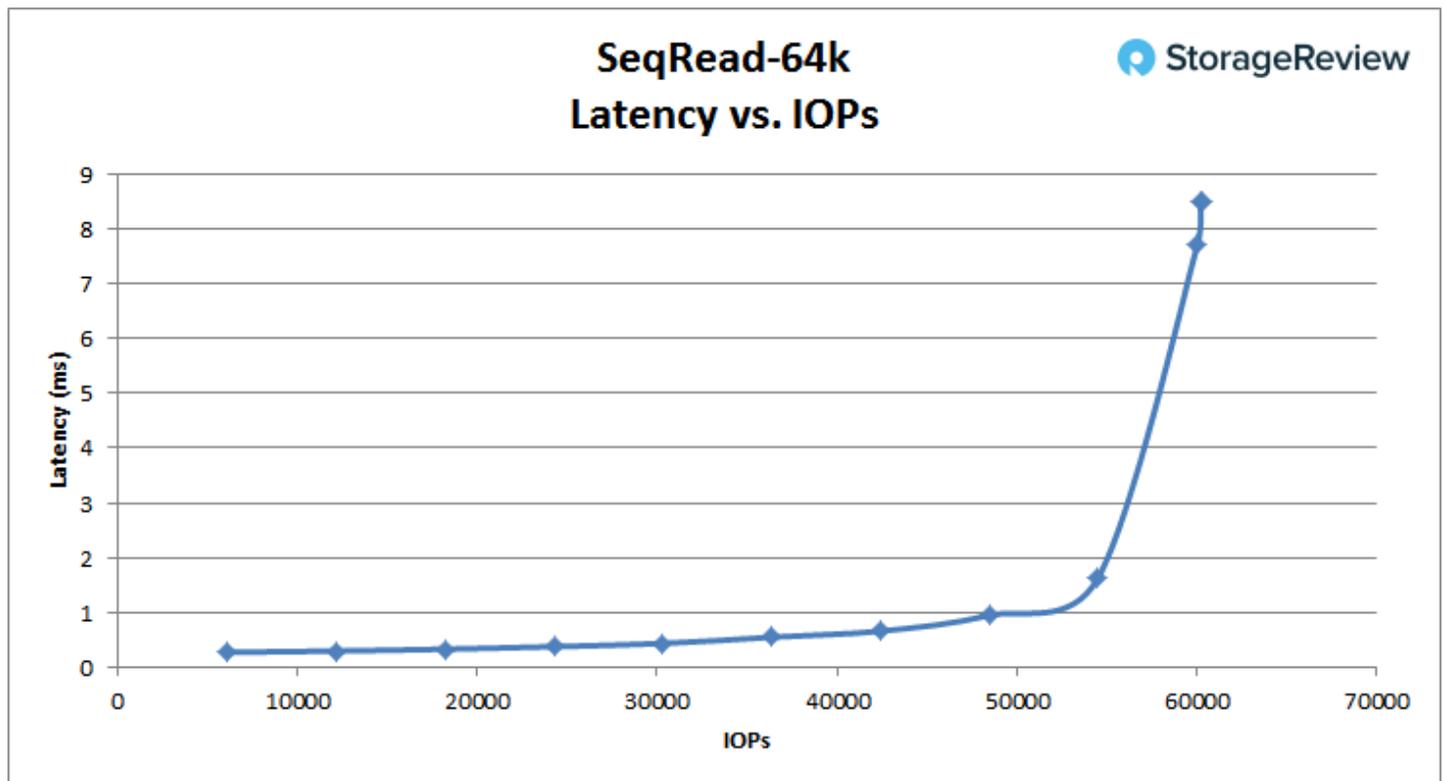
Looking at peak read performance, the NetApp AFF A200 offered exceptional low-latency 4k read performance, measuring 0.31ms at the start, and staying below 1ms up to around 190k IOPS. At its peak, the A200 measured 249k IOPS at a latency of 16.4ms.



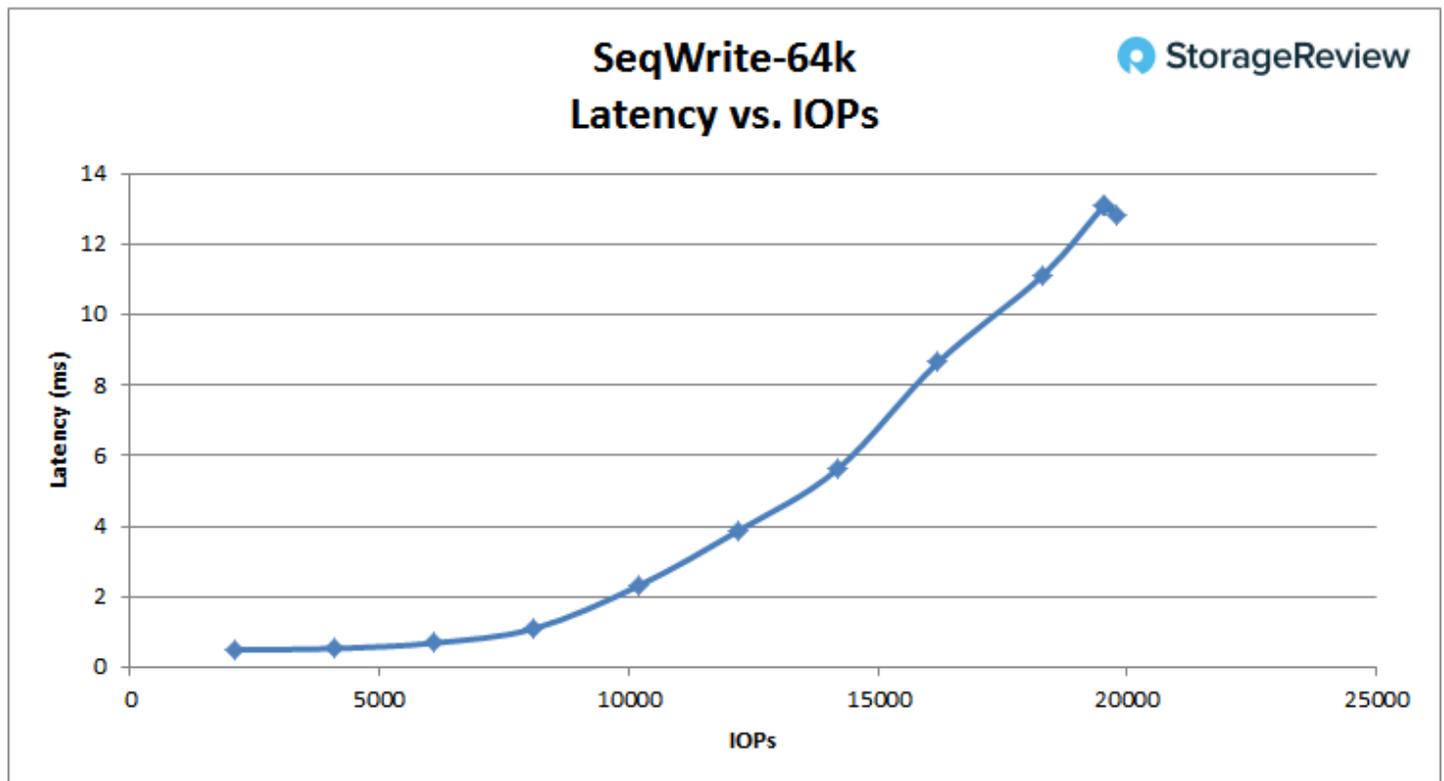
Looking at 4k peak write performance, the A200 started off with a latency of 0.34ms and stayed below 1ms until it hit between 40K and 50K IOPS. At its peak, the A200 hit over 85K IOPS at 19.6ms



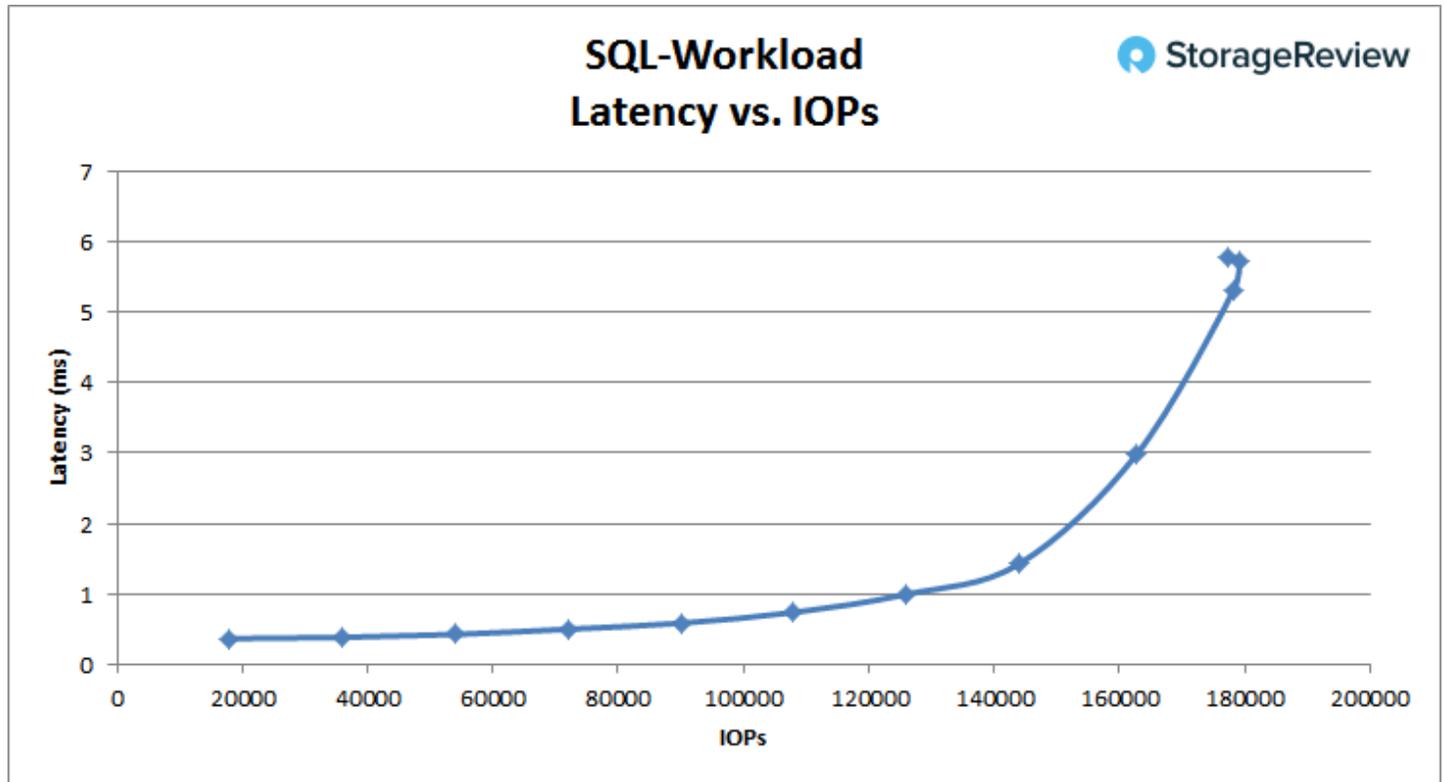
Switching to 64k peak read, the A200 started off at 0.27ms latency and stayed below 1ms until it hit above 48.5K IOPS. It peaked just over 60K IOPS with 8.5ms of latency. The A200 finished with a bandwidth of 3.75GB/s.



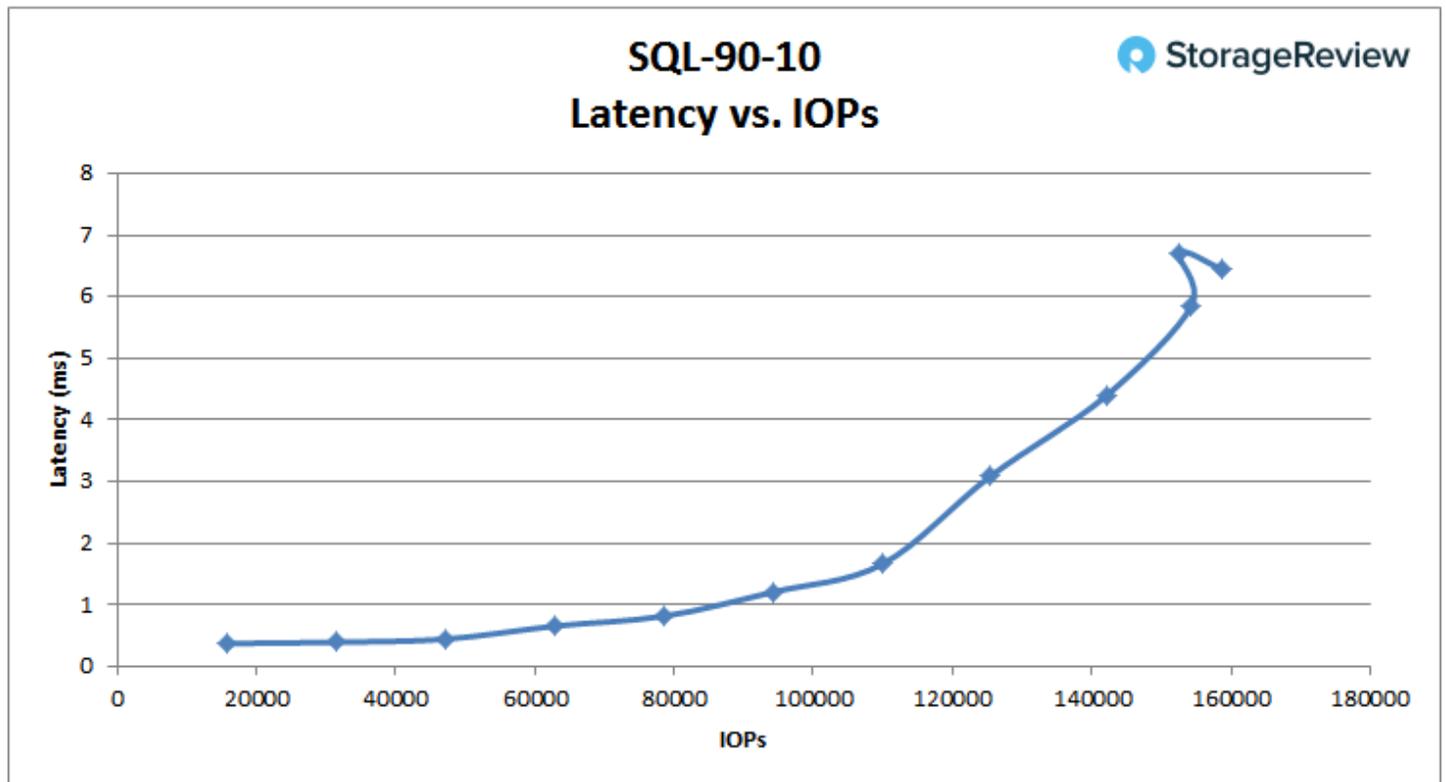
For 64k sequential peak write, the A200 started off at 0.49ms and stayed under 1ms until it hit just over 6K IOPS. The A200 hit its peak at 19.7K IOPS with a latency of 12.85ms. The A200 also had a bandwidth of 1.22GB/s at its peak.



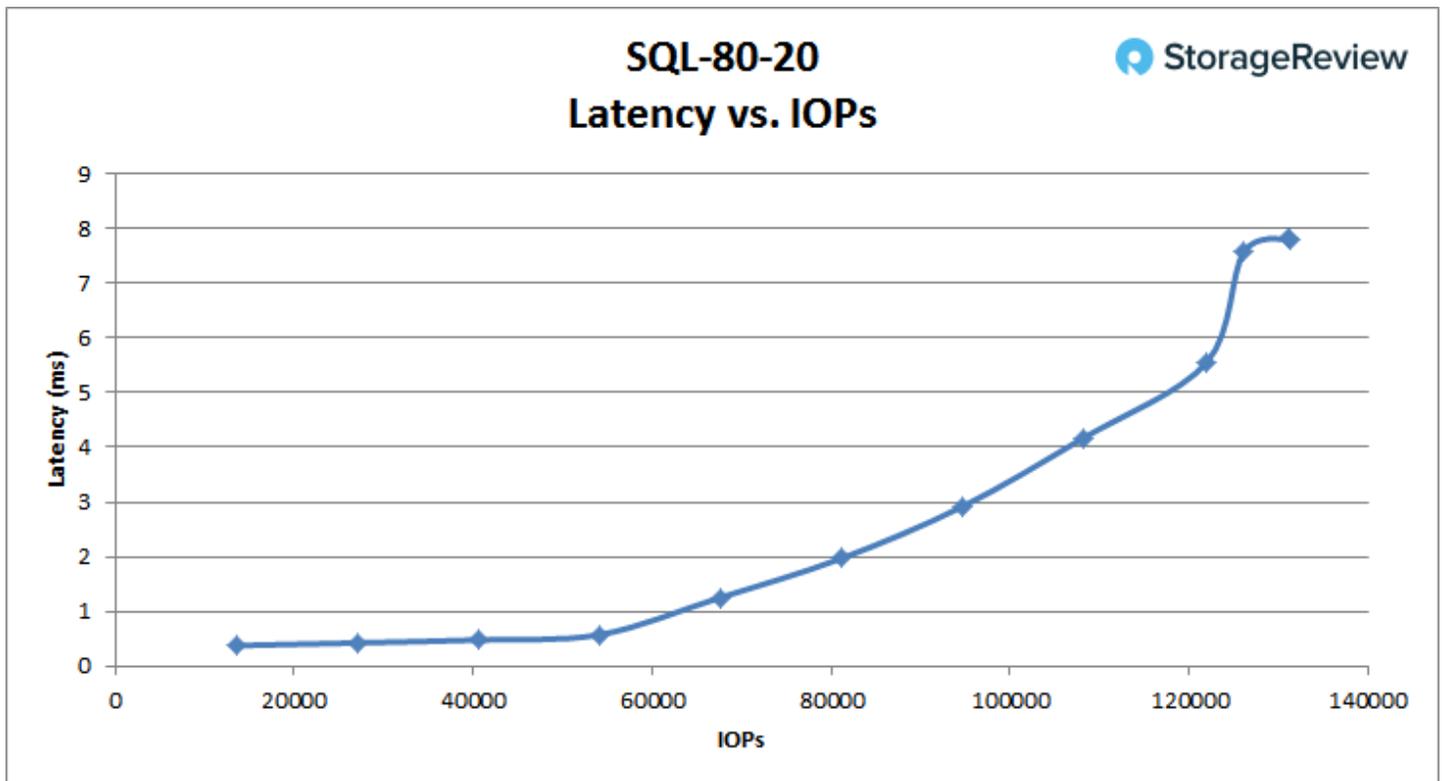
In our SQL workload, the A200 started its latency at 0.37ms and stayed under 1ms until just over 120K IOPS. It peaked at 179K IOPS and 5.7ms.



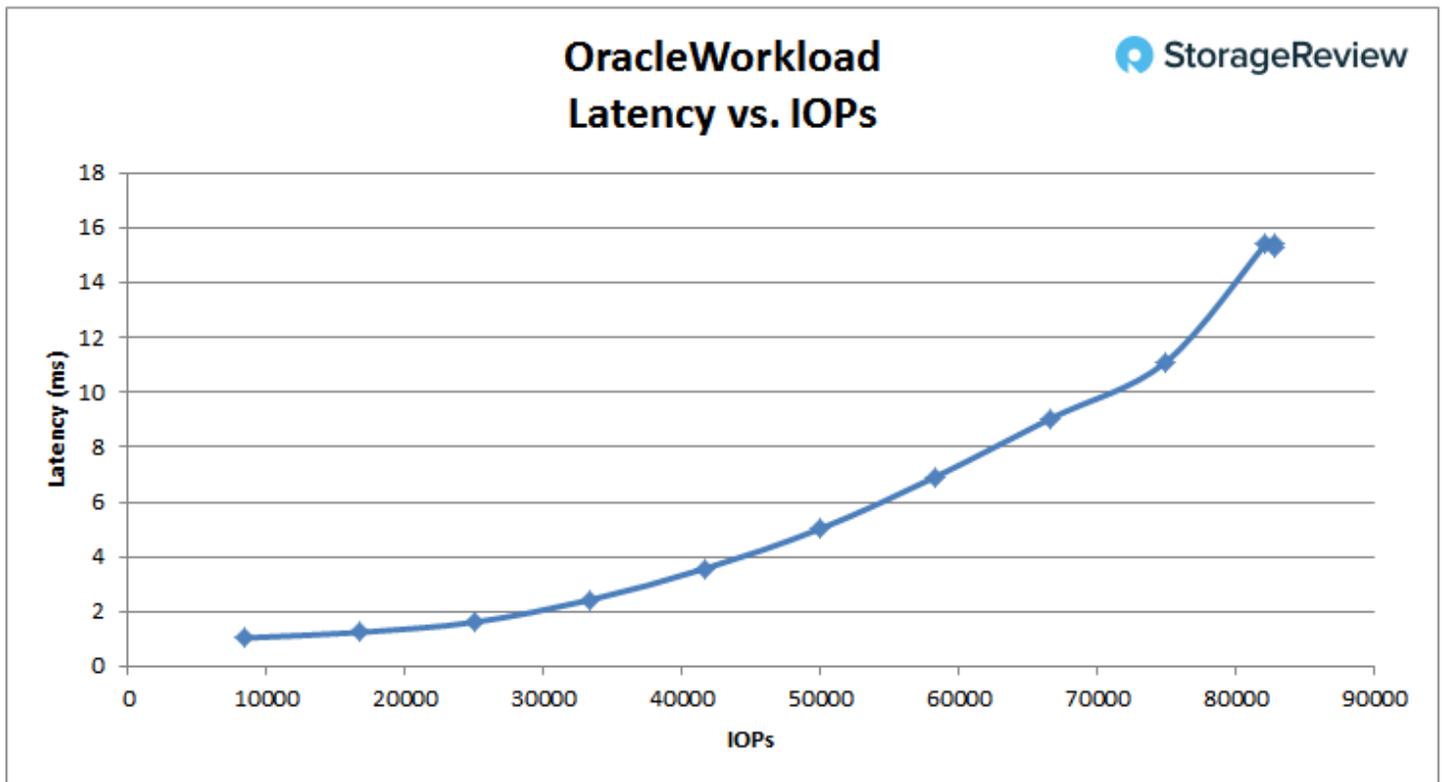
In the SQL 90-10 benchmark, the A200 started with a latency of 0.37ms and stayed under 1ms until it hit between 80K and 100K IOPS. The A200 peaked at 159K IOPS with 6.5ms latency.



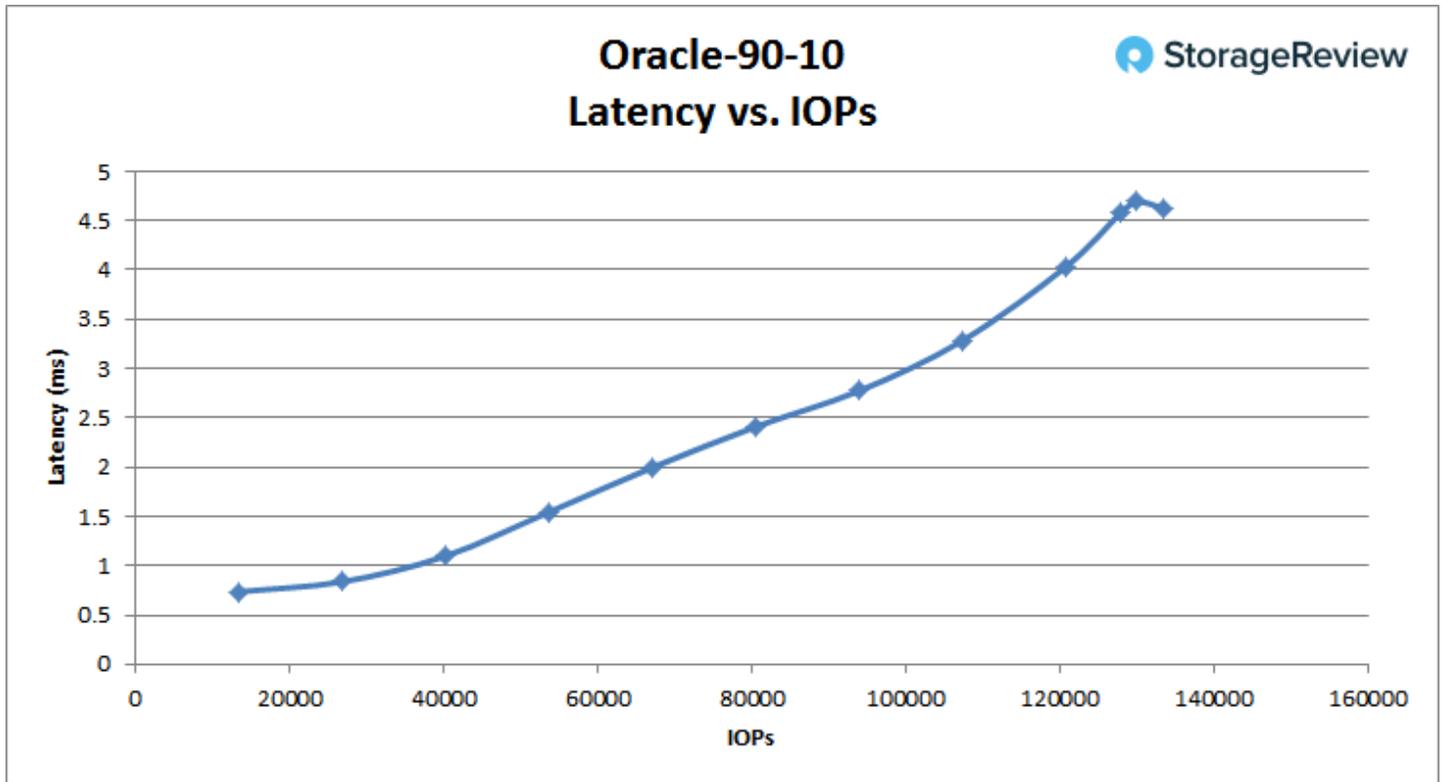
The SQL 80-20 saw the A200 start with a latency of 0.38ms and stay under 1ms until it moved over 60K IOPS. The A200 peaked at 131K IOPS with 7.8ms latency.



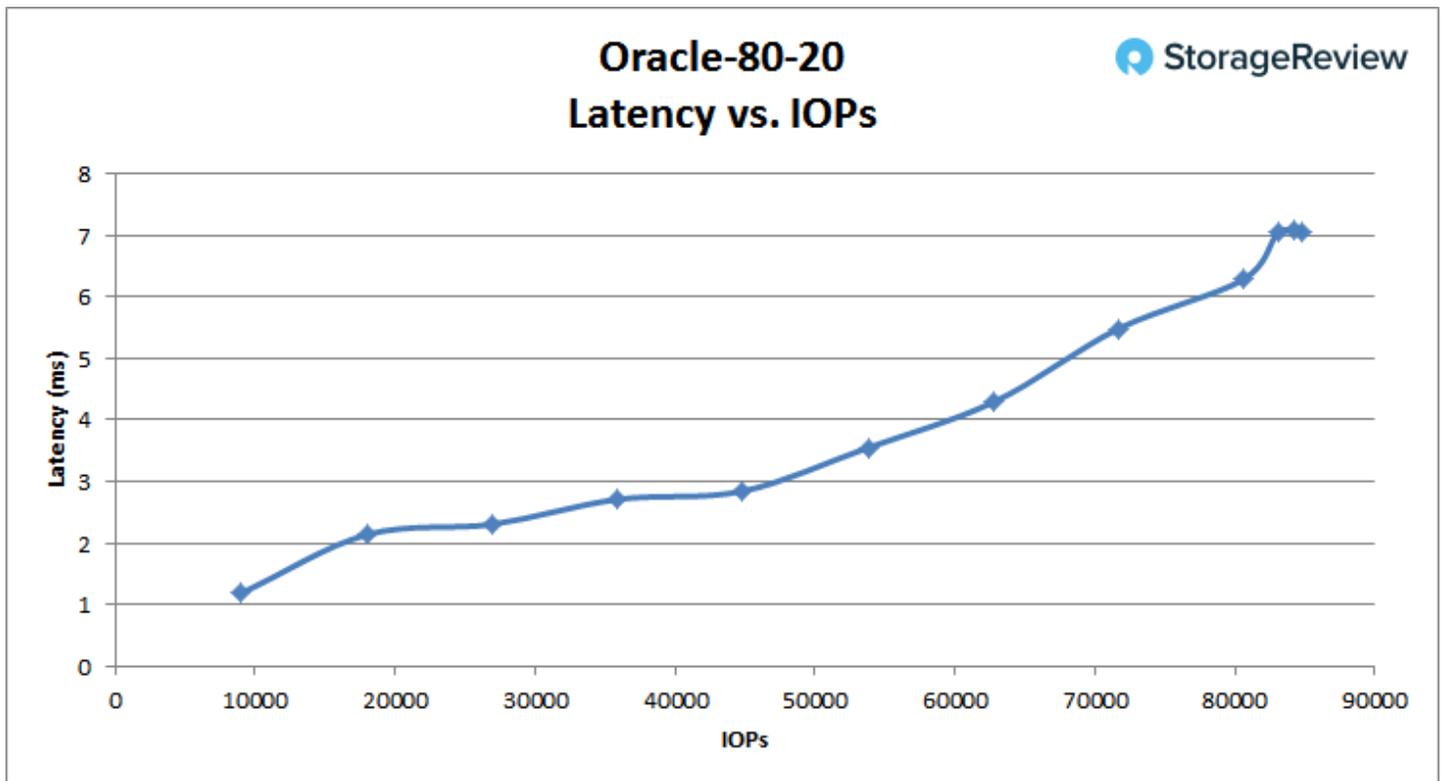
With the Oracle Workload, the A200 started with a latency of 0.39ms and stayed under 1ms until it went over 50K IOPS. The A200 peaked at 125K IOPS with a latency of 10.2ms.



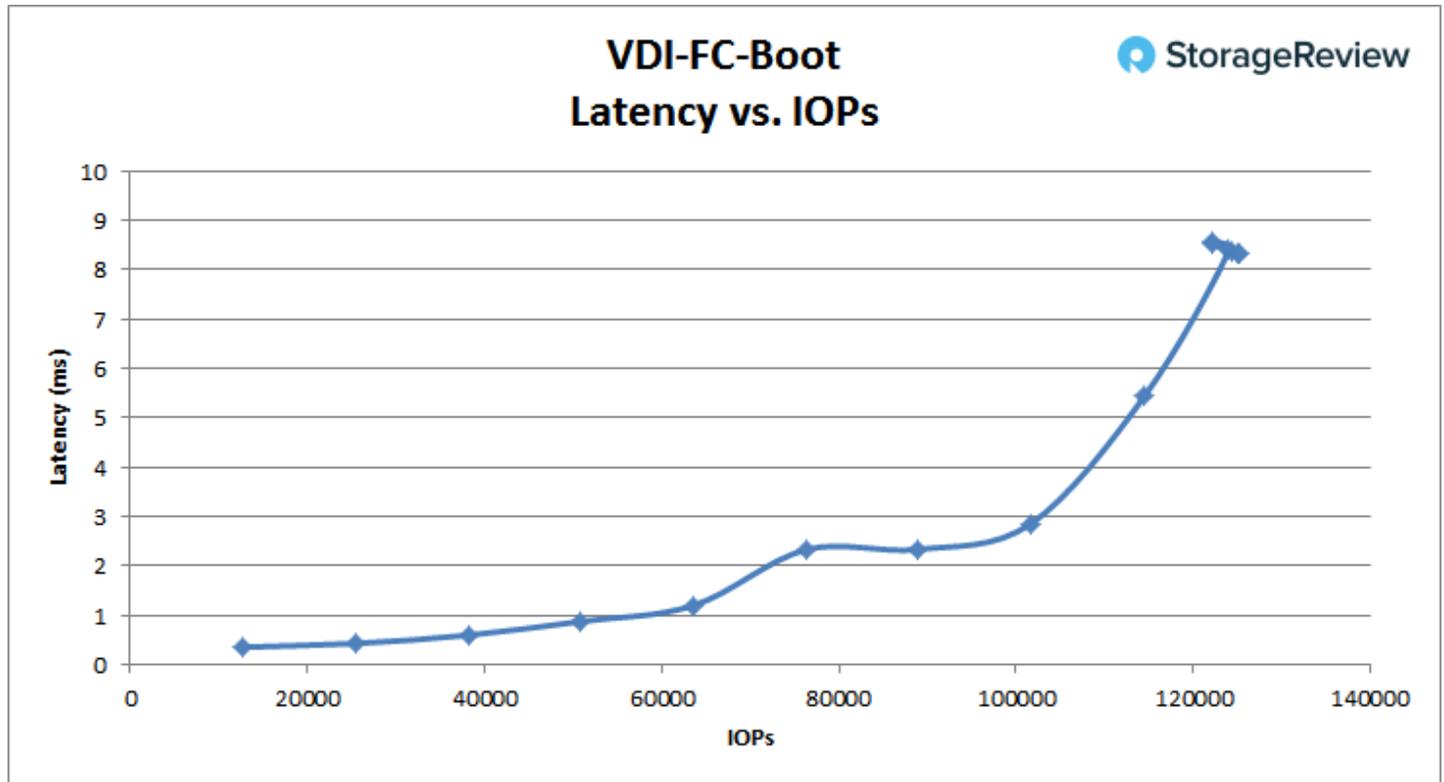
With the Oracle 90-10, the A200 started off at a latency of 0.37ms and stayed under 1ms until it was just under 100K IOPS. It peaked at 155K IOPS with a latency of 4.2ms.



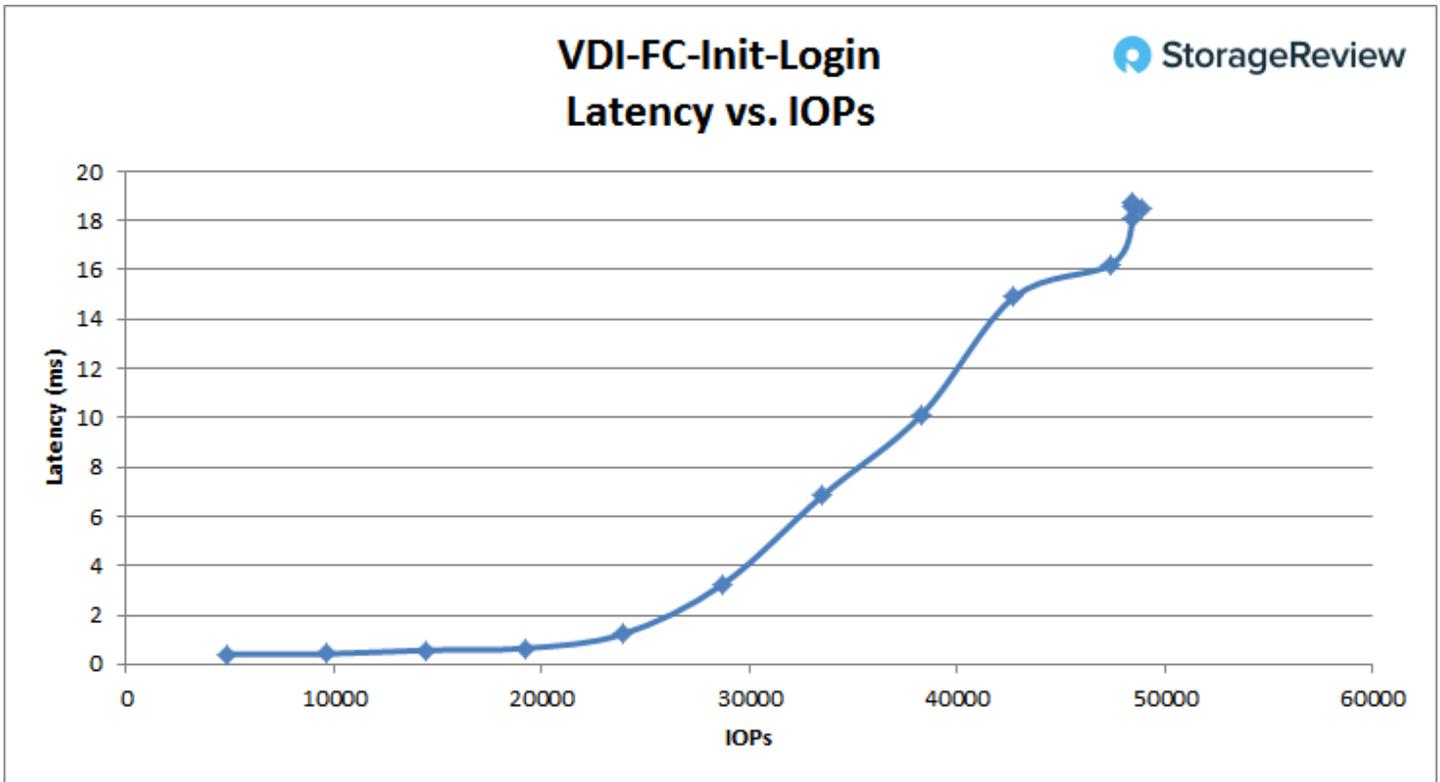
With the Oracle 80-20, the A200 started off at a latency of 0.38ms and stayed under 1ms until it was just under 65K IOPS. It peaked at 129K IOPS with a latency of 4.9ms.



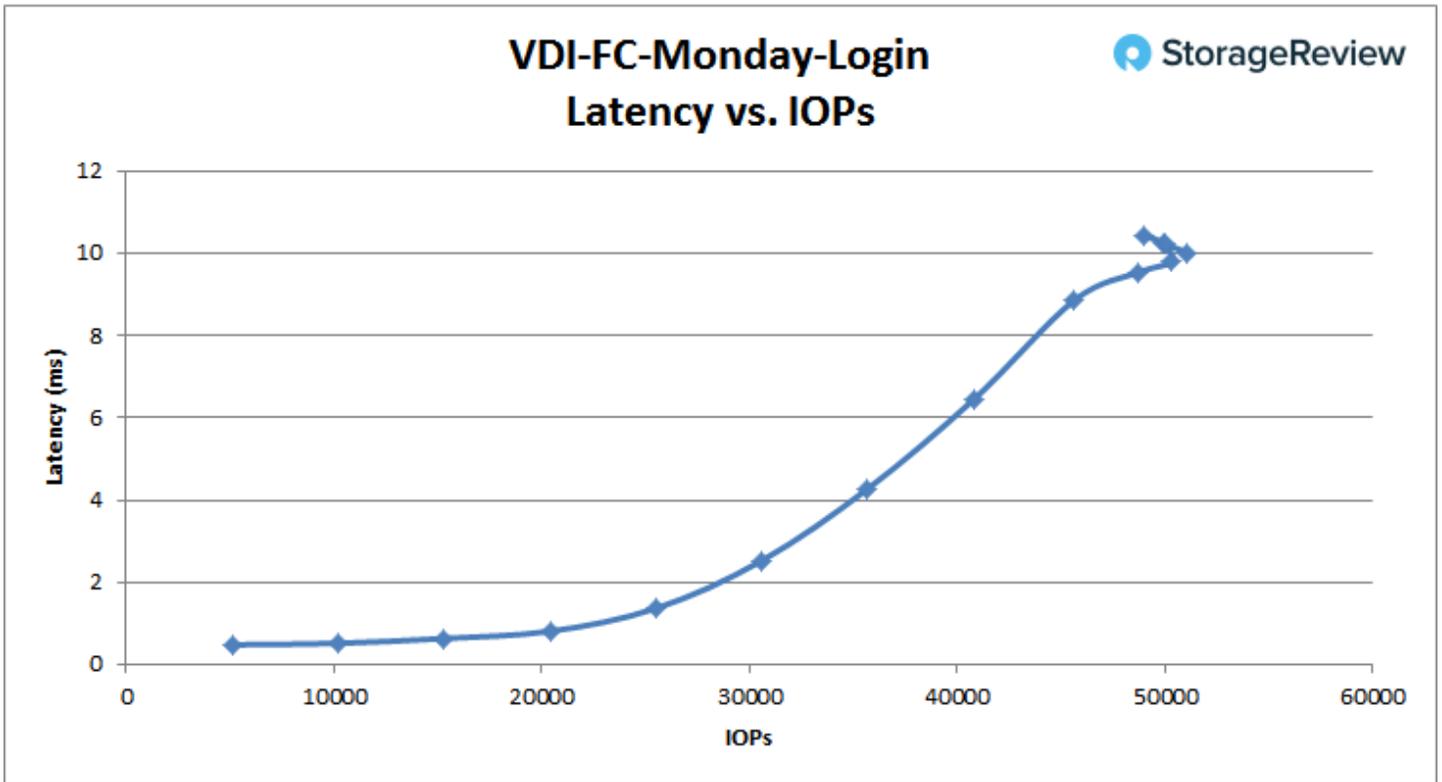
Switching over to VDI Full Clone, the boot test showed the A200 starting with a latency of 0.35ms and staying under 1ms until around 52K IOPS. The A200 peaked at 122K IOPS with a latency of 8.6ms.



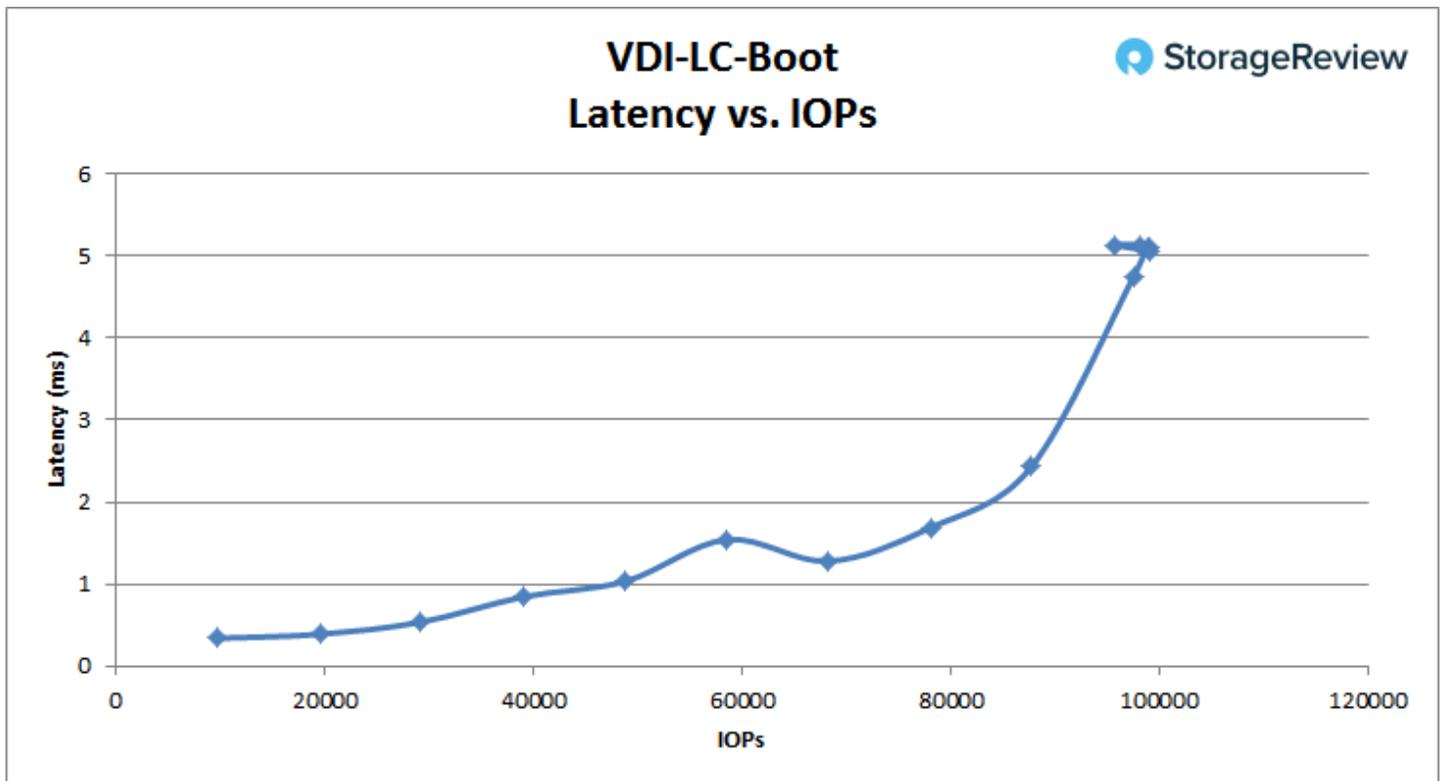
The VDI Full Clone initial login started off at 0.41ms latency and stayed under 1ms until around 22K IOPS. The A200 peaked at 48K IOPS with a latency of 18.6ms.



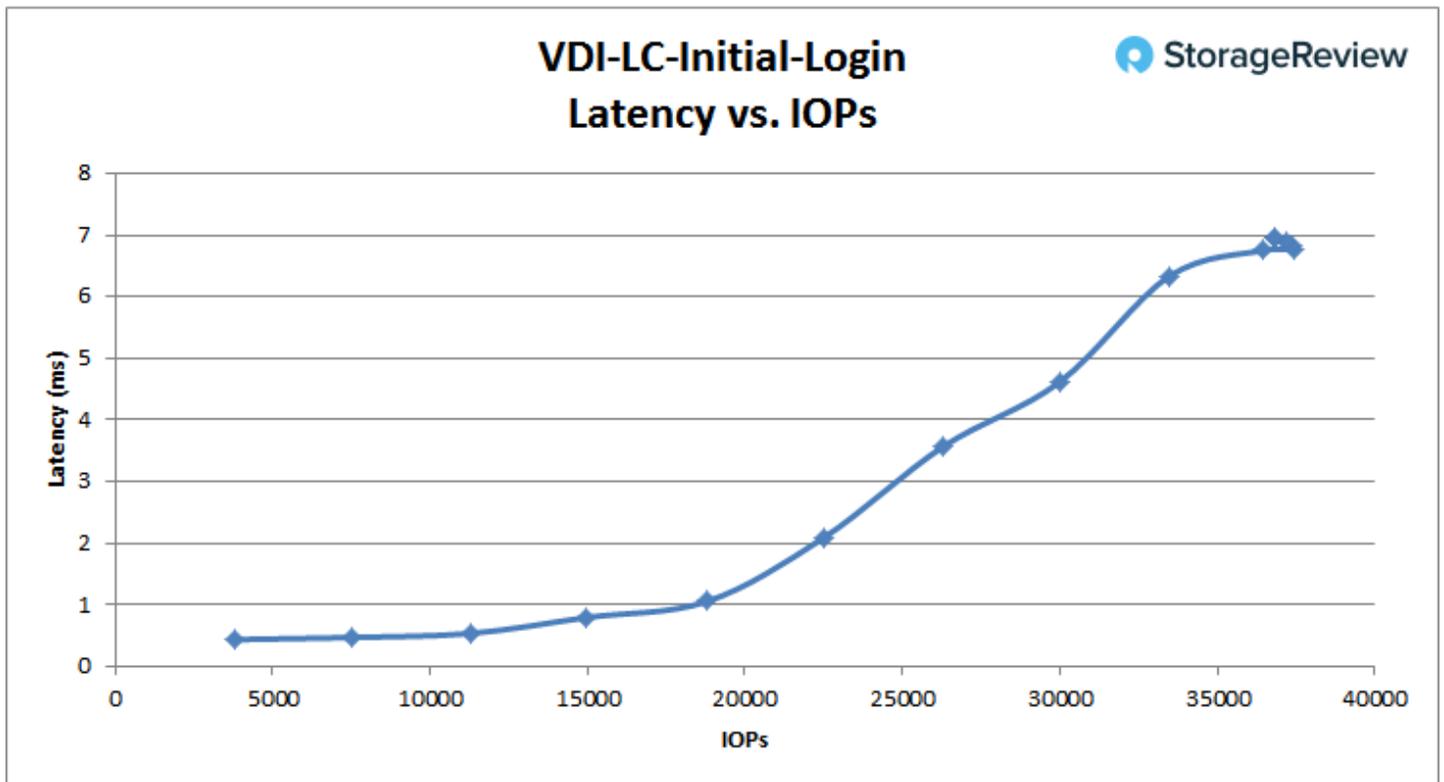
The VDI Full Clone Monday login started off at 0.48ms latency, staying under 1ms until over 20K IOPS. It peaked at 49K IOPS with 10.4ms.



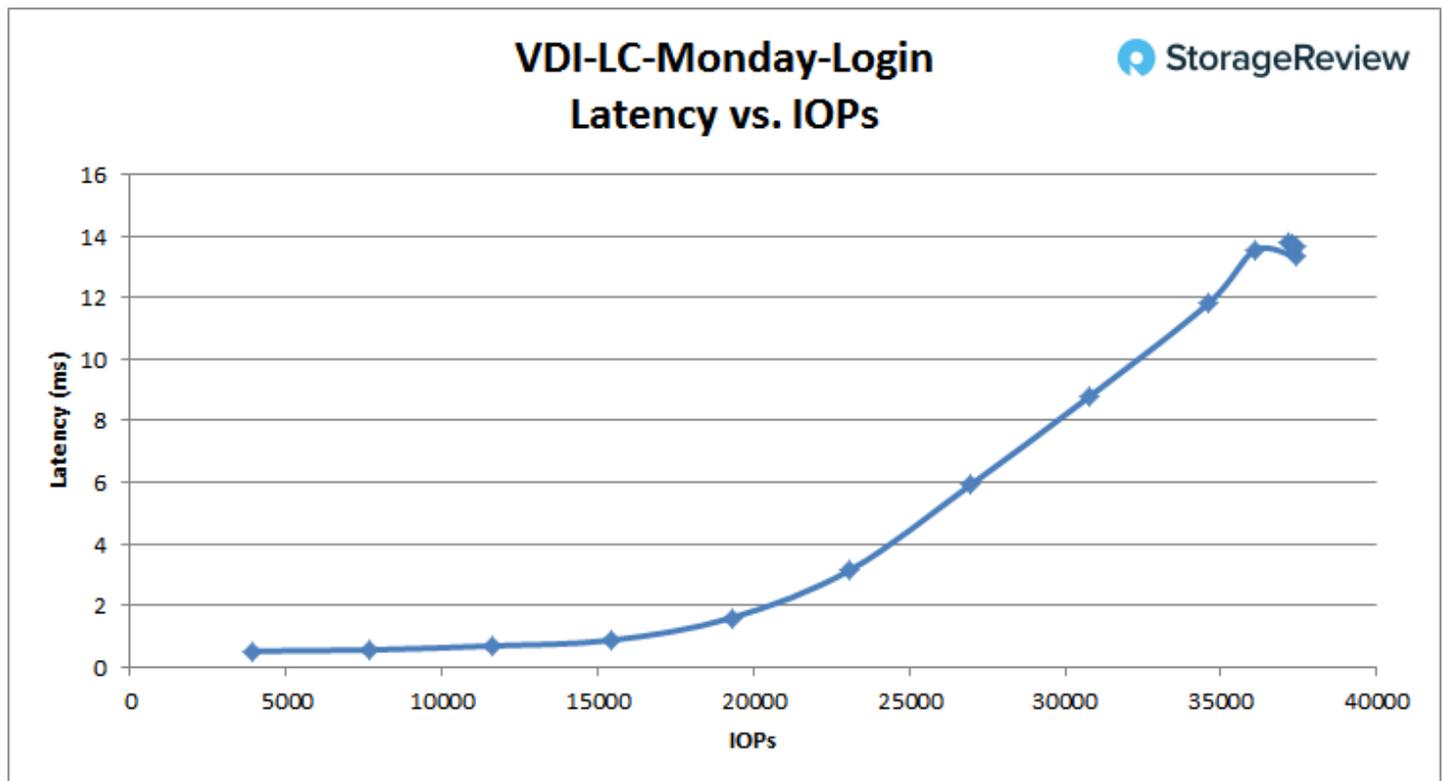
Moving over to VDI Full Clone, the boot test showed performance staying under 1ms up to roughly 49k IOPS, and later topping out at a peak of 95.7k IOPS with an average latency of 5.13ms.



In the Linked Clone VDI profile measuring Initial Login performance, we saw sub-ms latency up till around 18.8k IOPS, where it further increased to 36.8k IOPS at 6.95ms at its peak.



In our last profile looking at VDI Linked Clone Monday Login performance, we see the 1ms barrier transition happening at around 17.5k IOPS, where the workload continued to increase to its peak at 37.4k IOPS and 13.3ms average latency.



Conclusion

The NetApp AFF A200 is an entry-level array for small organizations that are either looking to begin with or migrate to all-flash storage, or as a nice option for remote/branch offices. The A200 is a dual-controller platform powered by six-core Intel Broadwell-DE processors and upward of 64GB of memory. From a capacity perspective, the A200 has 24 2.5" bays for SAS flash drives. The array supports up to 15TB drives, bringing a total raw capacity up to 367TB, although effective capacity is much higher with data reduction. Moreover, NetApp offers a guaranteed storage efficiency reduction of 4:1. The A200 also can add capacity through a DS224C expansion shelf. The array runs on NetApp's ONTAP operating system.

Looking at performance, we ran both our usual application workload analyses including SQL Server and Sysbench application workloads, as well as newly introduced VDBench Workload Analysis synthetic benchmarks. NetApp shared their POC Toolkit with us for the review, giving us an easier way to kick off workloads across multiple servers, and making it easier to test faster arrays in a consistent manner going forward.

With our application workloads, we test the array both with and without the inline data reduction services (DR) turned on. In our transactional benchmark for SQL Server, the impact of the DR was minimal with the aggregate score being 12,620.1 TPS raw and 12,583.8 TPS with the DR on. Individual VMs ranged from 3,145.3 TPS to 3,155.1 TPS. With SQL Server average latency, we saw the latency doubling with the DR on; the raw running 11ms (both individual and in aggregate), and the DR having an aggregate of 25ms. With Sysbench, we ran several sets of VM scaling including 4, 8, 16, and 20. At the lowest scale of 4VMs, the NetApp performed quite well, offering strong performance without having to fully saturate the array. The raw performance at 4VMs was 7,175 TPS, with an average latency of 17.84ms and worst-case latency of 48.63ms. On the other end with 20VMs, the raw hit 9,695 TPS with a latency of 66.02ms and a worst-case latency of 172.6ms. Again, there wasn't a tremendous difference with the DR on, though the raw performed better in all the tests.

Looking at VDBench tests performed with data reduction services turned on, it was impressive to see such strong performance at sub-millisecond latency. In random 4K, the A200 hit 40K IOPS before going over 1ms of latency in write, and in read, the A200 made it to 190K before going over 1ms of latency. This trend continued throughout the rest of the benchmarks. In 64K sequential tests, the A200 was able to hit 48K IOPS below 1ms latency in read, and in write, it hit almost 20K IOPS below 1ms latency (the test also finished with bandwidth speeds of 3.75GB/s read and 1.22GB/s write). We ran three SQL workloads at 100% read, 90% read and 10% write, and 80% read and 20% write, with the A200 hitting scores of 120K IOPS, 80K IOPS, and 60K IOPS respectively, all under 1ms of latency. Running the same three tests with an Oracle workload, we saw the A200 hit 50K IOPS, 100K IOPS, and 65K IOPS under 1ms of latency. We also ran VDI Full Clone and Linked Clone

benchmarks for Boot, Initial Login, and Monday Login. The A200 was able to hit 52K IOPS, 22K IOPS, and 20K IOPS under 1ms latency in Full Clone, and 49K IOPS, 18K IOPS, and 17K IOPS under 1ms latency in Linked Clone. NetApp is quick to comment how much optimization goes on behind the scenes to tune for workloads, and you can see this play out in every test we ran on the A200--even with full inline data reduction in play.

After all of these workloads and the many weeks of testing in our lab, one thing is patently clear: the migration to all-flash systems has been transformational for NetApp. Some of the improvement is the uplift flash offers, but a lot of it is thanks to ONTAP improvements. Wherever the credit lies, the end product is absolutely fantastic. The midmarket segment for storage is amazingly competitive; there are a smattering of startups, software-defined options, and the rest of the usual suspects. If you're looking to spend under six figures on storage, you could be forgiven for not looking at NetApp past a casual glance in this segment. That would, however, be a tragic mistake, as the A200 simply crushes. Delivering phenomenal performance under a millisecond is one thing, but here's the important part: NetApp is doing it with data reduction services turned on to get to that 4:1 capacity guarantee. This is not trivial; many other arrays either fall very flat with data reduction on, or simply don't offer it. Our entry-level A200 with the lowest capacity drives offered up 15.5TB across two 7.75TB pools, meaning we'd have a top-end capacity of 62TB if we hit that 4:1 target and over a petabyte with the 15TB drives NetApp offers. Pretty impressive reach for a 2U midmarket box. Performance, combined with a deep and mature set of data services, makes the A200 an easy choice as our second Editor's Choice winner of 2017.

Pros

- Up to 367TB in a 2U footprint (before 4:1 data efficiency)
- Data reduction technologies had minimal impact on application workload benchmarks
- Tremendous performance at sub-millisecond latencies in VDBench
- Mature set of data services and integrations

Cons

- Missing a 1.92TB SSD option to hit the price gap between the 960GB and 3.8TB configurations

The Bottom Line

The NetApp AFF A200 is an ideal unified storage solution for the mid-market that requires an uncompromising mix of application responsiveness, backed by an extensive list of thoroughbred data services.

