New Cluster-Ready FAS3200 Models

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NetApp recently introduced two new models in the FAS3200 series: the FAS3220 and the FAS3250. Our design goal for these models was to optimize them for use with clustered Data ONTAP® and Virtual Storage Tier technologies. We've doubled the computational ability and significantly expanded memory and capacity so that these systems are able to deliver outstanding performance and efficiency in a wide range of use cases, including consolidating midrange workloads, as a cluster building block, in cloud environments, and in FlexPod® configurations.

You'll notice that we simplified the FAS3200 line from three models to two. With clustered Data ONTAP you can now combine several systems—from across the NetApp® FAS2200, FAS3200, and FAS6200 product lines—to address your capacity and performance needs while improving infrastructure agility through the nondisruptive operations that clustering makes possible.

In this article I explain how NetApp designed the FAS3220 and FAS3250 to deliver great performance and efficiency while exploiting the latest advancements in Data ONTAP.

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- Enterprise-class FAS6200 series
- Midrange storage
  - Original FAS3200 series
  - FAS3220 and FAS3250
- Entry-level storage
  - FAS2240
  - FAS220

Flexible Configuration Options

When we introduced the FAS3200 series in 2010, we recognized that we needed a flexible, expandable platform that was capable of bridging the substantial gap that exists between entry-level and enterprise storage. That focus on flexibility and expandability continues.

We use the same 3U chassis as with previous models. A chassis can be occupied either by two controllers (each with two PCIe v2.0 slots)—creating an HA pair in 3U—or by a single controller and an I/O expansion module (IOXM) that provides an additional four PCIe slots.

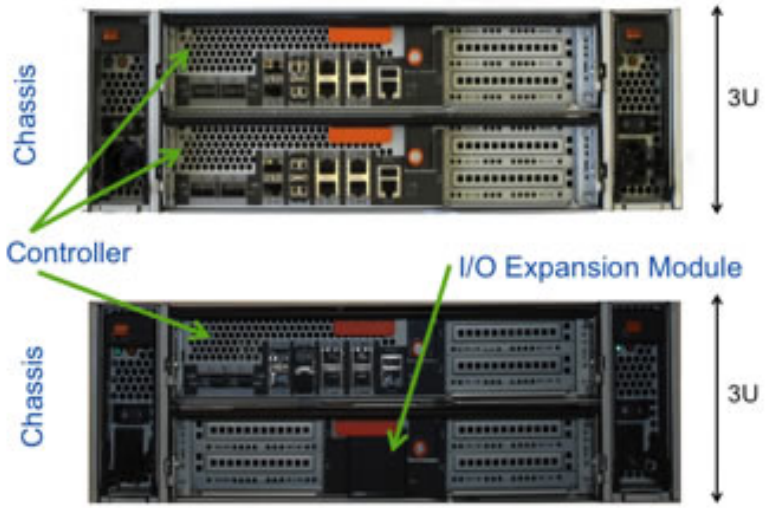

Figure 1) The 3U chassis of the FAS3200 series can be occupied by dual controllers (HA pair) or a single controller plus an I/O expansion module with four additional PCIe slots.

FAS3220 configurations are available with or without the IOXM. This means that you can have an HA configuration (two controllers) in just 3U with four available PCIe slots, or in 6U of rack space with 12 PCIe slots. All FAS3250 configurations include the IOXM for maximum expandability. An HA configuration occupies 6U of rack space and offers 12 PCIe slots. As before, there are V-Series versions of each model for virtualizing third-party storage.

Table 1) Available configurations for new FAS3200 models.

	FAS/V3220	FAS/V3250
Single-Chassis Standalone	FAS/V3220	NA
Single-Chassis HA	FAS/V3220A	NA
Single-Chassis with IOXM	FAS/V3220E	FAS/V3250E
Dual-Chassis HA (controller + IOXM in each)	FAS/V3220AE	FAS/V3250AE

As a general rule, NetApp recommends using the two PCIe slots built into the controller for high-performance 10GbE and/or 8Gb FC adapters. The additional expansion slots in the IOXM can be used for NetApp Flash Cache™ intelligent caching and additional connectivity for FC or SAS disks. The availability of these four IOXM slots offers obvious benefits for configuring systems to take advantage of Flash Cache.

FAS3220 Highlights

To enhance the power of the FAS3220 versus the FAS3210 that it is replacing, NetApp doubled the number of CPU cores, increased system memory by 2.4 times, and increased NVMEM by more than 3 times. We also doubled the maximum drive count to 480 drives and provided configurations with the IOXM for greater expansion. The result is a much more capable system delivering up to 80% more performance. The increased NVMEM will further accelerate write-intensive applications. As writes occur, they are journaled in the NVMEM. When the NVMEM fills, a checkpoint occurs and all writes are flushed to disk. A larger NVMEM decreases the frequency of these checkpoints and allows Data ONTAP to further optimize writes to disk for maximum efficiency.

Table 2) Comparison of the new FAS3220 with the FAS3210.

	FAS/V3210	FAS/V3220

HA Configuration	A	A or AE
CPU Cores	4	8
Physical Memory	10GB	24GB
NVMEM*	1GB	3.2GB
Max Drive Count	240	480
Max Capacity	720TB	1920TB**
On-Board Ports	4 GbE 4 FC 4 6Gb SAS	4 GbE 4 FC 4 6Gb SAS
PCIe Slots	4	4 or 12

*NVMEM consumes part of physical memory.
**Using 4TB drives. (Not qualified on FAS/V3210).

NetApp recently tested the FAS3220 as part of the Microsoft Exchange Solution Reviewed Program (ESRP). We found that the system is capable of supporting 21,000 Exchange 2010 users at 0.120 IOPS per user and a 1.5GB mailbox size in the Mailbox Resiliency (dual-copy) configuration. Since it achieved 49% more IOPS than targeted, it's clear that the tested solution still had significant IOPS headroom. This result compares favorably with those from competing midrange storage systems.

FAS3250 Highlights

For the FAS3250, we doubled the number of CPU cores, increased memory by 2.5 times, and raised the maximum number of disks supported to 720. We also include standard either a 10-Gigabit Ethernet card or an 8-Gigabit Fibre Channel card in each controller for both clustered Data ONTAP and 7-Mode configurations to satisfy cluster interconnect or high-performance I/O needs. The FAS3250 boosts performance up to 2 times versus the FAS3240.

Table 3) Comparison of the new FAS3250 with the FAS3240.

	FAS/V3240	FAS/V3250
HA Configuration	A or AE	AE only
CPU Cores	8	16
Physical Memory	16GB	40GB
NVMEM*	2GB	4GB
Max Drive Count	600	720
Max Capacity	2400TB**	2880TB**
On-Board Ports	4 GbE 4 FC 4 6Gb SAS	4 GbE 4 FC 4 6Gb SAS
Standard I/O Cards	NA	10GbE or 8Gb FC
PCIe Slots	4	4 or 12

*NVMEM consumes part of physical memory.
**Using 4TB drives.

We used the SPECsfs benchmark to assess the performance of the FAS3250. The FAS3250 delivers 100,922 SPECsfs2008_nfs.v3 Ops/sec with an overall response time of 1.76 milliseconds.

Clustered Data ONTAP for Increased Agility

With increased memory, processing power, and capacity, the FAS3220 and FAS3250 are ideal building blocks for clustered configurations that take advantage of the scale-out capabilities of clustered Data ONTAP 8. (Previous Tech OnTap® articles referred to clustered Data ONTAP as "Data ONTAP 8 operating in Cluster-Mode" or simply "Cluster-Mode.")

Clustering provides a layer of abstraction between data access and the physical storage hardware, creating a much more agile storage environment. All data access goes through a Virtual Storage Server, or "Vserver," which is a storage profile that isn't tied to a particular underlying storage system. The result is that you can move workloads within a cluster without requiring remounts or otherwise disrupting user access. This gives clustered storage a new set of capabilities analogous to the kinds of capabilities that hypervisors provide to server environments.

For instance, if a storage node needs maintenance, you can move all of its workloads elsewhere in the cluster, perform the maintenance, and move the workloads back without disrupting users or applications. You can also move workloads to balance the load across your cluster or to give more or different resources—such as a different media type—to a particular workload. Your storage environment becomes much more able to adapt dynamically to changing needs and unexpected events. You can add resources (capacity and performance) to particular workloads to address spikes in demand, and reallocate those resources elsewhere when they are no longer needed.

Clustered Data ONTAP continues to deliver all the capabilities you expect from NetApp, including unified storage (SAN and NAS), advanced storage efficiency capabilities (thin provisioning, deduplication, compression, and so on), and integrated data protection.

With clustered Data ONTAP you can build storage clusters with up to 24 storage controllers. You can build homogeneous clusters in which all cluster nodes are the same, as PeakColo did, or you can create heterogeneous clusters that include several types of FAS controllers and media, so that a single cluster—with a single point of management—provides several tiers and classes of storage.

Flash for Performance and Efficiency

The FAS3220 and FAS3250 are designed to take the fullest advantage of the NetApp Virtual Storage Tier technologies: Flash Cache™ and Flash Pool. Deploying these technologies gives you the performance benefits of flash technology while keeping both capital and management costs down. Capital costs are reduced because your storage can deliver the same or better performance using fewer disk spindles. Plus, you can combine flash with high-capacity SATA disks to achieve a given performance level rather than using more expensive high-performance SAS disks.

Flash Cache dramatically improves latency for random reads and is the easiest way to add flash to a NetApp configuration. Flash Pool accelerates both random reads and writes.

The additional memory and processing power in all new FAS3200 models allows them to take advantage of

current and future Flash Cache devices and Flash Pool SSDs.

Table 4) FAS3200 series flash support.

	FAS/V3220	FAS/V3250
Flash Cache per HA Pair	1TB	2TB
Flash Pool per HA Pair	1TB	2TB
Total per HA Pair	1TB	2TB

Conclusion

The earlier FAS3200 models—the FAS3210, FAS3240, and FAS3270—will remain available for current customers for some time to facilitate the transition. The FAS3220 and FAS3250 offer the same great reliability, availability, serviceability, and manageability features that we built into the FAS3200 series from the beginning. We added more cores, memory, and capacity to increase performance and deliver the capabilities that midrange storage needs to address the increasing demands created by business-critical applications, server virtualization, and cloud workloads.

These new systems are optimized to support clustered Data ONTAP and the NetApp Virtual Storage Tier so you can create a more agile data infrastructure that takes full advantage of flash technology to accelerate storage workloads.

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Steven has been the platform architect for NetApp for over six years and was responsible for the FAS3100, FAS3200, FAS6200, FAS2240, and FAS2220 as well as the Performance Acceleration Module (PAM) and Flash Cache (PAM II). He is also the NetApp Engineering liaison to the National Security Agency, National Geospatial-Intelligence Agency, and Central Intelligence Agency. Steven is currently involved with several IEEE and industry groups. He is credited with 31 issued patents and 19 pending applications in the areas of storage and high-performance computing.