

# The All-New FAS Product Line: Optimized for Modern IT



**Dave Mason**

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As the leader of NetApp's FAS engineering team, an important part of my job is spending time with customers. I want to understand your issues so I can make sure that the storage platforms we deliver meet your needs.

In talking with IT professionals from the CIO level on down, it's clear that IT teams are struggling to cope with aggressive SLAs from their customers, both internal and external. The scale-up mentality of standing up large, over-provisioned storage systems for specific workloads simply does not meet the requirements of business today. You need simplicity of operations, flexibility to adapt to ongoing change, performance without overprovisioning, built-in cost efficiencies, and the ability to grow performance and capacity on demand without interruption.

With the announcement this month of the new FAS2500 series—and the new FAS8080 EX to round out the FAS8000 series that we launched back in February—NetApp has completely refreshed our FAS lineup. We've dedicated a lot of time and attention to addressing the needs of modern IT in order to deliver a product line that is flexible, simple, and able to support a large number of simultaneous storage workloads of different types.

The new FAS lineup is designed to scale out, giving you greater flexibility to address specific capacity and performance requirements. You can start small and grow your storage environment to support millions of IOPS at petabyte scale, without disruption.

At a time when other storage vendors are adding more and more platforms to an already bewildering number of choices, we've simplified the FAS lineup, eliminated product overlap, and made it easier for you to choose the right storage. And, we believe we've delivered a product line that surpasses everything we've achieved in the past in terms of performance, efficiency, reliability, and availability.

The result is a new generation of FAS hybrid storage hardware that is extremely well suited to meet the needs of today's enterprise and adapt flexibly to new IT delivery models, including software-defined storage and cloud.

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## Explore

### Learn About the Latest FAS Platforms in Tech OnTap

Want to know more about the latest FAS platforms? This issue of Tech OnTap features three articles that bring you the latest information:

- [The All-New FAS Product Line: Optimized for Modern IT](#)
- [Simplify Operations with FAS2500 Unified Hybrid Storage](#)
- [FAS8080 EX Delivers Performance, Reliability, and Scale for Business-Critical Workloads](#)

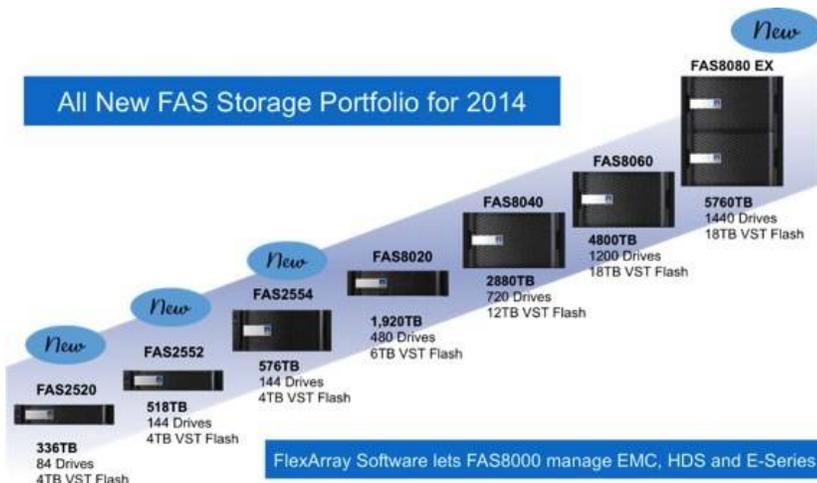
And don't miss this article from February highlighting the capabilities of the FAS8020, FAS8040, and FAS8060.

- [FAS8000: Scale-Out Storage for the Enterprise](#)

### More on the All-New FAS Platforms and Where NetApp is Headed

If you liked this article, you probably want to know more about where FAS is going and what NetApp is planning for the future. Check out these resources:

- Blog: [Keeping Up with the Pace of Change](#)
- Video: [NetApp EVP George Kurian Discusses the FAS2500 and FAS8080 EX](#)
- Blog and Video: [ESG: Impressions from NetApp's Industry Analyst Summit](#)
- Blog and Video: [You're Buying Flash from Who?](#)



**Figure 1)** Completely refreshed FAS portfolio. (Values shown are per HA pair.)

## Simplifying the FAS Product Line

At NetApp, we've always believed in keeping things simple. For this refresh, we've further reduced the complexity of the FAS product line with:

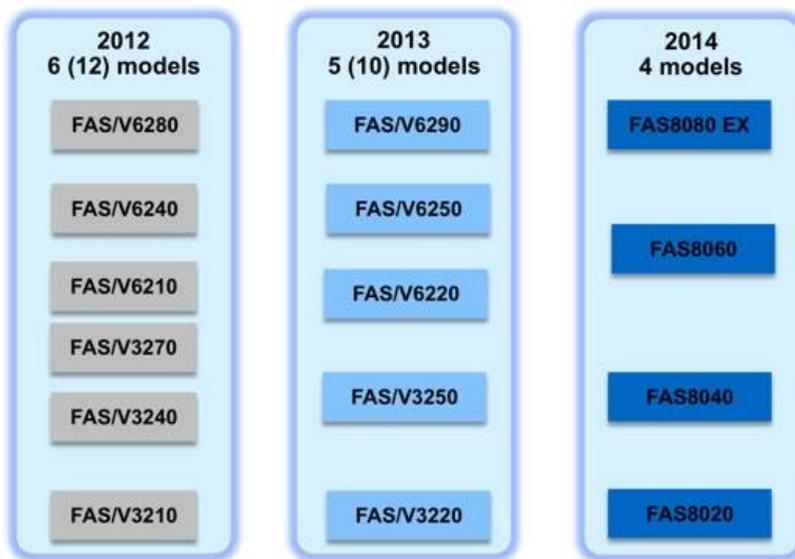
- A reduction in the total number of models
- More flexible networking
- A streamlined installation process

### Simplified Model Offerings

To simplify the platform selection process, we've reduced the total number of FAS/V systems from 13 down to seven FAS models. The refreshed FAS product line consists of:

- The FAS8020, 8040, and 8060 launched in February ([FAS8000 article.](#))
- FlexArray software, launched in February ([FlexArray article.](#))
- The just-announced FAS8080 EX (See the [FAS8080 EX article in this issue.](#) )
- Three models in the just-announced FAS2500 series (See the [FAS2500 article in this issue.](#) )

The new FAS2500 series replaces the previous-generation FAS2200 series. The FAS8000 series and FlexArray software replace all FAS3200, FAS6200, and V-Series models, meaning we've cut the number of midrange and high-end models from a total of 12 back in 2012 down to just four.



**Figure 2)** With the addition of FlexArray software to eliminate the need for separate V-Series models, the FAS8000 replaces the FAS3200 and FAS6200 product lines with just four models.

With enhanced scale-out capabilities, the four models in the FAS8000 line eliminate overlap and make it simple to decide which platform to deploy.

FlexArray software allows any FAS8000 system to virtualize EMC, HDS, HP, and NetApp® E-Series storage arrays without the need for separate V-Series systems, giving you greater deployment flexibility. You can add FlexArray software to extend the capabilities of the NetApp Data ONTAP® ecosystem—nondisruptive operations, storage efficiency, integrated data protection, and so on—to other storage arrays.

### More Flexible Networking

This FAS refresh delivers greater network flexibility and more high-speed connectivity. All new FAS systems (except the FAS2520) feature integrated Unified Target Adapter 2 (UTA2) ports (sometimes referred to as Converged Network Adapters or CNAs), an industry first. These ports can be configured for either 16Gb/sec Fibre Channel (FC) or 10GbE. UTA2 makes great sense for a unified storage platform, providing greater flexibility now and in the future.

You can configure UTA2 ports for FC and connect to FC SANs with the highest available bandwidth. If you don't currently need FC, you can configure all ports for 10GbE to support FCoE and iSCSI SAN host connectivity and/or NFS and CIFS/SMB client connectivity, taking full advantage of all available resources.

### Streamlined Installation

Over the last several years, NetApp has been working to simplify and accelerate the installation process for our entry systems. Now we've extended that capability across the entire product line, including all FAS2500 and FAS8000 models. No matter how big the storage system you're configuring, this capability makes it faster to get your storage unboxed and serving data.

### Delivering Performance

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FAS performance is an area where I think NetApp needs to work harder to get the message out. Not long ago I was discussing the FAS8000 with a group of financial customers in New York. They loved the Data ONTAP feature set and loved the scale-out model, but they chided me because they felt that NetApp didn't have the ability to deliver a performance tier within our scale-out architecture.

They were genuinely surprised to learn about everything that NetApp is doing to optimize performance—not just for Tier-1 workloads with all-flash FAS, but for every workload running on FAS. The fact is that for real-world workloads such as database and VDI, FAS8000 platform performance meets or beats the competition in terms of both IOPS and \$/IOPS, while delivering the full data management and storage efficiency capabilities of Data ONTAP. That's a pretty great combination.

The FAS performance story comes down to four elements:

- Enhanced hardware
- Flexible scale-out
- All-flash FAS for maximum performance
- Hybrid storage for mixed workloads

### **Hardware Enhancements**

We've augmented the hardware across the entire FAS line to optimize it for clustered Data ONTAP and deliver the performance to simultaneously drive front-end workloads, such as database and VDI, in parallel with important back-end workloads such as backup and replication. For the FAS8000, we've added the latest processor designs and more cores, more memory, and more cache than we've ever shipped before. We've also expanded and sped up the NVRAM used for write acceleration.

The just-released FAS8080 EX utilizes the latest Ivy Bridge processors with 40 cores per HA pair (dual, active/active controllers), 256GB of memory, up to 36TB of flash for hybrid storage configurations, and 1,440 drives. In a scale-out configuration, that translates to 480 cores, a maximum capacity of nearly 70 petabytes, and almost 4 million IOPS.

### **Flexible Scale-Out**

It seems like everyone is talking about scale-out right now. Scale-out holds the promise of allowing you to start small, grow performance and capacity incrementally as needed, and take advantage of technology improvements (and cost reductions) over time. The reality, however, is that most scale-out storage designs require that nodes be very closely matched (if not identical), which may leave you with limited upgrade options three or five years from now.

FAS storage and clustered Data ONTAP are much more flexible. You can mix nodes (controllers) across the current generation of platforms, and you can also cluster together nodes from different generations (some limitations apply). In addition to scale-out, each node has significant ability to scale up by adding capacity, network connections, and so on. This gives you much greater flexibility to deliver the performance and capacity you need without wasting resources.

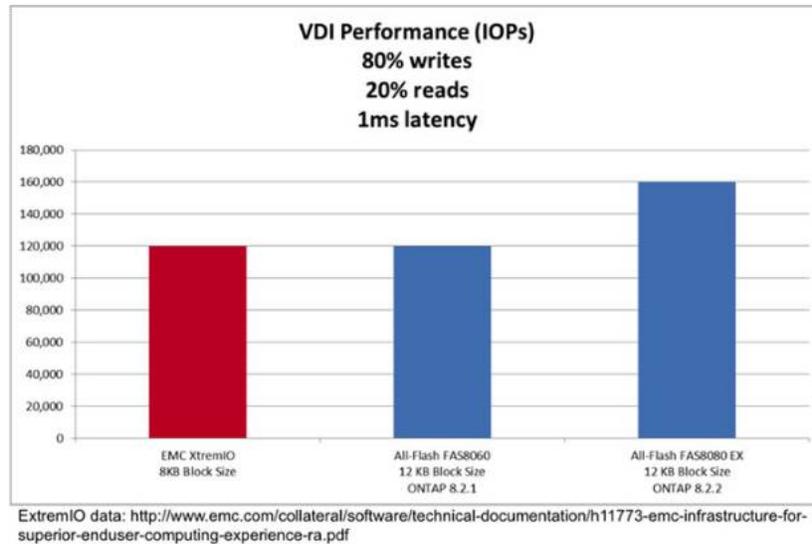
We've expanded the scale-out limits for all FAS platforms. The FAS2520 can scale to 4 nodes, while the FAS2552 and FAS2554 both scale out to 8 nodes. All models in the FAS8000 line scale to a maximum of 24 nodes for NAS or 8 for SAN. This approach to scale out gives you a tremendous range of performance—starting around 20,000 IOPS, up to almost 4 million IOPS for NAS workloads.

We also let you mix the latest technology with what you already have, preserving your investment and eliminating forklift upgrades. You can have nodes optimized for performance—creating a performance tier—in the same cluster with nodes optimized for capacity, and you can flexibly move workloads between tiers as your needs change. A single scale-out architecture can address your requirements for all-flash, hybrid storage, and bulk storage across both NAS and SAN.

### **All-Flash FAS Storage**

Most customers running clustered Data ONTAP love the feature set, but are looking for ways to increase

performance. This is where all-flash FAS comes in. With all-flash FAS, you can seamlessly add performance nodes to your cluster. We've been benchmarking FAS8000 systems for both VDI and OLTP, and the results are impressive.



**Figure 3)** All-flash FAS8000 VDI performance versus the competition.

The FAS8000, with its NVRAM9 architecture for write acceleration, performs extremely well on write-intensive VDI workloads and the FAS8060 comes in as low as \$55/desktop, [versus other storage providers such as Pure Storage at \\$100/desktop](#).

The FAS8000 also delivers impressive performance for read-intensive OLTP workloads. The FAS8060 matches competitors' performance, and preliminary testing suggests that the FAS8080 EX performs substantially better. (Look for more information on FAS8080 EX database performance in a future article on all-flash FAS.)

Any FAS system can be configured for all-flash and deployed either standalone or as part of a larger cluster with other media types. The people I talk to are really starting to understand and appreciate the value of having all-flash nodes as part of a larger cluster, offering the flexibility to move data sets nondisruptively to all-flash when performance is needed (like quarter and year end, holiday periods for retail, and so on) and then move them to other media when it's not—freeing up valuable flash for other uses.

### Hybrid Storage

While all-flash FAS is certainly an attention grabber, we've also made significant enhancements to the ability of FAS platforms to support hybrid storage configurations using our Flash Cache and Flash Pool technologies. We've dramatically increased the total amount of flash supported in hybrid configurations, especially for the FAS2500 series.

**Table 1)** Total flash supported in hybrid configurations per HA pair by each new FAS model, plus increase over the previous-generation platform being replaced.

FAS Model	Total Flash (Hybrid Confgs)	Increase
FAS2520	4TB	5X
FAS2552	4TB	5X
FAS2554	4TB	5X
FAS8020	6TB	3X
FAS8040	12TB	3X

FAS8060	18TB	1.5X
FAS8080 EX	36TB	1.5X

These increases let you optimize your storage to accelerate more workloads. For example, creating a Flash Pool by pooling SSDs with existing disk drives can nearly triple database throughput as measured in transactions per minute, while reducing latency to less than a third of that of disks alone.

## Powering the Enterprise and the Cloud

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With the refresh of the FAS product line, NetApp has created storage to meet the needs of today's enterprises, with an architecture and capabilities that allow you to adapt flexibly to new IT delivery models.

### Nondisruptive Operations

Reliability and availability have become paramount; keeping applications running 24/7/365 is the order of the day. We continue to improve the [nondisruptive operations \(NDO\) capabilities of clustered Data ONTAP](#) to eliminate the need for planned downtime.

Every new release of clustered Data ONTAP contains additional NDO features, widening the gap between NetApp and our competitors. With the 8.2.1 release back in February, we added nondisruptive shelf removal. Because clustered Data ONTAP can keep data online indefinitely, this enables you to replace existing shelves with the latest shelf hardware should that become desirable for any reason.

We think that the scale-out model of clustered Data ONTAP simply makes sense for the enterprise, because it eliminates downtime, simplifies deployment of storage capacity and storage performance, and allows you to create a storage architecture that can be continuously updated without forklift upgrades and wholesale data migrations.

### Hardware Reliability

We've taken great care to enhance the reliability of FAS hardware to reduce or eliminate unplanned downtime. I firmly believe that the reliability of this generation surpasses that of all previous platforms. The FAS8000 went through half a million hours of test time before we shipped a single unit, including use-case workloads, customer workloads, and test-to-break workloads in which we push a system to its limits to try to break the storage and the OS.

The FAS8000 has been shipping for about four months, and so far the feedback on overall reliability has been incredibly positive. Enterprise customers care about uptime and reliability, and I think you will appreciate the significant confidence this testing brings. Results so far show that the FAS8000 delivers on that promise. The annual component replacement rate for the FAS8000 series is running at less than half the rate of legacy systems, and I believe that the new FAS2500 and FAS8080 EX will prove to be just as reliable.

### Accommodating Bursty Workloads

In order to maintain a competitive edge, many organizations are working hard to decrease cycle times. For instance, one major semiconductor manufacturer that I talk with frequently is working to reduce its cycle times by 75%.

These efforts have a major side effect in the form of workloads that are more bursty or spiky. This is also an issue in cloud environments, or for anyone trying to take a more service-oriented approach. You have less visibility of the workloads utilizing your storage, making unexpected spikes in activity a concern.

I've noticed a lot of interest in the FAS8080 EX for exactly this reason. With its 40 cores, greatly expanded caches, and superior hybrid and all-flash support, the FAS8080 EX absorbs unexpected spikes with relative ease.

We added [storage Quality of Service \(QoS\)](#) starting with Data ONTAP 8.2 for the same reason. QoS allows you to set limits on workloads in terms of IOPS or bandwidth. This allows you to prioritize your most important storage workloads and prevent "rogue" workloads from affecting your business. This becomes particularly important in shared environments where you have multiple tenants on the same infrastructure.

## Making the Move to Software-Defined Storage and Cloud

When it comes to software-defined storage and cloud, we have an approach that I think will give you significant peace of mind.

NetApp has been on the path to software-defined storage since well before the phenomenon had a name. We've been virtualizing physical storage assets, simplifying management, and publishing APIs to make all NetApp features programmable. We continue to [enhance our OnCommand management tools to extend our software-defined capabilities](#) and facilitate cloud deployments that expose the full feature set of Data ONTAP.

Our approach to cloud lets you utilize NetApp FAS storage with the [private cloud deployment of your choice](#), including [OpenStack](#). You can create a hybrid cloud by connecting with cloud service providers (CSPs) to support dev/test, cloudbursting, and so on. Over 350 CSPs use FAS storage, making NetApp the number-one provider of storage for public cloud infrastructure. We're also forging strong relationships with hyperscale cloud providers such as Amazon Web Services.

The upshot is that no matter what cloud provider you want to work with, you'll be able to move data between your data centers and the cloud using our fast and efficient replication technologies. We've spent decades developing methods to simplify and accelerate the process of replication and data management. That's one more reason you can feel comfortable investing in NetApp FAS hardware.

## Building a Bright Future

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NetApp has never been a company to rest on its laurels. We're continuing to make strategic investments in the capabilities and technologies that you've told us matter most to your business, including:

- Increased serviceability
- Continued scale-out enhancements
- Performance enhancements (many upcoming changes will apply to existing NetApp storage as well as new systems.)

I wish I could say more about all the great things we've got in store, but you can be certain that the FAS cluster you install today will adapt to meet your needs far into the future.

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› [Got opinions about the All-New FAS Product Line?](#)

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**By Dave Mason, Senior Vice President, FAS Systems Group**

Dave is a highly successful product development leader responsible for launching technologically advanced products across Storage, Aerospace, Computer, and Telecommunications sectors. He has over 35 years of industry leadership experience spanning a broad range and scope of companies, from startups to multibillion-dollar corporations.

Currently Dave is senior vice president of NetApp's FAS Systems Group. The FAS Systems Group is responsible for delivering all NetApp hardware platforms, including NetApp controllers and storage shelves, as well as its HDD/SSD commodity strategy.

Prior to joining NetApp, Dave was the vice president of engineering for Occam Networks, a world leader in IP/Ethernet-based telecommunication systems. He also has held positions as senior director & VP of engineering for Sun Microsystems, vice president of product operations for Statek Corp, and several senior engineering management roles at General Dynamics Corp/Hughes Aircraft Corp.

Dave is a graduate of Cal Poly, Pomona, where he received his BS in chemistry and MBA.

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