

# Supercharge OLTP and VDI with the New EF550 Flash



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Technical Marketing Manager

There's no doubt that flash is changing the storage industry. It's transforming both the speed of business and the economics of storage. NetApp introduced hybrid storage back in 2009, and our first all-flash array, the EF540, debuted earlier this year. NetApp customers are turning to flash in all its permutations to improve application responsiveness, eliminate overprovisioning, and satisfy the needs of the most I/O-intensive workloads.

Since its introduction in February, the NetApp® EF540 all-flash array has seen steady growth. Its combination of performance, density, and enterprise RAS is creating quite a buzz. EF540 adopters are experiencing a 20x improvement in database latency, a 3x improvement in productivity, and a significant reduction in operational costs. In fact, one IT team used a single 2U EF540 to replace three full racks of spinning disks. Wow.

Next on the horizon is the just-announced EF550. A follow-on to the EF540, the EF550 offers improved performance, higher capacity, and new features. I want to describe what's new with the EF550 and talk about some popular use cases for all-flash arrays—including some that combine the advantages of all-flash and FAS.

## EF550: What's New?

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The EF550 all-flash array has evolved directly from the EF540 and adds to its capabilities. If you aren't familiar with the EF540, [my earlier article](#) is a good place to review the details of the EF platforms, including enterprise reliability and availability features.

We've enhanced the EF550 in some important ways:

- Improved performance
- Higher capacity
- New connectivity options
- Important new features

## Performance, Capacity, and Connectivity

Leveraging a heritage of performance leadership, the EF550 is well suited for a wide range of workloads. For transactional applications, it can burst up to 900,000 IOPS and sustain well over 400,000 IOPS at submillisecond latency, a 35% improvement over its predecessor. For throughput-oriented applications, the EF550 is capable of

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## Explore

### More about the EF550

Want to learn more about the EF550 flash array? View the video from NetApp VP Ty McConney, check out blogs to see what others have to say about it, and read the press release.

- [Video: The NetApp Approach to Flash](#)
  - [Analysis and Results in a Flash](#)
  - [NetApp Debuts EF550 Flash Array](#)
  - [From the Humvee to the Data Center: NetApp Announces Innovative Portfolio](#)
  - [NetApp Doubles Down on Flash + Latest Hybrid Cloud Push](#)
  - [Press Release: NetApp Introduces New All-Flash Array and Performance Optimized Enterprise Storage Systems](#)
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sustaining up to 12GB/sec.

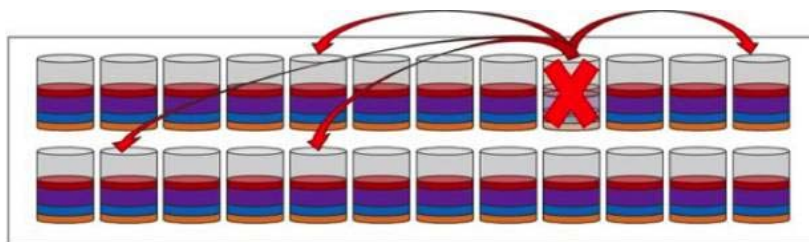
We've also expanded the scalability of the EF550, from 48 drives to 120 drives, for 96TB of raw capacity. By scaling up capacity, the EF550 can provide more data with access to low-latency performance. What's more, we've doubled the back-end bandwidth from two to four 6Gb/sec SAS ports, and we've replaced 8Gb/sec Fibre Channel interfaces with 16Gb/sec Fibre Channel. You still have a choice of Fibre Channel, SAS, Ethernet, or InfiniBand connectivity.

## Dynamic Disk Pools

One of the most exciting new features we're introducing is dynamic disk pool (DDP) technology, which simplifies RAID management, improves data protection, and delivers predictable performance under all conditions. If you're familiar with aggregates in Data ONTAP®, DDP works similarly, although the back-end implementation is different.

DDP distributes data, parity information, and spare capacity evenly across the EF550 entire pool of drives, simplifying setup, eliminating hot spots, and maximizing capacity utilization. With DDP, there's no need to spend a lot of time working out the best way to define RAID groups. Free space is distributed across all disks, so there are no dedicated hot spares—and no expensive SSDs sitting idle. You get the full performance of all disks in the system, all the time.

Additionally, DDP minimizes the performance impact of a drive failure and can return the system to optimal condition up to 8 times more quickly than traditional RAID. With shorter rebuild times and patented prioritize reconstruction technology, DDP offers a level of data protection that can't be achieved with traditional RAID.



**Figure 1)** In a dynamic disk pool, data, parity, and free space are spread evenly across all drives. If an SSD fails, reconstruction occurs across the entire pool, so rebuilds are complete up to 8X faster.

## EF550 Use Cases

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Among the many use cases for all-flash, there are four that we see a lot:

- Database acceleration
- Virtual desktops
- I/O offload
- Overprovisioning

I'm including links to recent success spotlights for a few of these customers. Most of these are large customers who won't let us release their names, so the profiles only give you a flavor of what they're doing. I'll also link to recent technical reports and white papers for those who want more information about how to configure the specific deployments I'm talking about.

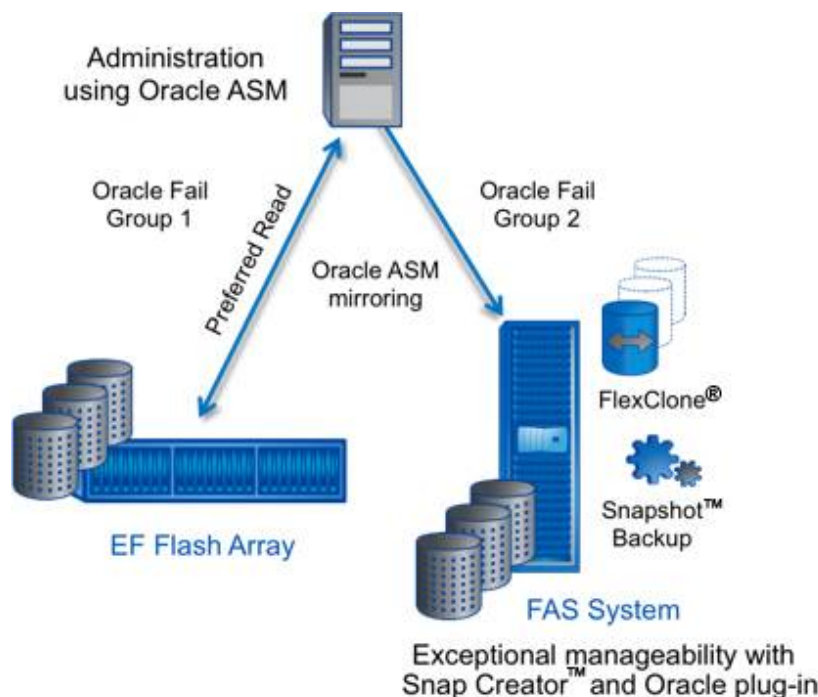
### Database Acceleration

I'm sure that it comes as no surprise that database acceleration is one of the "killer apps" for all-flash arrays.

Despite all the talk about virtualization and shared infrastructure, fast database infrastructure still favors bare metal installations and dedicated storage.

NetApp offers storage for database acceleration with the EF-Series alone or with a combination of EF and FAS. For example, a [global online retailer](#) has deployed hundreds of EF540 arrays to accelerate payment transactions and deliver fast access to online accounts and purchases. The company was able to improve the performance of its Oracle® databases governing purchase profiles twentyfold, while reducing the storage footprint to a quarter of what it previously was.

Others choose a combination of EF for speed with FAS storage providing a secondary copy for redundancy and data management. For instance, in Oracle environments this is accomplished by using Oracle ASM mirroring and two failure groups, as shown in figure 2.



**Figure 2)** Using a combination of EF for submillisecond latency and high transactional performance and FAS for redundancy and data management gives you the best of both platforms.

Reads are preferentially performed from the EF array, while writes go to both the EF array and the FAS system. Because Data ONTAP coalesces writes and distributes activity over all the spindles in an aggregate, write performance is not an issue. Data protection and data management functions such as backup, replication, and cloning can be performed on the FAS system by using a combination of NetApp and Oracle capabilities. This is discussed in detail in [another article in this issue on hot topics from Oracle OpenWorld](#).

Here are a few additional references for deploying high-performance database applications with various software platforms:

- [Sybase Adaptive Server Enterprise Version 15.7 on NetApp EF540 Flash Array and FAS Storage](#)
- [NetApp EF540 Reference Configuration for Microsoft SQL Server 2012 Fast Track Data Warehouse with Cisco UCS C220 M3 Server](#)
- [NetApp Extreme Analytics Solution for Oracle](#)

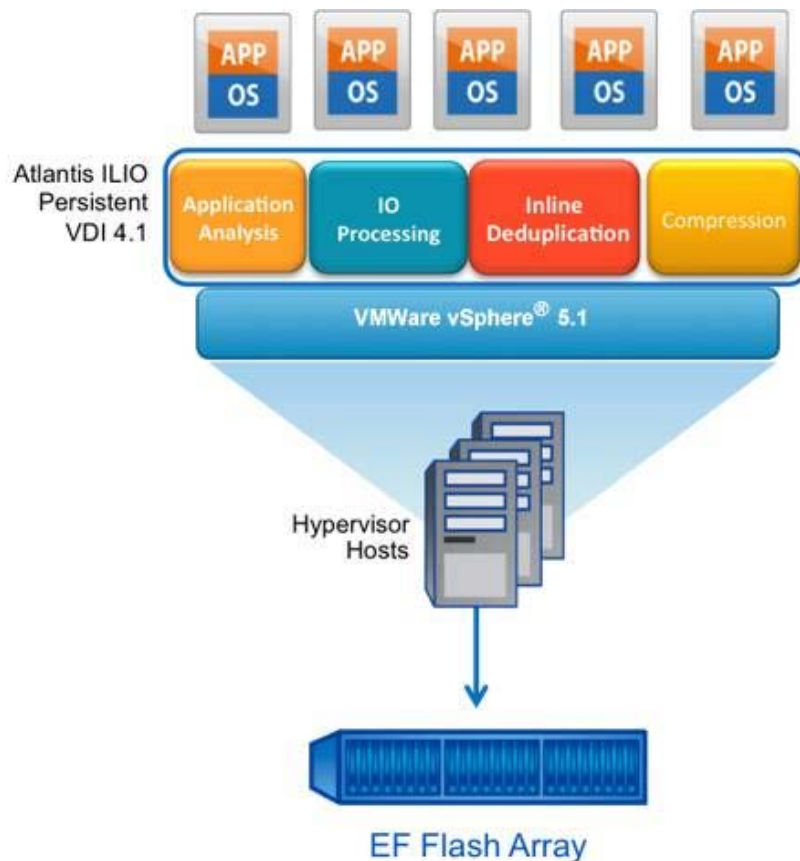
## Virtual Desktops

All-flash storage is great for supporting power users in virtual desktop infrastructure (VDI) environments. We define power users as those whose work demands high performance—35 IOPs or greater per desktop is a good metric.

Engineering and healthcare (because of the bandwidth consumed by imaging) are examples.

One of the great things about NetApp is that we can leverage our full portfolio to offer you a storage solution that's best suited to your unique combination of desktops, performance, and capacity requirements. A VDI environment can be deployed on either the EF550 alone or on a combination of EF and FAS, where the EF storage is reserved for the support of power users. Additionally, NetApp has partnered with Atlantis Computing to create a solution that delivers extreme IOPS for VDI power users.

Atlantis ILIO software enhances the way that virtual machines interact with storage, optimizing I/O based on content and providing inline deduplication, wire-speed compression, and write coalescing. It's easy to deploy and manage, and it provides a better-than-PC user experience with improved economics.



**Figure 3)** Combining an EF flash array with Atlantis ILIO software results in an efficient, high-performance storage environment for VDI power users.

Check out the solution brief and white paper on the Atlantis website for more details:

- [Solution Brief: High-Performance Persistent VDI Powered by Atlantis ILIO and NetApp EF All-Flash Array](#)
- [White Paper: High-Performance Persistent Virtual Desktop Architecture Powered by NetApp EF All-Flash Array and Atlantis ILIO](#)

### I/O Offload

Shared storage offers tremendous advantages, but occasionally there are I/O-intensive workloads that negatively impact shared storage environments by consuming valuable compute resources. In many cases, these are temporary workflows, such as scratch space or swap space, that require high I/O, but are typically purged after a number of days and don't need the efficiency and protection features of shared storage.

A [global software developer](#) had exactly this issue with its software build environment, which required extremely

fast storage for temporary data generated during active code builds, but was not needed after the builds completed. The company brought in multiple EF arrays to complement their existing FAS environment by providing resilient, high-performance storage specifically for scratch space, doubling the throughput of their software build system. Both the uncompiled source files and the final, compiled code are always written to FAS, where they benefit from the data protection and storage efficiency capabilities of Data ONTAP. This change allows the company to run more builds in parallel and to complete more builds per day, reducing time to market.

## Overprovisioning

A final use case for the EF550 is the classic overprovisioning scenario in tier 1 application environments. The fastest HDDs deliver only 200-300 IOPS. As a result, scaling to 200,000 or 300,000 IOPS may require thousands of drives, even when the capacity is not needed. The result is often large numbers of disks that are used to only 20% or 30% capacity.

A single, 2U EF550 can take the place of two or more racks of traditional disk storage when it has been overprovisioned in this fashion. That's the same or greater IOPS performance at lower latency with up to 95% less rack space, power, and cooling required.

## Conclusion

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The EF-Series all-flash arrays have been extremely successful because they deliver great performance with submillisecond latency, along with the enterprise features and proven reliability that mission-critical applications need. We've had 20 years of experience designing high-performance storage for production environments, including some of the most demanding tier 1 database environments. The result is a resilient and highly efficient design that's well suited to the extreme demands of latency-sensitive workloads. Bottom line, you can feel confident that the new EF550 will meet or exceed your performance and reliability expectations with no surprises.

The EF550 flash array can be ordered as of December 2013 and will begin shipping in January 2014. Upgrades from the EF540 to the EF550 will also be available.

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## By Rip Wilson, Technical Marketing Manager

Rip is a veteran of the computer and storage industry, with over 20 years of experience with enterprise storage solutions. For the past 14 years he's supported E-Series as a technical marketing manager, authoring technical content and traveling the world training our field, partners, and customers on E-Series technology. Rip is now responsible for our all-flash systems.

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