By DCIG Lead Analyst Jerome M Wendt

HP 3PAR StoreServ 7450 Comes Locked and Loaded as an All Flash Array

All flash arrays are the next big thing in storage. But delivering on flash’s promise requires an array that offers more than just fast performance and high levels of data integrity; it also must provide a robust architecture backed by proven, mature array management software. The HP 3PAR StoreServ 7450 all flash array comes locked and loaded with all of these features.

Flash’s high performance and low power consumption makes it almost an inevitable replacement for hard disk drives (HDDs) as a primary storage technology. Yet deploying flash storage arrays throughout the data center is more than a technology choice; it is becoming a “bet the farm” type of decision. By delivering the underlying technologies that an all flash array requires and complementing them with the mature, proven architecture available with the HP 3PAR StoreServ 7450, this becomes an easy choice.

The Inevitability of Flash-based Storage

Many analyst firms have for a number of years acknowledged that flash will rise to prominence in corporate data centers and likely replace HDDs as the primary storage technology in production storage arrays. As far back as 2009, the Gartner analyst group described flash as “one of the most important technologies in future data centers.” More recently in 2012 the analyst firm IDC forecast that worldwide solid state disk (SSD) shipments would increase at a compound annual growth rate (CAGR) of 51.5% from 2010 to 2015.

These predictions are becoming a reality. Flash memory start-ups such as Nimbus Data Systems, Pure Storage, Tegile Systems and others have emerged from stealth mode backed by tens of millions of dollars in venture capital investment and ship products with performance characteristics that make even the fastest HDD-based storage arrays seem slow by comparison.

At the same time, existing storage providers have also joined the all flash storage array fray. They are either acquiring flash memory storage providers (EMC acquired XtremeIO while IBM acquired Texas Memory Systems) or starting their own flash-based storage initiative such as NetApp did with its MARS project.

The initial case for flash memory storage arrays is in support of specific high performance applications. Applications such as client virtualization and databases can take full advantage of the 5–10x or greater boost in performance that flash memory storage arrays offer. Further, the software on all flash arrays provides specific features such as wear leveling and wear measurement that ensure flash’s durability and the integrity of the data stored on such arrays over time.

This combination of flash-based acquisitions, initiatives and start-ups leaves little doubt that flash will complement if not eventually replace HDDs as the primary storage technology used in high performance storage arrays. But as all flash arrays assume their new position in data storage and look to move up the data center storage stack, the features they offer must also expand.
Betting the Farm on Flash is a Different Conversation

The performance that organizations experience when running their most demanding applications on flash is prompting them to consider running more or even all of their applications on flash. While flash does cost more on a per GB basis than HDDs, its higher performance coupled with its substantially reduced power and cooling requirements versus HDDs make it compelling option. Couple these benefits with the increased focus that companies are putting on measuring a storage array’s effectiveness by how many dollars per IOP ($/IOP) they get from it and flash-based arrays almost seem like a no-brainer.

However a wholesale move from HDD-based arrays to flash arrays is more of a “bet the farm” type decision due to the scope of applications running on these arrays. Running more applications on flash changes the conversation as to what characteristics a flash memory storage array should possess as it necessitates that organizations answer questions beyond just “How well it performs?” and “Is data integrity preserved?”

For example, when used in this broader context, all flash arrays must take steps to minimize flash’s cost. This includes leveraging capacity optimization techniques such as small write allocation sizes and thin provisioning. It must also possess an architecture that scales the array’s network bandwidth and controller processing to keep up with and deliver all of the performance that flash has to offer.

Other intangible storage array features also come into play. Many of the applications accessing the all flash array will likely run on VMware and reside on virtual machines (VMs). In these cases, the all flash array should integrate with and support VMware APIs like the VMware APIs for Array Integration (VAAI) and VMware APIs for Data Protection (VADP).

Using VAAI organizations may manage the array using tools such as vSphere Server that is already installed and in use in many organizations to manage their virtualized environments. All flash arrays that support VADP give organizations new flexibility to use their existing backup software to take application-consistent array-based snapshots of their virtual machines (VMs) and then manage them using the backup software.

Array management software also has a role. Many emerging all flash arrays are only intended for use by a single application or department. However in larger enterprises and service providers, a single all flash array may be shared by multiple departments or companies but managed as if it were a single physical array belonging to a specific department or company. In these cases, they need but lack the array management software that safely shares the array’s resources.

Finally, organizations need a high level of confidence that that they can obtain the level of support when they need it should issues arise. While these issues might include array outages, it is supporting the day-to-day issues that more often than not create the real management headaches. These may include how to best configure and scale the all flash array so more applications may be added to it, troubleshooting network connectivity or even doing non-disruptive upgrades of its underlying microcode.

When these tasks need to be performed in mission critical environments, there is no margin for error. This is where having best practices in place on how to perform these tasks becomes important so that they can be executed upon flawlessly by an individual trained to perform them.

The HP 3PAR StoreServ 7450: Flash Innovation...

The HP 3PAR StoreServ 7450 stands out in marked contrast to other all flash arrays. Like other all flash arrays, it offers the new features that these arrays must possess to deliver the performance that organizations expect while taking the critical steps needed to mitigate flash’s shortcomings. For instance, the 3PAR StoreServ 7450 monitors flash memory segment usage and then allocates data to the least used segments. This approach, known as wear leveling, ensures that all segments wear out as evenly and as slowly as possible.

HP 3PAR StoreServ 7450 also does sequential writes to flash which addresses a peculiarity of flash memory. Random writes to various flash memory segments that do not completely fill these segments contributes to shortening flash’s life as future writes to that segment require that the existing data be copied, the entire segment erased and then the data rewritten with the new and old data. By bundling writes together and
then sequentially writing that data to each flash segment, HP 3PAR StoreServ 7450 fills the entire flash segment eliminating the need for repeated copies, erasures and writes and extends the life of the flash.

This is where the similarities between the HP 3PAR StoreServ 7450 and other all flash arrays begin to end and the key differentiators emerge. The flash component of the all flash HP 3PAR StoreServ 7450 sets it apart as it offers support for either MLC (multi-level cell) or SLC (single-level cell) flash.

SLC performs faster and is more resilient than MLC lasting up to 10x longer. However SLC’s benefits come at a price as it costs more than MLC. While most all flash array manufacturers (the HP 3PAR StoreServ 7450 included) address these MLC flash shortcomings by monitoring its usage and marking cells as “worn” when they have reached their erasure limit, the added durability and speed that SLC offers might be attractive for those organizations that have extremely performance sensitive applications with high data change rates. It is in these situations that the HP 3PAR StoreServ 7450 can provide either type of flash to meet the specific needs of the business.

... with Product Maturity

A number of storage vendors have been forced to offer a new storage array architecture in order to deliver an all flash array. The problem this presents, especially in the case of all flash arrays, is that introducing a new array model means that they often need to start from scratch when it comes to the array’s code maturity and feature functionality. Yet many storage providers are being forced down this path simply because their existing storage arrays cannot scale or be re-architected to deliver all of the performance that flash offers.

The HP 3PAR StoreServ 7450 suffers from no such design limitations. Rather the 3PAR StoreServ 7450 offers a full-mesh interconnect architecture that concurrently accesses and presents LUNs to any of the up to four (4) controllers that manage it. This offers two key advantages over other traditional storage architectures.

• **Uses purpose-built ASICs.** Most traditional modular storage arrays use two controllers based on general purpose processors such as Intel chips. While these chips work reasonably well when handling the workloads associated with storing and retrieving data from slower HDDs, the speed of flash overwhelms these processors so that these arrays cannot offer the full performance benefits of flash.

The availability of ASICs (Application-specific Integrated Circuits) in the HP 3PAR StoreServ controllers ensures that they can keep up with flash’s heightened performance demands. HP has the flexibility to customize the programming of the chips so that they are now optimized to handle flash’s idiosyncrasies as well as take advantage of the performance it offers versus HDDs.

• **Full-mesh interconnect.** Powerful controllers only matters if they can quickly access the data on the flash. To accomplish that, the HP 3PAR StoreServ uses its full mesh interconnect so that every controller has access to all back end flash so it may be presented to any host.

HP 3PAR StoreServ 7450 also takes the additional step to stripe data across its available capacity—a trait that is likely **not** present in other all flash arrays. While HP 3PAR StoreServ was originally built to meet the specific requirements of virtualized environments when it was using HDDs, the value of its system wide striping is amplified in an all flash array.
As it turns out, these features directly align with the need to effectively and efficiently manage flash. By leveraging its existing ability to do small write allocations, minimizing storage allocations through thin provisioning and identifying and reclaiming storage capacity with its zero detection feature and combining that with its new ability to optimize writes to flash, HP 3PAR StoreServ 7450 has a decided advantage over other all flash array offerings from both new and existing storage providers.

Yet what may help to make the HP 3PAR StoreServ 7450 all flash array a slam dunk is its mature, proven array management software. New array entrants into the all flash array market will have to get certifications from hypervisor providers like Citrix, Microsoft and VMware and develop their own replication and snapshot software. Further, they are going to have to beg, borrow and steal to get customers using their product so they can get customer references.

The HP 3PAR StoreServ 7450 bypasses these challenges. All of its existing integration with Citrix XenServer, Microsoft Hyper-V and VMware vSphere carry forward. Its replication and snapshot software has been in use for years across thousands of deployments with HP 3PAR StoreServ in use by 3 out of 4 of the world’s largest service providers. In short, the HP 3PAR StoreServ 7450 comes locked and loaded as an all flash array providing organizations the primary, single storage solution they want.

**The HP 3PAR StoreServ 7450 Delivers the Future of Flash Now**

Flash may be the future of storage but companies still need to live in the present. They see flash’s potential and recognize it is ready to be deployed in support of a few specific applications. However before they deploy it more widely they need assurance that it is ready to meet their broader enterprise requirements.

The HP 3PAR StoreServ 7450 provides the new innovation that an all flash arrays must offer to support flash. However it just as importantly brings forward a robust architecture and proven and mature array management software that they need in order to justify betting the farm on it.

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