



HP Covers All SAN Bases With Federated Storage Area Management

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Management Summary

HP's Federated Storage Area Management (FSAM) is both a far-reaching and pragmatic initiative to satisfy increasing storage requirements. It envisions a network of diverse storage resources that are pooled together and managed centrally. Each administrator is able to manage ten times more storage – crucial to keep pace with the rapid data growth of the Information Age and to keep personnel costs down. And enterprises receive the best overall set of benefits: performance (i.e., speed and availability), flexibility, and cost-effectiveness. **As the technology to implement the FSAM vision steadily evolves and improves, HP today offers a continuum of storage solutions that allow enterprises to buy according to their current needs and move over time toward the ideal.**

Accordingly, HP offers not one, not two, but *three* ways to implementing a storage area network (SAN) – widely considered a foundational technology for efficient, scalable storage. This SAN trio reflects the major trends of where the storage industry has been and is going. All of them deliver performance, flexibility, and cost-effectiveness. Why three then? Each has a strong suit that will appeal to certain enterprises. Choosing the best one is matter of knowing what is important to you:

- **Traditional, single-vendor SAN** – for those who value high performance and mature technology more than procurement flexibility and low cost. It includes HP storage arrays and switches and connects to host servers running multiple operating systems.
- **Multi-vendor SAN managed by HP's *OpenView Storage Area Management suite*** – for those who value high performance, procurement flexibility, minimal technology disruption, and lower (but not lowest) cost of ownership. It allows enterprises with heterogeneous storage arrays, switches, and servers to gain control over and centrally manage the storage infrastructure.
- **Multi-vendor SAN implemented with HP's *SANlink or StorageApps sv3000*** – for those who value lowest cost of ownership more than procurement flexibility and highest performance. These SAN-wide virtualization platforms present multiple, heterogeneous arrays as a single pool of storage and deliver advanced functionality like data replication and security.

Again, it is not a matter of choosing one benefit or the other, but deciding which are more important. Differences between the solutions become amplified as storage scales, so the impact of a decision today will increase as capacity grows in the future. To help decide which is best for you, read on for a more in-depth look at HP's three SAN approaches.

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Traditional Single-Vendor SAN

In a few short years, storage area networks (SANs) have become mainstream technology, especially for larger enterprises. A SAN abstracts storage arrays from individual servers and consolidates them into a common, partitionable pool that is accessible by multiple open servers and, in some cases, even mainframes. As a result, enterprises have enjoyed higher storage utilization, simpler management, shorter backup windows, and ultimately a lower total cost of ownership (TCO).

Homogeneous or single-vendor SANs¹ have been the norm because of interoperability issues and management complexities. Implementations of Fibre Channel, the de facto standard interconnect for SANs², have differed to a degree from vendor to vendor. One could not assume plug-and-play between equipment such as host bus adapters (HBAs), switches/hubs, and storage arrays. Therefore, storage vendors invested in extensive testing and specific adaptations to ensure interoperability in their particular solutions. General interoperability has come more slowly through industry consortiums such as FCIA³ and SNIA⁴. Furthermore, it is more effort to administer heterogeneous storage arrays because of the need to manage them separately and operate multiple device managers. As a result, most enterprises to date have implemented single-vendor SANs.

HP offers single-vendor enterprise SANs based on its *Disk Array xp512* and *xp48* products. The *xp* family is a high-end storage platform with no single point of failure, a crossbar architecture for high performance, and advanced features such as real-time mirroring, point-in-time copy, LUN⁵ access control, and performance management. **A SAN implemented with a single Disk Array xP512 can scale to 55 TB and connect to 50 heterogeneous servers.**

¹ Implies using storage arrays from only one vendor, and most likely one vendor for switches/hubs and host bus adapters as well. It does *not* imply a single host server vendor or operating system.

² See **The Clipper Group Explorer** dated December 14, 2001, entitled *Fibre Channel – The Defending Champion Has Staying Power* on Clipper's publications page at <http://www.clipper.com/publications.htm>.

³ Fibre Channel Industry Association.

⁴ Storage Networking Industry Association.

⁵ Logical Unit Number – a unit of capacity typically comprised of multiple blocks

HP also offers entry-level SANs based on its Virtual Array 7400 and 7100 products. These lower-cost, mid-range storage arrays are cleverly designed to continuously self-tune performance and allow for non-disruptive expansion and reconfiguration. **A SAN with a single VA 7400 can scale to 7.7 TB and connect to 12 hosts.**

A key benefit of HP's single-vendor SAN solutions is that they are tried and true. HP has had experience in selling enterprise SANs that are well accepted by the marketplace. IT managers would not be perceived as taking a technology risk to install one. Interoperability issues have been resolved. Data is secure even in a shared environment with multiple operating systems, thanks to array-based LUN masking. Performance in terms of bandwidth (MB/s), throughput (IOPS), and system availability is very-good-to-excellent, especially in high-availability configurations with redundant paths and replicated data.

The downside of a single-vendor SAN is being limited to HP's particular feature set, price, and services. **Though HP's offering is broad, many enterprises would like to have the flexibility to deploy products from multiple vendors.** IT departments could save on acquisition costs by creating classes of storage and allocating them according to the price/performance requirements of each application (e.g., less expensive and less robust storage for non-critical applications). Competition would also bring more leverage in purchasing. Though single-vendor SANs are trusted and perform well, new technologies are available that open up the possibility of multi-vendor SANs.

Multi-Vendor SAN with OpenView SAM

Assuming the devices in a multi-vendor SAN can connect together and communicate – which is now possible if heterogeneous storage arrays are in different zones⁶ – the management dilemma still exists. Coordinating all of the interconnected devices to work well together and meet user performance expectations is no easy task. Trying to manage each piece of equipment separately using device-specific element managers is a bit like herding cats. **A conductor is needed to stand up in front and**

⁶ Zoning allows devices connected to a switch to be logically isolated into groups.

direct the entire orchestra of storage.

HP's answer is *OpenView Storage Area Manager (SAM)*, a software suite that can **direct and coordinate the entire storage infrastructure from one console.** Though it can bring greater efficiencies to a single-vendor SAN, it really shines in a heterogeneous environment by reducing management complexity and administrative work. Ultimately, it helps storage fulfill its purpose – meeting service levels by application or user. OpenView SAM has several components:

- **Storage node manager** – device discovery, status and event monitoring, and topology mapping
- **Storage allocator** – manages and allocates storage securely at the LUN level by controlling the LUN masking feature in each storage array
- **Storage builder** – tracks storage allocation and utilization for capacity planning
- **Storage optimizer** – monitors end-to-end bandwidth and throughput for performance management
- **Storage accountant** – measures storage usage by application, user, or department for charge-back purposes

While OpenView SAM performs these higher-level management tasks, it is also able to directly launch individual element managers when necessary.

OpenView SAM currently supports – to varying degrees – storage arrays from HP, EMC, Compaq, IBM, Sun, and Seagate. For instance, it supports all features on HP products, all but performance monitoring for EMC, and node management and LUN access control for IBM. It also supports various models of switches, hubs, bridges, and tape drives, as well as HP-UX, Windows NT/2000, Sun Solaris, and Red Hat Linux host operating systems. Expect HP to add products and more comprehensive support over time.

A multi-vendor SAN managed by OpenView SAM can maintain high performance while improving cost-effectiveness and flexibility. It simplifies management and frees IT departments to deploy multiple makes and models of storage, taking advantage of unique

features and different price/performance points. It lowers acquisition costs by enabling classes of storage and by encouraging competition among array vendors. OpenView SAM can also improve asset utilization, thereby deferring storage purchases. Adding an overarching management layer to existing hardware and software assets extends their value while minimizing technology disruption.

There are a couple of tradeoffs, however. Enterprises using array-based features must continue to purchase software licenses for each new storage array. As storage vendors shift more value and price to software (e.g., remote mirroring, point-in-time copy, performance tuning, LUN access control, device management) costs can add up and reduce economies of scale, especially if the array software is only used for a subset of the array's capacity. Furthermore, though OpenView SAM takes care of many management tasks, IT administrators still must learn and operate a different element manager for each brand of equipment, especially if more advanced software features are employed. This affects administration costs – the largest portion of storage TCO. **Enterprises that want to pursue even greater economies may want to consider HP's third SAN approach.**

Multi-Vendor SAN with SANlink or StorageApps sv3000

This approach represents a more radical shift in technology. **It involves moving storage intelligence from storage arrays and servers to a central location in the network⁷ – a SAN-wide virtualization platform.** HP's platform resides in the data path and joins together heterogeneous servers and storage arrays. Therefore, it is able to process data real-time and perform advanced functions like data replication and storage virtualization⁸ across all connected devices. This goes well beyond the purview of the OpenView SAM solution, which handles high-level management tasks and controls limited functions in the storage arrays. A virtualization platform is more than a conductor directing storage components; it actually becomes the cornerstone of a highly cost-

⁷ See *The Clipper Group Explorer* dated February 22, 2002, entitled *Intelligent Storage Networks – Creating A More Cost-Effective Storage Infrastructure* at <http://www.clipper.com/publications.htm>.

⁸ Presenting multiple, heterogeneous storage arrays as a single logical entity to servers.

effective and unified storage infrastructure.

HP's high-end virtualization appliance is SANlink, and its entry-level version is StorageApps sv3000. They provide 32 and 14 Fibre Channel ports, respectively, for connecting to storage arrays and host servers. Through a switched fabric, the platforms can connect to as many as 256 servers running a variety of operating systems – HP-UX, Sun Solaris, Windows NT/2000, and Linux (on the sv3000 only). They can support multiple storage arrays from HP, Dell, LSI Logic, Hitachi, EMC, and Compaq (on the sv3000 only).

SANlink and StorageApps sv3000 present all arrays as a pool of storage that can be reallocated and expanded as necessary and without disruption. They can mirror data across Fibre Channel or IP links for disaster recovery, as well as create snapshot copies. To ensure data security, they provide LUN-to-HBA mapping. The platforms also contain redundant components for high availability. Furthermore, the utility *SANmaster* provides centralized management of the platforms and monitors connected storage arrays.

Of the three approaches to building a SAN, a SAN-wide virtualization platform delivers the lowest TCO. Not only can IT departments create classes of storage to lower acquisition costs, but they can purchase more basic storage arrays without costly add-on software. Since all connected devices can take advantage of the appliance's advanced functionality, there is no need to purchase licenses for array-based or server-based software. It also extends the value and useful life of existing storage assets. Furthermore, administrators can perform management functions centrally with *SANmaster*. The need to use individual device managers is minimized since most functionality resides in the virtualization platform. **Lower acquisition costs, lower management costs, and longer useful life all mean one thing: BIG SAVINGS.**

The tradeoff – and there are always tradeoffs – is less flexibility and possibly lower performance. **With SANlink or StorageApps sv3000 as the cornerstone of an enterprise's storage infrastructure, the enterprise is essentially committed to its feature set (i.e., data replication, security, etc.) for all storage assets.** As an intelligent platform that resides in the data path, it might also introduce data transfer latency and bandwidth limitations. However, performance tests show the impact is

minimal within certain constraints.⁹

Conclusion

A SAN is a strategic decision. **In many cases, a SAN is a necessary investment to cope with growing storage requirements and limited IT budgets.** Furthermore, since it supports enterprise applications like ERP, CRM, e-commerce, and e-mail, a high-performing and well-managed SAN can translate into more productive business processes and ultimately a healthier bottom line.

For its part, HP is covering all bases on the SAN playing field by offering traditional, single-vendor solutions as well as up-and-coming multi-vendor SANs enabled by OpenView SAM software and the SANlink and StorageApps sv3000 virtualization appliances. With this comprehensive approach, HP is recognizing that the industry is moving toward intelligent storage networks, but also that the transition will take time. **The strength of the FSAM strategy is that it is visionary enough to acknowledge the endgame and pragmatic enough to set forth a broad and continuous path to reach it.** By giving options, HP is letting customers decide when and how to move to *the next thing*.

Therefore, enterprises considering the three SAN options must do some soul-searching and decide what is most important. There is no “one-size-fits-all” answer at this point. If you want a solid, fully-integrated solution, are inclined to play it safe, and don't feel the need to reach for greater flexibility or cost-effectiveness, consider one of HP's single-vendor SANs. If you are willing to make a leap to the next thing in pursuit of greater flexibility and/or lower TCO, consider a multi-vendor SAN with OpenView SAM, SANlink, or StorageApps sv3000. **That's the great thing about choices – you are the one who gets to decide.**



⁹ No more than 3 or 4 storage arrays and a queue depth of 32 or less I/Os per LUN.

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