

High-Performance Fibre Channel Gains Foothold — IBM Introduces 4Gbps DS4800 Array

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Management Summary

Technology is truly amazing. It can find a solution to just about any problem. In fact, technology can solve many problems that we didn't even know we had! Take consumer electronics, for example. Three decades ago, if we wanted to watch a movie, we had two choices: go to the theater and buy a ticket or wait until it was released for television. Unfortunately, many times a movie would be aired opposite another must-see program, and you couldn't watch both, or could you? Enter technology and Sony's development of the VCR with *Betamax* cassettes. Now you could watch one program and tape another, at the same time. Beta achieved instant popularity, selling over 30,000 units in 1976. Unfortunately, Betamax format had limitations and was not licensed effectively. It was supplanted in the public consciousness by another technological advance, *VHS*.

VHS had improvements in speed (rewind/fast forward) and capacity that we didn't realize we needed, but certainly used. Introduced in 1977 at around \$1,300, VHS soon replaced Betamax as the home standard and the cost dropped dramatically. Now we could record two and three times as many shows on a single cartridge. Furthermore, we could go to the mall and rent a movie as VHS achieved a level of standardization that Beta did not attain. Unfortunately, progress knows no limits, and DVD replaced VHS and now TiVo is challenging DVD, with new technologies about to appear.

Within the data center, we face a similar need to store more and more data. Disk capacity continues to grow in order to meet the insatiable demands of databases, corporate governance, and compliance. Unfortunately, communication speed to transmit this data from server to storage has not kept up with the demands of a select set of mission-critical applications. Storage area networks (SANs) were introduced a decade ago with a speed of 1Gbps. That capability has now doubled to 2Gbps. Unfortunately, throughput hovered at that point due to limitations in server bus capability even though disk capacities surged from Kilobytes to hundreds of gigabytes per drive. Now, with the development of PCI-X and PCI-Express bus architectures (technology, again), the ability to once again double throughput is available. 4Gbps SANs are now a reality. By the end of 2005, there will be HBAs, switches, disk arrays, and disk drives at 4Gbps.

In response to an increasing demand for this capability, several vendors have positioned themselves to deliver various components of a 4Gbps infrastructure. One, IBM, is positioned to deliver all aspects. To ensure that their customers are ready, IBM has announced the DS4800, a 4Gbps disk array. To see how the DS4800 can help your enterprise, please read on.

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Data Center Storage Goals

The storage goals of most enterprises, large or small, are similar: promote business continuity by protecting the enterprise data assets, increase the performance of the SAN, effect management controls on record-setting storage growth, and lower the total cost of ownership (TCO) through implementation of an Information Lifecycle Management (ILM) process¹ and the creation of primary and secondary tiers of storage, recognizing the different value that enterprise data has over the passage of time. There are many ways to accomplish this, but they all have a common theme:

- Remove complexity in order to simplify the administration of the network;
- Reduce infrastructure through consolidation in order to improve SAN reliability;
- Take advantage of technology in order to increase data center throughput; and
- Reduce the time required to secure the enterprise information.

The consolidation of storage resources into a SAN is one effective way to accomplish these goals. Consolidation enables the IT staff to remove complexity from the storage environment by eliminating the redundancies that have infiltrated the data center over the years from uncoordinated growth by independent departments. Consolidation enables the sharing of a storage resource by all of the enterprise servers, simplifying the management of the most important asset of the enterprise, information. In order to be an asset rather than a liability, however, the consolidated storage must reside on a highly-performant, scalable storage architecture that promotes **reliability, availability, and serviceability**: RAS. Due to the climate in which enterprise management lives today, the IT staff can add **security** to that list of attributes, protecting the data and protecting executives from prosecution.

Unfortunately, as enterprise storage is doubling every 12 to 18 months, enterprise applications are putting an ever-increasing strain on both the capacity and performance of that single pool. In addition, as the data grows, management of

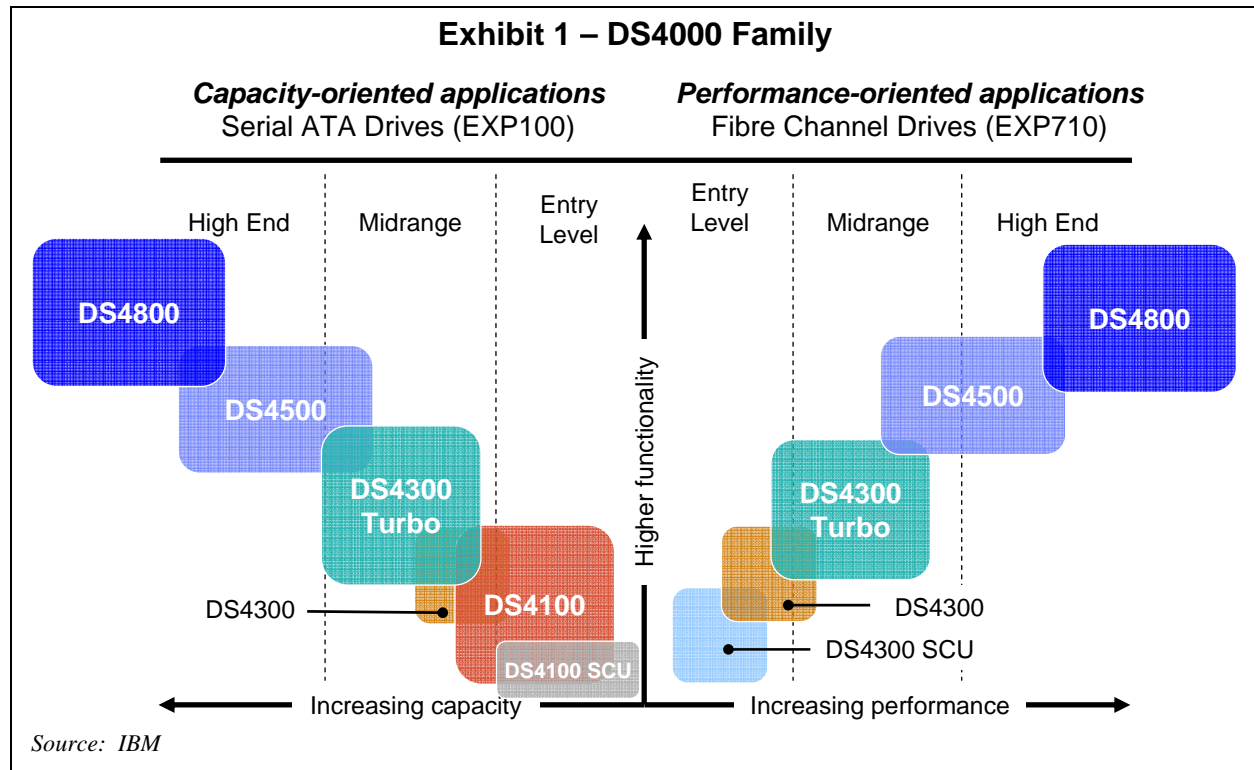
backups and disaster recovery processes becomes more important. The IT staff must address both the hardware and software aspects of SAN growth. Further, as the enterprise becomes more dependent on this asset, it becomes more important to ensure its resiliency. Enterprise data must be available on a 7x24x365 basis. Therefore, any plans for growth must include business continuity functionality with features such as high-availability, no single-point-of-failure, hot-swap components, and on-demand scalability. Scalability is a key with regard to removing complexity from the data center as it promotes the reduction of storage infrastructure, with the elimination of redundant adapters, cables, and switches. Scalability can also enable the implementation of a multi-tiered environment, with the integration of both primary and secondary data in a single array to lower the TCO. To do this, however, requires technological advances in terms of network throughput, flexibility, and resiliency in order to achieve the levels of response and reliability required.

One system supplier is trying to stay on the crest of the technology wave by offering a variety of SAN solutions, positioned for tomorrow, for all sized enterprises. Over the past 12 months, IBM has announced a family of storage arrays, tailoring storage solutions to the storage requirements of smaller businesses as well as the enterprise requirements of the largest corporations. At the entry level, IBM has announced the *DS300/400*, iSCSI, and Fibre Channel (FC) arrays. At the high-end enterprise levels, they have announced the *DS6000/8000* with superior scalability and functionality, with a price to match. For the midrange customer who can get by with *only* 67TB of storage, the *DS4000*, with its latest addition, the *DS4800*, may be the right solution for your enterprise

The TotalStorage DS Family

Recognizing that storage must keep pace with the never-ending growth of data in the mid-sized enterprise, IBM has transitioned their FASTT arrays into the TotalStorage DS4000 family of capacity- and performance-centric storage arrays. (See Exhibit 1.) Configured with SATA drives in an EXP100 expansion drawer, the DS4000 can scale with low-cost devices in a capacity-centric environment, especially useful for accessing secondary data in an ILM environment. Configured with FC drives, the DS4000 turns into a family of high performance arrays to access mission-critical information in the most sensitive

¹ See **The Clipper Group Explorer** dated August 29, 2002, entitled *Tiered Storage Classes Save Money — Getting the Most Out Of Your Storage Infrastructure* and available at <http://www.clipper.com/research/TCG2002030.pdf>.



environments. Building on the proven heritage with Engenio, IBM has protected the investment that its customers have made in FAS^T arrays, while partnering with Engenio for the development of the latest enhanced technology, 4Gbps FC², within the DS4800.

Targeted at enterprises with compute-intensive applications and replication requirements, 4Gbps enables the data center to maximize its ROI by doubling the performance through each FC port at the same cost per port as 2Gbps FC, when it was introduced over five years ago. Because storage systems are staying in production longer, any new technology must be backward compatible with previous generations. Based upon Engenio's 6th generation DS4800 RAID controller that can auto-negotiate between 1, 2, and 4Gbps architectures, 4Gb FC can coexist with these slower SAN storage arrays. This enables data centers to maintain the value of their installed hardware, where appropriate, integrating it into an ILM architecture, creating a multi-tiered environment. 4Gbps SANs also provide an ideal framework for consolidation.

In addition to simplifying your infrastructure

with fewer HBAs, switches, and cables required, consolidation reduces the amount of floor space and power required to house the storage pool, as well as reducing the size of the IT staff required to manage the SAN. Reduction in staffing, however, also increases the importance of implementing an automated storage management system. IBM has done this with common applications throughout the family to provision, virtualize, and protect enterprise storage.

As a proposed solution for the largest mid-range business or a small enterprise, the DS4800 replaces the DS4500, with 2Gbps technology, as the flagship of the DS4000 family. At the same time, IBM has reduced the price for the DS4500 and brought the DS4400, at 2Gbps, to end-of-life. In addition, IBM has introduced a 4Gbps switch from Brocade to allow for the immediate installation of a new, high-speed SAN infrastructure, with 4Gbps adaptors scheduled to be available in 3Q05³. This enables data centers with existing DS4000 arrays to create a multi-tier SAN architecture with DS4800, DS4500, and DS4400 all participating in an ILM environment.

The DS4800 Configurability

The DS4800 adds outstanding scalability, performance, and resiliency to the data center

² See **The Clipper Group Explorer** dated May 24, 2005, entitled *Faster SANs Arrive for the Data Center – 4Gbps Fibre Channel Rolls Out* and available at <http://www.clipper.com/research/TCG2005030.pdf>.

³ 4Gbps disk devices are being forecast for 4Q05 or 1Q06.

Exhibit 2 – DS4800 Configurability

- Dual hot-swap controllers
- Eight 4Gbps host/switch ports
- Eight 4Gbps drive ports
- 4/8GB cache per dual-ctrlr (16GB TBD)
- 512MB of memory
- Lithium Ion battery for longer life in the event of a power loss
- Dual 10/100 Ethernet ports for out-of-band management
- Supports RAID 0, 1, 3, 5, 10
- Supports up to 64 partitions

with enterprise-level configurability. (See Exhibit 2, above.) Using the latest technology, the DS4800 isolates the host interface in a front-end daughter board. This makes the DS4800 easy to upgrade and extensible for new advanced fabric technologies.

The DS4800 supports up to 16 EXP100s with 250GB SATA drives at 7200 rpm or up to 16 EXP710s with FC drives⁴, with four EXPs connected to two ports for redundancy. This equates to a maximum capacity of 224 drives and a maximum of 67TB of storage. The data center can protect the investment made in existing expansion drawers by connecting them to the DS4800, which will automatically recognize the proper attachment speed. The DS4800 allows you to integrate both SATA and FC drives into the environment, by drawer. The DS4800 consists of three types of hot-swappable, field replaceable units (FRUs), with a total of five FRUs in the system, to facilitate easy repairs.

With 400MBps of bandwidth on each port, the DS4800 will support up to 3,200 MBps with 4Gbps drives. Until these drives become available, the DS4800 will have a throughput of 1600MBps. This is twice that of the DS4500 because of the additional ports and improved internal bus capability. In terms of transactional throughput, the DS4800 has a rating of 550,000 IOPS for burst I/O rate cache reads using a 2Gbps infrastructure. This is three times the rating of the DS4500 (148,000) because of the number of drive ports and the bus architecture. Projected performance numbers with 4Gbps drives are not yet

available.

In addition to the hardware configurability, the DS4800 offers significant business continuity functionality with resilient copy services available from IBM's *FlashCopy*, *VolumeCopy*, and enhanced remote mirroring options that include *Global Copy*, *Global Mirror*, and *Metro Mirror*. The DS4800 also offers automated storage management, integrated into the Tivoli storage management functionality, to improve efficiency and to lower the TCO further.

Conclusion

The IT industry is heading toward 4Gbps technology. It will dominate the sales of new storage infrastructure in enterprises of all sizes by the end of 2006. It will become dominant in your data center, as well. All new storage products will be based on 4Gbps and your IT staff needs to prepare their enterprise infrastructure to support it as they upgrade and expand the enterprise storage environment.

The DS4800 will enable you to not only lay the groundwork for improved performance, but it will also enable your IT staff to implement a single, tiered SAN for an ILM architecture and simplify the enterprise storage infrastructure, reducing the TCO of the data center. An end-to-end 4Gbps solution will minimize the impact of mirroring on production environments and enable backups to be completed within their designated windows.

Before you add additional 2Gbps infrastructure within the enterprise data center, take a look at the DS4800 and how it can improve your cost/performance today, while preparing your SAN for the decade ahead.



⁴ Currently, 2Gbps FC drives are available from 36.4 – 300GB at 10K rpm or 18.2 to 146.8GB at 15K rpm.

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