



IBM TotalStorage DS6800 – Upper Class Storage for Middle Class Budgets

Analyst: Michael Fisch

Management Summary

From time to time, something new comes along that does not quite fit into existing categories. Consider the mountain bike that is now popular for off-road and trail riding. It is a relatively new invention, manufactured in volume starting in the early 1980s. It differs from racing and touring cycles in its fat tires and a sturdier frame, gears, and brakes. It also differs from BMX because of its larger size and ability to deliver a comfortable ride over long distances, not just stunts and short races. Therefore, the mountain bike does not really fit into those prior bicycle categories, and it has become a category unto itself.

Could the same be said of the new IBM TotalStorage DS6800? It breaks the mould of what one might expect in a storage array focused on the midrange. At first glance, it appears to be a new space-efficient modular array. The base unit has dual controllers and almost 5 TB (16 drives) in a compact 3U package that weighs 125 lbs. A single person could conceivably slide the unit into a 19" rack and then configure it with the DS6800's wizard-driven, graphical user interface. This slick packaging is also efficient with power consumption and needs only single phase. The system can grow to 67 TB with 224 drives, which puts it at the upper end of the midrange in terms of scalability. List pricing starts at under \$100,000. The DS6800's price, ease-of-use, and pay-as-you-grow characteristics certainly suggest a midrange array.

However, the software capabilities of the DS6800 are very similar to the high end. It runs the same software code base as IBM's high-end *ESS 750* and *800* (a.k.a., *Shark*) and the new *DS8000* series. This code is quite stable after five years of refinement and development in the ESS products, contributing to overall availability. It also allows the DS6800 to connect to open systems (*Unix, Linux, and Windows*), *z/OS* and *z/VM* (mainframe), and *i5/OS (iSeries)* hosts – enabling broad storage consolidation. It has the same advanced replication and copy services as its bigger brethren, including *Global Copy, Metro Copy, and FlashCopy*. Thus, the DS6800's functionality is more suggestive of a high-end storage array. Performance is also quite good, delivering an estimated 310,000 IOPS and 1,400 MB/s.

Where does the DS6800 fit? Is it midrange or high-end? Perhaps it should be in its own category – something like “premium value” or “enterprise midrange.” It is like *upper class storage* for middle class budgets. **Categories aside, the value and capabilities it offers to enterprises are the most important considerations, and the DS6800 has a solid story here.** Read on for details.

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IBM TotalStorage Family

IBM recently refreshed its *TotalStorage* family of disk storage solutions. It now includes the *DS300* and *DS400*¹ at the entry level, the *DS4000* series in the midrange, and the new *DS6800* and *DS8000*² series that span an “enterprise continuum” from the midrange through the high end. **The TotalStorage family addresses a broad swath of storage requirements – from basic to advanced, small to large – as measured in terms of capacity, performance, availability, business continuity options, complexity of environment, and price.** It corresponds to the reality that enterprises vary in size and degree of complexity. It also corresponds to the need to store information in different service-level tiers as its value changes over time – also known as *information lifecycle management*³ (*ILM*).

The TotalStorage DS6800, DS8100, and DS8300 are the newest members of the family. They share a similar architecture, code base, and set of data and storage management services. The DS8000 series is the successor to the *TotalStorage ESS* or *Shark* series of high-end storage arrays. The DS6800 is something altogether new.

The Altogether New DS6800

The DS6800 is a modular storage array focused primarily on the midrange with some high-end characteristics that you would not necessarily expect. It breaks the mould, in a sense. The DS6000 is based on the IBM PowerPC Architecture running three PowerPC 750 microprocessors on each controller. It has dual active controllers with up to 4 GB of mirrored cache. Eight Fibre

Channel or FICON host ports connect to a maximum of 1,024 host servers through a SAN. A Fibre Channel switched fabric connects the controllers and disk drives and enhances performance and service-ability. It scales in modular, 3U high, units to a maximum of 67 TB. *See the chart on the next page for the technical details.*

Modular Architecture

The DS6800’s building-block architecture scales in small, discrete units while preserving a single system image. An enterprise can start with a rack-mounted controller unit that is 3U in size and contains 8 or 16 drives. As needs increase, it can add drives in groups of 8 (later 4), with up to 16 per 3U expansion unit, and 13 expansion units total. The system tops out at 224 drives or 67 TB using 300 GB drives. The economic benefit is “pay-as-you-grow,” with incremental investments in capacity on an as-needed basis. This fine-grained scalability enables more conservative and gradual financial outlays, as opposed to a large upfront expenditure.

High Density

Related to modularity is density because it delivers efficiency of space and power. Data center floors space is valuable real estate, especially in and around metro areas. Electricity costs are significant, too. A DS6800 with 4.8 TB consumes about 2.5% of the space as the prior-generation ESS 750 with equivalent capacity. It also requires only 14% of the power⁴ (single-phase). This juxtaposition is remarkable. By allowing enterprises to do more with less real estate and power, it lowers operating costs. IBM achieved this level of density through micro componentry and a clever balance of dense layout and effective cooling.

Resiliency

Consistent access to data is important because it translates into application uptime and productivity. The DS6800 is “bullet-proofed” with a variety of RAS⁵ features.

¹ See *IBM Introduces SAN Storage for the Entry SMB - A Storage Strategy Appears* in **The Clipper Group Navigator** dated October 9, 2004, and available at <http://www.clipper.com/research/TCG2004084.pdf>.

² See *True Enterprise Storage for On-Demand Data Centers - IBM Introduces TotalStorage DS8000* in **The Clipper Group Navigator** dated October 9, 2004, and available at <http://www.clipper.com/research/TCG2004086.pdf>.

³ See *Top 10 Things You Should Know About Information Lifecycle Management* in **The Clipper Group Explorer** dated May 11, 2004, at <http://www.clipper.com/research/TCG2004041R.pdf>.

⁴ The controller and expansion units consume 0.69 kVA and 0.48 kVA, respectively.

⁵ Reliability, availability, and service-ability.

IBM TotalStorage DS6800 and DS8000 Series – At A Glance

	DS6800	DS8100	DS8300
Controllers	Dual active	Dual active	Dual active
Processor	PowerPC 750	2-way 1.5 GHz IBM Power5	4-way 1.9 GHz IBM Power5
Max drives	224	384	640
Supported drives (Fibre Channel)	73 GB @ 15k 146, 300 GB @ 10k	73 GB @ 15k 146, 300 GB @ 10k	73 GB @ 15k 146, 300 GB @ 10k
Max capacity	67 TB	115 TB	192 TB
RAID levels	5, 10	5, 10	5, 10
Max cache	4 GB	128 GB	256 GB
Max host ports	8	64	128
Max hosts (via SAN)	1,024	8,000	8,000
Host connections	Fibre Channel, FICON	Fibre Channel, FICON, ESCON	Fibre Channel, FICON, ESCON
Est. max cache reads	310,000 IOPS	1,700,000 IOPS (using 2k records)	3,400,000 IOPS (using 2k records)
Est. max seq. reads	1,400 MB/s	1,800 - 2,000 MB/s	3,600 - 4,000 MB/s
Host operating systems	<i>Windows, Linux, AIX, HP-UX, VMWare, Solaris, z/OS, z/VM, i5/OS, and more</i>	<i>Windows, Linux, AIX, HP-UX, VMWare, Solaris, z/OS, z/VM, i5/OS, and more</i>	<i>Windows, Linux, AIX, HP-UX, VMWare, Solaris, z/OS, z/VM, i5/OS, and more</i>
Packaging	3U per controller & per expansion unit	1 to 2 frames	1 to 3 frames

Redundant hardware includes dual active controllers that provide access to all drives in the event of a failure, mirrored cache, N+1 power and cooling, RAID, dual-ported Fibre Channel drives, and four backend switched fabric connections to each drive port. Battery backup protects volatile memory in case of power failure. The underlying hardware has self-healing and data integrity features like *Chipkill* ECC, memory scrubbing, and LRC and other metadata protecting each sector of data. System upgrades and configurations are non-disruptive and components are hot swappable.

On the software side, the DS6800 re-uses the same code as on the high-end *ESS*. Like a manuscript for a book, software code is never perfect on the first iteration. It takes testing, time, correction, and real-life usage to become more stable. The benefit is that IBM has refined and enhanced this code for the last five years, so it is more robust.

Advanced Replication Services

Because the DS6800 runs the *ESS* code

base, it provides the same high-end replication features like *Metro Mirror*, *Global Mirror*, and *FlashCopy*. These are useful for business continuity, disaster recovery, and repurposing data. The DS6800 is also compatible with the *ESS* and the new DS8000 series, so it can replicate data to and from these high-end arrays. It offers a less-expensive target mirror for a remote disaster recovery solution, helping to lower costs.

Full Enterprise Host Support

Another result of this common code base is the ability to support open systems and mainframe environments. No other midrange array with a similar architecture has this capability. The DS6800 supports *Windows*, *Linux*, *AIX*, *HP-UX*, *VMWare*, *Solaris*, *z/OS* and *z/VM* on the mainframe, and *i5/OS* (formerly known as *AS/400*). There are a couple of benefits here. First, more opportunities for storage consolidation exist in an array with broad host OS support. Second, enterprises with mainframes and only moderate storage requirements have a lower-cost storage option.

Performance

The performance of the DS6800 places it in the upper midrange, possibly reaching into the high end. It delivers 310,000 IOPS for cache reads and 1,400 MB/s for sequential reads according to IBM's performance estimates. Though these are best-case marketing specs, they are useful as back-of-the-envelope benchmarks.⁶ They suggest the DS6800 is very fast for a storage array positioned in the midrange and likely unbeatable on a physical size basis. It achieves this performance in large part due to its server architecture and the backend switched fabric. IBM is unique in its strategy to leverage the ongoing innovations in its pSeries line of Unix servers directly into its storage product line. It gives a de facto "rising tide" for future storage development efforts.

Management

Management simplicity is sought-after because it is the most significant factor in storage operating costs. It determines the amount of time and effort that skilled administrators must put in over time to install and keep a solution running.

As a product focused on the midrange, IBM designed the DS6800 for ease of installation and use. Enterprises install it with a wizard-based utility. For configuration and ongoing management, administrators use the same graphical user interface as the DS8000 series. This provides consistency in a product line that spans both the midrange and high end. The interface has remote and centralized management capabilities. For greater management centralization, the DS6800 can be managed by the IBM *TotalStorage Productivity Center*⁷ as well as through the SMI-S interface standard. The DS6800 can also participate in a broader virtualized and tiered storage infrastructure by connecting to the IBM *TotalStorage SAN*

⁶ Actual performance depends on an enterprise's particular workload and environment.

⁷ See *IBM TotalStorage Productivity Center – Seeing the Big Picture* in **The Clipper Group Navigator** dated April 8, 2004, at <http://www.clipper.com/research/TCG2004034.pdf>.

*Volume Controller*⁸.

Price

Price is the linchpin in the value equation for the DS6800. IBM leveraged internal technologies in developing this product (i.e., ESS software code, eSeries servers), which helped bring it to market at a relatively low cost point. In turn, IBM has priced it competitively for a midrange solution – especially given its feature set. Entry-level configurations start at under \$100,000.

Conclusion

The DS6800 delivers a lot in a compact package. It is like upper class storage for middle class budgets. There is a variety of uses for it, such as:

- Mid-sized storage consolidation,
- Enterprises with limited budgets that want "pay-as-you-grow",
- Storage where space and power are at a premium,
- Low-cost storage for mainframes with limited requirements
- Low-cost replication target (and even source) for advanced business continuity and disaster recovery solutions, and
- Secondary storage in a tiered infrastructure (especially when ATA drives become available in the future).

If your enterprise has similar requirements, consider the new TotalStorage DS6800. In light of its robustness and advanced features, IBM has priced this one for value.



⁸ See *Managing More Storage with Less Effort – IBM Unveils Its SAN Volume Controller* in **The Clipper Group Navigator** dated April 30, 2003, at <http://www.clipper.com/research/TCG2003018.pdf>.

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- ***The Clipper Group can be reached at 781-235-0085 and found on the web at www.clipper.com.***

About the Author

Michael Fisch is Director of Storage and Networking for The Clipper Group. He brings over eight years of experience in the computer industry working in sales, market analysis and positioning, and engineering. Mr. Fisch worked at EMC Corporation as a marketing program manager focused on service providers and as a competitive market analyst. Before that, he worked in international channel development, manufacturing, and technical support at Extended Systems, Inc. Mr. Fisch earned an MBA from Babson College and a Bachelor's degree in electrical engineering from the University of Idaho.

- ***Reach Michael Fisch via e-mail at mike.fisch@clipper.com or at 781-235-0085 Ext. 25. (Please dial "1-25" when you hear the automated attendant.)***

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