



Dell Delivers a Storage Infrastructure for the Virtual Environment

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Management Summary

We all make plans – we plan to do something tomorrow, we plan to do something else next week-end, and more importantly, we plan to go on vacation in six months. If tomorrow’s plans deal with being outside, we can check the evening news for the weather report. Generally speaking, you can trust the Channel 4 meteorologist, or the Weather Channel, to get tomorrow’s weather right. Not always, mind you, but generally (bring an umbrella, just in case). The weekend report, on the other hand, is a toss up; she might be right, but then again, probably not. When they are right five days in advance, they let you know on Monday – “We hit that one”. However, how many of us are willing to book our next vacation on what our local soothsayer is willing to predict? The *Farmer’s Almanac* probably has a better record of accomplishment, and that is printed a year in advance!

Predicting how much storage the data center will require over the next twelve months is a similar dilemma as the IT staff tries to reduce the storage total cost of ownership (TCO). Normal growth sees storage requirements doubling from one year to the next, not including the effects of new mission-critical applications or that acquisition that management have been talking about for months. However, that does not prevent the CIO from asking how much storage you will need “tomorrow”. Anyone on the IT staff is willing to tell you how much storage the enterprise will need next week, but next month, or next year, is another story. Times like that make you wonder why you didn’t get your degree in Meteorology!

Server sprawl in the data center has led to the consolidation of multiple, older open systems servers onto new, multi-core, multi-CPU platforms. In turn, these systems are virtualized, enabling multiple applications to run simultaneously using shared resources. Unfortunately, the older servers used direct-attached storage (DAS), unsuitable for sharing between networked servers. This led to the deployment of Fibre Channel (F.C.) storage area networks (SANs) to enable multiple servers to share a common resource. However, the cost of acquiring and maintaining a F.C. SAN is very expensive, for both the platform and the skill set necessary to support it. Because of the costs, F.C. SANs are mainly deployed in enterprise data centers; they are too costly for the SMB, or even the remote department of a large enterprise. Recently, however, data centers around the globe have begun to deploy SANs based upon iSCSI, using the IP protocol found on the Internet in every data center.

One of the primary proponents of iSCSI is Dell, with both their PowerVault MD3000i and the AX 4-5i platform acquired from EMC. In order to extend the reach of iSCSI into even larger IT environments, Dell acquired EqualLogic, one of the leaders in iSCSI storage development, and has now introduced the Dell EqualLogic PS5000 iSCSI SAN Array into the Dell product set. To learn more about the PS5000, please read on.

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The Data Center Storage Dilemma

The uncontrolled proliferation of open systems servers throughout the enterprise, along with shrinking IT budgets, has forced data center management to rethink the way that they deploy both business-critical and mission-critical applications in the data center. The existing architecture is replete with over-provisioned and under-utilized servers, many running at less than 20% of processing capacity. This has forced the CIO to change the data center deployment paradigm to lower the TCO of the IT infrastructure. Two major efforts are underway in most, if not all enterprises. The first is to consolidate multiple under-utilized servers onto fewer, multi-core platforms in order to eliminate over-provisioning and reduce the strain on the energy requirements of the data center¹. The second effort involves the virtualization of that platform to enable multiple applications, in fact multiple operating systems, to utilize fully the server processor capability and to share the same server resources. In addition to the improvement of asset utilization, virtualization also helps to conserve energy, improve the data center TCO, and equally important, help to improve application availability. **This effort has had a direct and immediate effect on the deployment of storage throughout the enterprise.**

The older architecture usually involved a single application commanding all of the server's resources in a scale-out environment with direct-attached storage (DAS). This had proven to be a simple and efficient method to deliver storage within the data center. Unfortunately, when you deploy a shared server environment, a multi-tiered storage resource must be available to not only all of the applications running on a single server; they must also be available to all of the servers in the data center. **Changing the server paradigm also requires you to change the storage paradigm.** A consolidated server architecture requires a storage area network (SAN) to make it operational.

The past decade has seen some of the largest data centers in the world migrating their storage from a DAS environment to a storage area network, or SAN, to be specific, a Fibre Channel SAN. F.C. SANs deliver high performance, high reliability, and advanced functionality to all connected servers. **Oh yes, they also deliver a very high acquisition price tag along with the requirement for uniquely skilled administrators in order to achieve that performance, reliability, and functionality.** So

¹ See the March 31, 2007, issue of *Clipper Notes* entitled *Reducing Cost and Improving Performance – Consolidating the Smaller Data Center*, which is available at <http://www.clipper.com/research/TCG2007049.pdf>.

high, in fact, that F.C. priced SANs out of the reach of the majority of small and medium businesses (SMBs), especially in support of mission-critical applications. In the past few years, however, a proven technology has been adapted to the storage environment to enable a less expensive SAN deployment. Using the IP technology that has enabled the Internet for decades, along with Gigabit Ethernet switches, storage vendors have developed an effective iSCSI-based architecture to enable the rollout of scalable iSCSI-based storage arrays². The data center can share an iSCSI SAN between enterprise servers, using the existing communications infrastructure, and even more importantly, using the same open systems skill sets that already exist within the data center staff. Now, in fact, the data center can deploy iSCSI-based SANs with advanced functionality similar to that available in a F.C. SAN in virtualized environments.

iSCSI SANs have become increasingly popular in virtualized *Windows* and *Linux* environments running under *VMware* or *Xen*, or some other hypervisor, especially in blade servers. In order to be attractive to an SMB, or department in a larger enterprise, the iSCSI SAN array must be affordable and capable of supporting Enterprise-class storage designed for mission- and business-critical environments. That environment must have **high performance, high availability, and business continuity**, among other data management capabilities. (See Exhibit 1, on next page.) In the past year alone, many companies have introduced iSCSI storage arrays into their storage lineup. One company, Dell, has been uniquely aggressive in promoting this architecture with both homegrown and OEMed products.

The Dell iSCSI Product Set

Dell offers a complete family of iSCSI platforms, geared mainly to the SMB, but gaining popularity within larger enterprises, especially in multi-tiered environments looking for an inexpensive, yet functional, secondary storage solution. For an entry-level solution, Dell offers the *PowerVault MD3000i SAN Array*³, along with the *PowerVault MD1000 Expansion Drawer*⁴, as an entry-level iSCSI array designed by Dell to support up to 16

² See the issue of *Clipper Notes* dated March 5, 2007, entitled *iSCSI SANs – Panacea or Placebo?*, and available at <http://www.clipper.com/research/TCG2007037.pdf>.

³ See *The Clipper Group Navigator* dated September 10, 2007, entitled *Dell Expands Storage Tiers for the SMB – Introduces Low-Cost, Extensible Storage*, which is available at <http://www.clipper.com/research/TCG2007087.pdf>.

⁴ See *The Clipper Group Navigator* dated June 23, 2006, entitled *Dell Expands Storage Portfolio – Provides Choice for All Tiers*, and available at <http://www.clipper.com/research/TCG2006051.pdf>.

SAN connected hosts with up to 45 SAS or SATA devices.

In February, Dell upgraded their SMB storage portfolio with the introduction of the *Dell AX4-5i*⁵, a scalable, consolidation solution replacing the Dell/EMC AX150i, which supported up to 10 iSCSI SAN, connected hosts. The AX4-5i supports up to 64 servers, with up to 45TB of SATA storage.

Dell recognized that there was a gap between their SMB level products and their high-end *Dell/EMC CX* family. Management, therefore, made the commitment to fill that gap. They did so by acquiring one of the leading lights of the iSCSI storage industry, EqualLogic⁶, and introducing a new family of iSCSI platforms under the Dell logo.

The Dell EqualLogic PS5000 Series

One week after announcing the completion of the acquisition of EqualLogic, Dell announced the introduction of a new set of Dell iSCSI storage arrays, the *PS Series iSCSI Arrays*, with a show of commitment that an investment of \$1.4B can foster. Reinforcing their commitment to virtualization and iSCSI as the path to IT simplification, Dell hit the ground running with the *Dell EqualLogic PS5000E*, the *Dell EqualLogic PS5000X*, and the *Dell EqualLogic PS5000XV* iSCSI arrays, scalable to 192TB and 60,000 high transaction users. Along with the platforms, Dell includes an embedded package of SAN functionality, at no extra charge, previously only found in Tier-1 arrays, to deliver ease-of-use in identifying network topology, building RAID⁷ sets, and conducting system health checks. This enables you to hit the ground running as well, with installation time reduced to less than an hour. Embedded enterprise data services functionality enables the data center to implement best practice storage techniques in any enterprise. See Exhibit 2, on the next page, for a partial list of software features that are included.

The EqualLogic PS Series is a unique storage architecture providing simplified management and linear scaling of performance and capacity. It uses a virtualized modular storage architecture, enabling the data center to reduce the TCO of the SAN by acquiring additional storage only when and where the data center staff needs it, protecting the investment already made. Each modular array is a complete SAN. As PS arrays are added to the group, perfor-

⁵ See [The Clipper Group Navigator](#) dated February 18, 2008, entitled *Dell Simplifies Storage with New, Flexible, Scalable Array*, and available at <http://www.clipper.com/research/TCG2008010.pdf>.

⁶ See [The Clipper Group Navigator](#) dated November 15, 2007, entitled *iSCSI Train Gains Steam – Dell Drives Ahead on the Fast Track*, which is available at <http://www.clipper.com/research/TCG2007100.pdf>.

⁷ RAID 5, RAID 10, and RAID 50 are supported.

Exhibit 1 – Enterprise-Class Storage Issues

- **Server Consolidation** – Increased server utilization requires fast access to support the increased workloads.
- **Poor Scalability** - Non-disruptive scalability due to rapid data growth is essential.
- **Failed Backups** – Rapid data recovery is required to insure business continuity through dynamic data management.
- **Complexity** – Consolidation of DAS islands into a SAN is required to simplify data center operations to support server consolidation.
- **High Availability** – Constant access to business applications is a necessity.
- **Reliability** – No-single-point-of-failure systems required to support failover and load balancing.
- **Insufficient Disaster Recovery** – Existing architecture (DAS) does not support remote mirroring due to complexity of infrastructure
- **Lack of adequate storage management** – Advanced features are required to provide data protection.

mance, as well as capacity, scales linearly. You can choose the tier of storage required by device capacity or throughput. Dell eliminates the cost of over-provisioning and prevents the under-utilization of valuable enterprise resources. All PS Series arrays work together to automatically manage the data, load balance across all resources, data protect and enable transparent scalability, on demand, and without system interruption.

Dell EqualLogic PS5000E

The PS5000E is a **virtualized entry-level iSCSI SAN**, combining automation with fault tolerance to simplify the deployment and administration of the storage array. It has transparent scalability, delivering the reliability expected of platforms that are more expensive.

With an initial array configuration of 2TB, using eight 7200 RPM 250GB SATA drives, and a single storage controller with 1GB of battery-backed cache, the PS5000E makes an ideal solution for the SMB looking for an affordable entry-level platform priced at \$19K. A high-availability model of the PS5000E is available with dual storage controllers for redundancy, with 2GB of cache, and is scalable to 16TB, using 16 1TB SATA drives, to handle data intensive applications and the explosive growth of data being seen in all data centers. It supports up to 1,024 volumes with 512 snapshots per volume⁸. Up to 512

⁸ Up to 10,000 snapshots total.

Exhibit 2 – PS Series Data Services

- Storage Virtualization
- Thin Provisioning
- Multi-Path I/O
- Pooled and Tiered Storage
- Automatic Load Balancing
- Auto-Snapshot Manager
- Roles-based Administration
- PS Group Manager
- E-Mail Home
- Auto-Replication
- Auto-Stat Disk Monitoring System
- Smart Copy for MS SQL Server and Windows File Systems
- Volume Management

SAN-connected hosts can access the PS Series Group.

The PS5000E bases its reliability upon fully redundant and hot-swappable components, including the dual controllers, dual fan trays, dual power supplies, and hot spares for the disk drives. It supports multiple versions of *Windows*, *Linux*, and *UNIX*, including Sun's *Solaris*, IBM's *AIX*, and *HP-UX*. It also supports *ESX Server* from VMware and *Novell Netware*.

Dell EqualLogic PS5000X

The PS5000X is a virtualized iSCSI SAN array, combining automation with fault tolerance to simplify the deployment and administration of the storage array. It has **near enterprise-level performance** and transparent scalability, delivering the reliability expected of Tier-1 platforms.

The PS5000X is configured with 16 hot-swappable 10K RPM SAS drives, 450GB each, with a total storage capacity of 6.4TB. It has dual storage controllers, with a total of 2GB of battery-backed cache memory, to provide up to 72 hours of data protection. The PS5000X makes an ideal solution for the SMB or enterprise department looking for an affordable high-performance platform. It also supports up to 1,024 volumes with 512 snapshots per volume. Up to 512 SAN connected hosts can access the PS Series Group.

Dell EqualLogic PS5000XV

The PS5000XV is a virtualized iSCSI SAN array, combining intelligence and automation with fault tolerance to simplify the deployment and administration of the storage array. It has the **enterprise-level performance** required by OLTP applications, along with transparent scalability, delivering the reliability required of Tier-1 platforms in highly

transactional environments.

The PS5000XV is configured with 16 hot-swappable 15K RPM SAS drives, either 146 GB or 300GB, with a total storage capacity of 4.8TB. It has dual storage controllers, with a total of 2GB of battery-backed cache memory, to provide up to 72 hours of data protection. The PS5000XV makes an ideal solution for any smaller enterprise or enterprise department looking for an affordable OLTP platform to process at the highest performance levels. It also supports 1,024 volumes with 512 snapshots per volume. Up to 512 SAN-connected hosts can access the PS Series Group.

Conclusion

Dell is continuing to drive their iSCSI engine at full speed ahead. The acquisition of EqualLogic and the introduction of the PS5000 Series provides them with an expanded product line and access to a new customer channel for not only storage products, but for their PowerEdge family as well. Data centers can look to Dell to provide them with a single homogeneous IT architecture, with only one “throat-to-choke”, if anything goes awry.

By including a full set of advanced data management features with the PS5000 platforms, Dell enables a simplified iSCSI deployment, removing the complexity that troubles the data center staff when configuring competitive solutions, eliminating all hidden licensing fees.

The transition from DAS to iSCSI does not result in a loss of performance, reliability, or availability; in fact, the PS5000 family improves on those characteristics with a scalable, self-managing set of arrays that are affordable and easy-to-use. iSCSI and the PS-5000 enable the data center to change their data center paradigm, moving to a fully virtualized and simplified storage environment, providing the IT staff with extensive flexibility and the automation of routine processes.

Dell has clearly enabled the data center to make informed decisions regarding storage. With the PS5000, the IT staff can deploy the storage that they need today, while building the infrastructure necessary to add additional capacity as applications demand. You will have no problem with over-provisioning or under-utilization. If you are tired of trying, and failing, to predict the amount of storage that your enterprise will need, look at Dell and the EqualLogic PS 5000. It may be the simplest answer to your forecast dilemmas.



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