



Optimize your business-critical workloads with Dell EqualLogic PS Series



New era of the digital enterprise

A profusion of data flowing into and across the modern enterprise fuels today's mission-critical applications and influences strategic decision making. However, the rampant data growth combined with evolving demands of diverse application workloads is straining budgets and hindering IT productivity.

Everything digital

Many different factors put pressure on IT organizations to make sure storage resources meet today's real-world demands. In particular, the rapid growth of unstructured data calls for efficient storage management of emerging data types. IT leaders are looking to deploy additional storage to meet this growth without increasing administrative overhead. Meanwhile, the steady march toward virtualization in data centers is driving increasingly concentrated server environments.

Today's multicore servers are designed to handle virtual environments with a mix of different workloads as organizations combine diverse applications onto fewer physical servers. However, virtualization consolidates not only processing but I/O as well. The combined workloads present a concentrated blend of randomized I/O to a consolidated storage infrastructure, which can lead to degraded storage performance on traditional storage architectures. For example, an organization may require a storage system that can support the sudden bursts of high I/O activity from online transaction processing (OLTP) without degrading the performance of other applications within the same system.

Dell EqualLogic PS Series, the #1 iSCSI worldwide vendor¹, offers simplified, unified, virtualized storage for companies and organizations with growing data and performance needs.

Virtual desktop infrastructure (VDI) deployments can also place high capacity and performance demands on storage. For example, consolidating large amounts of inexpensive stand-alone desktop storage into a centralized infrastructure can create tremendous capacity demands with minimal I/O requirements during normal operations. However, storm events, such as morning logons and afternoon logoffs by many users at approximately the same time, can cause I/O spikes that place high-performance demands on the storage infrastructure.

Business-critical workload requirements

Organizations need storage systems with the performance to meet workload challenges, while making it simple to expand capacity on demand and balance the load among storage resources for maximum efficiency. To accommodate shrinking budgets, a storage solution should offer a long-term, low TCO while offering advanced software that provides data protection and seamless integration with current applications and operating systems. A storage solution can help meet I/O workload demands and performance while maintaining budget requirements by:

- Using flash technologies for critical workloads including all-flash and hybrid-flash with automated tiering and load balancing
- Providing seamlessly scale-out, multigenerational storage for all types of workloads
- Offering industry-leading low TCO that delivers lasting value
- Delivering simplified management and reliable data protection that integrates easily with your environment

Dell EqualLogic PS series storage optimized for business-critical workloads

Dell™ EqualLogic™ PS Series, the #1 iSCSI worldwide vendor¹, offers simplified, unified, virtualized storage for companies and organizations with growing data and performance needs. EqualLogic PS Series provides a frameless, IP-based peer storage architecture that enables live, non-disruptive firmware upgrades and maintenance, as well as linear scaling of capacity and performance with each array added to the storage group. With EqualLogic PS Series software, you can easily streamline operations, optimize resources, and protect data through advanced integration with leading operating systems, hypervisor and application platforms. A groundbreaking, all-inclusive software model allows access to the latest product features, and enables multiple generations of EqualLogic PS Series and Fluid File System (FluidFS) NAS appliances to work seamlessly to provide file and block data services from a single, virtualized storage pool.

EqualLogic storage is designed to provide rapid deployment, simple management and seamless expansion. All EqualLogic storage products include host integration tools to simplify host configuration and administrative tasks in Microsoft® Windows®, Linux® and VMware® environments. A browser-based Group Manager interface helps streamline management, while application-layer integration helps simplify storage operations supporting industry-leading virtualization, operating system and application platforms. An in-depth reporting, performance and event monitoring system lets you automatically transmit diagnostic data to Dell Support.

¹ #1 iSCSI storage vendor worldwide by units, revenue and total terabytes in 2014 per the IDC Worldwide Quarterly Disk Storage Systems Tracker Q1 2014.



With its unified, virtualized architecture, EqualLogic enables organizations to manage both block- and file-based storage in a group — through a single GUI instance — that can seamlessly grow to up to 509TB in file capacity and over 2PB in block or total capacity, providing flexibility and operational ease for any mix of structured application data and unstructured file data. The EqualLogic FS7600 and FS7610 NAS appliances support Fluid File System (FluidFS) v3, which features powerful policy-based deduplication and compression that can be used to minimize the data footprint and maximize an organization's return on investment in EqualLogic storage.

A breakthrough, peer storage architecture gives EqualLogic scale-out performance once reserved for top-tier data centers. The EqualLogic Peer Storage architecture enables combining the types of flash and spinning storage members needed to meet the application needs and automatically load balance across members in a pool, enabling optimized storage for every size organization. Moreover, EqualLogic's hybrid-flash arrays automatically tier and migrate data between flash and spinning media inside each member to further optimize performance.

Using flash technologies for business-critical workloads

Organizations are finding that traditional spinning disk storage can no longer address the requirements of many business critical workloads. As one of the last remaining mechanical devices in the server to storage data path, spinning disks in HDD-based storage systems introduce inherent rotational and seek latencies that limit application performance. Flash has emerged as a storage medium that can address many of the demanding characteristics of high I/O workloads, and the single easiest way to provide dramatic performance

gains for applications that need new levels of real-time responsiveness. In addition to excelling at random I/O performance and delivering predictable ultra-low latency, SSD-based arrays can pack many more IOPS into a smaller footprint than a comparable HDD system, using less power and space and allowing customers to scale-out capacity and performance.

But for many organizations, cost (as measured in \$/GB) is still the top barrier to the broad adoption of flash. A majority of all-flash solutions on the market today do not meet the cost or capacity requirements of today's demanding applications, and many do not offer the enterprise-class features that the customers need to run an agile and resilient data center. Dell EqualLogic offers advanced flash technology that brings a new level of performance for your most demanding applications, while delivering the simplicity of the EqualLogic management experience.

The latest generation EqualLogic PS6210 arrays feature a new controller reengineered with higher-performance hardware than the previous-generation controller, including more powerful processors, more 10GbE ports, and enhanced software that optimizes flash performance. The arrays also are designed to minimize latency and have four times more memory compared to the previous-generation arrays.

The flash-based EqualLogic PS6210 Series arrays have demonstrated up to three times the maximum IOPS compared to prior-generation² (as seen in figure 1) for 100 percent read I/Os. EqualLogic arrays can also offer significantly higher IOPS when scaled out in large groups. All-flash arrays

take advantage of EqualLogic's load-balancing algorithms and peer scaling to grow SSD performance and capacity predictably. Hybrid-flash arrays are ideal for VDI deployments, important databases, and other mixed workloads thanks to auto-tiering for hot data.

Figure 1 depicts that PS6210XS is approximately three times the 100 percent random read workload performance with one-third the latency.

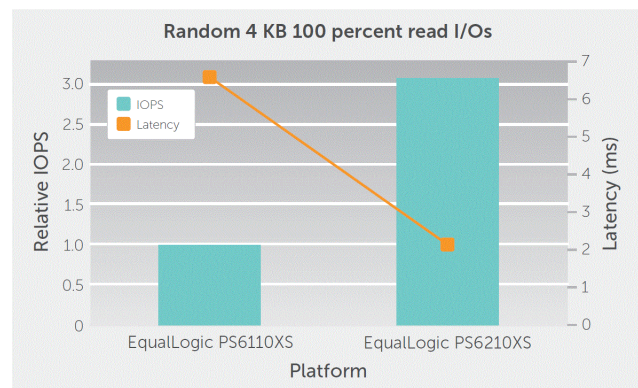


Figure 1

Hybrid-flash offers the best of both worlds for VDI and OLTP with automated tiering

EqualLogic PS6210 arrays are well suited for VDI environments. The EqualLogic PS6210XS hybrid array can host 2,000 VMware Horizon™ View desktops, a 2.4 times improvement over the EqualLogic PS6110XS.³ These arrays provide the capacity to store not only desktop virtual machines, but also the associated end-user application data. In addition, EqualLogic PS6210 arrays are designed to deliver the performance required for handling utilization spikes such as I/O storms generated when large numbers of virtual desktops are booted simultaneously.

EqualLogic PS6210 arrays also provide exceptional storage performance and capacity for OLTP environments where read/write operations are near 70/30. The EqualLogic PS6210 family includes

² Performance may vary depending on the workload and drive type. Based on September 2013 Dell performance testing comparing the EqualLogic PS6210XS and EqualLogic PS6110XS arrays with 4 KB block and 100 percent random read I/Os.

³ Performance will vary depending on the VDI workload. Based on October 2013 Dell performance tests using LoginVSI VDI workload generator tool.

³ Desktop Virtualization with VMware Horizon View 5.2 on Dell EqualLogic PS6210XS Hybrid Storage Array," by Paul Wynne and Chhandomay Mandal, Dell Inc., December 2013, dell.to/1hn3fJc.

a hybrid option that combines both SSDs and traditional HDDs in the same chassis. The automated data tiering capability of the hybrid array balances the performance of the SSD tier and the capacity of the HDD tier to meet the mixed requirements of an OLTP environment. In fact, the EqualLogic PS6210XS hybrid array provides up to two times the OLTP workload performance with less than half the latency when compared to the EqualLogic PS6110XS array⁴ (as seen in figure 2).

Figure 2 depicts more than two times the simulated OLTP database workload performance with less than half the latency.

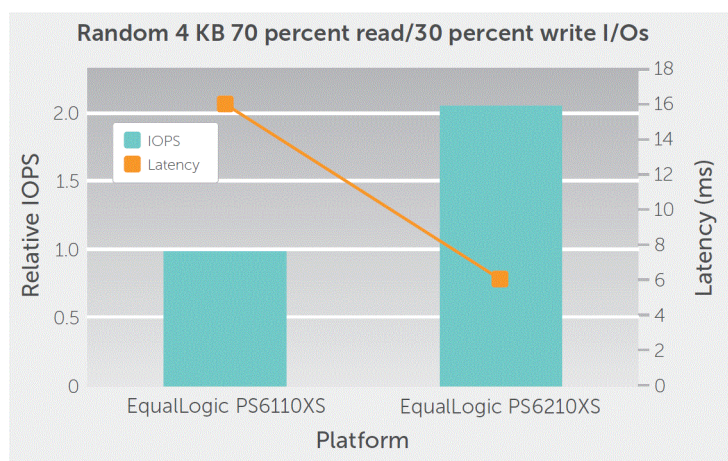


Figure 2

Seamlessly scalable multi-generational storage

The widespread use of flash SSDs, alone or in hybrid arrays, has strained the performance capabilities of storage system controllers on traditional SAN systems. Controllers can be hard-pressed to keep up with the high throughput of SSDs, so the storage system may fail to fully leverage the SSD speed advantage. Moreover, overall performance can suffer. Because traditional scale-up storage systems with fixed dual-controller designs are often challenged to support growing numbers of SSDs, other workloads and drives within the same array may be deprived of their processing resources.

In contrast, the scale-out EqualLogic architecture enables organizations to rapidly obtain additional processing performance, capacity, throughput and bandwidth by simply deploying another EqualLogic array in the storage pool. This scale-out capability helps organizations handle the performance demands of SSDs and minimize I/O bottlenecks as workloads grow.

With EqualLogic's scale-out storage architecture, you can run a mix of applications — each with its own particular set of performance requirements and environmental considerations — to meet the demands of each business operation.

To support this application mix, you can configure multiple heterogeneous storage pools with multiple arrays containing a mixture of SSD, HDD, and hybrid disk systems.

As your storage and business requirements grow, your existing EqualLogic

hardware resources receive continuous advancements in capabilities from software releases and can be pooled with newer EqualLogic arrays. To expand capacity or performance, you can simply add an array to the SAN, and the solution automatically redistributes workloads across arrays to best suit the application mix required. The new array adds processor and throughput resources, in addition to disk capacity and spindles, all of which can improve overall storage performance. By scaling out storage when required, you can reduce lifecycle costs by enabling expansion when necessary with affordable storage arrays.

Redefining the economics of enterprise storage

Traditionally, meeting storage requirements for high performance and high capacity meant moving to a flash solution, which has been cost-prohibitive for many organizations. Dell is helping to change that paradigm with the latest-generation, high-performance EqualLogic PS6210 storage arrays. In fact, one PS6210S (SSD) can replace four PS6210XV (15K) arrays for a 30,000 IOPS OLTP database workload with 10TB of usable capacity, and deliver up to 35 percent more IOPS, 75 percent rack unit reduction, 64 percent lower latency, 8 percent more capacity, 11 percent lower price and lower power.⁵ After careful analysis, organizations may find that EqualLogic PS6210 all-flash or hybrid arrays meet capacity and performance requirements even more affordably than HDD solutions, helping them attain a high performing, efficient data center.

In addition, a study conducted by Enterprise Strategy Group indicated the Dell EqualLogic PS Series arrays are approximately half the cost of the leading competitor array.⁶ The difference can be primarily attributed to a combination of cost savings in hardware for EqualLogic, the fact that EqualLogic arrays include software licensing at no additional charge, and the ease of management and support for EqualLogic arrays.

Simplified enterprise storage management and data protection

A successful storage solution also provides a management infrastructure that remains available and reliable as the workload environment grows and changes. In large environments, managing storage assets and coordinating them with hosts can be challenging. A storage solution that integrates management and data protection processes is the key to keeping workload management simple.

⁴ Performance may vary depending on the workload and drive type. Based on September 2013 Dell performance testing comparing the EqualLogic PS6210XS and EqualLogic PS6110XS arrays with 4 KB block and 70/30 read/write random I/Os.

⁵ Based on November 2013 Dell internal analysis of US list pricing, technical specifications and performance testing when comparing the PS6210XV and PS6210S arrays with 70/30 read/write random workload with 8K block size. System comparisons will vary depending on the workload and configuration.

Dell EqualLogic offers all-inclusive software that provides advanced functionality with both new and existing EqualLogic PS Series arrays and FS Series NAS appliances. With the innovative features of EqualLogic Array Software, the monitoring and analysis tools of SAN Headquarters (HQ), and the Host Integration Tools for VMware, Microsoft, and Linux environments, EqualLogic equips you with an innovative storage solution that provides exceptional investment and data protection, ease of use, and integrated virtualization capabilities.

EqualLogic Array Software, including integrated firmware, management and utility tools, provides advanced functions that enable virtualized storage and data protection. With the tools for a sound data protection strategy, and automatic virtualization and optimization of resources within the SAN, EqualLogic delivers consistent application performance with the availability your organization requires. EqualLogic PS Series Firmware is a full-function SAN operating system integrated across the entire family of EqualLogic storage arrays to virtualize SAN resources by automatically adjusting system resources, optimizing performance and capacity, and reducing IT administrative effort.

EqualLogic Group Manager is a management tool integrated with the EqualLogic PS and FS Series Firmware that provides you with detailed information on your block and file storage configuration, and gives you an easy-to-use tool for storage provisioning, data protection and array management. EqualLogic Manual Transfer Utility is a host-based tool that enables the replication of large amounts of block storage data using removable media that helps your organization eliminate network congestion, minimize downtime and accelerate replication setup.

To help ensure high availability and reliability, Dell EqualLogic offers storage management resources, comprehensive data protection of virtual resources, load balancing and performance optimization of storage resources, and seamless integration with critical applications and operating systems to optimize critical workloads. EqualLogic offers an intelligent, automated management framework, and a comprehensive set of enterprise data services with a fault-tolerant hardware architecture that can support many major operating systems and applications. Through SAN HQ, EqualLogic offers historical monitoring across virtualized SAN groups, consolidates performance and event statistics both on a near real-time and trended basis, and provides the ability to export the data collected, including capacity, IOPS and networking statistics to help ensure optimal performance. When enabled, system log and diagnostic data are transmitted to Dell Support through SAN HQ with SupportAssist to help accelerate detection, streamline issue resolution and track case status.

EqualLogic Host Integration Tools for VMware, Microsoft and Linux automate end-to-end operations from the hosts to the array, helping streamline data management and enabling simplified configuration of multi-pathing and high availability environments with ease. Dell helps simplify and automate protection and recovery tasks customized to user applications and environments with Auto-Snapshot Managers that enhance the efficiency and performance of data-protection tasks for Microsoft SQL Server®, SharePoint®, Exchange, Hyper-V® and NTFS file systems, as well as Red Hat® and SUSE® Linux environments. Dell Virtual Storage Manager (VSM, part of the Host Integration Tools for VMware) offers high-performance, space-efficient data protection of VMware VMs and datastores within folders and clusters.

Conclusion

Many organizations struggle to successfully implement business-critical workloads due to complexities in workload performance and scalability as projects go from pilot to production. The storage supporting the workloads is a critical factor in determining the success of these projects. For this reason, a growing number of organizations have adopted flexible, scalable storage solutions with advanced software features that offer automated tiering and management simplicity along with high availability and reliability.

From your most critical and demanding workloads to your cold data, Dell EqualLogic PS Series can automatically tier volumes or data to the most appropriate arrays or media (flash SSDs or HDDs) and offers advanced software features to help ensure availability and reliability — all to help you efficiently manage your data center. Whether you are running a data center, deploying a virtual desktop environment, or have a remote or branch office, EqualLogic is an effective storage solution to support both your physical and virtual servers.

⁶ Source: ESG Lab Report, "Dell EqualLogic PS Series Storage and TCO Analysis- Delivering Lasting Value with Streamlined Management and Improved Performance Scalability," a January 2014 report sponsored by Dell. For the full report see http://en.community.dell.com/techcenter/extras/m/white_papers/20438150/download.aspx.

