



# PS SERIES

## INTELLIGENT iSCSI STORAGE ARRAYS

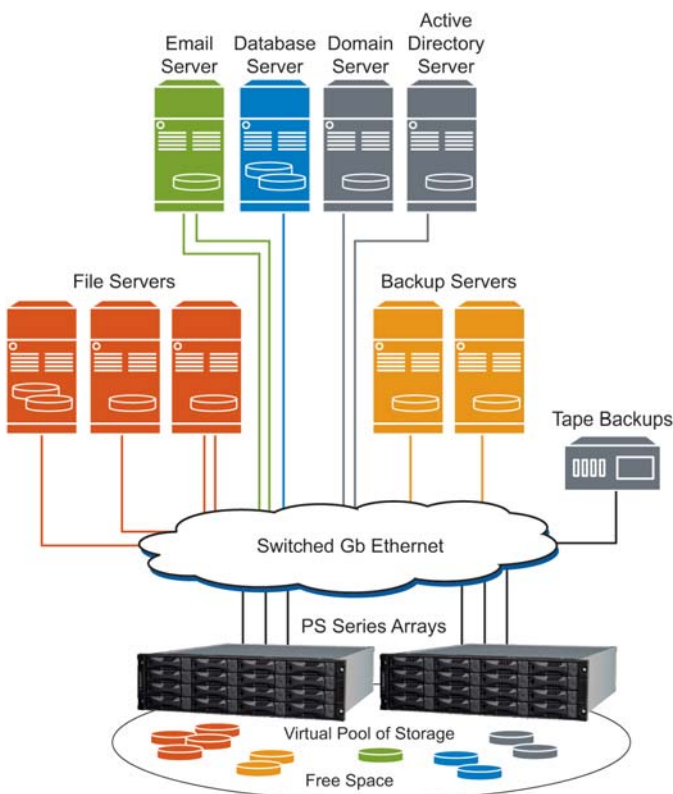
Storage management is at the center of an increasingly complex IT problem. Applications continually demand more from their storage systems – as performance, capacity, availability, backup, and disaster recovery needs intensify, so do expectations of the servers and storage products that support them. As a result, IT professionals need a storage solution that integrates a full complement of high-end management capabilities, includes data protection, and operates with a "set it and forget it" intelligence that can be trusted. They need a reliable storage system that expands transparently and ensures consistent data availability regardless of the server configuration, operating system, or application.

The EqualLogic PS Series of iSCSI storage arrays offers a fundamental change in the way customers think about purchasing and managing storage. Built on the company's patented peer storage architecture, these solutions offer enterprise-quality performance and reliability, intelligent automation, and seamless virtualization of a single pool of storage for simplified storage management. The PS Series combines an intelligent, automated management framework and a comprehensive set of enterprise data services with a fault-tolerant hardware architecture that supports all major operating systems. EqualLogic's PS Series delivers a modular and affordable solution that can be deployed in appropriate increments for small and medium businesses, while also being cost-effective for large enterprises requiring high-end capacity and performance.

## PEER STORAGE ARCHITECTURE: COMPLETE SOLUTION WITH UNPRECEDENTED EASE OF USE

The EqualLogic PS Series was designed based on a unique concept – the *peer storage architecture*. We use "peer" to describe the collaboration and equal partnership in our single, simple architecture; components and arrays function as peers, working together to share resources, evenly distribute loads, and collaborate to optimize application performance while ensuring complete data protection.

The result is an intelligent storage array that delivers rapid installation, simple management, and seamless expansion. Using patented page-based data mover technology, all members in a SAN work together to automatically manage data, load balance across all resources, and expand to meet growing storage needs. Because they share this architecture, all PS Series arrays can be used as modular building blocks for simple SAN expansion.



Grouping multiple PS Series arrays increases capacity and performance linearly – without increasing management complexity

This unique architecture makes numerous features and capabilities possible. PS Series arrays include *peer deployment*, a SAN configuration technology that senses network topology, automatically builds RAID sets, and conducts a system health check to ensure that all components are fully functional. With peer deployment, most EqualLogic arrays are installed, configured, and serving storage in minutes.

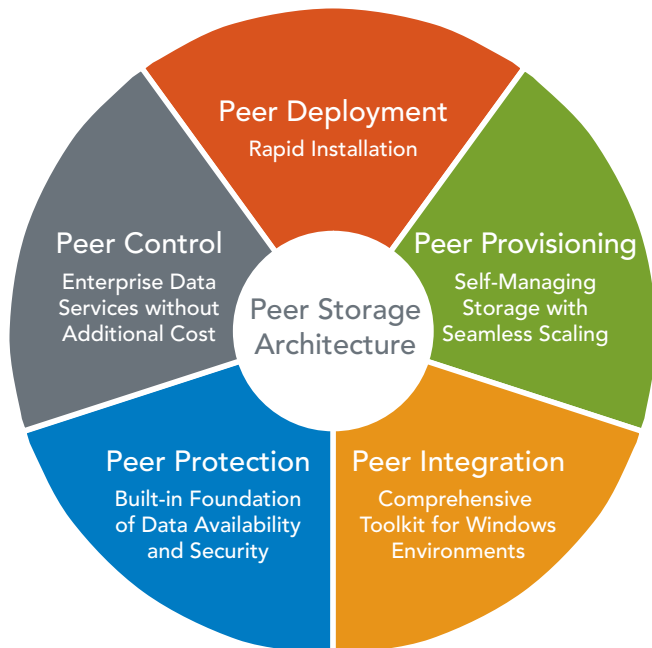
*Peer control* offers virtualized storage management with a single view. PS Series arrays are self managing; the system continuously monitors storage resources, automatically load-balancing data across controllers, network connections, and disk drives to deliver optimal performance. Peer control automates key functions for configuration, management, storage pooling, and data distribution, minimizing the complexity of storage administration.

With EqualLogic's *peer provisioning*, you can dynamically provision to meet every application's storage needs – including not only disk space, but also connectivity, security, performance, and data protection. When application requirements change, the storage configuration can change seamlessly. Peer provisioning delivers "no hassle" expansion while systems remain online; new arrays are added to the group and connect to the SAN automatically. Expansion is linear – you scale not only disk drives but also controllers, ports, and cache – and performance actually improves as you grow. Peer provisioning enables you to purchase storage on-demand, which facilitates more efficient use of both capital and storage resources. Advanced thin provisioning capability is included, giving administrators additional flexibility in providing storage to applications. Administrators can allocate virtual storage to volumes up to preset limits and automatically add physical capacity on demand. In both physical and virtual server environments, cloned volumes can be instantly assigned to new servers to meet changing business needs on the fly.

Peer protection starts with a robust design, no single point of failure, and "five 9s" availability. It also includes built-in features such as space-efficient snapshots for quick recovery and remote replication for disaster protection. In minutes with no add-on software, users can create an end-to-end solution that delivers total protection from any type of failure or outage.

EqualLogic's peer integration provides a comprehensive software toolkit to facilitate the deployment, ongoing management, and protection of EqualLogic SANs in your Microsoft® Windows® environments. As a Microsoft Simple SAN solution, the PS Series is proven interoperable and easy to setup and manage for Windows platforms. Auto-Snapshot Manager provides a feature-rich tool for protecting and recovering data for Windows applications.

The peer storage architecture makes enterprise performance, scalability, and reliability possible in an intelligent, automated management framework that eliminates tedious administrative tasks while enabling effortless best-practice storage management.



EqualLogic's all-inclusive enterprise-class features are designed around EqualLogic's unique peer storage architecture

## MODULAR DESIGN WITH ENTERPRISE RELIABILITY

EqualLogic PS Series arrays have a modular design that lets you purchase only the storage you need, when you need it – preventing both underutilization and over-provisioning. Its peer storage architecture uses industry standard protocols, disks drives, and network interfaces to provide low connection costs and high performance access to data across heterogeneous environments, including Microsoft Windows, Novell® NetWare®, Red Hat® Enterprise Linux®, SUSE™ Linux Enterprise, Linux, Sun Solaris™, UNIX®, HP-UX, Mac OS® X, IBM AIX®, and VMware® ESX.

Designed to meet and exceed the rugged requirements of the data center, EqualLogic engineered fault tolerance into every aspect of the PS Series hardware design. All components are fully redundant and hot swappable with optional dual controllers, standard dual fan trays, and dual power supplies. The hot-swappable controller module features high-performance dual-core 64-bit processors with a high-speed HyperTransport™ I/O bus and twin 64-bit DDR channels. Each control module is equipped with 1 GB of high speed battery-backed DRAM. Each disk drive is interconnected with its own independent, hot-swappable serial channel and mechanically with an inertial dampening chassis that eliminates drive vibrations. Self tuning controller caches are battery-backed and mirrored across controllers for ultimate protection without compromising performance.

EqualLogic PS Series arrays support Serial attached SCSI (SAS) and Serial ATA (SATA) disk drives with a variety of performance and capacity options. Enterprise-class RAID protection governs completely hot swappable disk drives, including RAID 5/10/50 support, hot-sparing, automatic rebuilds, accelerated rebuild times, advanced stripe integrity algorithms, online RAID set expansion, geometry transformation, and patent-pending predictive media-error detection and correction. Service is not only done online, but the system isolates faults to insure against cascading failures or loss of protection during service. The result is excellent data protection and

performance even during service procedures. The redundancy of our design eliminates any single point of failure with a net result of greater than 99.999% availability.

### PEER DEPLOYMENT: RAPID INSTALLATION

EqualLogic PS Series arrays can be fully functional within minutes of opening the shipping box. Built into the array is an automatic sensing and configuration technology that eliminates complex and cumbersome manual tasks, enabling the quick start. Once it identifies the network topology, this intelligence checks component functionality and automatically builds RAID sets. With a few simple steps and without special expertise, your enterprise-class SAN can be serving storage seamlessly, without downtime. This capability eliminates the complex manual configuration of other SANs, leaving administrators to focus on servers and applications.

### PEER CONTROL: ENTERPRISE DATA SERVICES WITHOUT ADDITIONAL COST

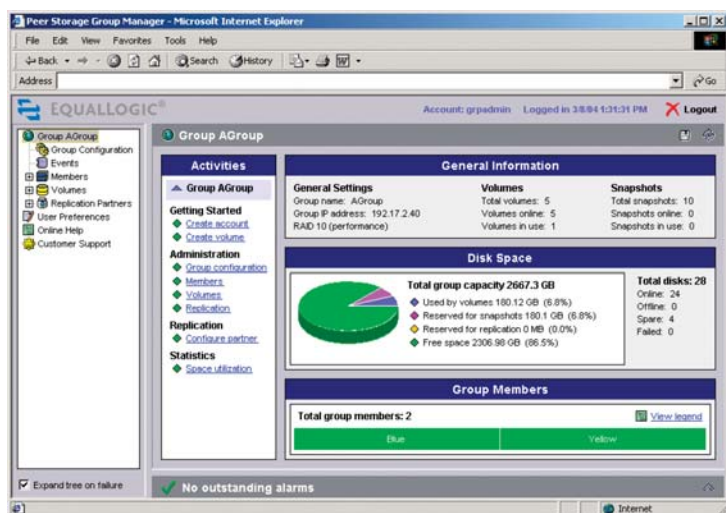
The PS Series has built-in storage features once relegated to top-tier data centers, enabling best practice storage for every size organization. EqualLogic's PS Series arrays include enterprise software features such as automatic load balancing, automatic snapshot management, automatic replication, volume cloning, volume management, storage virtualization, thin provisioning, SAN boot capability, roles-based administrative management, historical performance trending and reporting, tiering and pooling, and multi-path input/output (MPIO) with no additional licensing fees or host-based software to implement.

### PS Group Manager

PS Series arrays in a SAN are managed from a single administrator interface – the PS Group Manager. This web-based GUI can be invoked from any browser, eliminating the need for a dedicated management workstation or server and allowing administrators to remotely manage any aspect of their EqualLogic iSCSI SAN. In addition to the web interface, PS Series arrays can be managed via a scriptable command line interface (CLI) over SSH and telnet. Built-in monitoring and notifications provide e-mail, syslog support, and complete SNMP monitoring and traps, all standard.

### Volume Snapshot

PS Series arrays provide space-efficient snapshots that raise the bar with capabilities that exceed all other products in this class. EqualLogic arrays support up to 512 snapshots per volume, thousands per array, and read-only as well as read-write snapshots. Snapshots can be used for quick recovery and offloading backup operations. PS Series arrays implement the safest form of snapshot recovery (data is never discarded unintentionally), providing administrators with the flexibility to implement true enterprise IT storage.



A single “pane of glass” GUI delivers simplified storage management across a single or group of PS Series arrays

### Optimized Performance via Automatic Load Balancing

EqualLogic's approach to optimizing performance is simple: maximize the horsepower of all available components in the SAN. The peer storage architecture makes our arrays unique – instead of relying solely on individual components to deliver performance, peer control leverages all relevant components. It automatically load balances to seamlessly spread data across all active storage, maximizing performance by intelligently optimizing all available network connections, cache, controllers, and drives. Through this optimization capability, each PS Series array is capable of handling up to 300 MB and 60,000 I/Os per second. When multiple arrays are added together the PS Series quickly scales. The PS Series delivers unmatched performance in its class and with each additional array, performance grows linearly.

### Tiering and Pooling

EqualLogic's tiering capability enables administrators to prioritize applications within a SAN by placing them on separate storage resources, each optimally configured for the required service level of the application. Administrators can configure separate storage pools within a single SAN to build the most efficient, flexible, easy-to-manage storage environment. Using this "SAN within a SAN," you gain the advantages of consolidation, but can also easily separate workloads as needed: by application, by service level, by disk type, by cost, even by departments within your organization. Because online data movement is built into all PS Series arrays, you can adjust application resources and move data between different pools of storage without downtime or disruption.

### PEER PROVISIONING: SELF-MANAGING STORAGE WITH SEAMLESS SCALING

The intelligence of peer provisioning combined with the modular design of the PS Series enables you to quickly and easily expand your storage capacity without affecting data availability. Start with a single storage array – when your storage, performance, and network requirements grow, add more members to increase capacity, performance, and network bandwidth automatically and linearly.

Configuring one or more EqualLogic PS Series arrays as a PS Group enables you to manage the arrays as a single system with a shared pool of storage. EqualLogic peer provisioning automates all of the key functions needed to configure, manage, and scale storage, eliminating much of the complexity of storage administration. Each group member is automatically configured and participates in balancing the load, distributing data, and tracking host access to data. No user intervention is required. As a result, storage management stays simple, regardless of scale.

The power of peer provisioning also enables a key feature – on-demand growth. Because capacity expansion in the PS Series is non-disruptive, you can grow while applications remain online. As a result, there is no need to tie up capital by over-provisioning – leaving underutilized storage assets – as IT managers often do in order to avoid future downtime. With a PS Series SAN, you can purchase the storage capacity you need today, and plan for future storage growth knowing that when you need to expand it will be simple and non-disruptive, without interrupting performance. In addition, PS Series arrays are fully integrated with Microsoft Virtual Disk Service (VDS), enabling application-level provisioning by supporting applications.

Thin provisioning is an important advanced feature of peer provisioning which enables the automatic addition of physical capacity on demand up to preset limits. With advanced thin provisioning, buy-as-you-grow storage management and virtualization are made seamless for servers and applications. When a volume is created, it can be sized for the long term needs of the application without initially allocating the full amount of physical storage. Instead, as the application needs more storage, capacity is allocated to the volume from a free pool. EqualLogic's implementation of thin provisioning provides enhanced flexibility and safety controls – with proactive, user-defined threshold alarms and controls, administrators can depend on automatic space allocation without worrying about reaching allocation limits or unexpected depletion of physical storage.

Peer provisioning offers significant economic benefits to businesses of all sizes because physical storage is purchased when it is actually needed. These benefits include increased asset utilization, lower management costs, reduced floor space footprint, lower power and cooling costs, and smarter, more efficient capital expenditures.

## PEER PROTECTION: BUILT-IN FOUNDATION OF DATA AVAILABILITY AND SECURITY

### Complete System Monitoring

EqualLogic's system monitoring capabilities provide administrators with a comprehensive view of the health and status of their SAN. Within the PS Group Manager, administrators can view the status of individual SAN components such as drives, power supplies, and controllers, as well as the overall system. Unique to EqualLogic, the PS Series also includes the Auto-Stat Disk Monitoring System (ADMS) which proactively scans disk drives in the background to detect media anomalies and correct them. Combined with automatic sparing and spare utilization, this provides enhanced protection and ensures optimal performance of all disks.

### E-mail Home

To ensure complete availability of your system and data, EqualLogic's PS Series comes standard with group event notification methods (e-mail, syslog, and SNMP), but also allows users to enable E-mail Home functionality. With E-mail Home, EqualLogic Customer Support is automatically contacted in the case of a hardware component failure (e.g., disk, control module, fan tray, or power supply), or if the firmware on a PS Series array is updated. E-mail Home functionality enables EqualLogic to rapidly respond to issues and assist administrators.

### Multi-path I/O

EqualLogic's multi-path I/O provides high availability and performance load balancing across multiple network ports (HBAs and/or NICs) for Windows, Linux, UNIX and VMware environments. By leveraging the ease and economics of Ethernet, multi-path I/O removes all single points of failure between the server and the storage.

### Auto-Replication

The ultimate in data protection and disaster tolerance, EqualLogic's Auto-Replication remotely replicates data from one PS Group to another over a standard IP network across any distance. Auto-Replication offers geographic isolation – a critical component in any true disaster recovery plan – without any of the traditional complexity. Administrators can quickly and easily configure volumes for replication, letting the PS Series arrays manage the underlying hardware resource complexity. A catalog of recovery points is maintained at each disaster recovery site, providing multiple points of recovery from which to choose in the event of a disaster – a choice that offers protection from "cascading" failures such as software viruses.

Making a disaster recovery site operational is simple, even if the primary site already stores terabytes of data. EqualLogic provides the capability to perform an initial manual sync by copying primary site data to transportable media, physically shipping the media to the remote site, unloading the data, and then starting up the automatic replication. Automatic failover and failback functions enable non-disruptive testing of the disaster recovery deployment in addition to facilitating continuous access to data. Auto-Replication is completely array-based, freeing IT administrators from the arduous task of managing host-based software as well as the economic burden of host software licenses.

## PEER INTEGRATION: COMPREHENSIVE TOOLKIT FOR WINDOWS ENVIRONMENTS

EqualLogic peer integration facilitates the deployment, ongoing management, and protection of EqualLogic SANs in Microsoft Windows environments. As a Microsoft Simple SAN solution, the PS series is proven, interoperable, and easy to setup and manage for Windows platforms.

### Remote Setup Wizard

Each PS Series array comes complete with EqualLogic's Remote Setup Wizard. This easy-to-use tool has transformed the way administrators set up their SANs. From a Windows system, in just minutes a PS Series array

is configured and running. Configuration of multi-path I/O (MPIO) between Windows servers and an EqualLogic SAN – a multi-step operation with the basic Microsoft iSCSI driver – is vastly simplified with the Remote Setup Wizard. Configuration time is shortened and administrators are assured that MPIO has been configured properly – maximizing the availability and performance of your deployment. When you need more capacity or performance, the Remote Setup Wizard can also be used to add members to your existing SAN.

#### Auto-Snapshot Manager for Windows

EqualLogic's Auto-Snapshot Manager is a feature-rich application for protecting and recovering Windows application data, including Windows NTFS file systems and SQL Server databases. Auto-Snapshot Manager, included with all PS Series arrays, is an intuitive, easy-to-use GUI that creates "clean" file system and SQL Server database snapshots, clones and remote replicas. Integration with Microsoft Volume Shadow Copy Service (VSS) provides hardware-based snapshots with full or differential copies. A scheduler with E-mail notification options is included to simplify maintenance operations. In the event that a file system or SQL database recovery is necessary, Auto-Snapshot Manager provides several quick restore options to maximize the availability of critical data and applications.

Auto-Snapshot Manager also allows administrators to safely snapshot, backup and restore their Microsoft Windows Server™ 2003 applications with advanced third party backup software modules by supporting Microsoft Volume Shadow Copy Service (VSS) and Virtual Disk Server (VDS) interfaces. This capability eliminates the extensive system configuration and scripting that other systems require for snapshot-based backups.

Peer integration makes it easier to bring shared SAN storage into Windows application environments, eliminating the worries of time-consuming storage management and freeing up more time to focus on delivering better Windows-based business solutions.

#### FLEXIBILITY WITH LOW COST OF OWNERSHIP

EqualLogic's PS Series represents an advancement in storage economics, from purchase and set up to operation and upgrades. Unlike traditional SANs, the EqualLogic PS Series comes complete with all available software features and applications. There is no additional software to install or service costs to incur to initiate any of the data management or protection features you would expect from an enterprise-level SAN. EqualLogic arrays scale on-demand and online allowing you to grow your storage without disrupting your application environment or your budget. This unique packaging model, combined with the ease of use and automated intelligence of the PS Series, enables EqualLogic to provide a low total cost of ownership.

Whether you are consolidating your direct-attached storage (DAS) infrastructure, migrating data from an existing SAN, streamlining data protection processes, or just adding capacity, the EqualLogic PS Series offers a family of proven, high-performance, self-managing storage arrays designed to meet the requirements of any SAN or NAS environment. Based on our patented peer storage architecture, the PS Series of storage arrays is completely interoperable and upgradeable, seamlessly scaling arrays without disrupting application or data availability.



EqualLogic PS Series storage arrays



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