Lab Validation
Report

HP 3PAR StoreServ Storage

Simple, Efficient, Affordable Tier-1 Storage

By Tony Palmer, Senior Lab Analyst and Kerry Dolan, Lab Analyst

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ESG Lab Reports

The goal of ESG Lab reports is to educate IT professionals about data center technology products for companies of all types and sizes. ESG Lab reports are not meant to replace the evaluation process that should be conducted before making purchasing decisions, but rather to provide insight into these emerging technologies. Our objective is to go over some of the more valuable feature/functions of products, show how they can be used to solve real customer problems and identify any areas needing improvement. ESG Lab's expert third-party perspective is based on our own hands-on testing as well as on interviews with customers who use these products in production environments. This ESG Lab report was sponsored by Hewlett Packard.
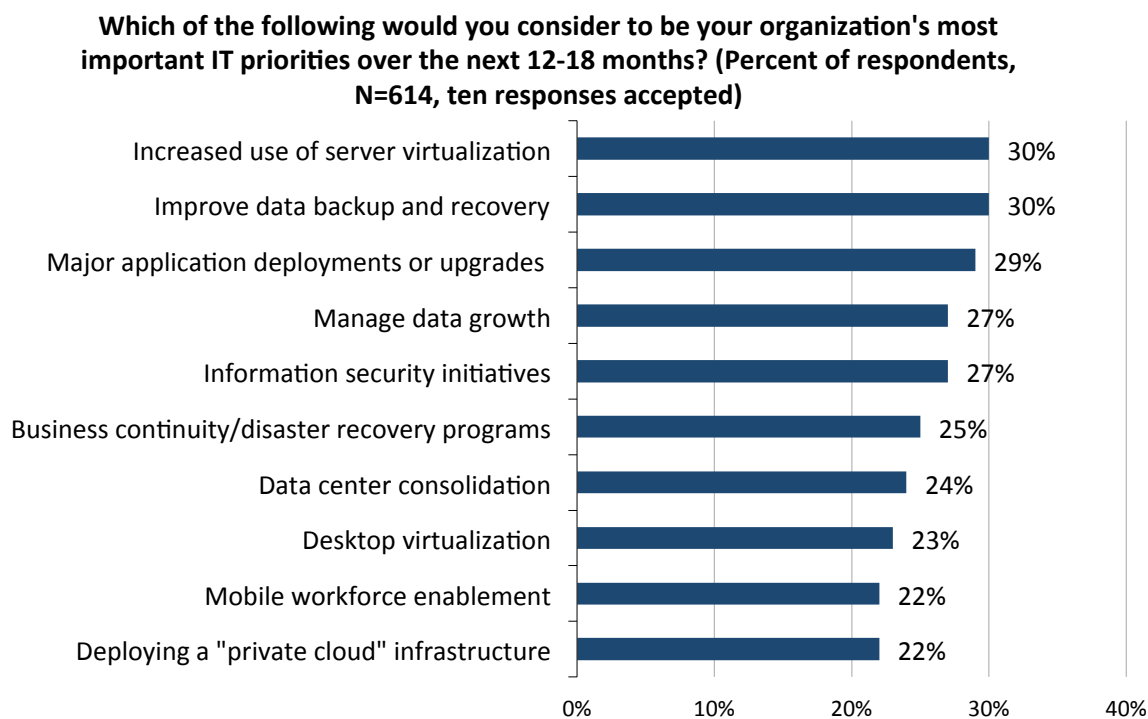
Introduction

This report documents the results of ESG Lab's hands-on testing and validation of the HP 3PAR StoreServ 7000 storage array, with a focus on autonomic simplicity, efficient unified storage, application performance, and resilience for mid-range enterprises.

Background

In large and small organizations around the globe, IT professionals are faced with managing a wide variety of important projects. According to ESG Research, a number of these involve virtualization technologies, as Figure 1 demonstrates; among the top 10 priorities for the next 12-18 months are the increased use of server virtualization, data center consolidation, desktop virtualization, and deploying private clouds.[1] Along with these are managing data growth (which is becoming a perennial focus), major application deployments and upgrades, and improving backup, business continuity, and disaster recovery. These priorities indicate that IT is facing increasing pressure to improve efficiency while delivering non-stop application and data access.

Figure 1. Most Important IT Priorities

Which of the following would you consider to be your organization's most important IT priorities over the next 12-18 months? (Percent of respondents, N=614, ten responses accepted)

Increased use of server virtualization	30%
Improve data backup and recovery	30%
Major application deployments or upgrades	29%
Manage data growth	27%
Information security initiatives	27%
Business continuity/disaster recovery programs	25%
Data center consolidation	24%
Desktop virtualization	23%
Mobile workforce enablement	22%
Deploying a "private cloud" infrastructure	22%

Source: Enterprise Strategy Group, 2013.

Achieving these objectives is difficult with silos of individually managed storage. Deploying, configuring, managing, and scaling separate block, file, and object storage for different applications adds complexity, which increases both the time and cost of providing infrastructure services to end users. Additional pressure stems from the greater "consumerization" of IT that often results in higher end-user demands and less tolerance for poor performance or downtime.

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[1] Source: ESG Research Report, *2012 IT Spending Intentions Survey*, January 2012.
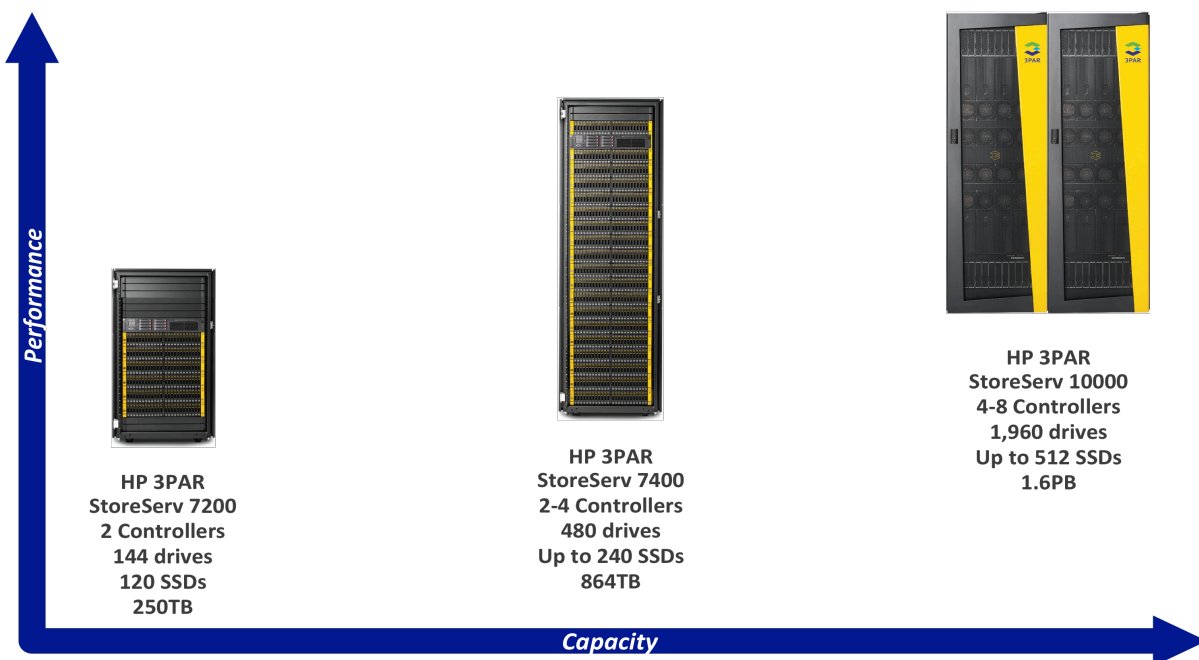
HP 3PAR StoreServ 7000 Storage

With the HP 3PAR StoreServ 7000, HP demonstrates its dedication to making storage simple and affordable for mid-sized organizations, while recognizing that these organizations have the same feature requirements as large enterprises. By including numerous advanced features in a cost-efficient platform the company not only enables easier storage management, but also works towards eliminating the need to compromise in a budget-constrained environment.

The HP 3PAR StoreServ 7000 delivers consolidated block, file, and object storage for physical and virtual servers. It supports a variety of applications and workloads including MS SQL Server and Exchange, Windows Server 2012, Oracle, and SAP without sacrificing performance. Two models are available (7200 and 7400), with 2-4 controller nodes and a combination of small and large form factor disk drives to accommodate performance-optimized SSDs and capacity-optimized SATA drives. The arrays support up to 64GB of cache, plus up to 24 Fibre Channel ports (up to 8GB FC), up to 8 iSCSI/FCoE ports (1GB or 10GB), and up to 4 built-in IP Remote Copy ports. For larger environments, HP provides the StoreServ 10000 family which offers support for more controllers and capacity.

The HP 3PAR StoreServ 7000 was designed to provide a flexible, scalable storage environment with the resiliency and high availability required by Tier 1 workloads. Storage federation software enables easy, non-disruptive data migration, and built-in replication technologies provide data protection and online recovery. Industry-leading thin technologies ensure that storage capacity requirements are minimized. The 7000 Series was built for fast and easy installation and provisioning, and it shares the same architecture, software stack, and management console with all other HP 3PAR arrays.

Figure 2. The HP 3PAR StoreServ Storage Family

HP 3PAR
StoreServ 7200
2 Controllers
144 drives
120 SSDs
250TB

HP 3PAR
StoreServ 7400
2-4 Controllers
480 drives
Up to 240 SSDs
864TB

HP 3PAR
StoreServ 10000
4-8 Controllers
1,960 drives
Up to 512 SSDs
1.6PB

Some important capabilities demonstrate the benefits of the HP 3PAR StoreServ 7000.

- **Virtualization focused** – high I/O performance and workload agility enable double the virtual machine density per physical server, for greater consolidation and cost savings. Integration with VMware vCenter and Microsoft System Center enhance visibility across the environment.
- **Peer Persistence** – enables federated storage across primary and secondary data centers for transparent failover and failback of VMware deployments. Hosts, VMs, and data can move freely without impacting

applications, enabling a true cloud environment unconstrained by physical boundaries. Active-active mode maximizes productivity, as the secondary site can support production operations until needed for failover.

- **Peer Motion** – zero-downtime migration tool providing simple data movement for workload balancing or array migration. No application downtime or host configuration changes are needed, making workload balancing and technology refreshes simple and cost-efficient.
- **Adaptive Optimization** – provides reliable, non-disruptive, autonomic storage tiering to ensure effortless efficiency as well as balancing performance and cost.

HP 3PAR StoreServ 7000 Operating System Software Suite

This foundation provides simplicity, efficiency, and resilience, making the HP 3PAR 7000 Series simple to install, manage, and upgrade. Features include autonomic, non-disruptive system tuning; automated snapshot scheduling; flexible, independent clones; support for SNMP, SMI-S, and a Web Service API for open administrative support; and user-configurable volume security. In addition, some key software applications are included:

- **SmartStart** – wizard-based installation in six quick and easy steps. In addition to installation and configuration of HP 3PAR StoreServ storage, SmartStart Includes installation of the simple and intuitive 3PAR **Management Console**, robust and customizable reporting tools, HBA drivers, and HP 3PAR **Host Explorer**, an autonomic storage management tool for secure host-storage communication channels. Host Explorer automates host discovery and collection of configuration details to speed provisioning and simplify maintenance.
- **Rapid Provisioning** – instant, application-focused provisioning managed intelligently and autonomically, and delivering system-wide data striping for predictable service levels across workloads.
- **Autonomic Groups** – simplifies provisioning for clustered and virtual server environments, enabling host, volume, and domain groups plus automated provisioning that reduces errors.
- **Online Import** – enables fast, simple data migration from existing HP EVA storage using Command View EVA, including rapid conversion of standard volumes to thin volumes.
- **Autonomic Rebalance** – optimizes future capacity expansion by intelligently balancing disk usage without administrative effort.
- **Thin Provisioning** – built-in functionality enables efficient storage utilization including conversion of standard volumes to thin volumes and reclamation of unused capacity.
- **Thin Persistence –** Ensures that VMware vSphere environments remain thin over time—from the time that VMs are initialized up through their deletion. Thin Persistence eliminates capacity tradeoffs that can result from using the highest-performing VMDK format, Eager Zeroed Thick. Eager Zeroed Thick virtual disks write zeros across the entire VMDK file at the time they are created, meaning that the full size of the VMDK is reserved on traditional storage arrays before the VM is ever used. The built-in zero-detection capability of the HP 3PAR Gen3 ASIC allows users to create Eager Zeroed Thick VMDKs that do not consume physical capacity for the storage blocks that are "zeroed" at initialization.
- **Persistent Cache** – maintains data availability by re-mirroring cache to other cluster nodes in the event of component failure in quad-node or larger models.
- **Persistent Ports** - enables non-disruptive, online software upgrades without reliance on failover or multi-pathing.
- **Remote Copy** – enables efficient, multi-mode replication across 3PAR models for low RTOs and zero-data-loss RPOs, providing distance flexibility and one-step operation.

Optional software bundles are available to augment replication, data optimization, security, and reporting capabilities. In addition, application-specific software suites are available for:

- **VMware** – including HP 3PAR Recovery Manager for VMware, Host Explorer for VMware, VASA support, and plug-ins for VMware SRM, VAAI, and View.
- **MS Exchange** – including HP 3PAR Recovery Manager for Exchange and the VSS Provider software.
- **Oracle** – including HP 3PAR Recovery Manager for Oracle and Oracle Space Reclamation capabilities.
- **MS SQL Server** – including HP 3PAR Recovery Manager for MS SQL and VSS Provider software.

ESG Lab Validation

ESG Lab performed hands-on evaluation and testing of HP 3PAR StoreServ 7000 Storage at HP facilities in Colorado Springs, Colorado and Fremont, California. Testing was designed to validate ease of use and management as well as autonomic storage efficiency, resilience, and disaster recovery capabilities in a highly virtualized enterprise environment.

Autonomic Simplicity

ESG Lab started with a pre-wired test bed as summarized in Figure 3. Four HP BladeSystem ProLiant BL460 Server s were installed in an HP BladeSystem c-Class enclosure connected via 8GFC SAN switches to two HP 3PAR StoreServ 7000 Storage Systems[2]. The HP 3PAR StoreServ 7400 was configured with four Controller Nodes, 32 300GB enterprise SAS and 16 2TB nearline drives, while the 7200 was configured with two Controller Nodes and 24 450GB enterprise SAS drives. The HP Blades were pre-installed with VMware vSphere 5 with four Windows 2008 R2 virtual machines installed on each.

Figure 3. The ESG lab Test Bed
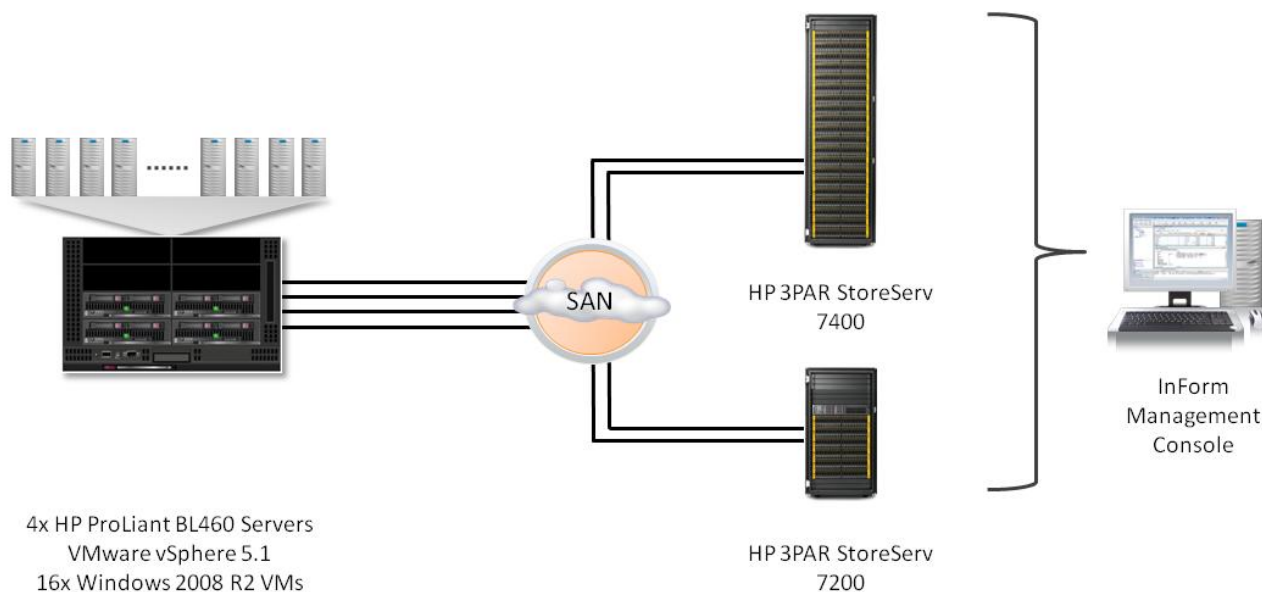
ESG Lab Testing

Testing began with the HP SmartStart utility; SmartStart provides a wizard-based installation of a new HP 3PAR StoreServ Storage system. SmartStart includes installation of the HP 3PAR service processor (SP), a physical or virtual Linux based system designed to provide remote error detection and reporting and to support diagnostic and maintenance activities for HP 3PAR storage systems. SmartStart also installs and configures the 3PAR Management Console, customizable reporting tools, HBA drivers, and the HP 3PAR Host Explorer. ESG Lab launched SmartStart from an HP Provided CD on the management workstation.

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[2] Configuration Details can be found in the Appendix.

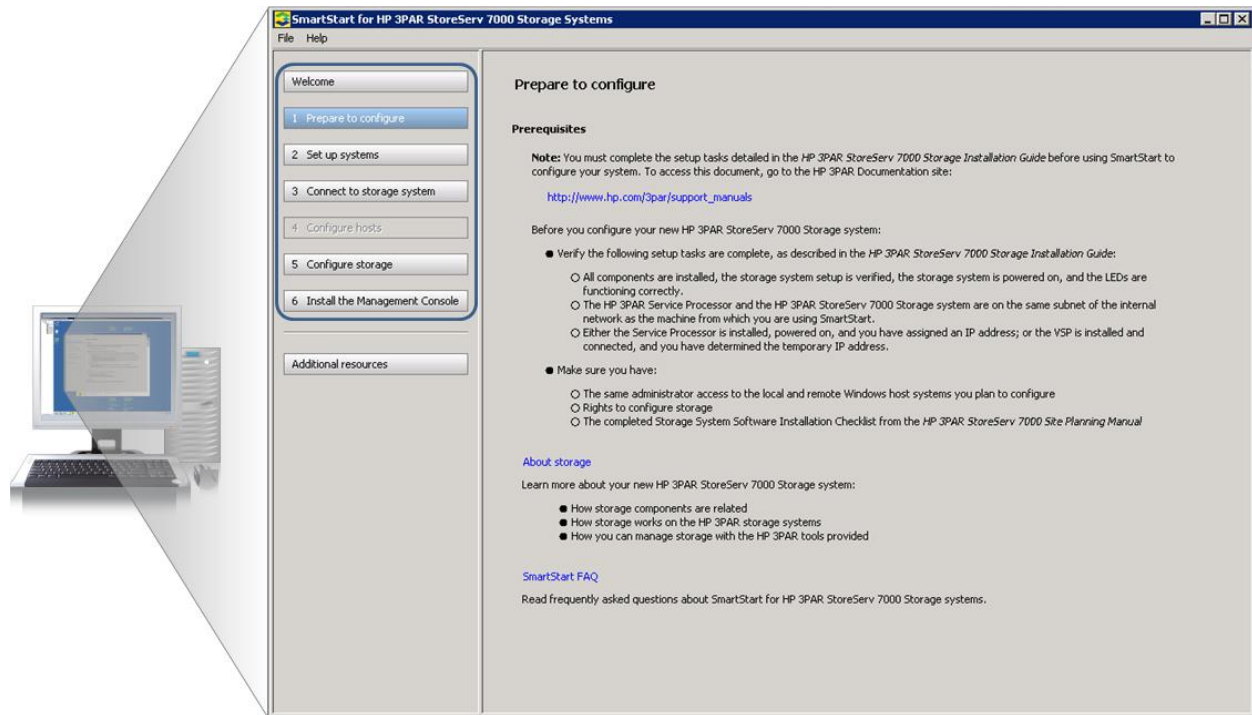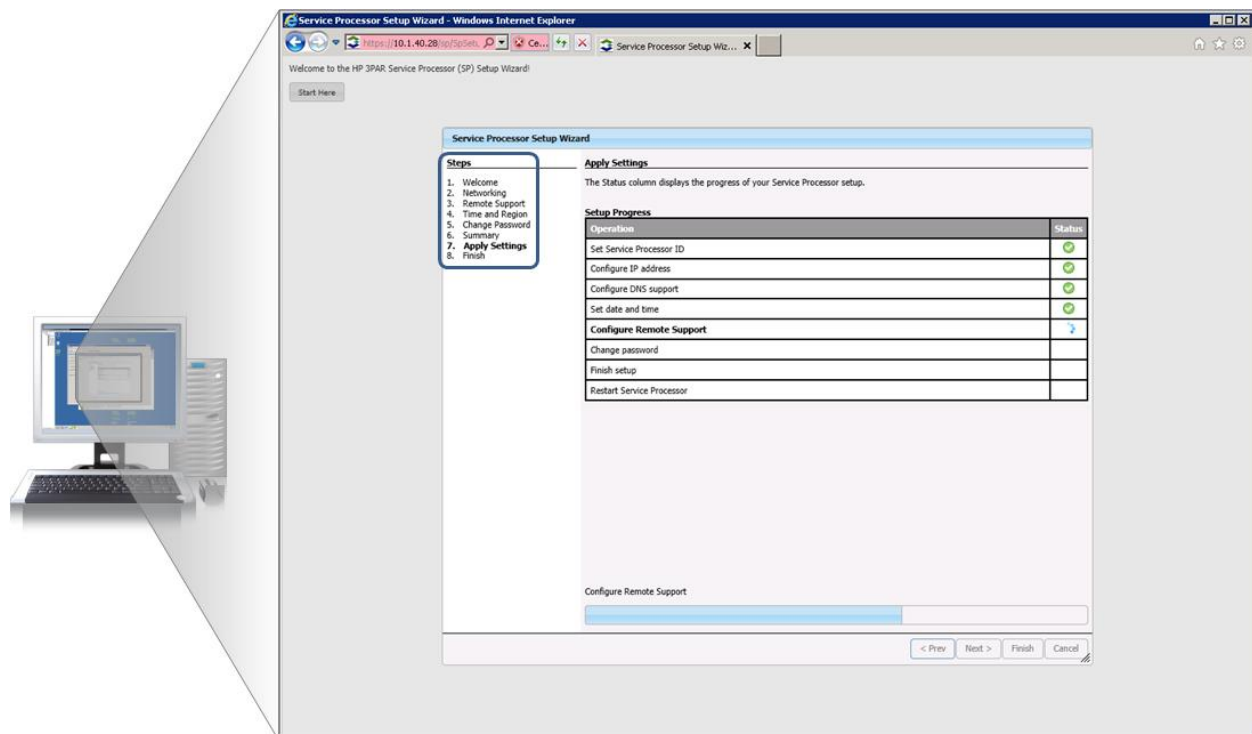*Figure 4. HP SmartStart for HP 3PAR StoreServ 7000*

Figure 4 shows the opening screen of the Smart Start wizard, with a summary of the activities to be performed and offers links to manuals and FAQs. Clicking on "Set Up Systems" opened the Service Processor setup wizard.

Figure 5. Configuring the HP StoreServ 7000 Storage Service Processor

After entering the SP name, IP address and setting the time and password, the wizard configured the Virtual SP, as seen in Figure 5. Next, SmartStart launched the Storage System Setup Wizard, seen in Figure 6. the Storage System

setup wizard had a very similar look and feel to the Service Processor wizard, first verifying the storage system, then prompting for name, IP address, time, and password.

*Figure 6. Configuring the HP StoreServ 7000 Storage System*
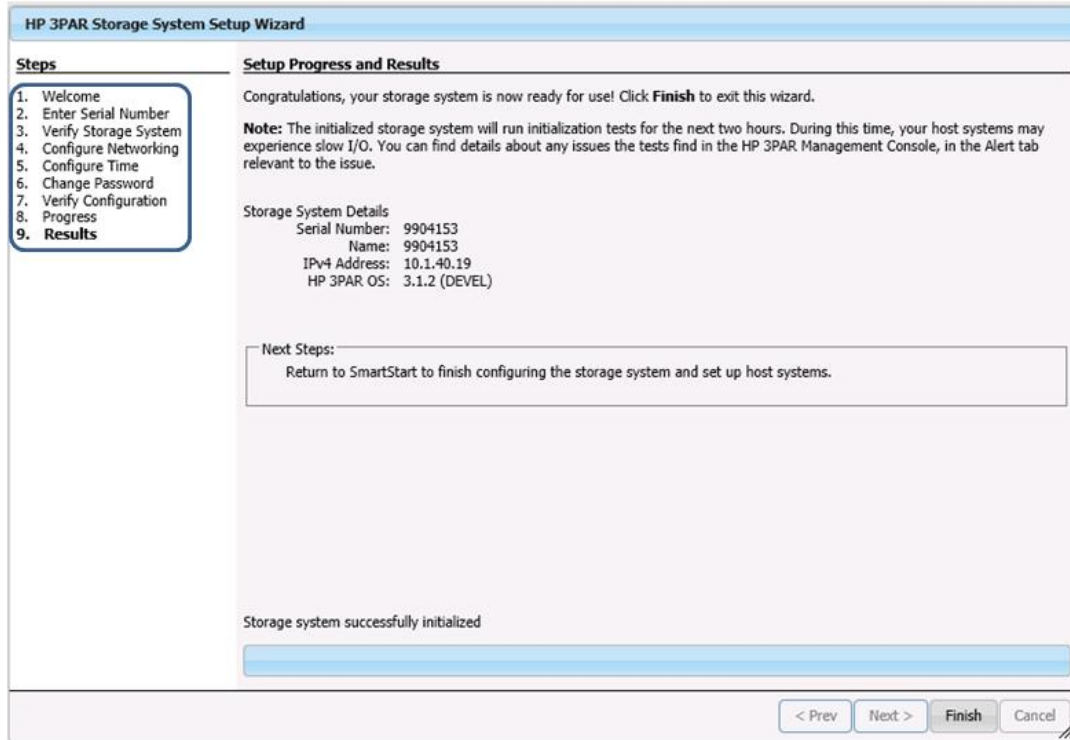
The final elements of SmartStart walk a new admin through configuration of hosts and storage. At this point, an experienced administrator can close SmartStart and begin managing the system using the HP 3PAR InForm management console or the HP 3PAR vSphere plug-in. ESG Lab continued through SmartStart and configured one Fibre Channel attached Windows 2008 Virtual Machine, Created a Common Provisioning Group, then created and exported one storage volume to the host. SmartStart configured the host's HBAs, set up multipath I/O, installed Host Explorer software, then provisioned and exported storage to the host. Figure 7 shows the volume visible on the host after SmartStart had completed.

Figure 7. Storage Visible to the Host
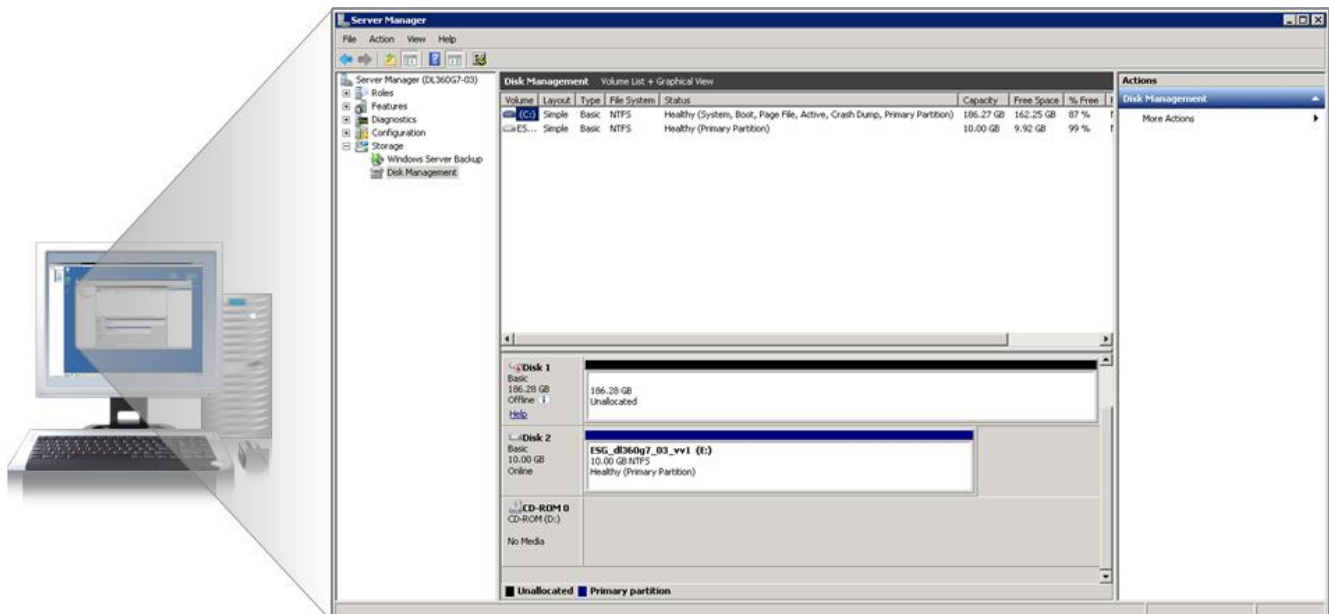
ESG Lab next took a look at the HP 3PAR vSphere plug-in, which enables VMware administrators to provision and export storage directly from the vSphere client by clicking on the HP 3PAR tab.

Figure 8. Provisioning from vSphere
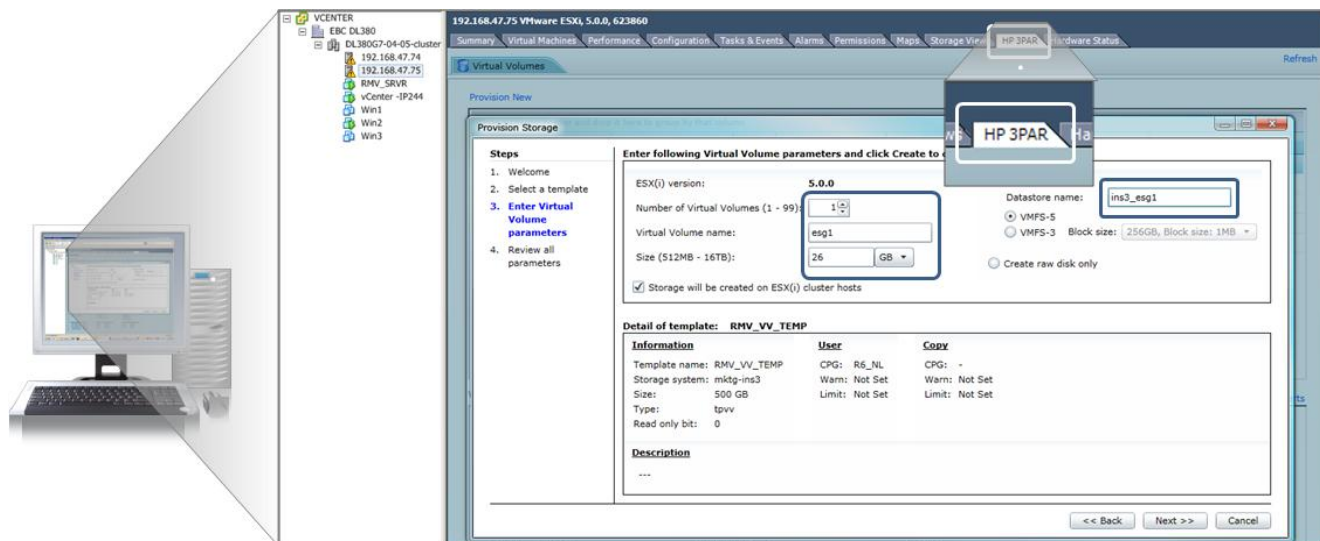
ESG Lab also performed an online import of a volume on a running Windows server from an HP EVA system to the HP 3PAR StoreServ 7400. The source volume was provisioned on an HP EVA 4400 system and mounted by a Windows Server 2008 R2 virtual machine.
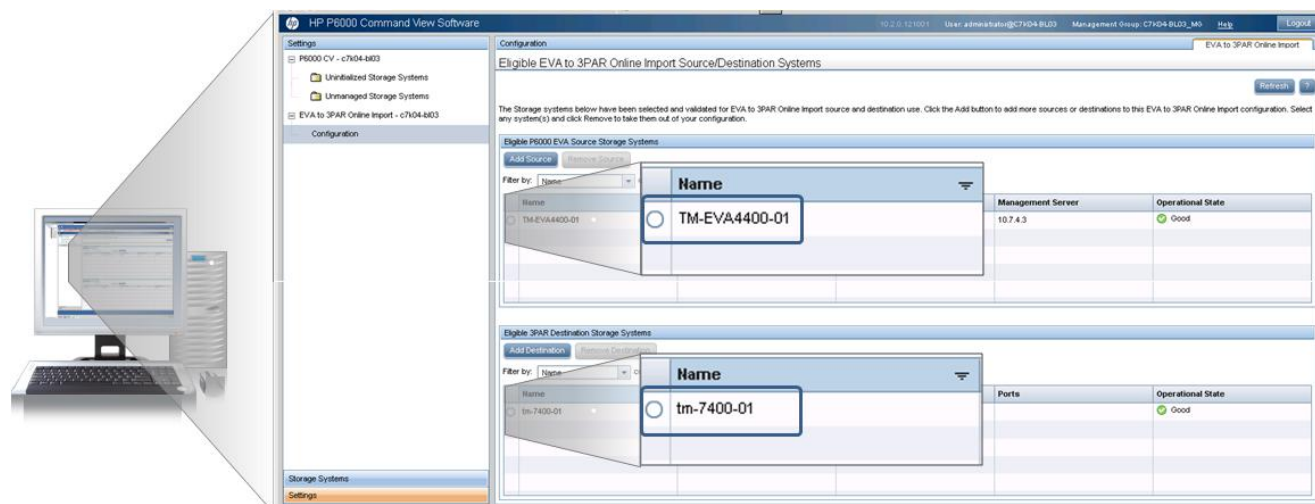
Figure 9. Online Migration of Volumes

Figure 9 shows the source HP EVA and the target HP 3PAR StoreServ 7400 used for the migration. The online migration extracts the configuration data for both the volume and the owning host and replicates them on the target system. This allows a seamless failover once the volume is copied to the target system. Online Migration supports migration from fully provisioned volumes to thin provisioned volumes, enabling capacity efficiency automatically, as hosts are migrated.

ESG Lab used the five step Add Migration wizard to configure the migration, which included zoning the 3PAR system to the running host, and enabling access to the source volumes through the target system. At that point the source system can be unzoned from the host and the migration can begin. The migration was executed with a click in the HP P6000 (EVA) Command View application. Before, during, and after the migration, the source volume was confirmed to be online and fully accessible by the server.

Finally, ESG Lab explored a number of additional autonomic features and functions from within vCenter, including managing Virtual copies (snapshots). From within the vSphere client, it was simple to create snapshots and restore both individual files and entire virtual machines. Restoring deleted files was accomplished completely online, with no disruption.

Why This Matters

ESG research has found that among organizations that support or plan to support highly virtualized or private cloud environments, faster storage provisioning and increased simplicity of implementation and management is consistently among the top prerequisites for doing so.[3]

The HP 3PAR StoreServ 7000 was extraordinarily easy to deploy, configure, and manage. In ESG Lab testing, the SmartStart Wizard configured storage hardware and software, provisioned and exported storage, and enabled management of host connections right from the management console. The HP 3PAR Management Console required only a handful of intuitive, well-supported actions for complete functionality and system administration. Online import of volumes from an HP EVA array executed flawlessly. With HP 3PAR StoreServ Storage, organizations have the potential to significantly reduce administration complexity and cost.

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[3] Source: ESG Research Report, *The Evolution of Server Virtualization*, November 2010

Efficient Unified Storage

ESG Lab examined the HP 3PAR StoreServ 7000's efficiency as a platform, including hardware-based thin provisioning, the ability to convert from fully provisioned volumes to thin provisioning as well as the option of converting from thin to full, dynamically and online and Thin Persistence, which enables organizations to maintain capacity efficiency even as thin provisioned volumes age and large amounts of data are written and deleted. Adaptive Optimization for operationally efficient performance optimization was also explored.

ESG Lab began with a look at storage provisioning. HP 3PAR is different from traditional arrays in that storage virtualization is built into the system at the most basic level. Rather than manage disks, administrators can manage their environment more granularly, and offer different levels of protection or performance on the same disks.

HP uses the term *Thin Provisioned Virtual Volume* (TPVV) to describe thin provisioned disk presented to a host from an HP 3PAR StoreServ Storage system. Figure 10 compares traditional provisioning with the HP 3PAR implementation. When provisioning a volume for a host in the traditional manner, the amount of physical disk allocated is equal to the size of the volume presented to the host.

Figure 10. Thin Provisioning
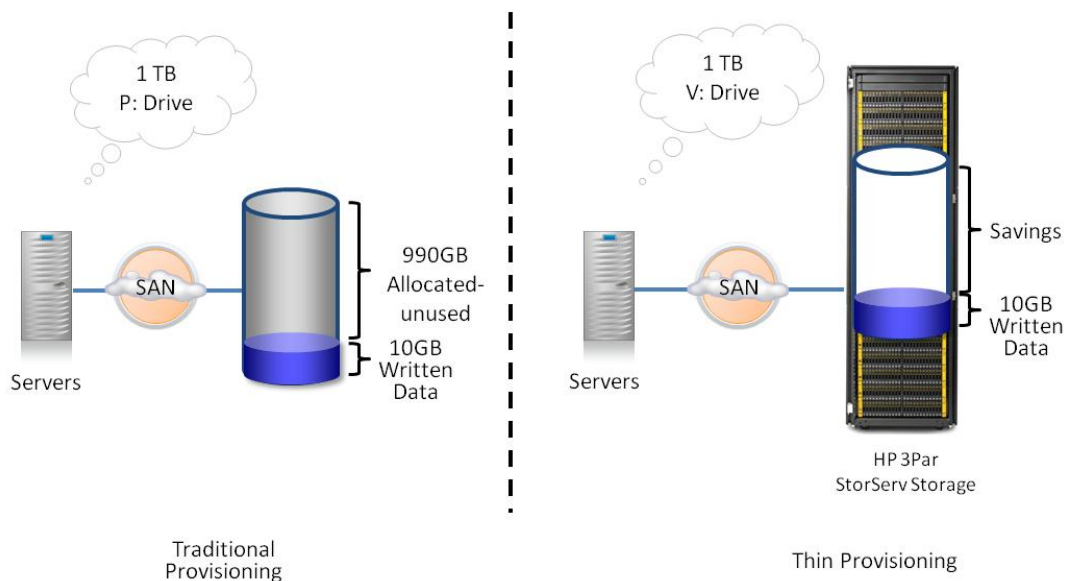
In the example shown above, a server running a mission-critical online application has a storage capacity requirement of only 10GB, but over time, its storage requirement is projected to grow to 1 TB. With traditional provisioning, 1 TB is pre-allocated to the application. This means that 99% of the physical storage assigned to this volume would be unused and, importantly, unavailable to other applications.

With HP 3PAR, the administrator creates a TPVV and specifies its virtual capacity only. This is the maximum capacity that the volume may consume on disk. Physical disk space is consumed only as data is written to the thin provisioned volume.

It's important to note that unlike some thin provisioning implementations, HP 3PAR Thin Provisioning Software does not require a user to pre-dedicate storage to a thin provisioned volume at the outset. 3PAR Thin Provisioning minimizes manual effort by automatically allocating capacity in fine increments from a single pool with no pre-dedication of any kind while volumes benefit from the wide-striping of data across the entire system.

ESG Lab Testing

ESG Lab provisioned two 10GB volumes, one thin provisioned and the other fully provisioned, and populated each with file data, as seen in Figure 11. The Iometer utility was used to generate IO against each volume throughout the conversion.

Figure 11. Thin Provisioning-Full and Thin Volumes
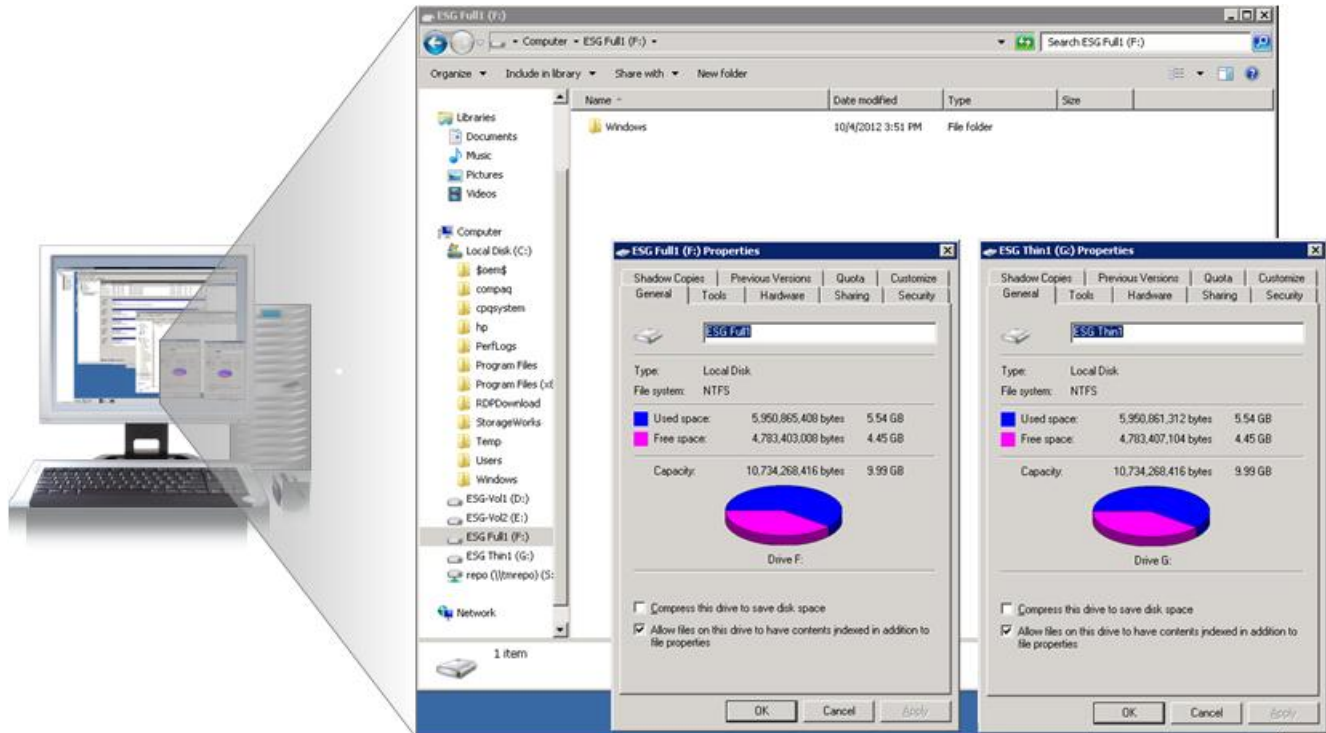
ESG Lab then used the HP 3PAR InForm management console to convert the fully provisioned volume to a thin provisioned volume and simultaneously convert the thin provisioned volume to a fully provisioned volume.

Figure 12. Thin Provisioning-Converting Full to Thin and Thin to Full
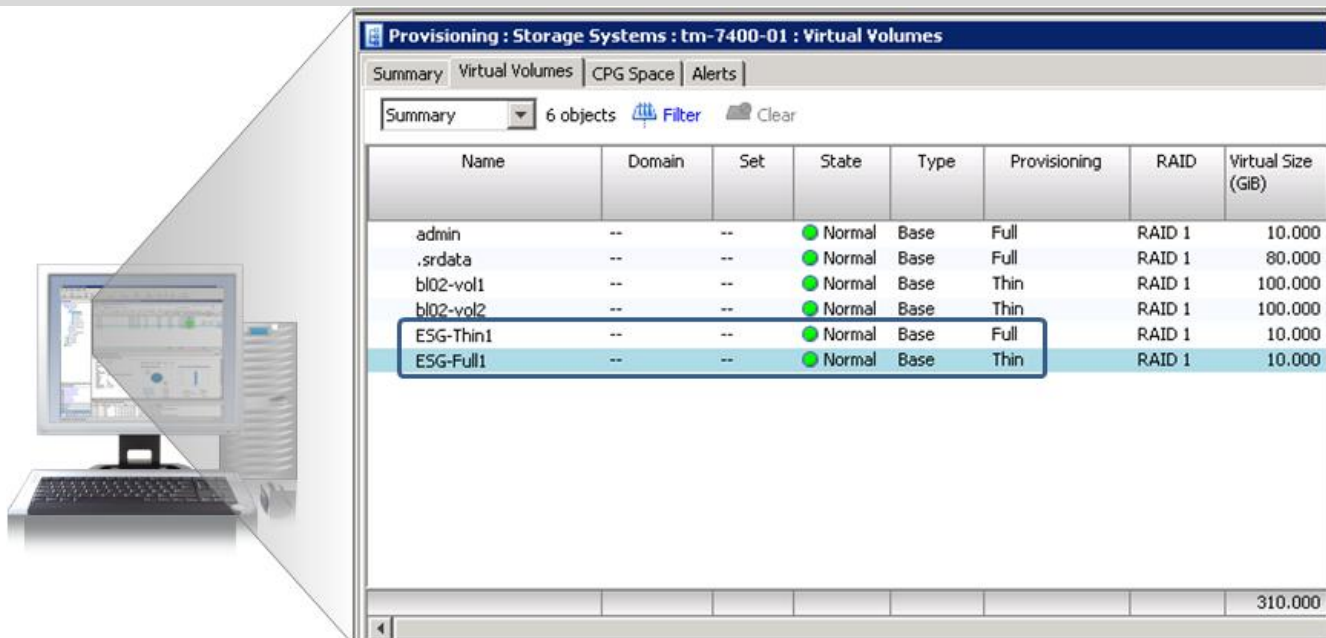
I/O continued to the volumes uninterrupted as their provisioning was converted.

Next, ESG Lab examined Thin Persistence, a feature that enables HP 3PAR StoreServ Storage to reclaim unused thin provisioned space when it is zeroed out by the operating system. When files are deleted in thin provisioned volumes, capacity remains allocated unless the storage system has a method of communicating with the OS. As seen in Figure 13, HP 3PAR StoreServ Storage detects zeros written in unused capacity and reclaims the capacity for reuse.

*Figure 13. Thin Persistence-Reclaiming Capacity from Thin Voumes*
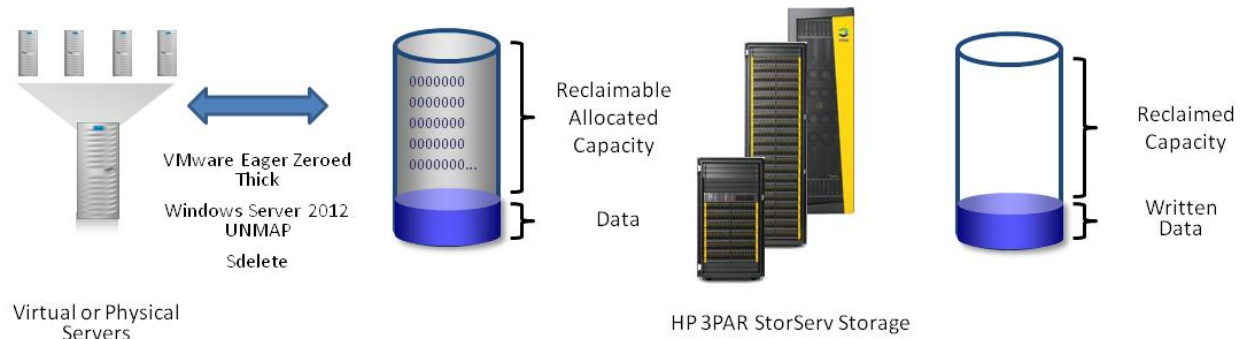
In Windows Server 2008 and earlier, the sdelete command was used to overwrite blocks which had been used by deleted files with zeros. HP 3PAR automatically detected the zeros and reclaimed the capacity. Windows Server 2012 introduced the UNMAP feature, which automatically writes zeros over files as they are permanently deleted, invoking thin persistence with no user interaction required.

VMware offers three volume types when creating a virtual machine, VMware thin provisioning, Thick Provision Lazy Zeroed, and Thick Provision Eager Zeroed. The highest-performing VMDK format is Eager Zeroed Thick, which is not natively capacity efficient, as Eager Zeroed Thick virtual disks write zeros across the entire VMDK file at the time they are created, meaning that the full size of the VMDK is reserved on traditional storage arrays before the VM is ever used. The built-in zero-detection capability of the HP 3PAR Gen3 ASIC allows users to create Eager Zeroed Thick VMDKs that do not consume physical capacity for the storage blocks that are "zeroed" at initialization.

To test thin persistence, ESG lab created a new virtual machine, and selected Thick Provision Eager Zeroed for the VMDK file. This automatically signals the StorServ system to reclaim the unused space in the volume, enabling VMware administrators to leverage hardware-based thin provisioning and use thick provisioned VMware volumes for best performance.

After clicking finish to begin creating the VMDK file, ESG monitored the HP 3PAR CLI and observed as the space allocated for the volume dropped as the StoreServ detected the zeros being written by vSphere, seen in Figure 14.

Figure 14. Thin Persistence-Space Reclaimed Automatically in VMware
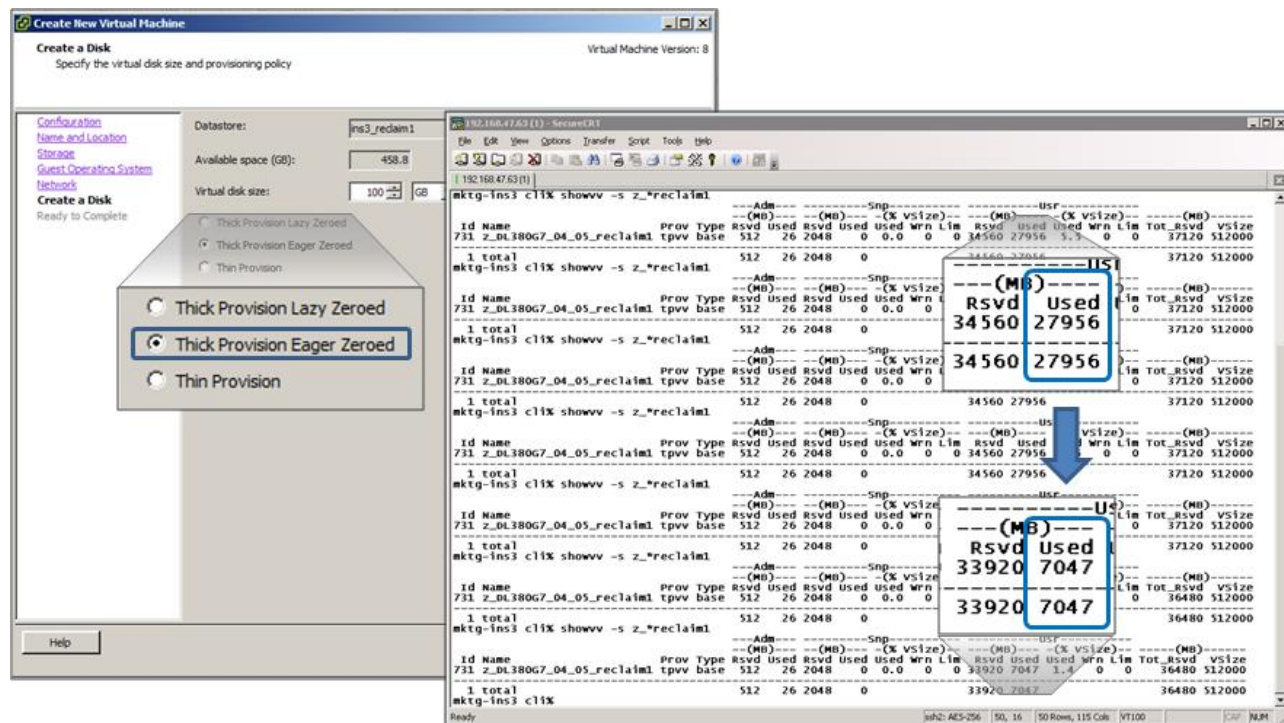
Finally, ESG Lab examined HP 3PAR Adaptive Optimization Software. Adaptive Optimization offers granular, policy-driven storage tiering enabling organizations to deliver service level optimization to reduce cost while increasing agility and minimizing risk. Adaptive Optimization Software uses a fine-grained, highly automated approach to service level optimization. Policy-driven, granular data movement takes place autonomically, designed to provide reliable, non-disruptive, cost-optimized storage tiering at the sub-volume level.

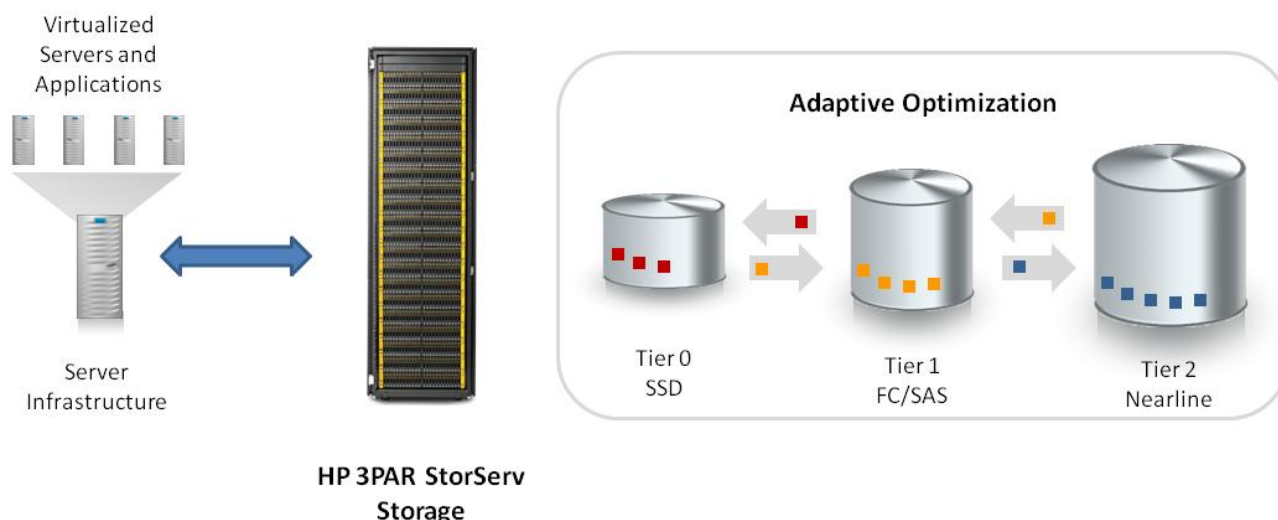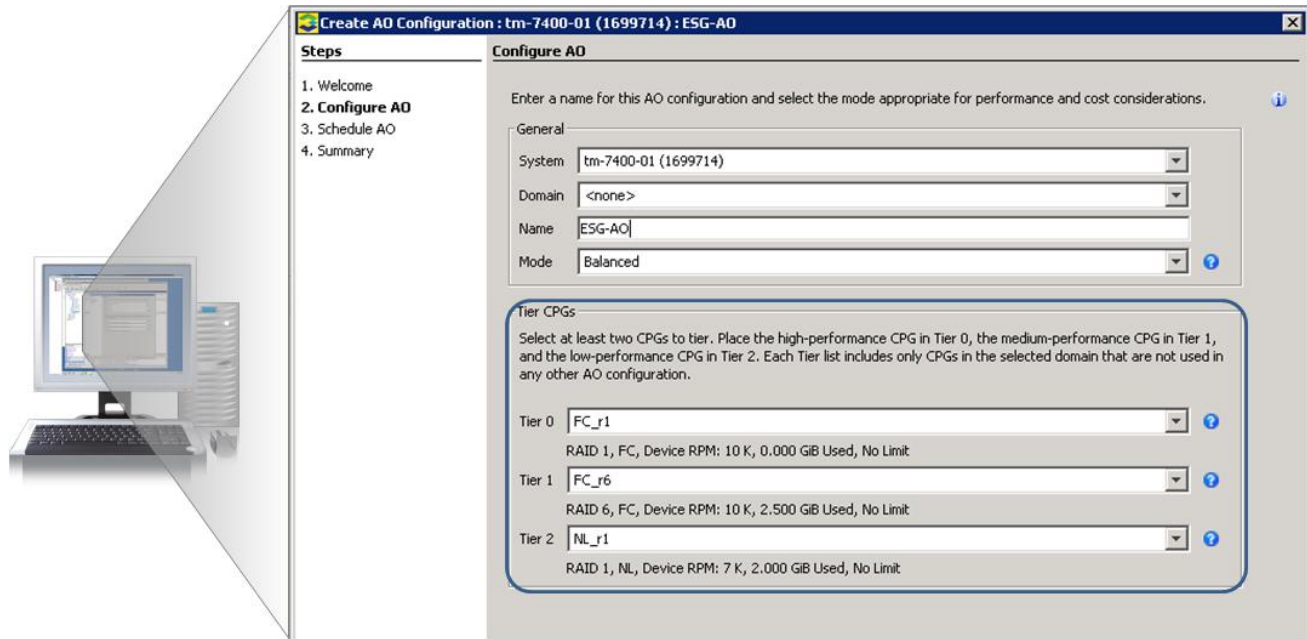Figure 15. Adaptive Optimization

Figure 15 illustrates a common configuration of HP 3PAR Adaptive Optimization. Any Common Provisioning Group (CPG) can be designated as a tier in an Adaptive Optimization configuration. A CPG is a logical definition of how data is laid out and protected as it is written to the HP 3PAR system. This is different from the storage pool

concept seen in traditional storage arrays. A storage pool is a group of discrete disks and disks can only be a member of a single storage pool. In a 3PAR system, a CPG is a definition of data protection and performance characteristics and a disk may participate in multiple CPGs because RAID is applied at the sub-disk level. As an example, consider the Adaptive Optimization configuration illustrated in Figure 16. In this system, three CPGs are configured using only two types of disks, FC_r1, FCr6, and NLr1. Adaptive Optimization will place the most active data in the FC_r1 CPG, migrating less active data to the FC_r6CPG , and placing the least active data on NL_r1.

Figure 16. Configuring Adaptive Optimization

Adaptive Optimization can be set to favor performance, cost, or balance between the two. Administrators also have the option to run optimization immediately to rebalance a system on the fly, or define a schedule to continuously analyze the system and rebalance daily, weekly, or monthly.

Why This Matters

ESG has found that end-users often acquire and implement new storage systems when they have allocated but unused storage capacity. In a survey of enterprise storage administrators, more than half reported that up to 50% of their purchased storage capacity was stranded and unused. In addition, 45% percent indicated that they purchased new storage systems to support new and existing applications every six months or more frequently.[4] With thin provisioning, less physical storage is required since the amount of stranded storage is significantly reduced. In addition, Companies continuously are challenged to cost effectively meet the capacity and performance requirements of applications. Failure to meet these requirements can result in downtime leading to lost productivity and costly loss of services.

ESG Lab has validated that HP 3PAR Thin Provisioning is easy to manage and extremely capacity efficient. Provisioning additional storage capacity happens behind the scenes while the application and file system remain unaware of any changes. The storage system automatically provisions additional capacity as needed without any manual intervention. HP 3PAR Thin Persistence takes capacity efficiently to another level, automatically reclaiming data as it is freed up inside thin provisioned volumes. HP 3PAR Adaptive Optimization enables significant levels of storage efficiency, with autonomic data movement to the most appropriate tier, optimizing for performance, cost, or both.

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[4] Source: ESG Research Report, *Scale-out Storage Market Trends*, December 2011
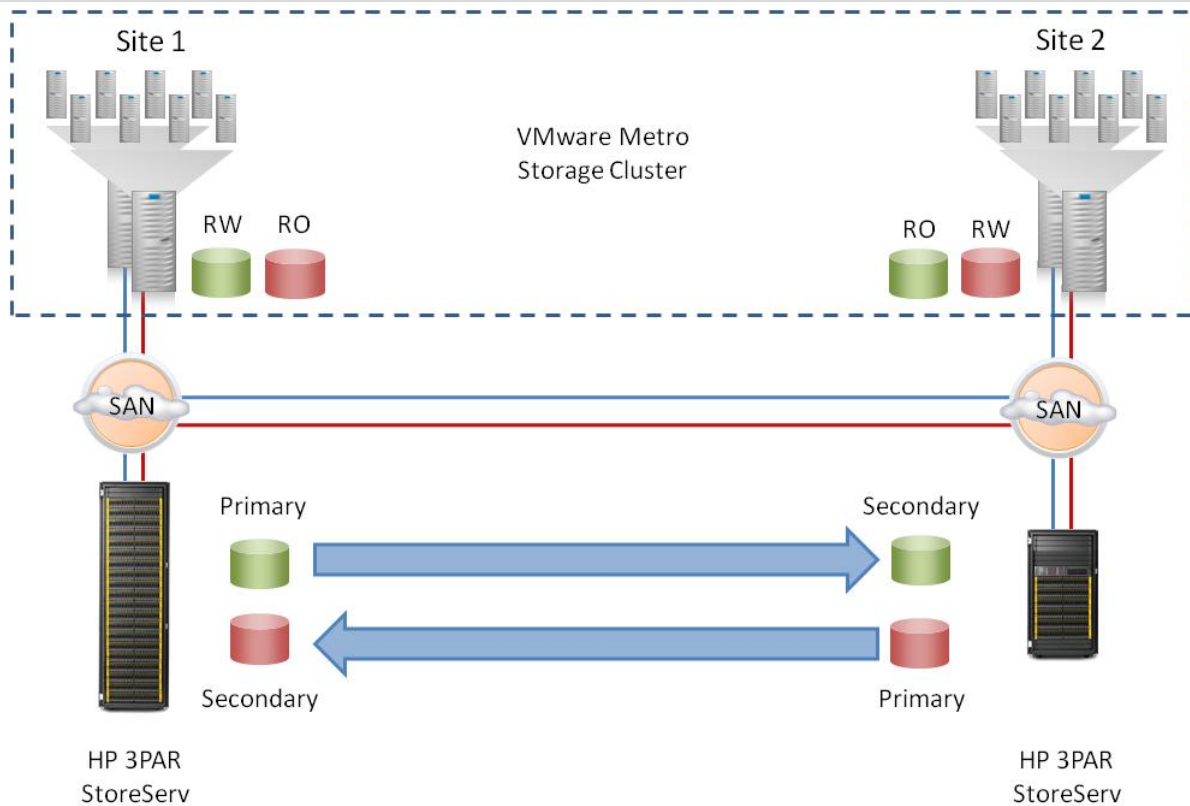
Peer Persistence

HP 3PAR Peer Persistence software enables HP 3PAR StoreServ systems located in different sites at metropolitan distances to act as peers to each other, presenting a nearly seamless storage system to hosts and servers. This capability is designed to enable users to configure a high-availability solution between two sites where failover and failback remains completely transparent to both hosts and the applications running on those hosts. Peer Persistence software allows hosts to remain online when they switch from their original site to the disaster-recovery (DR) site, resulting in greatly reduced recovery time.

Peer Persistence software takes advantage of the Asymmetric Logical Unit Access (ALUA) capability that allows paths to a SCSI device to be marked as having different characteristics. As seen in Figure 17, each host is connected to each HP 3PAR StoreServ on both sites via redundant SAN fabrics. Additionally, each StoreServ maintains a synchronous copy of it's volumes at the other site.

While the primary volumes at each site are exported in read/write mode, their corresponding secondary volumes at the opposite site are exported read-only. The volume paths for a given volume are active only on the StoreServ where the primary copy of the volume resides.

*Figure 17. HP 3PAR StorServ Storage Peer Persistence*

ESG Lab Testing

ESG Lab tested Peer Persistence between an HP 3PAR StoreServ 7400 Storage System and an HP 3PAR StoreServ 7200. Each system was attached to a SAN fabric and both SAN fabrics were linked to simulate a campus or metropolitan network. The volume "PeerPers_vol" was replicated between the StoreServ systems using synchronous Remote Copy exported by both arrays to the same vSphere ESXi server: ESXi5_ip11, with the same fibre channel worldwide name (WWN), so the server recognizes the two copies as the same volume.

Figure 18 shows the paths the server can see the volume on, the two active paths are to the StoreServ 7400 and the stand by paths are to the StoreServ in the simulated remote site.

Figure 18. Primary and Secondary Volumes
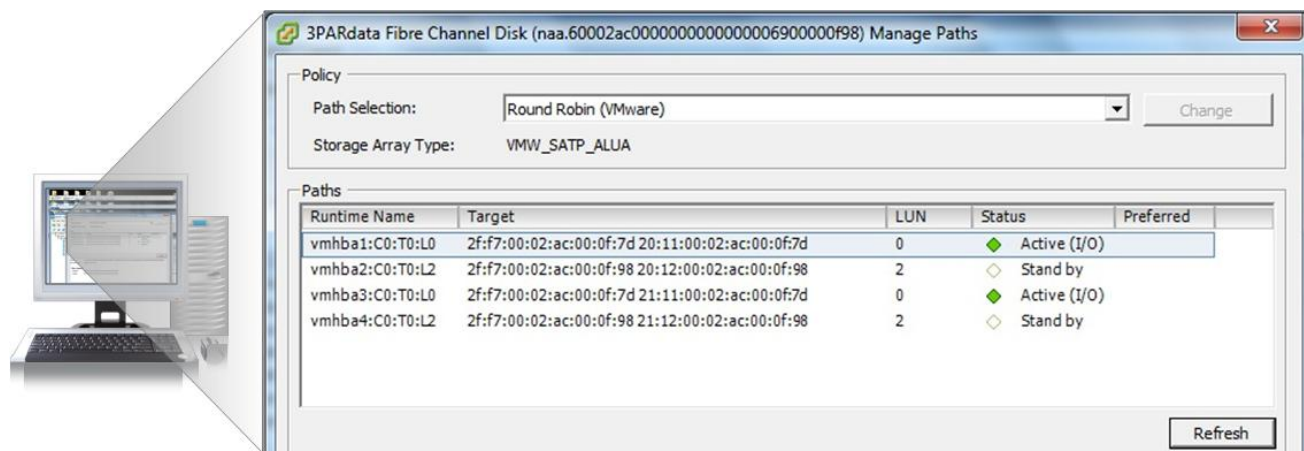
The Iometer utility was used to generate a continuous workload to simulate an active application sever. When ESG Lab initiated the failover the active paths changed from the StoreServ 7400 to the StoreServ 7200 as seen in Figure 19, and the server continued to read and write to the volume without interruption..

Figure 19. Data Paths Before and After Failover
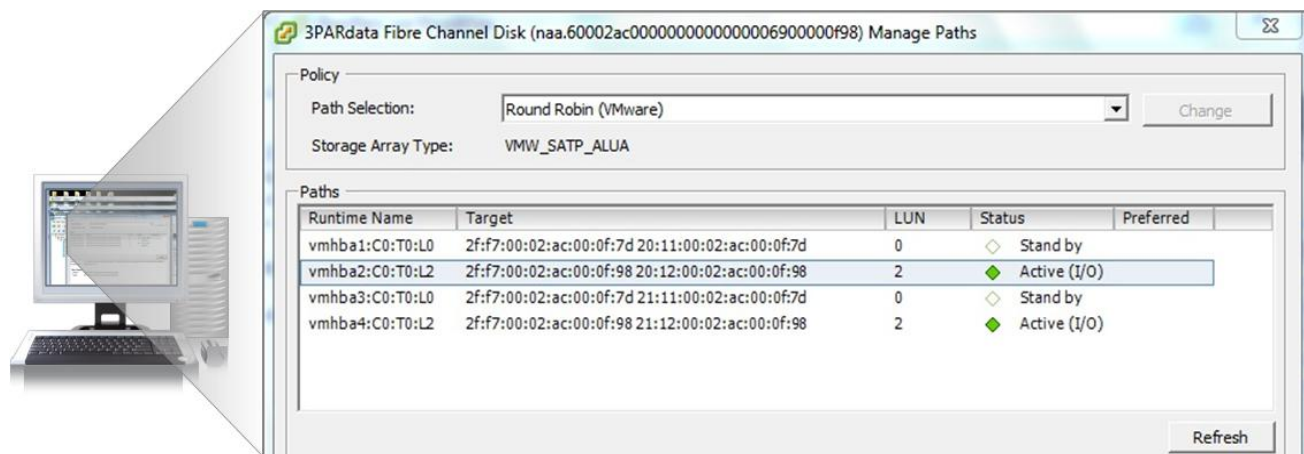
ESG Lab monitored I/O from the HP 3PAR InForm management consoles for both arrays, as seen in Figure 20.

Figure 20. Host I/O Moving Seamlessly Between Systems
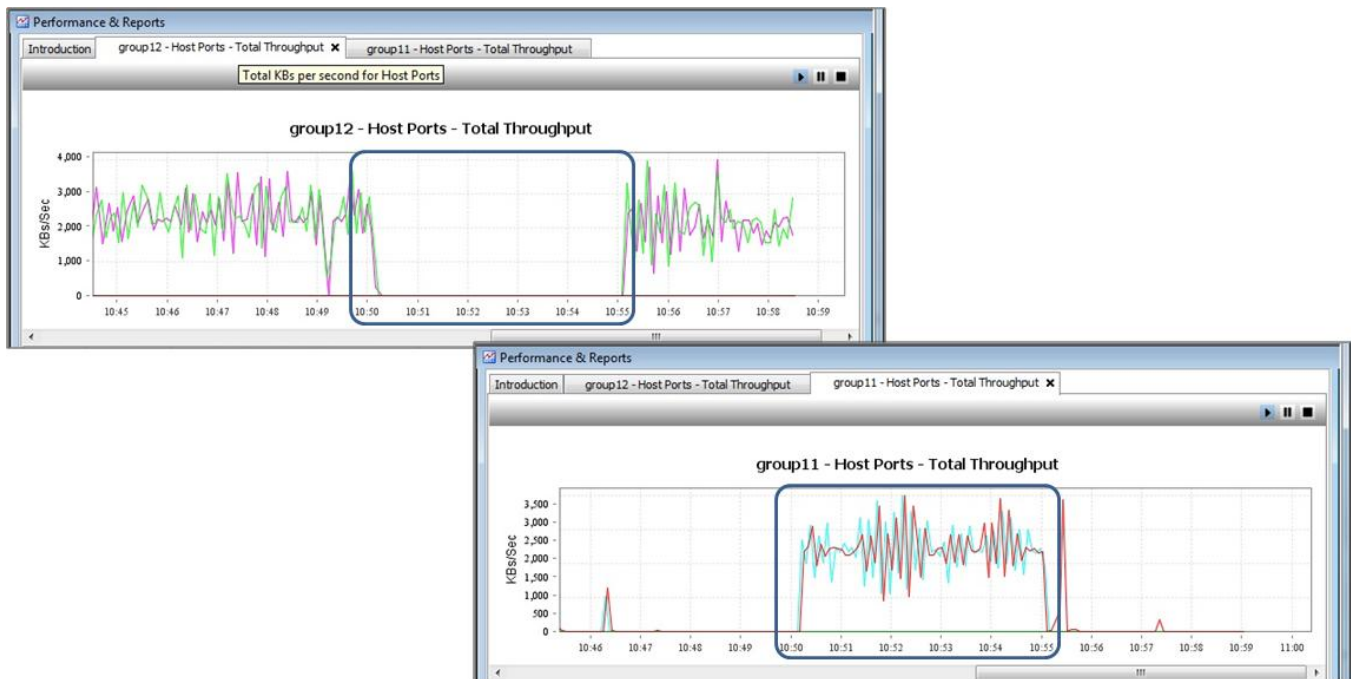
As Figure 20 shows, when failover was initiated, I/O stopped at the primary site and immediately picked up at the remote site, and then failed back just as seamlessly.

Why This Matters

Virtualization of servers and business applications increases both data storage requirements and complexity as IT strives to bring applications and services to traditional IT infrastructure dynamically and on-demand. IT administrators and managers were asked by ESG to list their top IT priorities for 2012-13 and Increased use of server virtualization was once again the top response, managing data growth and business continuity/disaster recovery also ranked in the top ten in the same survey.[5] One in four enterprises reported that purchasing new SAN storage systems was the most significant area of investment. This means more data migrations and more sensitivity to data availability as storage and servers are consolidated into federated pools of IT resources. Users need the ability to provide live applications with on-demand data mobility.

HP 3PAR StoreServ Storage Systems are designed to provide flexible, tier-one, federated storage, engineered for efficiency, performance, and multi-tenancy in support of private and public cloud delivery of storage services. HP Peer Persistence Software has been engineered to take advantage of HP 3PAR's massively parallel architecture and mesh-active technology to provide robust, federated high availability for the storage used by servers and applications.

ESG Lab found HP 3PAR Peer Persistence easy to configure and execute, able to non-disruptively fail data volumes over between two storage arrays while a server was executing live read and write I/O to the volume. ESG Lab was able to fail a volume over to a secondary site, and fail back on demand, with no interruption to data access and no impact on performance.

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[5] Source: ESG Research Report, *2012 IT Spending Intentions Survey,* January 2012.

ESG Lab Validation Highlights

☑ ESG Lab found the HP 3PAR StoreServ 7000 was extraordinarily easy to deploy, configure, and manage.

☑ The SmartStart Wizard configured storage hardware and software, provisioned and exported storage, and enabled management of host connections in a consolidated "wizard of wizards".

☑ The HP 3PAR Management Console required only a handful of intuitive, well-supported actions for complete functionality and system administration.

☑ ESG Lab was able to import live volumes from an HP EVA array quickly and with minimal disruption.

☑ ESG Lab has validated that HP 3PAR Thin Provisioning is easy to manage and extremely capacity efficient.

☑ HP 3PAR Thin Persistence was particularly impressive, automatically reclaiming data as it is freed up inside thin provisioned volumes.

☑ ESG was able to configure HP 3PAR Adaptive Optimization to provide autonomic data movement between fine-grained storage tiers, optimizing for performance, cost, or balanced between the two.

☑ ESG Lab found HP 3PAR Peer Persistence easy to configure and execute. Peer Persistence was able to fail a volume over to a secondary site, and fail back on demand, with no interruption to data access and no impact on performance.

Issues to Consider

☑ While Peer persistence provided completely transparent and non-disruptive failover and failback between sites during ESG testing, failover and failback are manual processes as of this writing. ESG Lab is of the opinion that integration with host-based recovery technologies like VMware Site Recovery Manager (SRM) should be a priority.

The Bigger Truth

Respondents to a recent ESG survey indicated that increasing the use of server virtualization was their number-one IT priority in recent years and will continue to be the top priority for the next 12-18 months. While server virtualization penetration continues to gain momentum, IT organizations still have numerous hurdles to overcome in order to deploy it more widely and move closer to a 100% virtualized data center with the goals of reduced costs, improved resource utilization, non-disruptive upgrades, and increased availability.

In addition, IT is feeling significant pressure to more effectively support the business, increase asset utilization, and improve information management and security—all while holding down costs across the board. Recent ESG research also indicates that a majority of organizations are making significant commitments to server and storage virtualization in the hopes of improving the performance, cost-effectiveness, and utilization of IT resources.[6]

As IT organizations virtualize server and storage infrastructure, they absolutely must be able to balance IO within and across systems at will, seamlessly refresh technology, control both capital expenditures and asset lifecycle management costs, and provide highly available infrastructure for critical business applications. HP 3PAR Adaptive Optimization enables fine-grained tiering of storage volumes across any storage in any HP 3PAR StoreServ Storage Systems online and non-disruptively, HP 3PAR Online Import enables businesses to refresh their storage infrastructure online and with minimal impact to applications. HP 3PAR's hardware-based built-in thin provisioning and Thin Persistence technology power simple and rapid provisioning of capacity-efficient volumes and extend capacity efficiency by automatically reclaiming unused space owned by operating systems. HP 3PAR Peer Persistence was easy to configure and executed non-disruptive volume failover and failback between two storage arrays while a server was executing live read and write I/O to the volume, with no disruption.

Through hands-on testing, ESG Lab found that HP 3PAR StoreServ Storage provides a robust, efficient midrange storage platform with all of the tier 1 capabilities of its larger enterprise-focused siblings. ESG Lab confirmed that with a simple configuration, autonomic operation, and non-disruptive migration and failover capabilities, HP 3PAR StoreServ Storage delivers simple, powerful, and efficient storage that can enable organizations of any size to optimize their IT environments and resources with enterprise class functionality.

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[6] Source: ESG Research Report, *2012 IT Spending Intentions Survey*, January 2012.

Appendix

Table 1. ESG Lab Test Bed

HP Storage	Capacity
HP 3PAR StoreServ 7400 4-Node Firmware 3.1.2.246	32x 300 GB 15K RPM FC drives 16x 2TB 7.2K RPM NL drives
HP 3PAR StoreServ 7200 2-Node Firmware 3.1.2.246	24x 450 GB 10K RPM FC drives
VMware vSphere	**Software**
4x HP ProLiant BL460 G6 1x quad-core Intel Xeon E5520 16GB RAM	vSphere 5.1
Virtual Machines	**Operating System**
16x VMs 1x vCPU, 4GB RAM 50GB VMDK	Windows Server 2008 R2 64 bit
Workload Generation	**Workload Definition**
Iometer 2006.07.27	OLTP 4K: 4KB I/O, 66% read, 33% write

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