LAB VALIDATION REPORT

LSI StoreAge SVM

Simplifying Heterogeneous Storage Virtualization

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ESG Lab Reports

The goal of ESG Lab reports is to educate IT professionals about emerging technologies and products in the storage, data management and information security industries. 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 LSI Corporation.

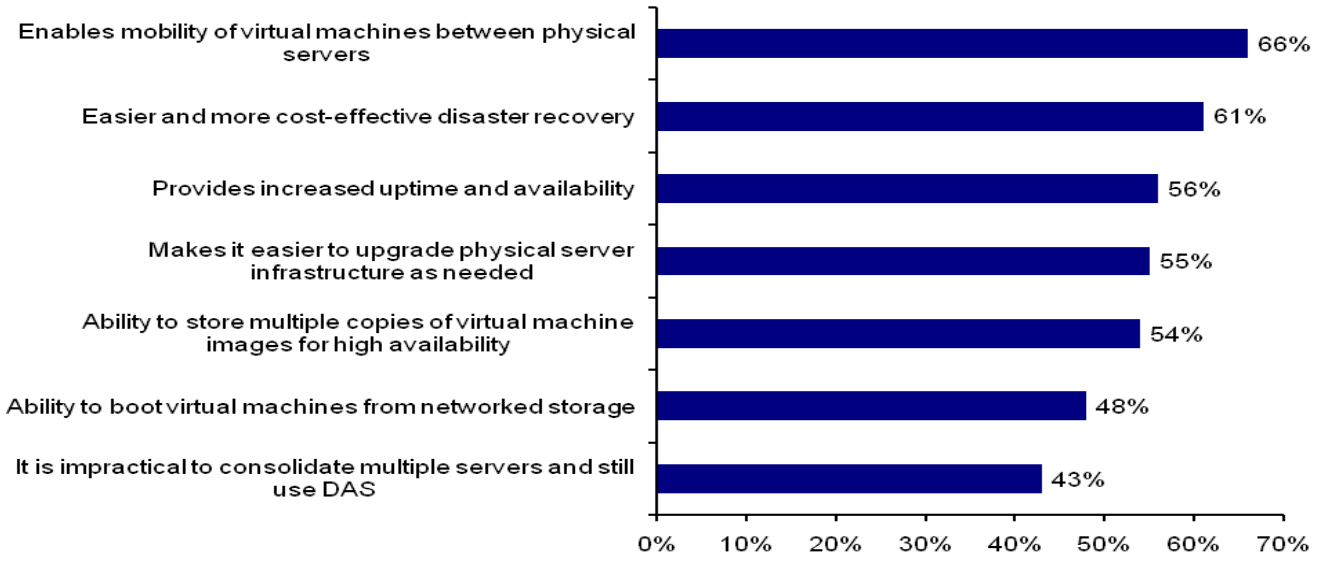
Introduction

This report documents the results of ESG Lab testing of LSI StoreAge SVM version 5 with a focus on the fundamentals of heterogeneous storage virtualization including centralized management, ease of use, thin provisioning, data mobility and capacity-efficient point-in-time snapshots. The enhanced high availability and disaster recovery capabilities of synchronous local and remote mirroring are also presented.

Background

Enterprise Strategy Group undertook an in-depth global survey of current and planned x86 server virtualization customers to better understand the relationship between the growing use of storage virtualization in virtualized server environments.[1] As shown in Figure 1, system mobility, cost-effective disaster recovery and increased uptime/availability topped the list of expected benefits that planned adopters were most interested in.

FIGURE 1. EXPECTED BENEFITS OF STORAGE VIRTUALIZATION



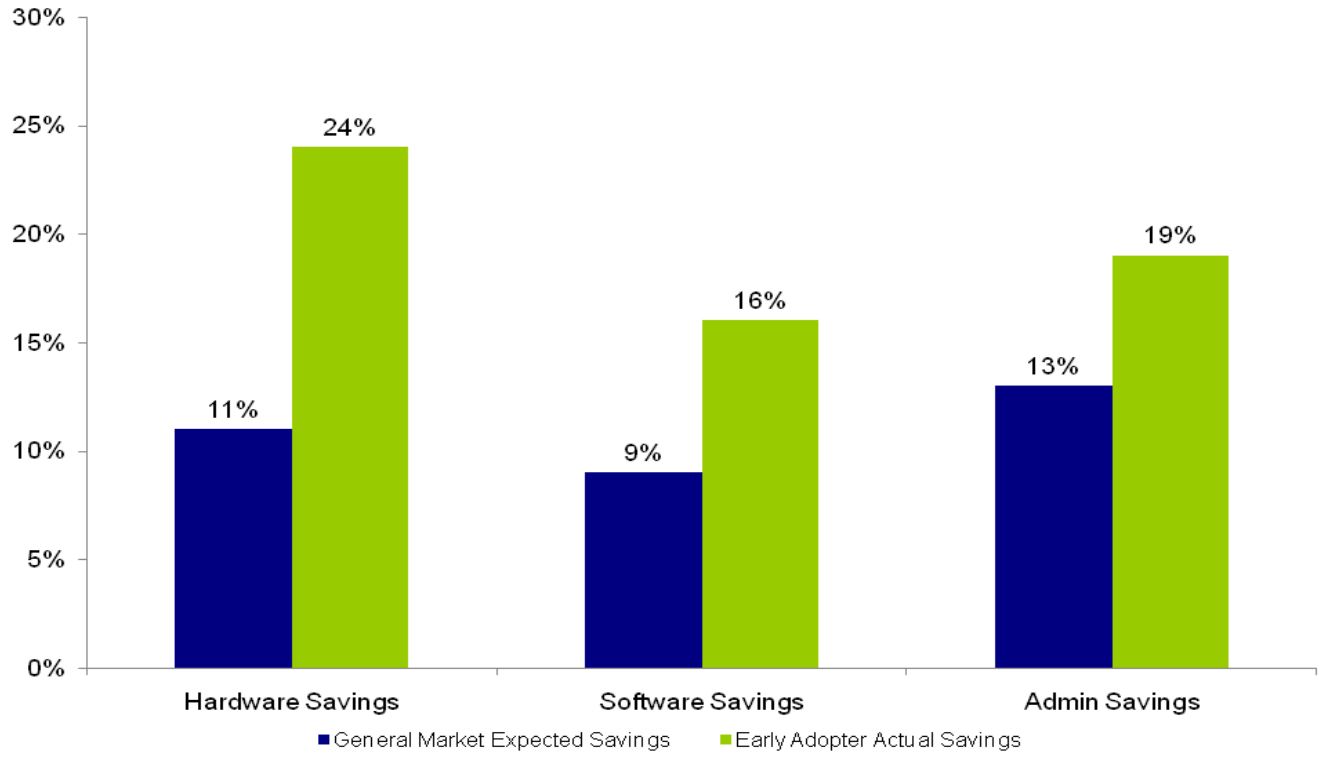
The benefits shown above should look familiar to IT professionals who have experience with server virtualization. Like server virtualization, storage virtualization provides increased availability, fault tolerance and mobility. Storage and server virtualization are also similar in their ability to enable consolidation, which reduces complexity and cost. Given the similarities, it's not surprising that ESG also learned that an increasing number of organizations are deploying server and storage virtualization together. Twenty-four percent of organizations surveyed have already deployed storage virtualization in conjunction with server virtualization and an additional 33% plan on doing so within the next 24 months.

One of the most significant findings—if not the most significant—is the substantial economic benefit of deploying heterogeneous storage virtualization. For example, 79% of early adopters with a large SAN believe they have

[1] Source: ESG Research Report, *The Impact of Server Virtualization on Storage*, December 2007

reduced their annual storage hardware spending to some degree, with these users reporting a mean average annual savings of 19.7%. As shown in Figure 2, storage hardware savings were the most significant due to the ability to reclaim and re-use existing storage (the least expensive storage is the storage you already have). Consolidating storage software that previously ran on multiple servers or storage systems onto a centrally managed infrastructure also helped reduce storage software spending and storage administration costs.

FIGURE 2. EARLY ADOPTER SAVINGS – EXPECTED VS. ACTUAL



LSI Storage Virtualization and Data Services

More than 300 SANs are being managed and protected worldwide using the four main components of the LSI StoreAge software suite:

StoreAge SVM - Storage Virtualization Manager
This core component provides heterogeneous capacity virtualization services for all major operating systems and storage devices. SVM aggregates all available storage capacity into centrally managed pools. Volumes are allocated to servers from these shared pools. Volumes can be striped over multiple arrays for maximum performance or replicated between arrays for maximum availability. Additional capacity can be added to existing volumes to avoid application crippling out-of-space conditions.

StoreAge multiMigrate
This component provides transparent online migration of application data from any SAN-connected storage array to any other SAN-connected storage array. Production applications can remain online during migrations and no server or application level changes are required. When a migration has been completed, the original volume can be retained, intact, for backup purposes.

StoreAge multiView and StoreAge multiCopy

These components are used to create instant, fully read/write-able copies of production data for backup acceleration, rapid restores and testing/development. The multiView utility uses redirect-on-write technology to create space-efficient copies while the multiCopy utility uses the same technology to provide instantly available read-write views of full volume copies while the copy occurs in the background. multiView creates low-capacity snapshots that can be retained independently of the original data and made available to any host on the SAN. One benefit unique to redirect on write snapshots is the ability to allow destructive testing of a snapshot via a view without having to fold back in any other snapshots.

StoreAge multiMirror
This component is used to mirror volumes between storage arrays over a LAN, MAN or WAN for disaster avoidance. High performance replication over short and long distances is optimized using snapshot-enhanced mirroring for use over limited bandwidth connections. Any-to-any replication between all major storage devices is supported so that customers can mirror primary storage to more affordable solutions at a remote site if desired.

This report explores the functionality and capabilities of LSI StoreAge SVM version 5 using the recently enhanced GUI to configure, provision, migrate, copy and protect applications and data in a heterogeneous storage environment.

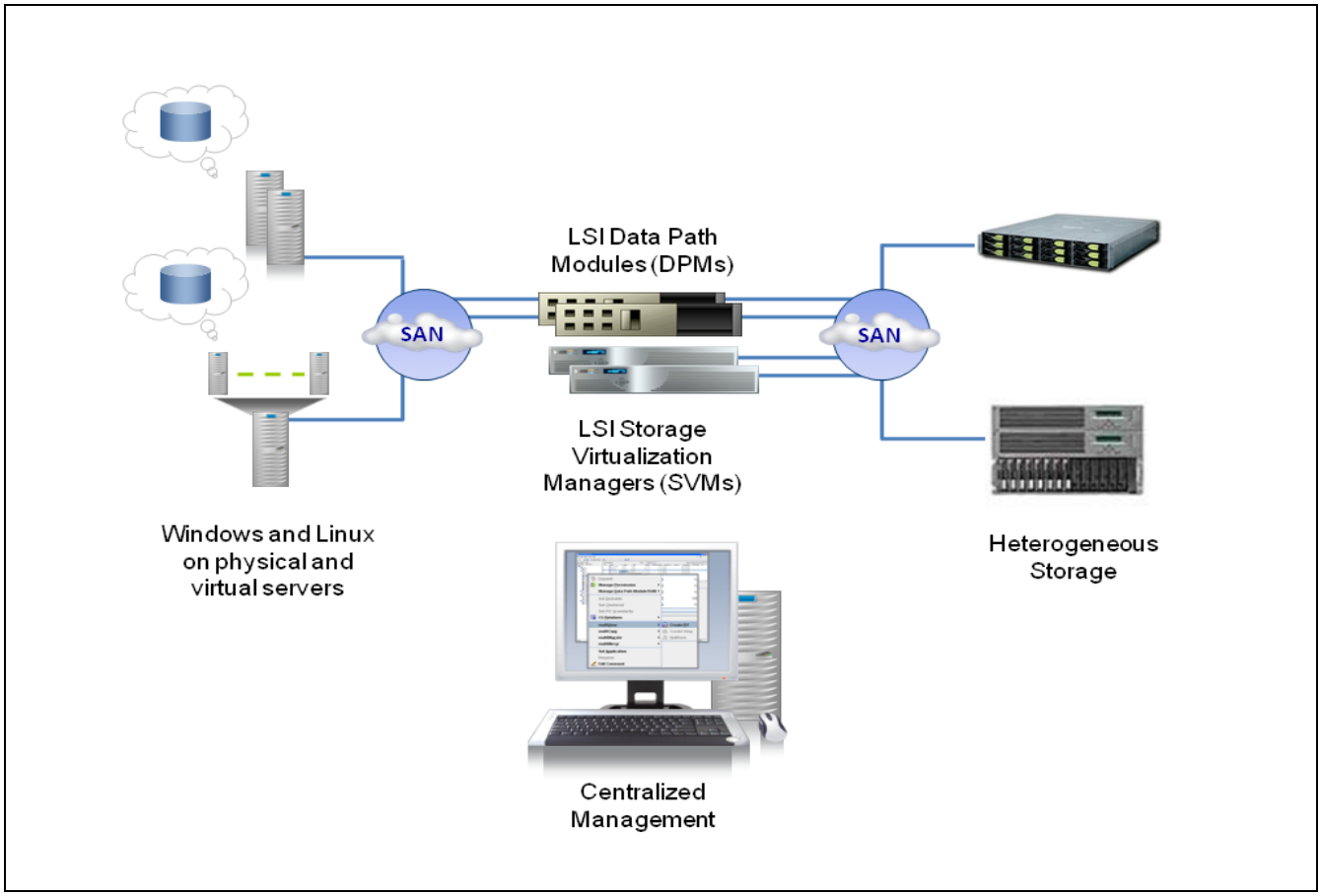
ESG Lab Validation

ESG Lab performed hands-on evaluation and testing of LSI's Storage Virtualization Manager—StoreAge SVM—at LSI's Irvine California facilities. Testing was designed to evaluate ease of manageability, virtual provisioning, data migration, creation and use of point-in-time copies and synchronous data mirroring capabilities using industry standard systems, tools and methodologies.

Centralized, Role-Based Storage Management

Figure 3 illustrates the test bed used by ESG Lab for this Validation report.[2] Two physical servers were configured with Microsoft Windows 2003 and RedHat Enterprise Linux builds while two additional servers were configured with VMware ESX 3.5 and hosted identical Windows and RedHat installations in virtual machines.

FIGURE 3. THE LSI STOREAGE SVM TEST BED



The servers and storage arrays were attached via Fibre Channel SAN switches to a pair of LSI Data Path Modules (DPMs). The DPMs take the raw storage from the attached arrays and present virtualized volumes to the attached servers. Two LSI Storage Virtualization Managers (SVMs) attached to the storage arrays via Fibre Channel SAN switches provided a centralized management interface that could be accessed from anywhere on the LAN.

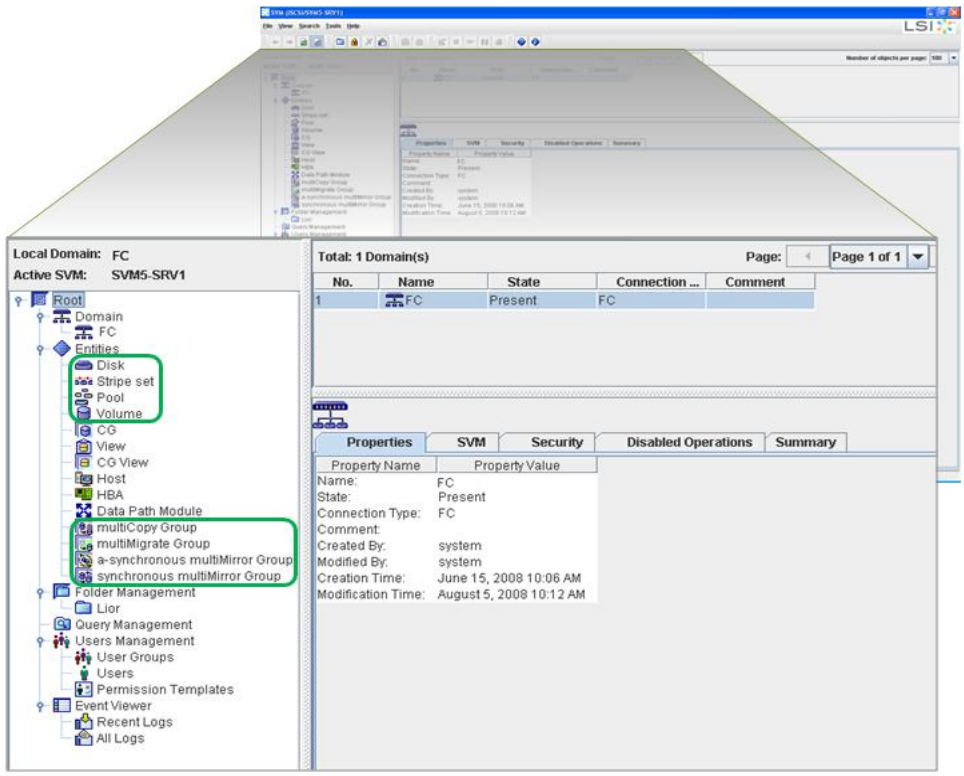
[2] Detailed configuration data is listed in the Appendix.

ESG Lab Testing

The LSI StoreAge SVM management GUI is a locally installed application that users download and install by pointing a web browser at the IP Address of either of the Storage Virtualization Managers installed in a customer's environment. Microsoft Internet Explorer and Mozilla-based browsers are fully supported. Installation was a straightforward 'click-through' affair that took less than two minutes, consisting of accepting the default locations offered by the installation wizard and clicking 'Finish' at the end. ESG Lab logged into the GUI by double clicking on the new icon on the administrator's desktop.

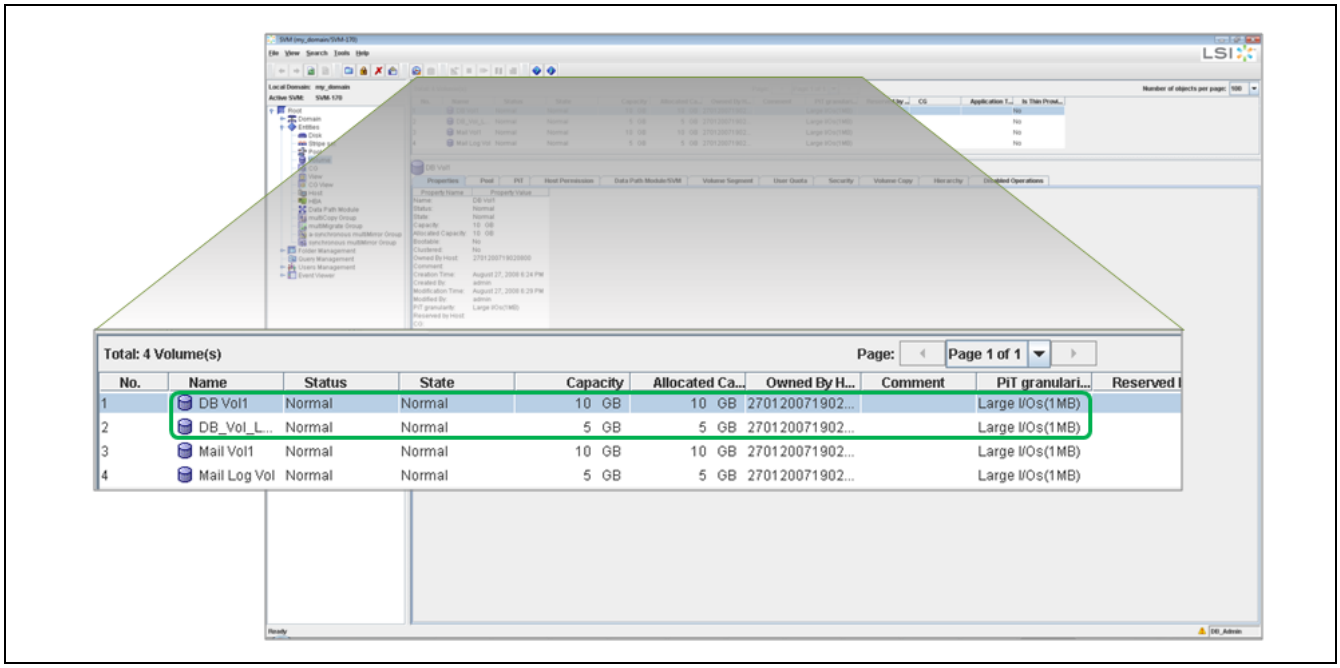
The SVM user interface, shown in Figure 4, presents a clean view of the user's environment with a familiar-looking tree view on the left side of the screen. Users drill down into individual components and entities from high level categories to manage all aspects of their virtualized storage environment.

FIGURE 4. THE SVM USER INTERFACE



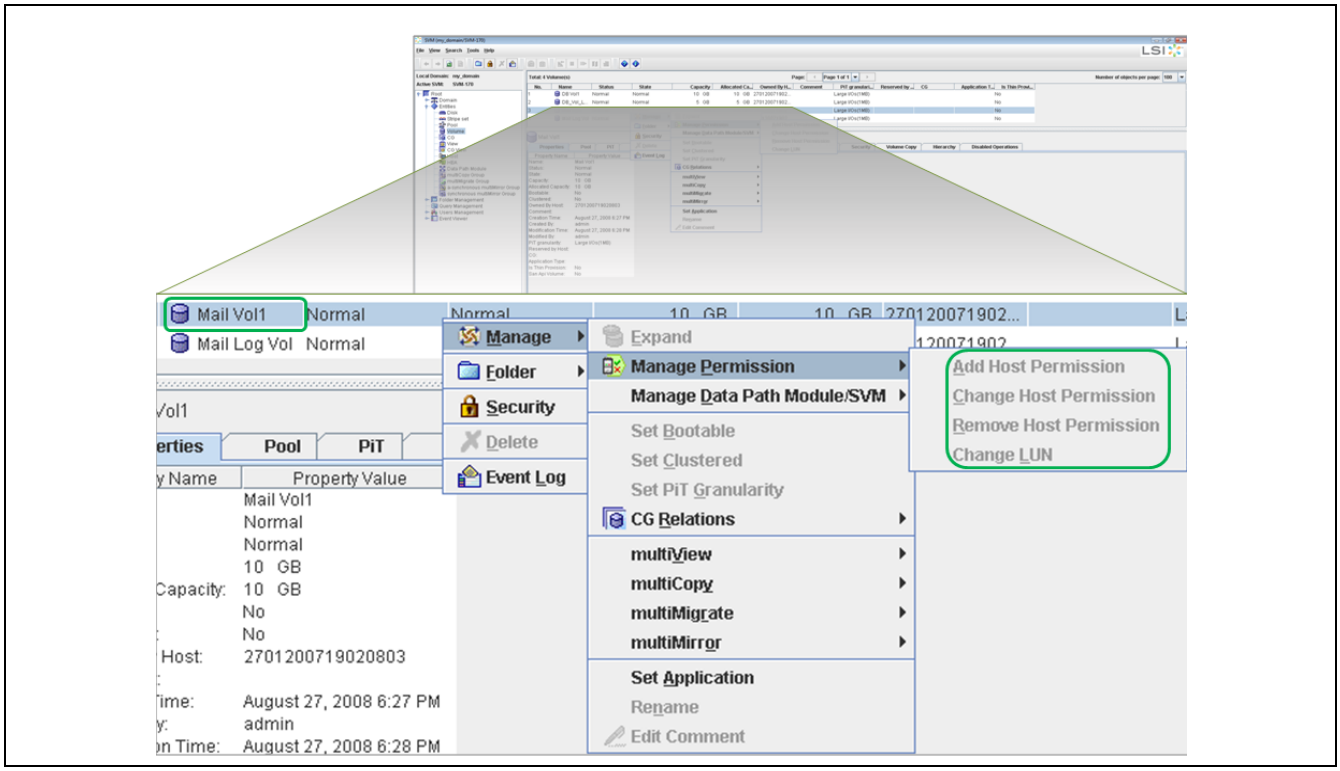
To test role-based management, called "My SVM" by LSI StoreAge, ESG Lab began with a set of four pre-configured virtual volumes utilizing storage on an LSI array. Two were designated as Mail volumes and two were designated as Database volumes, as seen in Figure 5. None of the four volumes were assigned to any host.

FIGURE 5. ROLE-BASED ADMINISTRATION SETUP



Next, ESG created a user profile for a database administrator and enabled full access to the two database volumes but assigned no rights to the two mail volumes. Finally, ESG lab logged out of the SVM GUI and logged back in using the database administrator's credentials. ESG Lab was able to assign the two database volumes to hosts, create Point-in-Time snapshots and perform all management on these two volumes with no trouble.

FIGURE 6. MANAGING VOLUMES USING "MY SVM" ROLE-BASED ADMINISTRATION



While ESG Lab was able to see all volumes under management by the SVM, none of the management functions were accessible for any volume to which the logged-in user was not expressly granted access. As seen in Figure 6, when ESG lab right-clicked on a volume to manage it, all management functions were simply grayed out.

The new SVM user interface was a very pleasant surprise. When ESG Lab last looked at the SVM user interface, it was unpolished and lacked essential functionality. The current interface has functionality and usability features normally seen only in much more mature UIs. The explorer-like menu tree allows easy drill down to specific items for intuitive right-click management. Every function is wizard-driven, providing step by step guidance yet allowing advanced users to skip ahead and configure exactly what they need quickly and efficiently. Context-sensitive log views enable users to right-click on an object and get logs filtered for that object alone (Volume, Pool, User, etc…). Comprehensive, detailed help files provided clear documentation; every command and every property is clearly explained.

Why This Matters

ESG research indicates that the complexity of managing storage is the number one concern driving adoption of storage virtualization.[3] Virtualized storage infrastructure, and the data that resides within that infrastructure, is needed to predict and avoid space and performance problems before they arise, optimize storage resource utilization, forecast future growth and enhance the productivity of storage administrators.

ESG Lab validated that LSI SVM software can be easily configured and integrated into an existing SAN environment, providing centralized and secure management with de-centralized administration using "My SVM" for heterogeneous storage environments without the added complexity and cost of managing distributed host agents.

[3] Source: ESG Research Report, *The Future of Network-based Storage Intelligence*, September 2004

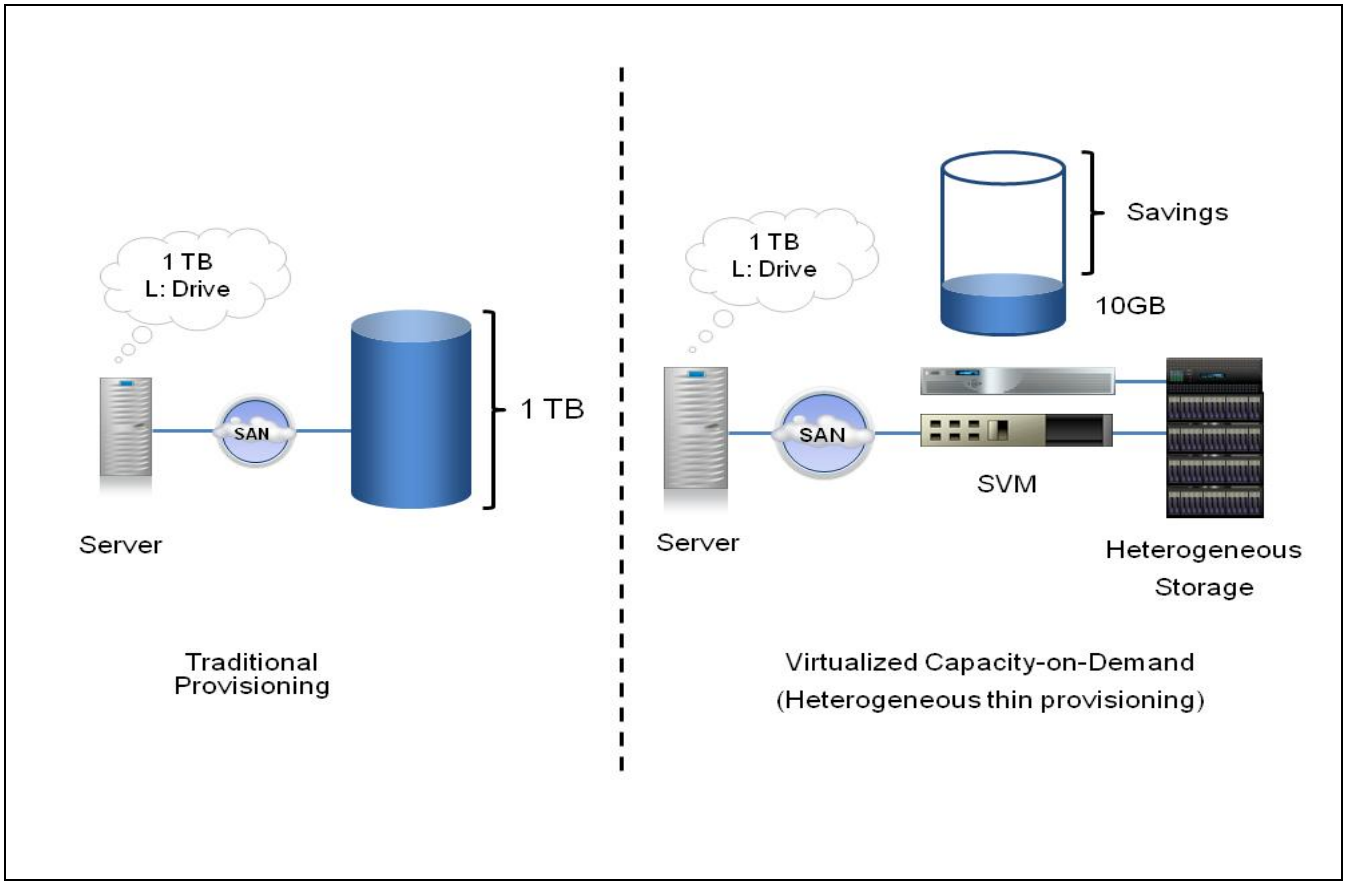
Dynamic Thin Provisioning

Dynamic Thin Provisioning is LSI's term for thin provisioning, the ability to allocate virtual disk storage based on anticipated capacity requirements without having to dedicate physical disk in advance. This feature, introduced in the latest release of SVM, allows administrators to create servers with all the storage space they might ever need available to them while physically allocating only what is immediately needed to get the server up and running.

ESG Lab Testing

Figure 7 illustrates the differences between traditional physical provisioning and Dynamic Thin Provisioning. With traditional provisioning, if a server running a critical application is anticipated to require 1 TB of capacity over its useful lifespan, then the full 1 TB needs to be allocated up front. Dedicating 1 TB to that particular server/application is required to avoid the risk of capacity-expansion related downtime in the future.

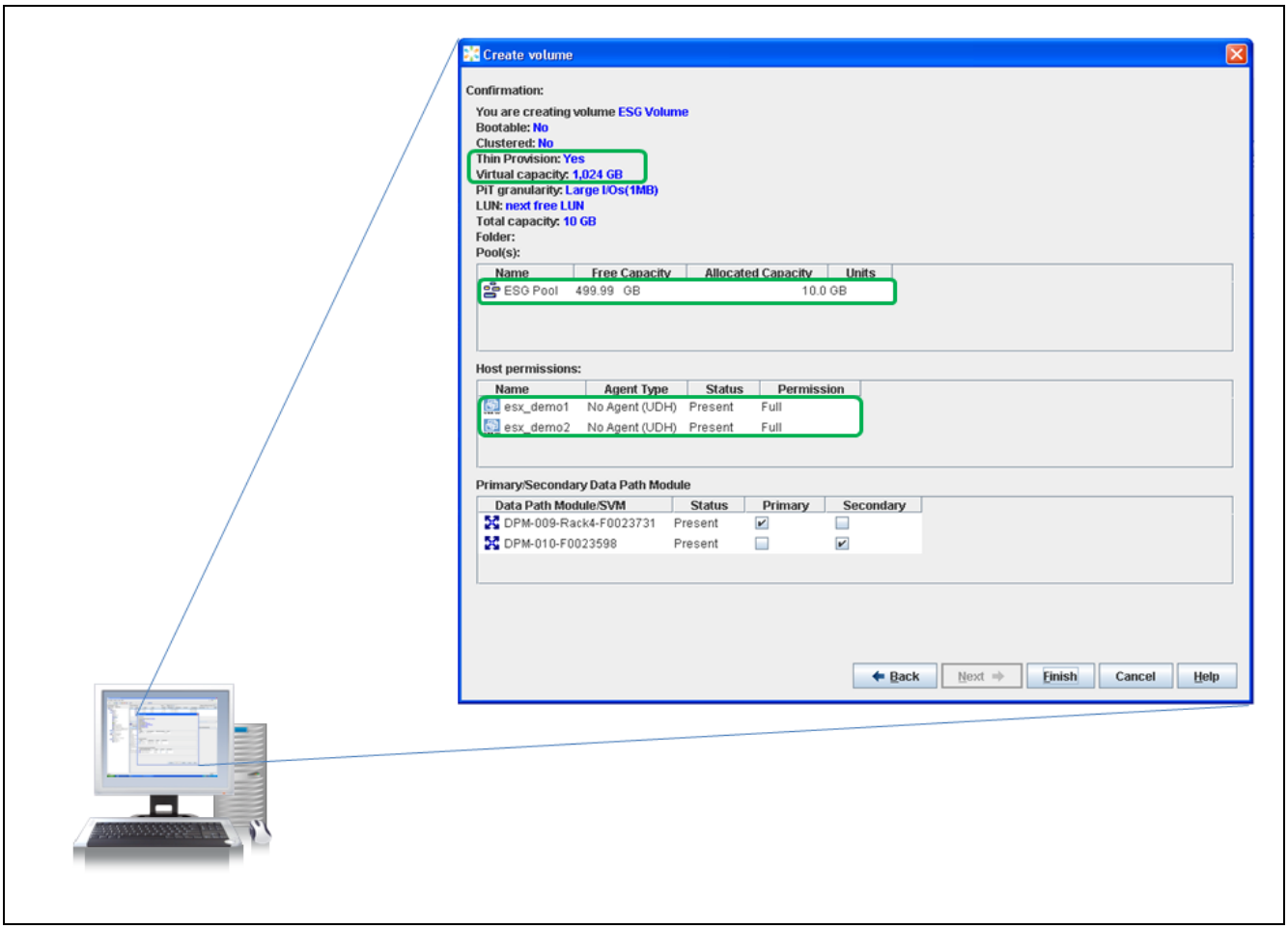
FIGURE 7. VIRTUALIZED CAPACITY-ON-DEMAND



Virtualized Capacity-on-Demand allocates disk from a pool of heterogeneous storage, allowing administrators to create a virtual volume using very little physical disk that appears to a server to be a physical volume of any size supported by the server OS. In this example, which was tested by ESG Lab, the thin provisioned volume presents 1 TB of capacity to the server, yet only 10 GB of actual disk capacity has been consumed.

Figure 8 shows how a thin provisioned 1 TB volume presented to two ESX servers is consuming only 10 GB of physical disk capacity.

FIGURE 8. CONFIGURING A THIN PROVISIONED VOLUME



To test thin provisioning in the LSI SVM environment, ESG first created a thin provisioned volume with 5 GB of virtual capacity and allocated only 1 GB of physical storage to the volume from a pool of storage with only 5 GB of total storage. This configuration was intended to facilitate testing of storage allocation algorithms as well as capacity thresholds. ESG Lab set the free capacity threshold (the level at which an administrator would be alerted that a pool is nearing maximum allocated capacity) to 40%.

Next, ESG Lab copied 1.1 GB of data files to the thin provisioned volume and confirmed that the volume's allocated physical capacity expanded to 1.5 GB while, to the server, it still looked like a 5 GB volume. Next, ESG Lab copied 500 MB of additional data to the volume and confirmed that the volume expanded again to 2 GB. Finally 1 GB of additional file data was copied to the volume and ESG Lab confirmed that disk allocation had grown to 3 GB.

ESG Lab then verified in SVM system logs that a critical event was triggered when the volume exceeded the Free Capacity Alert threshold.

Why This Matters

ESG conducted a survey of storage administrators managing large enterprise infrastructures focusing on the limitations and challenges of traditional storage provisioning methods.[4] More than half reported that between 31% and 50% of their purchased capacity was stranded and unused. Fully 80% felt that storage provisioning had a significant negative impact on IT time and resources.

ESG has found that end-users actually acquire and implement new storage systems because of allocated but unused storage capacity. Thin provisioning can eliminate this potentially major cost. With thin provisioning, less storage is required over the life of the storage system since the amount of stranded storage can be reduced or eliminated. Purchase of new storage systems can be delayed or deferred based on reclaiming stranded storage.

Also, thin provisioning simplifies the cumbersome task of storage provisioning. Customers can create large logical volumes without any cost to them, allowing applications to grow as needed while remaining online. ESG believes that thin provisioning is one of the most useful storage functions today and yet few storage systems currently support this capability. StoreAge SVM's Dynamic Thin Provisioning provides the benefits of thin provisioning for all SVM-managed disk arrays even if they do not support thin provisioning themselves.

ESG Lab testing has confirmed that SVM's Dynamic Thin Provisioning can be used to reduce the cost and complexity of storage provisioning while providing significant capacity savings. With its wizard-driven configuration process and advanced management capabilities including alert thresholds, LSI StoreAge provides enterprise class storage virtualization capabilities for all classes of SAN-attached storage, in any environment.

[4] Source: ESG Report, *Thin Provisioning*, April 2006

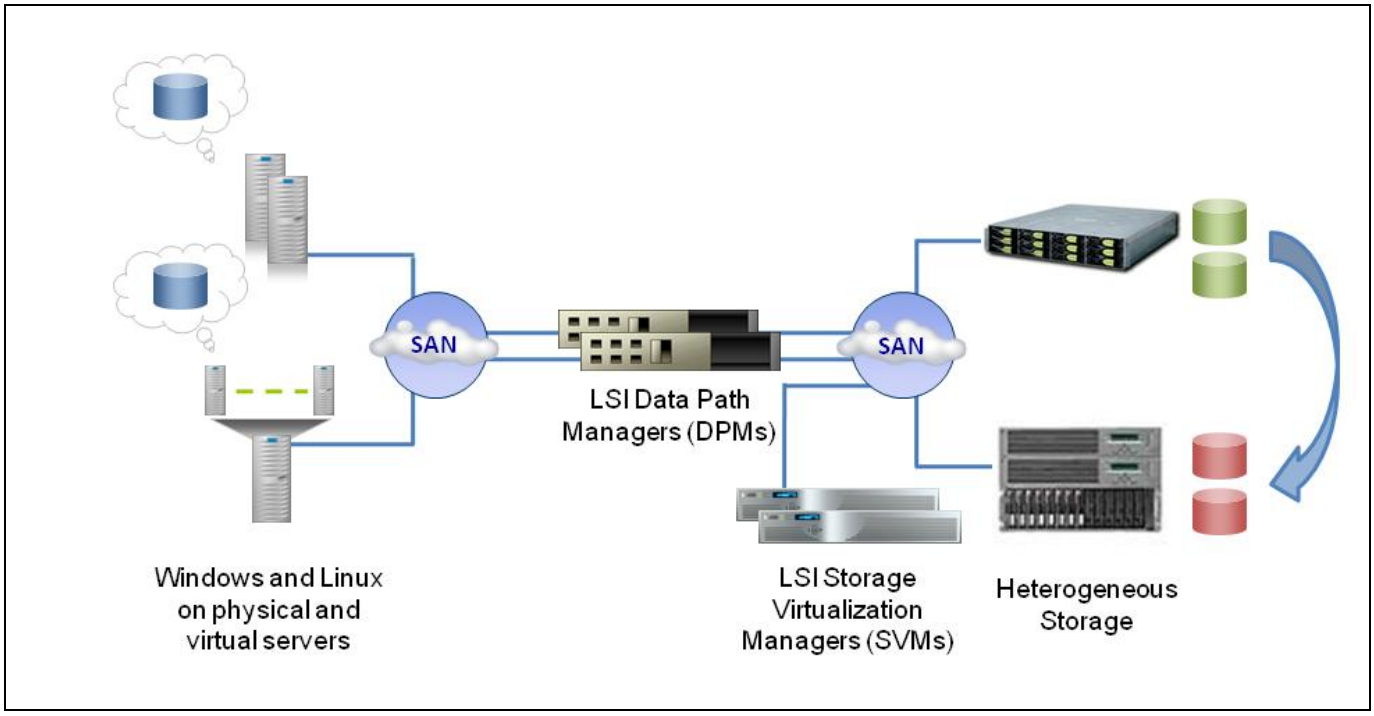
Seamless Any-to-Any Migration

LSI StoreAge multiMigrate is a component of SVM that enables online migration of data from any storage device to any other storage device regardless of vendor. Migrating data for running applications like e-mail and databases is often problematic for IT administrators. Using traditional methods, an administrator must shut down the application, move the data, configure the server to see the new volumes, and restart the application. SVM multiMigrate greatly simplifies this process while keeping applications online. An administrator simply selects a volume to migrate, selects an available target, and multiMigrate takes care of the rest.

ESG Lab Testing

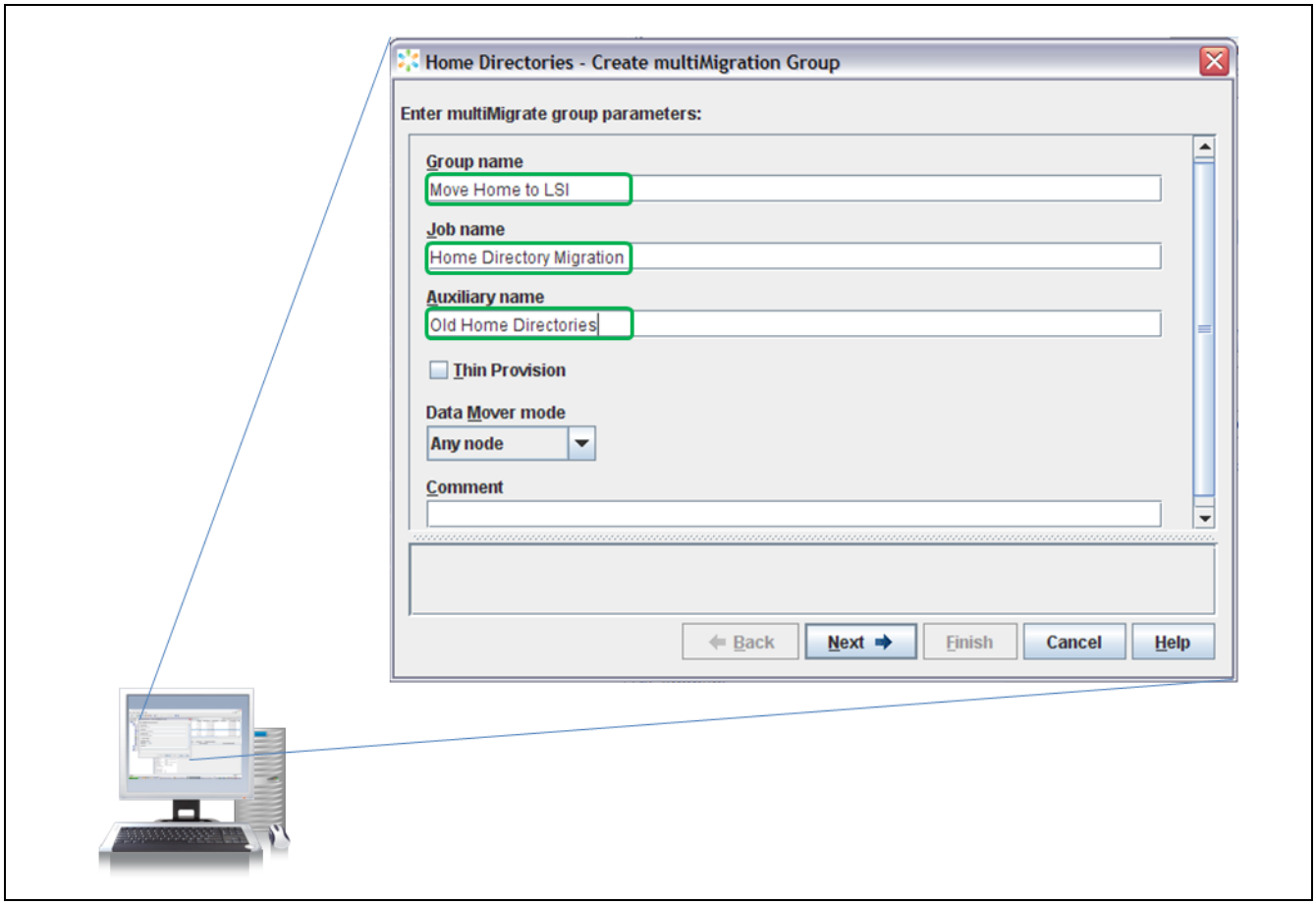
ESG Lab's goal in this phase of testing was to perform a data migration between heterogeneous storage systems with simulated users active and online, writing data to the volume while the migration takes place. Figure 9 shows the migration test bed. A virtual machine running RedHat Linux was assigned a volume allocated from capacity in an HP EVA storage array.

FIGURE 9. MIGRATING WITH APPLICATIONS ONLINE



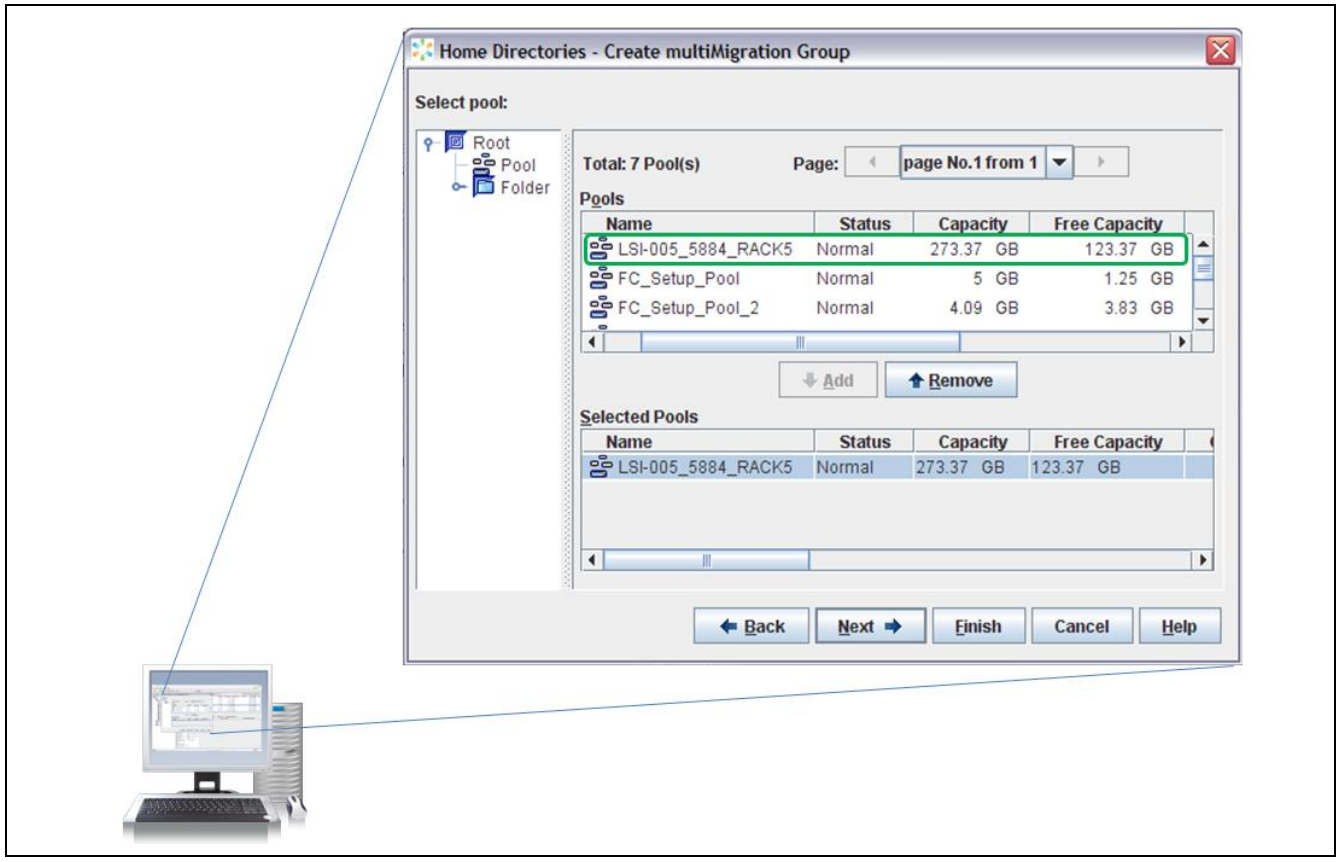
A write process was started on the Linux server by running the 'dd' command and having it write a 500 MB file to the volume in a continuous loop to simulate users writing files to their home directories. ESG Lab then opened the multiMigrate wizard by right-clicking on the volume in the SVM GUI and selecting "Manage,' then 'Create multiMigrate Group' as seen in Figure 10.

FIGURE 10. USING THE MULTIMIGRATE WIZARD



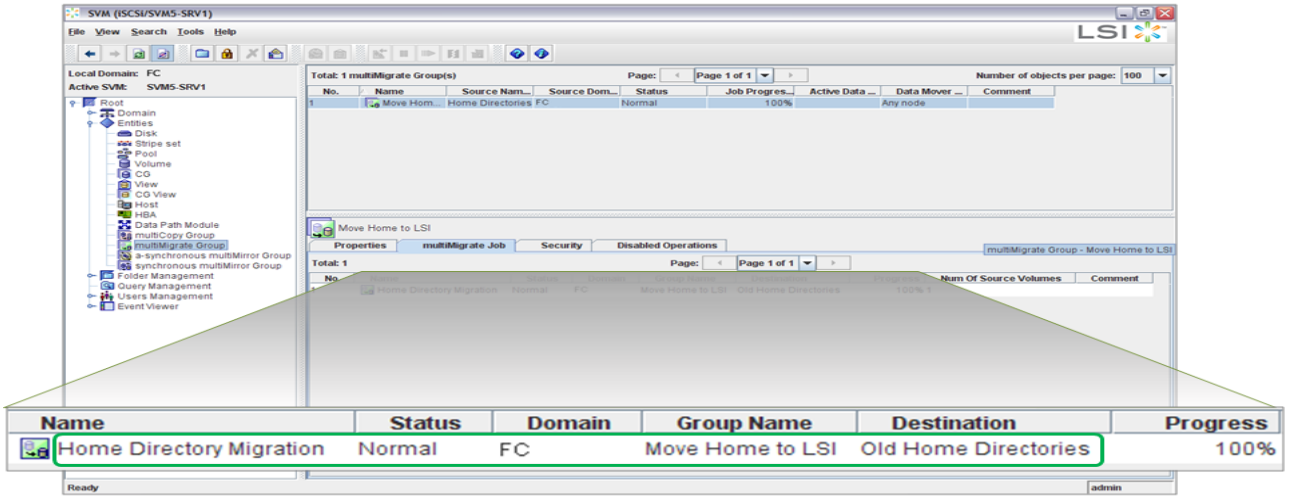
Next, ESG Lab selected a target pool for the migration from the list of pools presented by the wizard. multiMigrate automatically created the target volume from the available space in the pool, assigned the host, and renamed the volumes. Figure 11 shows ESG Lab selecting an LSI 5884 disk array as the target for the migration.

FIGURE 11. SELECTING A MIGRATION TARGET



When ESG Lab clicked 'Finish,' multiMigrate created the new target volume, started the migration job and moved the volume transparently to the new storage array with no impact to the writes occurring on the Linux host.

FIGURE 12. MIGRATION COMPLETED



ESG Lab verified that the Linux host was accessing the new volume on the LSI array by deleting the original source volume once the migration progress had reached 100% complete, as seen in Figure 12. The Linux host continued to write data to the volume throughout the entire process, with no interruption.

Why This Matters

Data migrations using traditional methods cause application downtime and can have significant business impact. Recent ESG research indicates that a majority of IT organizations can't tolerate more than four hours of downtime for their most mission critical applications before experiencing a significant impact to their businesses.[5] Five percent indicate that zero downtime has been mandated. Given the volumes of data associated with most mission-critical applications, traditional host- or storage-based migration methods fall short of meeting these strict service level agreements.

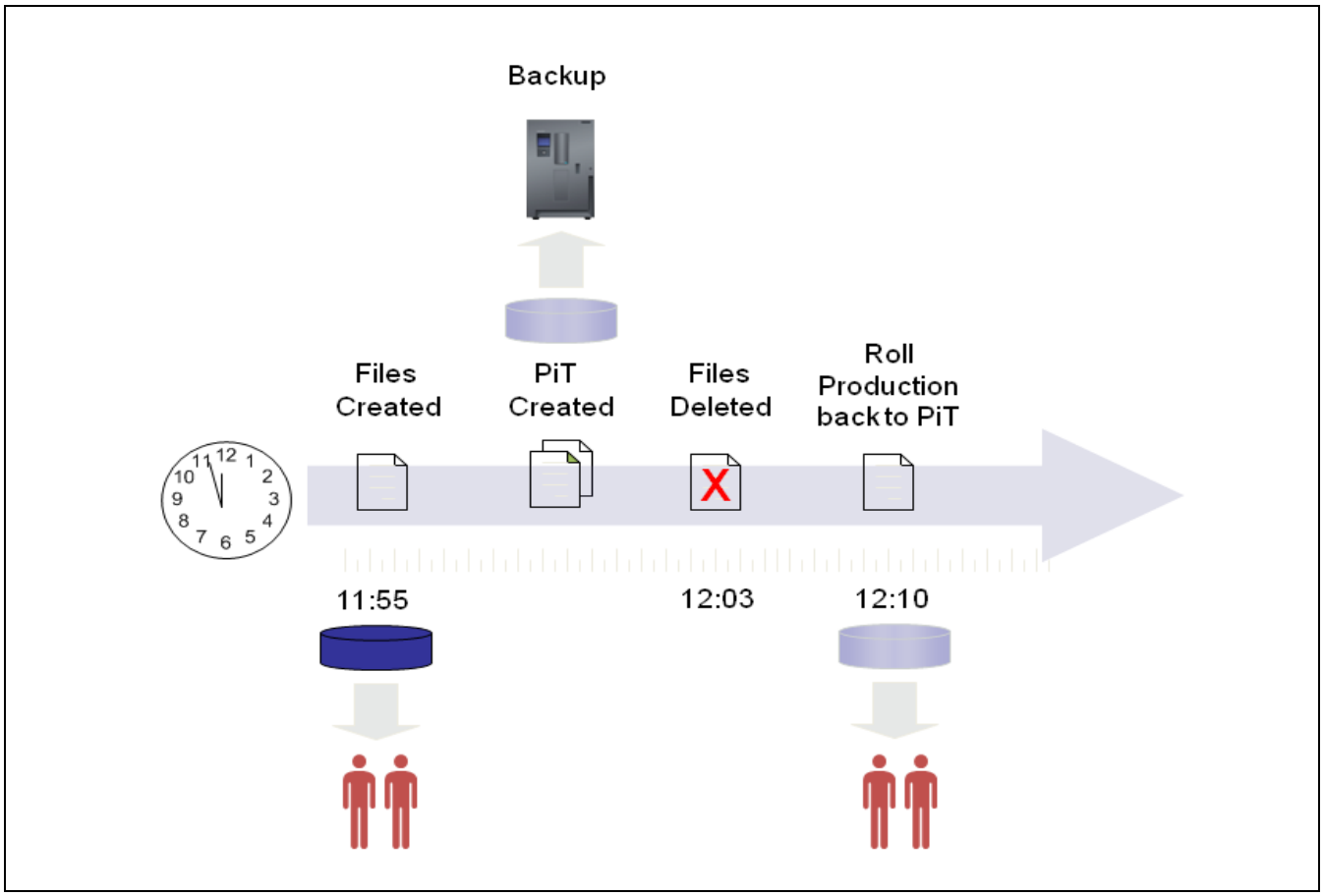
ESG Lab was able to configure and execute a migration quickly and easily using the LSI StoreAge SVM between heterogeneous storage platforms with no interruption to IO, which translates to no application downtime. multiMIgrate provided on-demand storage mobility (think 'Storage VMotion') with zero overhead to the ESX server—since the migration completed in the fabric, no CPU or IO cycles were consumed.

[5] Source: ESG Research Report, *Data Protection Survey*, January 2007, N=398

Application Recovery, Testing and Backup with multiView

LSI StoreAge multiView is a capacity-efficient snapshot solution that enables administrators to create multiple read/write Point-in-Time copies of volumes (PiTs). The copies created with multiView can be retained independently and separately from the original volumes. Administrators use point-in-time copies of production volumes to perform non-disruptive backups of production data, as seen in Figure 13, as well as for application testing, development and fast recovery of deleted files or from corrupted data.

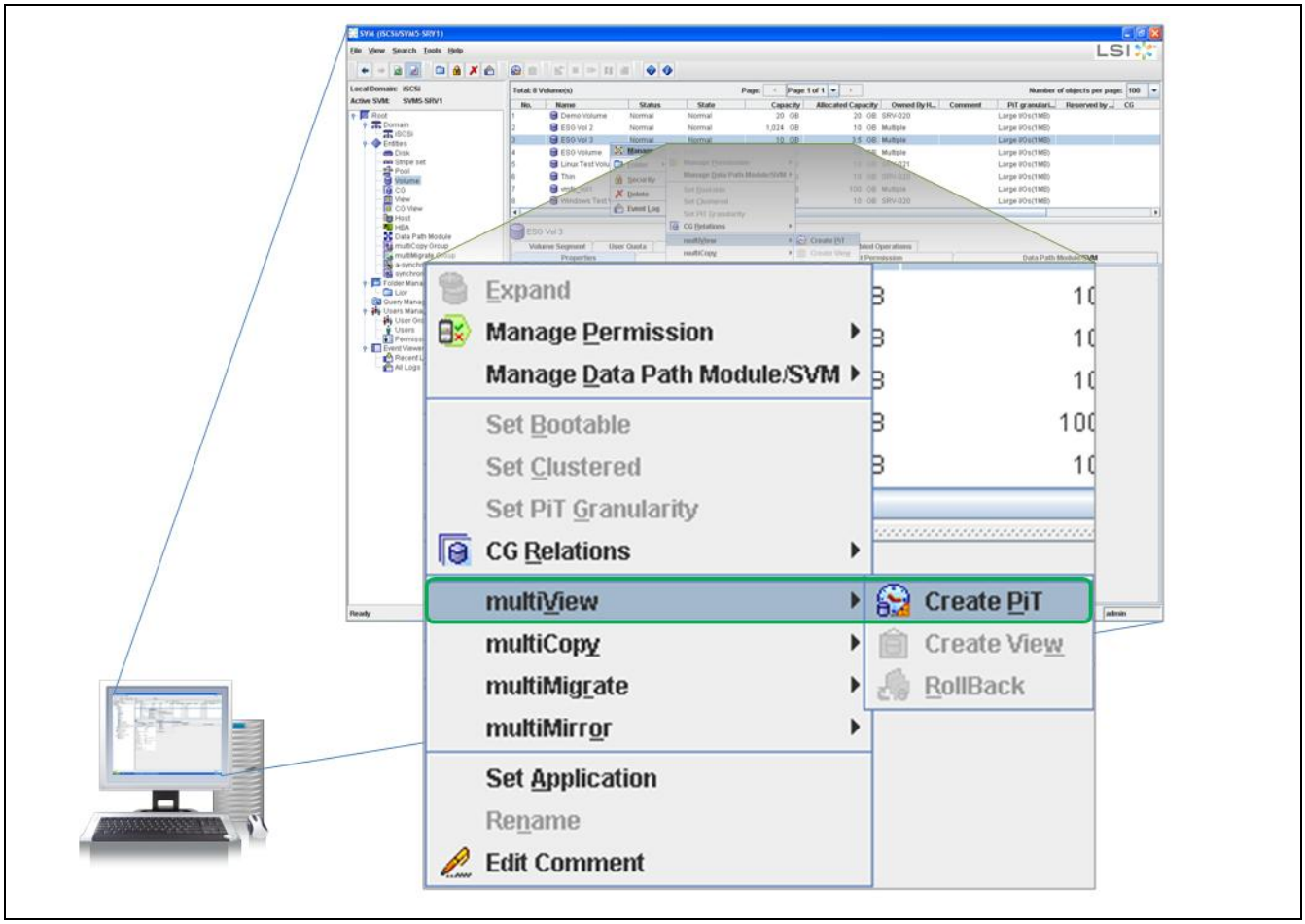
FIGURE 13. POINT-IN-TIME SNAPSHOTS WITH MULTIVIEW



ESG Lab Testing

To test multiView, ESG lab assigned a volume to a Windows virtual machine and copied multiple folders and files to it, simulating a home directory structure with users' files stored on a central file server. Next, ESG Lab created a PiT (snapshot) by right clicking on the volume and selecting 'Create PiT' under multiView, as shown in Figure 14. The PiT was created instantly, with no impact to user access to the production volume.

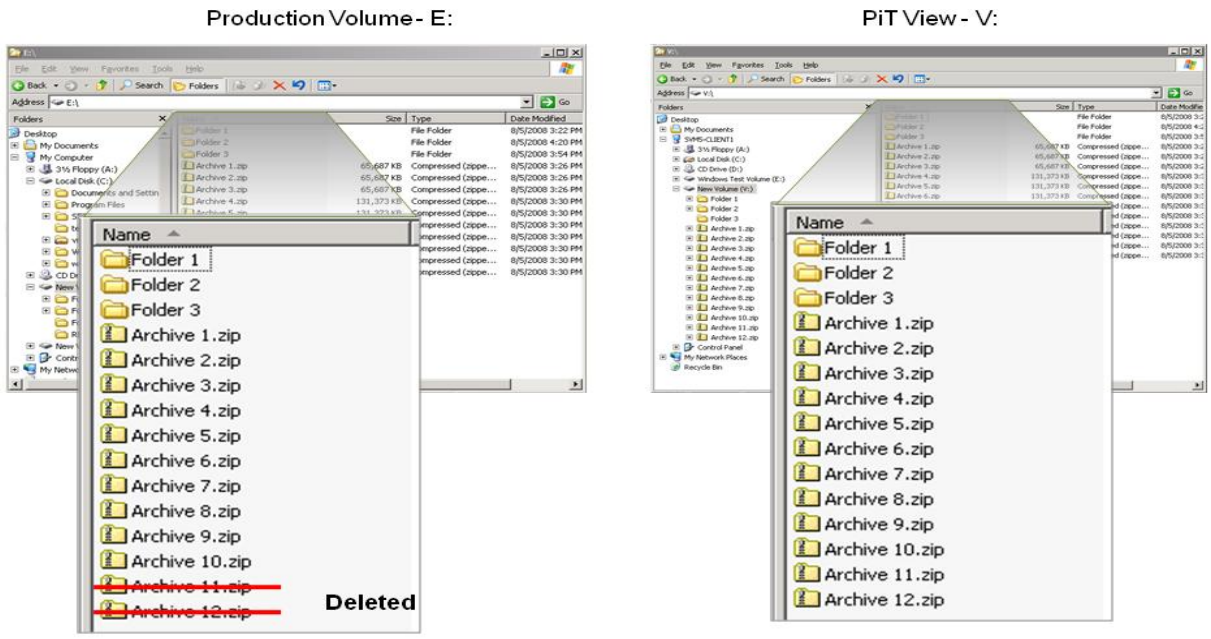
FIGURE 14. RIGHT-CLICK SNAPSHOT CREATION



When a PiT is created, an administrator has the ability to create a 'View' that can be mounted for test, development or file recovery. In this case, a view was created and mounted by a physical server running Windows 2003. ESG Lab confirmed that both systems saw the exact same files as no changes had been made to the production volume.

Next, ESG Lab deleted two files from the production volume on the virtual machine. Once the files were deleted, ESG Lab verified that the backup system still had access to the deleted files, as illustrated in Figure 15.

FIGURE 15. PRODUCTION AND PIT VIEWS OF THE SAME VOLUME.



ESG Lab next rolled the production volume back to the point in time before the deletion took place. To accomplish this, ESG Lab needed to remove the drive letter from both Windows servers mounting the production and PiT views. Once this was complete, the PiT view was deleted from the SVM console, and then the production volume was rolled back to the point in time before the deletion. And the drive letter was restored. These steps are necessary to ensure that all files are closed and the volume is consistent.

Why This Matters

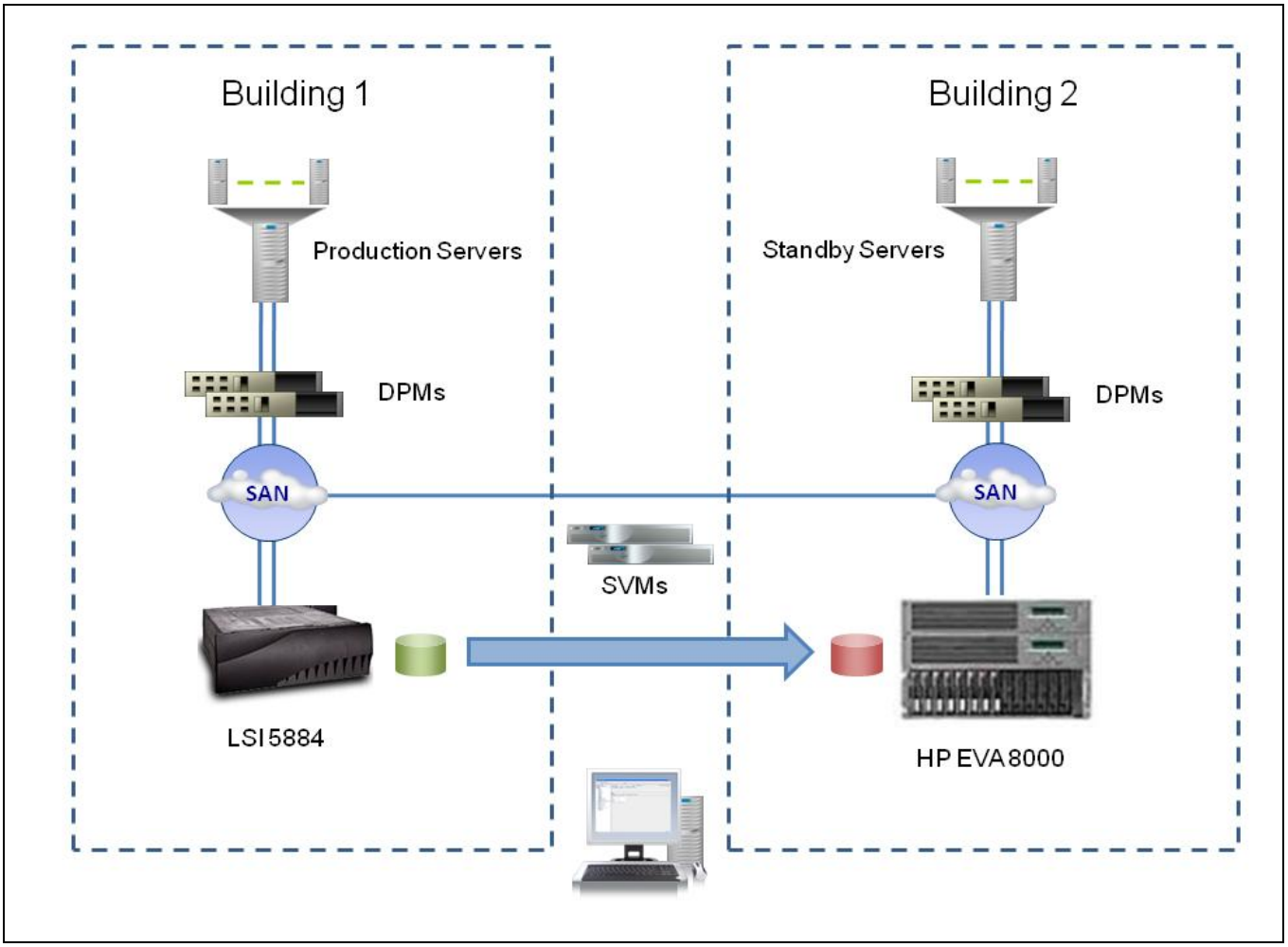
Clean, consistent point-in-time copies of live application data are needed for a variety of reasons including backup, recovery and application testing. Creating consistent copies of application data while applications stay up and running has been a challenge that data managers have been struggling with for years. Disk array vendors have been providing point-in-time functionality to address this problem, but each vendor's implementation is proprietary and the tools and techniques are unique to each solution. Instead of running PiT functions separately on many storage arrays, ESG Lab has confirmed that LSI StoreAge multiView can be used as a unified platform for creating and maintaining multiple read/write point-in-time copies of volumes, and can retain the space-efficient copies independently and separately from the original volume. In addition, ESG Lab was impressed with SVM's redirect-on-write snapshot technology. In contrast to the more commonly used copy on write technology, redirect-on-write offers both flexibility and performance efficiency while enabling administrators to create, access and manage a virtually unlimited number of independent Point-in-Time copies.

Heterogeneous, Snapshot-Enhanced Synchronous Data Mirroring

LSI StoreAge multiMirror provides a simple and fast data mirroring service that enables organizations to provide a uniform storage service to their users, across multiple brands of storage systems while using capacity-efficient snapshot technology to optimize bandwidth and network utilization.

ESG Lab Testing
ESG Lab tested multiMirror in synchronous mode between two heterogeneous storage systems attached to separate SAN domains to simulate an intra campus disaster recovery strategy. As shown in Figure 16, systems are protected by synchronously mirroring their volumes to a second data center on-campus.

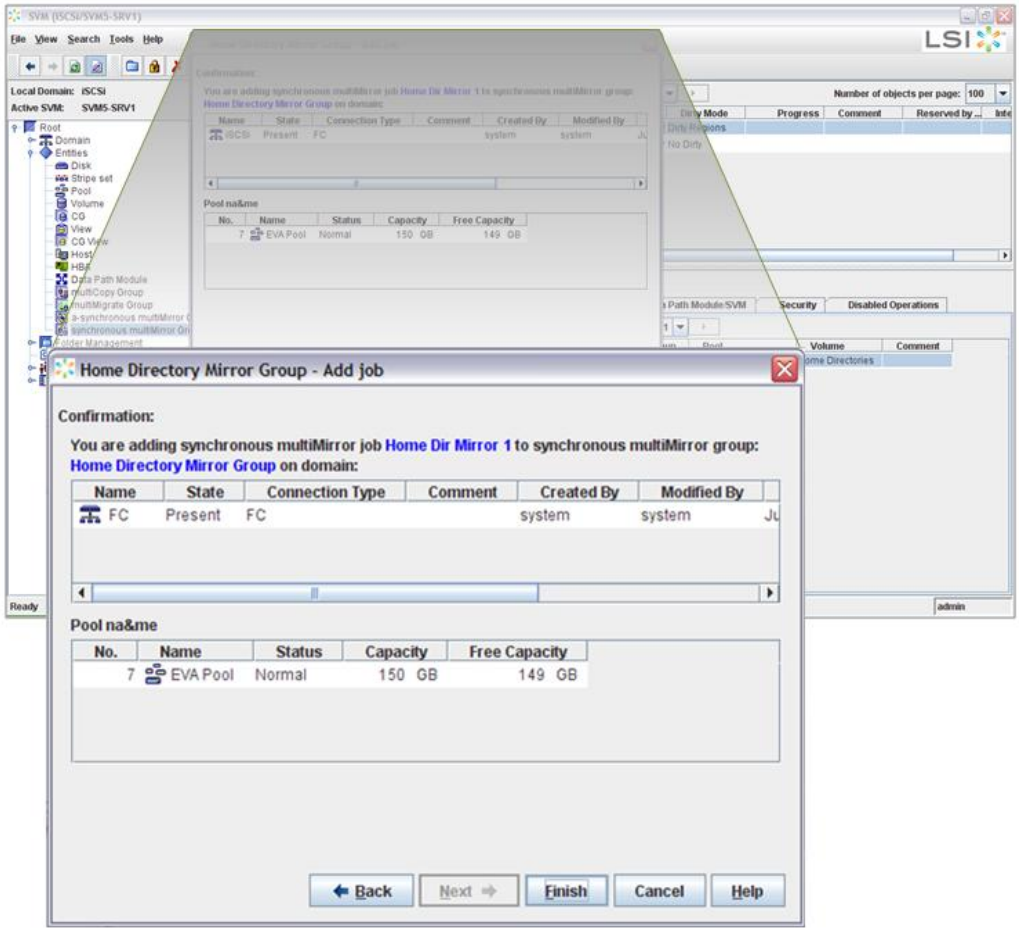
FIGURE 16. SYNCHRONOUS REMOTE MIRRORING



ESG Lab configured the 'Production' servers using the storage pool on an LSI 5884 array. The target volumes were assigned from an HP EVA 8000 array on a separate SAN connected via 4 Gb/sec Fibre Channel.

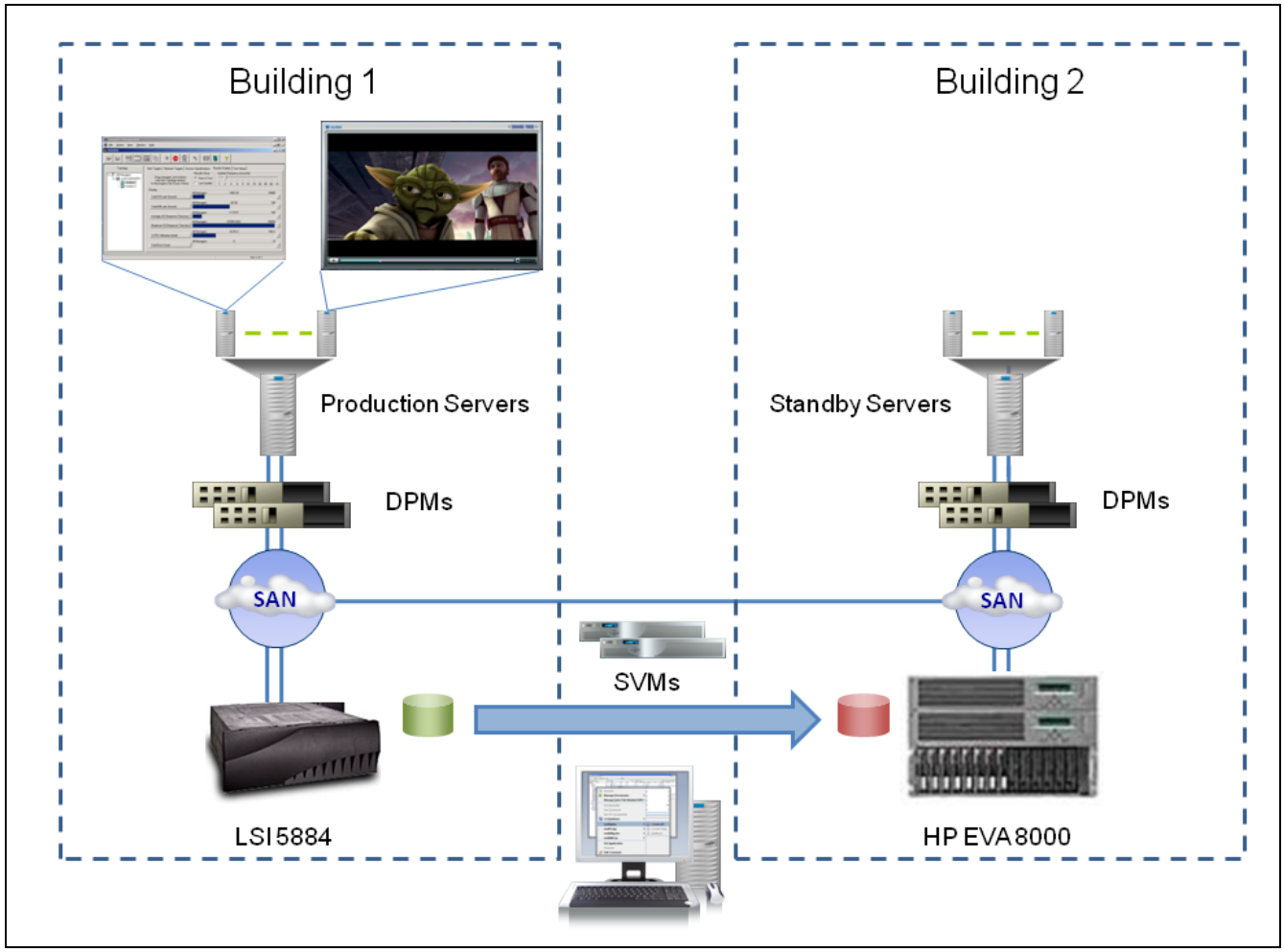
Next ESG Lab created a synchronous mirror of two volumes between the LSI and EVA arrays using the multiMirror configuration wizard, seen in Figure 17. One volume was assigned to a virtual machine running Windows 2003 and one volume was assigned to a RedHat Linux virtual machine.

FIGURE 17. THE MULTIMIRROR CONFIGURATION WIZARD



ESG Lab generated write IO on the Linux VM by running dd to copy 500 MB of data to a file on the volume in a continuous loop. Read IO was generated on the Windows VM by running IOMETER and playing a video file stored on the mirrored volume, also in continuous loops. Figure 18 illustrates the steady state with applications running on the source side and volumes being mirrored between heterogeneous arrays. In a full disaster recovery configuration, servers would use clustering technology to fail applications over to the target data center. For the purposes of this test, ESG Lab was interested in the storage mirroring functionality provided by SVM multiMirror.

FIGURE 18. HETEROGENEOUS SYNCHRONOUS MIRRORING WITH RUNNING APPLICATIONS



ESG Lab verified IO was being read from and written to the correct volumes on both arrays. The next step was to simulate a major failure. This was done by physically disconnecting the source array's Fibre Channel ports from the SAN. ESG lab validated that IO was still running to the surviving volume without interruption by observing the virtual machines directly and using the ESX performance monitor graph. Both virtual machines continued to read and write to their volumes without discernable interruption.

FIGURE 19. HETEROGENEOUS SYNCHRONOUS MIRRORING WITH RUNNING APPLICATIONS

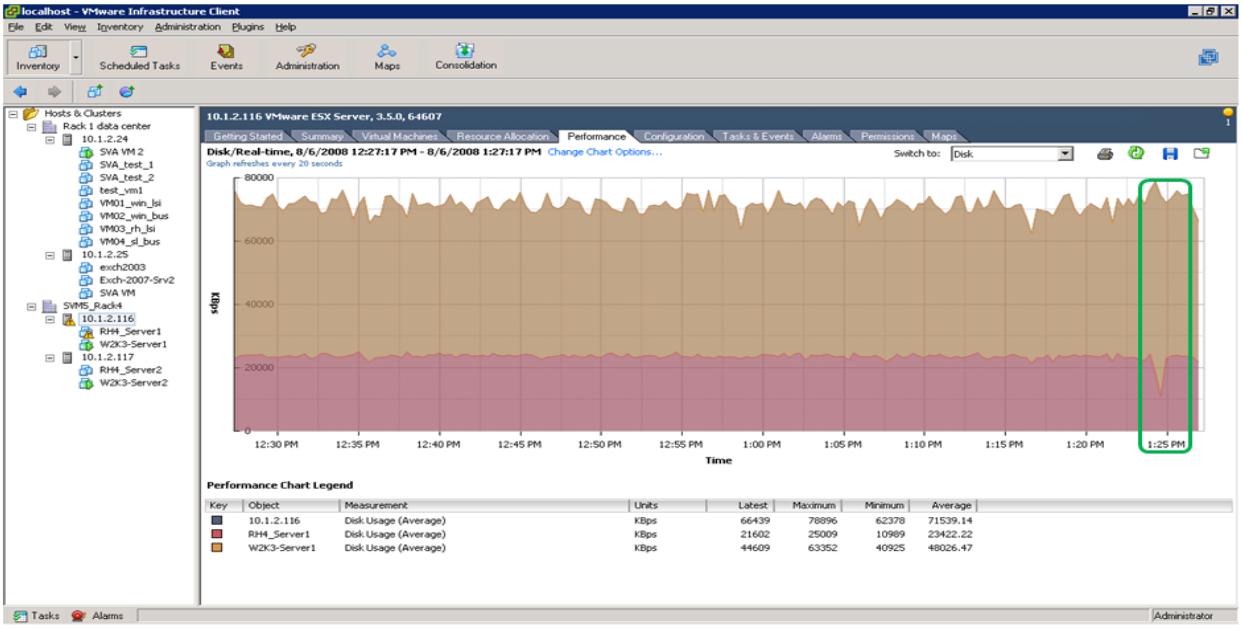


Figure 19 confirms this somewhat dramatically. The graph was left running for approximately one hour while the applications on each virtual server read and wrote data to their respective volumes. The tan area represents the read IO being generated by the Windows server while the red area represents the write IO being generated by the Linux Server. The circled region of the graph represents the moment when the source array was unplugged. The read IO was completely unaffected while the write IO showed a momentary dip, but never stopped completely. Write IO is back to pre-failure levels in less than 60 seconds.

Why This Matters

Organizations replicate business critical applications to a secondary site because they cannot tolerate interrupted access to those applications before, during or after a major failure in a production data center. In enterprise class environments, storage arrays' remote mirroring capability has been used to recover quickly from such disasters. Array-based replication solutions are unique to each vendor in the way that they are configured and used, and most require the same storage systems on each end of the wire.

ESG Lab validated LSI StoreAge multiMirror Synchronous mode, recently added to SVM's mirroring capability. LSI's StoreAge multiMirror Synchronous mode provides a heterogeneous storage mirroring service which can be used to implement disaster tolerant applications running on heterogeneous server, operating system and storage platforms. Customers could conceivably deploy a smaller, more affordable storage system, or an older storage system they already own, at the remote site to additionally reduce the total cost of disaster avoidance.

ESG Lab Validation Highlights

- ☑ ESG Lab was impressed with the improvements made to the SVM5 user interface. Explorer-like menus, intuitive right-click management, wizard-driven configuration, context-sensitive log views and comprehensive, detailed help files provided a robust management experience greatly improved over previous versions.
- ☑ SVM's Dynamic Thin Provisioning was used to reduce the complexity of storage provisioning while providing significant capacity savings. With its wizard-driven configuration process and advanced management capabilities, LSI StoreAge SVM provides enterprise class storage virtualization capabilities for any SAN-attached storage.
- ☑ ESG Lab confirmed that multiMigrate was able to transparently execute a heterogeneous data migration quickly and easily with no interruption to IO, which translates to no application downtime.
- ☑ ESG Lab was impressed with multiView's redirect-on-write snapshot technology. Redirect-on-write offers both flexibility and performance efficiency while enabling administrators to create, access and manage a virtually unlimited number of Point-in-Time copies. LSI's snapshot technology also works behind the scenes to enable transparent data migrations and heterogeneous data mirroring.
- ☑ ESG Lab validated that LSI's StoreAge multiMirror Synchronous mode provides a heterogeneous data mirroring service which can be used as a foundation to implement unified disaster recovery across all of IT.

Issues to Consider

- ☑ Migration from standard to thin provisioned volumes is not yet available with SVM. This would be an extremely useful feature for users looking to migrate from traditional arrays to a fully virtualized environment non-disruptively. Standard volumes can be thin provisioned after migration, offering the same end result but requiring an extra step.
- ☑ All of the functionality tested for this report was with volumes created and managed directly by SVM. The ability to 'import' volumes already presented by existing storage arrays (called encapsulation) is supported by SVM but was not tested for this report. Encapsulation presents a path for users with existing traditional storage to move into virtualization with minimal disruption. Organizations can encapsulate existing volumes and convert them to SVM native volumes to take advantage of advanced virtualization features like thin provisioning.
- ☑ StoreAge SVM was invented to provide virtualization to FC-attached disk arrays. IP-based SANs, which use the iSCSI protocol to leverage commodity Ethernet technology, have emerged in recent years as a viable, cost-effective alternative to FC—especially for the growing number of small to medium sized businesses who are adopting server virtualization technology using iSCSI to implement their first SAN. Given the complimentary benefits of deploying server and storage virtualization at the same time, and the growing number of organizations who have embraced iSCSI, ESG believes that SVM support for iSCSI attached disk arrays would be a valuable enhancement.
- ☑ Businesses planning to implement an LSI SVM implementation should note that additional FC switch ports will be required (as is true for any external storage virtualization solution). The exact number will be determined by the specifics of each customer's SAN installation and the number of FC interfaces to be virtualized. Clients should consult with LSI to determine the precise requirements for each implementation.

ESG Lab's View

Unchecked data growth in IT today has strained processes to the breaking point and beyond. To gain control of this growth and adapt to continuously evolving business requirements, innovative approaches are needed to automate processes and throttle back the associated cost and complexity. Virtualization technologies are needed to simplify, consolidate and automate routine IT functions.

The promise of storage virtualization has been talked about in the industry for almost ten years now, yet progress and adoption have been painfully slow until fairly recently. Today, innovative virtualization technologies are being deployed by a growing number of IT organizations. A recent ESG survey of 602 IT professionals indicates that server virtualization is leading the charge. Thirty-three percent of respondents report that server virtualization is in "wide-spread production use."[6] Server virtualization, like storage virtualization, is powerful game-changing technology that can be used to consolidate and simplify complex IT infrastructure.

Early adopters of storage virtualization report that management complexity has been simplified and costs have been reduced. Given the synergistic benefits, it is not surprising that ESG research indicates that a growing number of forward-looking organizations are deploying storage and server virtualization together. Twenty-four percent have deployed both already and 33% plan on doing so within the next 24 months. While the cost savings of consolidation drove the first wave of IT virtualization adoption, the second wave is being driven by the mobility, flexibility and enhanced fault tolerance that can be achieved with a networked virtualized IT infrastructure.

ESG has been tracking solutions in this space for years and we are pleased to report that viable, mature and interoperable solutions—like those from LSI StoreAge tested by ESG Lab for this report—are now available, adoption is picking up and the benefits are tangible and real. The vast majority of storage virtualization solutions in production at this time are based on an in-band approach using software that runs on an appliance. As tested by ESG, LSI's split-path approach provides enterprise class performance, scalability availability and management. LSI's mature StoreAge software supports both the traditional host agent and intelligent fabric approaches. Both configurations leverage the Split-Path architecture.

With more than 300 production implementations, LSI StoreAge SVM is solving real world problems for customers while simplifying storage provisioning and providing a centralized platform for valuable data services including online data migration, PiT snapshot services and remote replication. To address concerns about the potential performance impact of a storage virtualization appliance, ESG Lab is pleased to report that SVM's embedded switch technology provides secure, wire speed virtualization with zero impact to applications and end-users. ESG Lab has also validated StoreAge SVM clusters' use of robust, active-active failover techniques provide continuous data availability through catastrophic hardware failures.

ESG Lab tested the powerful, heterogeneous virtual volume management capabilities of LSI's StoreAge SVM—from virtualized capacity-on-demand, presenting virtual disk capacity to servers as SVM allocates physical capacity on a just-in-time basis to online data migration, low-capacity read-write snapshots and remote replication. Virtualized capacity-on-demand eliminates the cost of unused, 'stranded' storage as it simplifies the task of assigning storage capacity to applications. StoreAge SVM provides a centrally managed platform for deploying this valuable emerging technology which is generally referred to as thin provisioning.

ESG Lab was impressed by SVM's implementation of thin provisioning, Dynamic Thin Provisioning— especially the wizard-driven configurability—programmable thresholds and alerting, and automatic volume extension. With a really awesome GUI, newly added synchronous replication capability, as well as all the other field-proven capabilities provided, ESG believes that LSI StoreAge SVM is a solution deserving serious consideration by IT managers looking to simplify, consolidate and automate complex enterprise storage environments.

[6] Source: ESG Research Report, *IT and Service Management Process and Automation Priorities*, March 2008

Appendix

TABLE 1. TEST CONFIGURATION	
SVM 5: LSI SVM W2K3 HP ProLiant DL360 G5 4x 3GHz Intel Xeon 2GB RAM 1x QLogic QLA2342 LSI DPM 8400	Core Version 5.0.283 Web Server Version: 5.0.283 Client Version 5.0.283
Storage	
LSI 5884 10TB: 6 x 14 x 250GB SATA LSI 2884 5TB: 3 x 14 x 250GB SATA HP EVA 8000 5TB: 5 x 14 72GB 15K FC	
ESX server 1: Ver. 3.5.0 64607 HP ProLiant DL360 G5 4x 3GHz Intel Xeon 2GB RAM 1x QLogic QLA2342	Guest 1: RedHat Enterprise Linux V4 (32bit) 2x vCPU 512MB RAM Guest 2: MS Windows 2003 R2 Standard Edition SP2 2x vCPU 512MB RAM
ESX server 2:Ver. 3.5.0 64607 HP ProLiant DL360 G5 4x 3GHz Intel Xeon 2GB RAM 1x QLogic QLA2342	Guest 1: RedHat Enterprise Linux V4 (32bit) 2x vCPU 512MB RAM Guest 2: MS Windows 2003 R2 Standard Edition SP2 2x vCPU 512MB RAM
SAN Connectivity	2x QLogic SANbox 5600
IOMETER 2006.07.27	

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