

The Lenovo logo is displayed in white text on a black rectangular background.

Implementing StorMagic SvSAN on Lenovo Servers

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Describes the Deployment Ready Offering for SvSAN on Lenovo Servers

Shows step-by-step implementation details used to deploy the offering

Provides configuration details complete Bill of Materials and a choice of platforms

Provides use cases that fit key segments like Retail and Distributed Branch Offices

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Abstract

This paper describes the Lenovo® Deployment Ready Offering (DRO) to implement a software-defined storage solution. The offering is comprised of StorMagic SvSAN software and Lenovo x3650 M5, x3550 M5 and x3250 M6 servers. The offering allows you to create a highly resilient virtual architecture specifically tailored for remote office/branch office (ROBO) clients and the distributed enterprise.

This solution is designed primarily for the North American market. This guide is written in keeping with that mindset. However because the Lenovo configurators are powerful enough to convert part numbers for most support geographies this solution can be enabled for use in other parts of the world.

The intended audience for this document includes IT professionals, technical architects, sales engineers, field consultants and partner engineers who plan to deploy the StorMagic offerings from Lenovo enabling full resiliency and eliminating any single point of failure for ROBO and SMB/SME environments.

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Introduction

This paper describes the Lenovo Deployment Ready Offerings (DROs) that are based on Lenovo System x® servers and the StorMagic SvSAN software-defined storage solution. The offerings are designed to create a highly resilient virtual architecture specifically tailored for remote office and branch office (ROBO) environments and distributed enterprises. These offerings enable the high-end features of shared storage, such as high availability and workload mobility, without the added hardware and management expense.

StorMagic SvSAN uses server-based storage (internal or direct-attached) to create synchronously mirrored, virtualized storage pools across two or more clustered servers, keeping applications and data highly available. A Virtual Storage Appliance (VSA) is created on each server and operates as a virtual iSCSI SAN. In the event of server failure, the other servers in the cluster continue to support data services without interruption.

SvSAN also supports mirroring with stretch clustering across distances that have been tested up to 100km, for added resiliency. Such a configuration is shown in Figure 1, where a two-node cluster provides affordable high availability for a business-critical deployment.

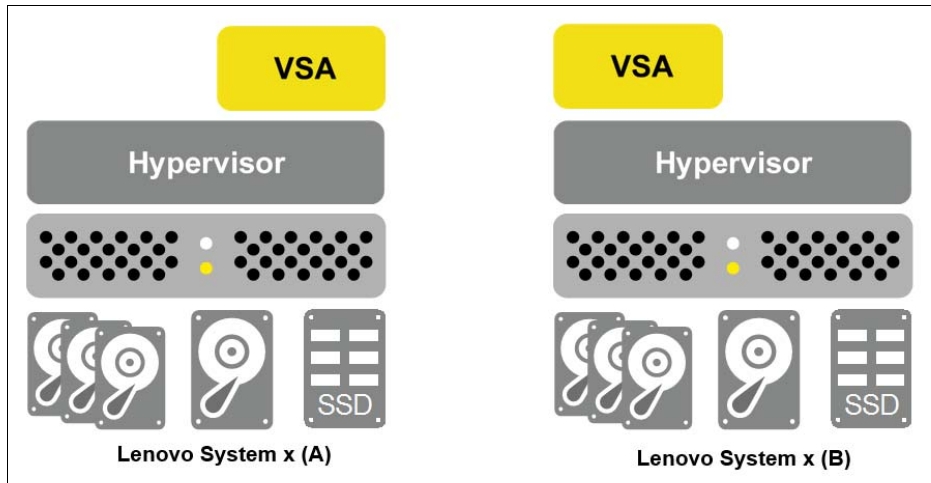


Figure 1 Two-node Virtual Storage Appliance configuration for high availability

StorMagic SvSAN provides a synchronous, active-active network RAID-1 mirror between pairs of VSAs to ensure high availability for every deployment scenario. If one node of the mirror fails, the hypervisor's multipathing software will detect the path failure and instantly fail over to the other node.

From a data-integrity standpoint, it is crucial that both nodes have the same view of the mirrored data at all times. If that view was to be disrupted due to a network failure or a server unexpectedly going down, a scenario could occur in which the two nodes have a different view of the data, known as a "split-brain" scenario. When this happens, a third party is required to act as a tie-breaker or quorum service to help maintain the correct state of the mirror. To address this scenario and prevent data loss, SvSAN utilizes a Neutral Storage Host (NSH) service running on a third, physically independent, host. If one side of the mirror goes down, the NSH serves as a quorum service to reliably handle the failure.

The dual VSA, NSH-protected StorMagic SvSAN deployment eliminates any single point of failure. Typically, synchronously-mirrored solutions require a minimum of two of the three points (either one VSA and the NSH or both VSAs) to remain online and communicating with each other to stay active. With SvSAN this logic is modified to provide data access under more failure scenarios, but the order of the failure is key.

- ▶ If one of the two VSAs goes down, any hosted VMs are failed over to the other node and serviced by the remaining VSA. The storage remains online, even if the connection to the NSH later becomes unavailable.
- ▶ If, however, the NSH connection fails first and that failure is followed by a subsequent failure on a host or one of the two VSAs, then the storage will be taken offline to protect the data.

This particular configuration shows an important differentiator for StorMagic SvSAN: Only two of the three points are required to be on-premises. As shown in Figure 2, the uniquely designed NSH service can serve all remote locations and be centrally located on a single server at a global headquarters or even in the cloud, requiring less hardware and, therefore, less cost.

This perfect balance of high availability, deployment flexibility, and cost savings makes SvSAN ideal for distributed organizations with a large number of branch offices or stores looking to run a lean IT infrastructure.

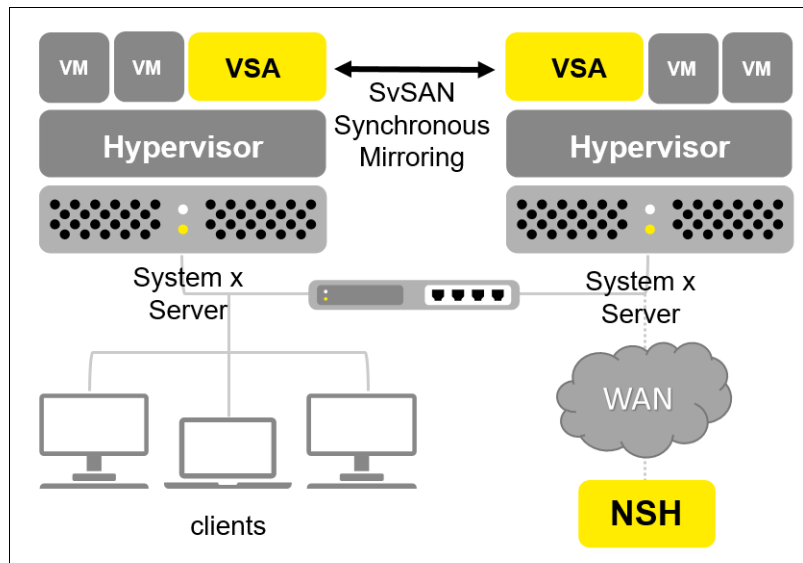


Figure 2 SvSAN high level architecture

Business value

Today's competitive landscape demands high levels of application and data availability across the enterprise. But providing for *always on* productivity, especially in a distributed enterprise with multiple remote locations, is not an easy task. The additional hardware and management required are not only expensive, but they also complicate the IT landscape. Most organizations are looking for ways to deliver what the business needs without the additional costs and headaches.

Very often, remote locations (for example, retail outlets of large chains) are an organization's closest link to customers, making their application and data availability essential to

maximizing revenue and limiting liability. Applications at the business's remote sites are often critical, and trying to keep them up and running continuously while working to reduce costs is an ongoing struggle.

Key benefits of StorMagic SvSAN with Lenovo include:

- ▶ Lower cost-of-entry for shared storage in virtualized environments
- ▶ High compute hyperconverged architecture to easily scale up within hosts or scale out to additional nodes
- ▶ Sharable storage to compute-only nodes
- ▶ A hypervisor-agnostic storage infrastructure, accommodating both VMware vSphere and Microsoft Hyper-V implementations
- ▶ Unique multi-site features, such as a simple 2-server configuration entry point
- ▶ Highly available local storage
- ▶ Centralized management (vCenter or SCOM)
- ▶ Easy, automated deployment and available APIs

Other virtual scale-out storage solutions require a minimum of three servers: two for mirroring data and a third to serve as a *tiebreaker* in cases where writes have been committed to one server but not the other. This quorum server is the arbiter of which server in the cluster has the correct data.

As can be seen in Figure 3, SvSAN eliminates the requirement for having the third server on-premises by providing a centralized sharable quorum service. The Neutral Storage Host (NSH) was designed to use minimal network bandwidth, and it can tolerate a high latency network and survive network downtime.

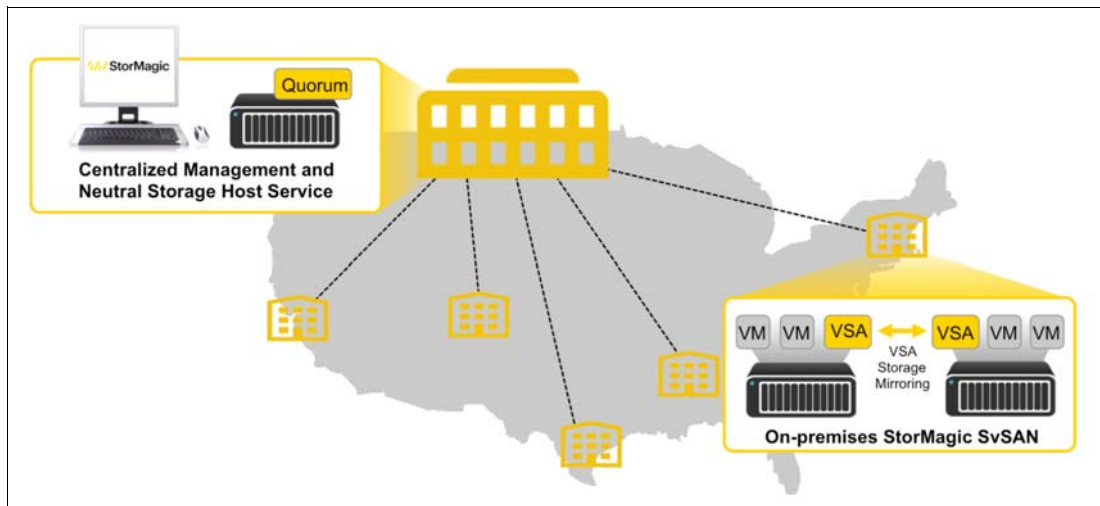


Figure 3 Sharing a centralized management server significantly reduces capital expense

Benefits of an SvSAN deployment include:

- ▶ The ability to maintain application uptime and data availability without the expense and management of SAN/NAS arrays.
- ▶ Lower CapEx, with less hardware (a minimum of 2 rather than 3 servers) and no SAN/NAS infrastructure required. Organizations can leverage existing servers to deliver shared storage.

- ▶ Lower OpEx, including less complexity, which eliminates the need for onsite IT staff or specialized storage skills; and reduced floor space/power/cooling/maintenance costs.
- ▶ A software-based, server-hardware agnostic solution that is simple to deploy and manage, including remote deployment and provisioning.
- ▶ Support for VMware vSphere and Microsoft Hyper-V hypervisors.
- ▶ Integration with VMware vCenter and Microsoft System Center.
- ▶ Scalability by simply adding storage capacity to the onsite servers to expand the virtual SAN.
- ▶ Simple capacity-based licensing.

SvSAN makes remote location high availability simple and cost effective, and can quickly solve the problem of lost revenue that stems from planned or unplanned downtime for business-critical remote applications. Instead of having to build a SAN at every location and have IT staff available to manage it, distributed locations simply need two servers with internal or DAS storage, and SvSAN software.

Many organizations' distributed and disparate locations are seeing the need to virtualize to provide HA. However, alongside this reduce cost and complexity as a critical business driver for profitability. IT down-time can translate to disastrous losses both in terms of revenue, employee time as well as customer satisfaction; both hard to recapture.

This is where Lenovo's System x servers provide a complementary set of features to StorMagic's SvSAN software to provide an ideal, affordable distributed SDS offering.

Three key features about this offering:

- ▶ Perfect fit for distributed environments like departments stores, education, clinics, court house and legal
- ▶ Highly reliable solution when uptime matters with an entry point of two servers
- ▶ Simple to deploy and manage on premise or centrally, at enterprise scale to virtually eliminate IT costs in the branches

SvSAN is ideal for distributed environments:

- ▶ Retail chains
- ▶ Education Systems and schools
- ▶ Branch offices such as legal and government
- ▶ Energy – windmill farms and the oil & gas industry
- ▶ Manufacturing
- ▶ Hospitality
- ▶ Video Surveillance and Security Solutions

These offerings result in affordable large deployments keeping function and performance in balance with scale to fit demanding budgets.

Solution overview

The solution is based on:

- ▶ Lenovo System x servers:
 - System x3250 M6
 - System x3550 M5
 - System x3550 M5
- ▶ StorMagic SvSAN software
- ▶ VMware vSphere or Microsoft Hyper-V
- ▶ Plugin deployment to VMware vCenter (Windows or vCSA) or Microsoft Hyper-V host
- ▶ Linux-based VSAs

This solution uses enterprise-quality servers that lead the industry in reliability. A choice of three platforms in the System x family provides the following decision areas:

- ▶ Storage Dense server: The x3650 M5 server has 26 drive bays for flexible storage options and excellent growth potential
- ▶ Compute Dense server: The x3550 M5 is a well-balanced 1U 2-processor server that shifts the storage CPU balance towards compute. In a 2U space two servers can provide 4 CPUs
- ▶ Retail and SMB server: The x3250 M6 is an affordable 1U 1-processor server with ample storage for retail and SMB operations.

Features of the hardware components

This section describes the features of the hardware components in the solution.

Reliability and resiliency

SvSAN is currently deployed in data centers around the world. ROBO and branch office environments are not typically cooled data centers, but in some cases can be extremely harsh. For example, off-shore platforms, or servers in a hardened case to run military systems.

In scenarios like these the high availability that SvSAN introduces is key; however, having trusted reliable hardware is also vital.

When running a lean hyperconverged architecture, the compute, networking, and storage resources are converged or collapsed into the same hardware. This enables reduced cost and lower server requirements to build virtualized environments. On the other hand, this puts all the eggs in one basket. Lenovo has the industry's highest reliability rating for x86 servers, as stated in the independent study by ITIC, Figure 4. The report is available from the following URL:

http://www.lenovo.com/images/products/system-x/pdfs/white-papers/itic_2015_reliability_wp.pdf

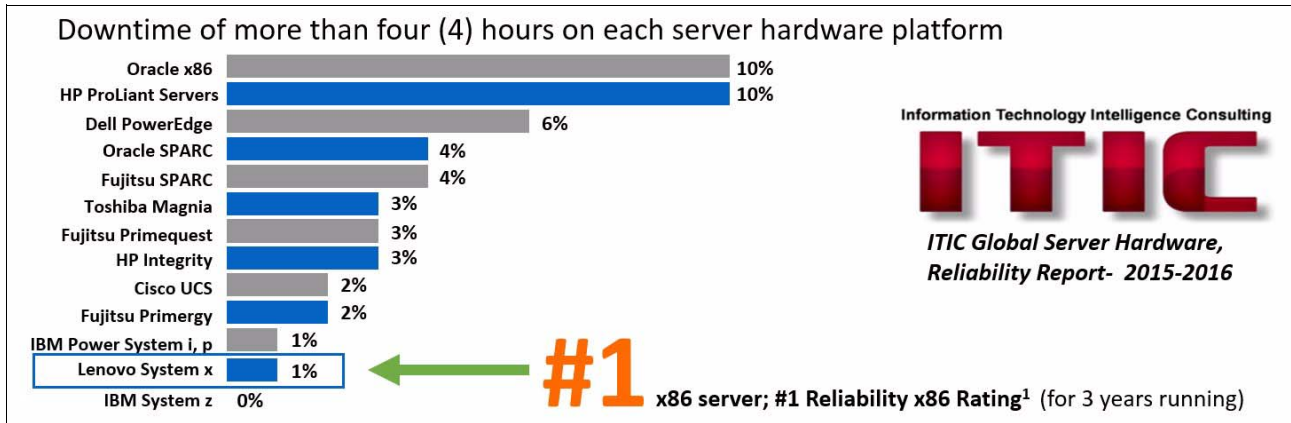


Figure 4 ITIC Global Server Hardware Reliability Report

Faults and light path diagnostics

When a fault does occur, such as a DIMM failing, it is important to get that node back up and running as soon as possible to enable full high-availability protection. Lenovo servers offer a combination of LEDs next to all components to indicate a failed component, predictive failure analysis monitoring the hardware at all time (and warning of impending failure *before* one occurs), and in the x3650 M5 and x3550 M5, a next-generation light path panel, as shown Figure 5).

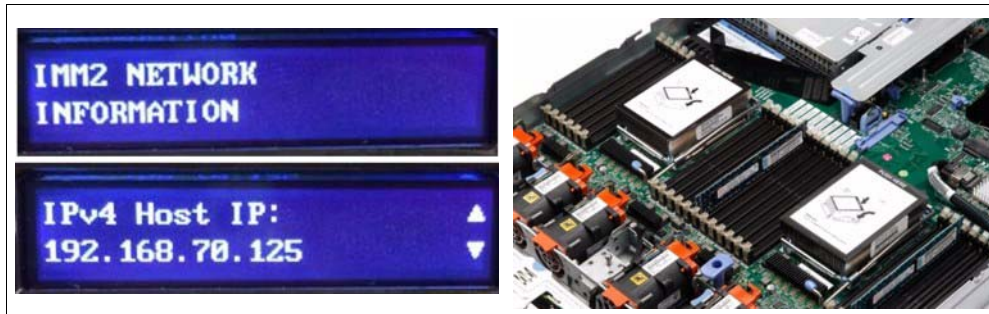


Figure 5 Lenovo next generation light path panel

For more information about Lenovo's light path diagnostics, see the video "Improved Server Uptime with Lenovo Light Path Diagnostics" available from:

<https://lenovopress.com/lp0050-light-path-diagnostics-video>

Security

As virtualization and enterprise features become more accessible, the physical hardware is all the more likely to be in an insecure environment. Security then becomes even more important. This is why Lenovo Trusted Platform Assurance is designed to prevent unauthorized firmware from being loaded. It also enables the ability to identify, track, and trace authorship of firmware code that has been through extensive third-party validation of testing processes, including ethical hacking.

Manageability

This Lenovo offering provides a number of choices based on client needs for affordability, performance, and scalability. Operational costs are also made affordable with the "single pane of glass" manageability provided by the SvSAN plug-in for VMware vCenter.

Centrally managing a server estate measured in the hundreds, and even thousands, requires the right tools. This includes VMware vCenter and the SvSAN plugin — enabling the management of the software layer, and Lenovo XClarity™ — enabling the management of hardware monitoring and firmware compliance through audit trails and failure prediction.

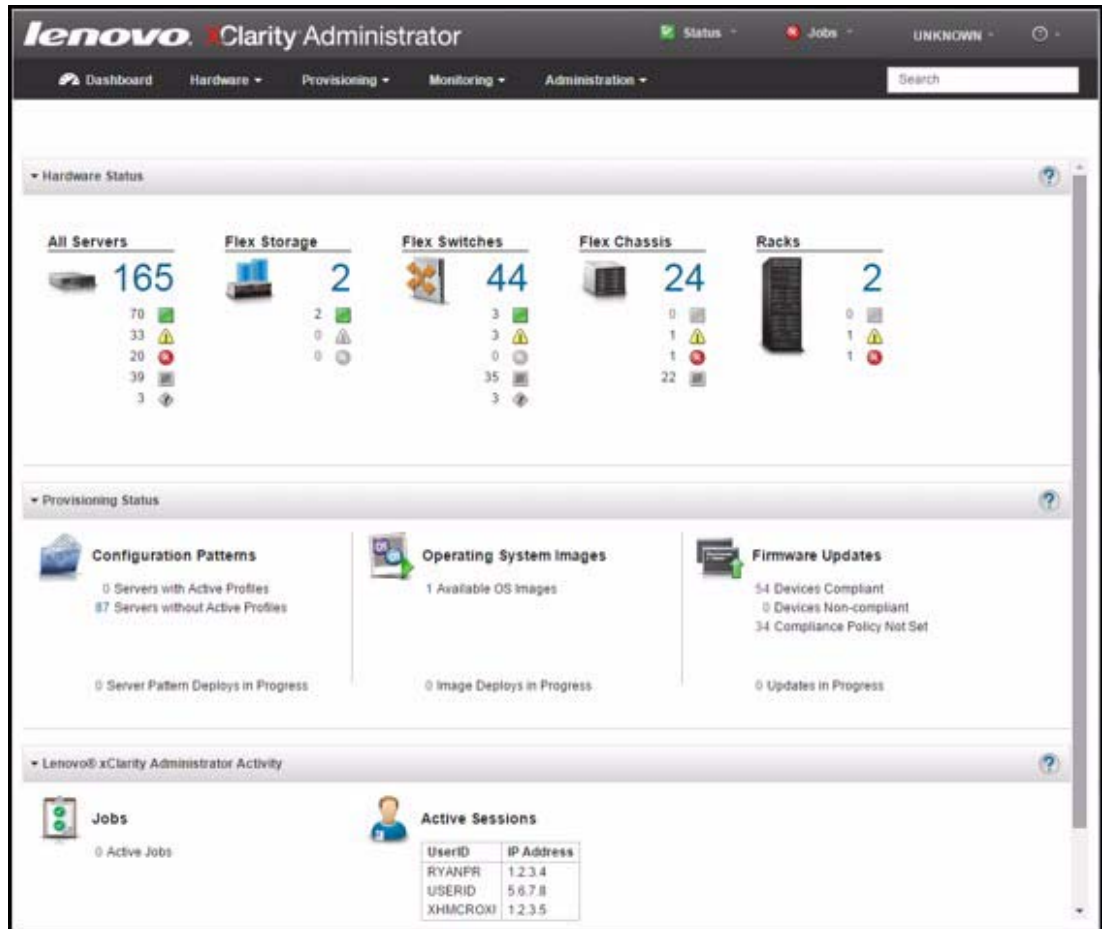


Figure 6 Lenovo XClarity web interface

Software and hardware components

StorMagic consists of the following components, each of which is assigned a Lenovo part number and is available from Lenovo:

- ▶ SvSAN Installer for VMware vCenter for Windows and Microsoft Hyper-V 2012 R2
- ▶ SvSAN Installer for VMware vCSA (vCenter Appliance)
- ▶ SvSAN VSA OVF for manual deployment without vCenter
- ▶ SvSAN VSA Firmware Image for upgrades NSH Appliance OVF
- ▶ Debian NSH Installer for ARM CPUs (e.g. Raspberry Pi) and x86 CPUs
- ▶ SvSAN PowerShell Toolkit for scripting
- ▶ SvSAN SCOM Management Pack

Part numbers are listed in Table 3 on page 11.

SvSAN software requirements

SvSAN software has specific hardware requirements in order to function. The minimum hardware requirements are listed in Table 1.

Table 1 Minimum hardware requirements for SvSAN VSAs

Component	Requirement
CPU	1x virtual CPU core
Memory	2GB RAM
Disk	2x virtual drives used by VSA 1x 512MB boot device 1x 20GB journal drive
Network	1x 1Gb networking Multiple interfaces recommended for resiliency 10Gb networking supported Jumbo frames supported

SvSAN will work with any internal server storage configured in the RAID configuration of preference.

Note: SvSAN passes I/O to a hardware RAID controller to enable the RAID configuration of preference. If utilizing RAID, a battery-backed cache is best practice.

Hypervisor support

SvSAN on Lenovo System x and/or Lenovo ThinkServer is fully supported and certified with:

- ▶ Microsoft Windows Server 2012 R2 with Hyper-V
- ▶ Microsoft Hyper-V Server 2012 R2
- ▶ VMware vSphere 5.1, 5.5, 6.0, and updates

NSH requirements

The SvSAN Neutral Storage Host (NSH) can be installed onto a physical server or virtual machine with the following operating systems:

- ▶ Microsoft 64-bit Server OS
- ▶ Debian Linux x86 Linux distributions (32-bit)
- ▶ Debian Linux ARM distributions
- ▶ NSH Appliance (available for easy installation)

Note: The NSH must be installed onto a system separate from the SvSAN cluster and is sharable to thousands of VSAs.

Base configuration

The recommended base configuration for the offering is listed in Table 2.

Table 2 Base hardware configuration

Quantity	Item	Description
2	Server	Choice of: <ul style="list-style-type: none">▶ Lenovo System x3650 M5▶ Lenovo System x3550 M5▶ Lenovo System x3250 M6

Quantity	Item	Description
Per node	CPU	1x Intel Xeon E3 or E5 CPU
Per node	RAM	Recommended minimum 1x 8GB RAM
Per node	Disk	Internal disk configured in RAID of desired type. All disk types supported, see http://www.stormagic.com/manual/svsan/5-3-update-1/en/#configuration-options-vs.htm%3FTocPath%3DDeployment%20of%20SvSAN%7CvSphere%20deployment%7C_____2
Per node	RAID	ServeRAID™ controller with cache if utilizing parity RAID
2	OS	VMware vSphere 5.5/6.x Microsoft Server 2012 R2
1	SvSAN	StorMagic SvSAN License

SvSAN software and services part numbers

Table 3 shows all the software and services part numbers offered by StorMagic as Lenovo part numbers. All of these parts can be purchased directly from Lenovo.

Notes:

- ▶ SvSAN is licensed by the mirrored VSA storage capacity. SvSAN licenses are available for 2TB, 6TB, 12TB, and unlimited usable storage capacities.
- ▶ SvSAN is available with either a Standard and Advanced license. Advanced offers additional features and functions. See “Standard and Advanced licenses” on page 14 for details.
- ▶ StorMagic offers both Gold and Platinum level support agreements as listed in the table. For a comparison of support levels, see “Support options” on page 18. Each license includes 1 year of service and support. Additional years of service and support are also available as listed in the table.
- ▶ Upgrades are available both for storage capacity upgrades and upgrades from Standard to Advanced, as listed in the table.
- ▶ One SvSAN license provides two VSAs to provide high availability; however, individual licensing is available for scale out beyond 2-server configurations.

Table 3 Lenovo part numbers for SvSAN components

Lenovo PN	StorMagic PN	Stormagic Description
2 TB storage capacity - Standard License		
7ZN7A04017	SM-SvSAN-2TB-STD-PLAT1	SvSAN 2TB Standard License + 1 Year Platinum Maintenance
7ZN7A04018	SM-SvSAN-2TB-STD-GOLD1	SvSAN 2TB Standard License + 1 Year Gold Maintenance
7ZN7A04019	SM-MAINT-2TB-STD-PLAT2A	SvSAN 2TB Standard Platinum Maintenance - 2 Year Add-on
7ZN7A04020	SM-MAINT-2TB-STD-PLAT4A	SvSAN 2TB Standard Platinum Maintenance - 4 Year Add-on
7ZN7A04021	SM-MAINT-2TB-STD-GOLD2A	SvSAN 2TB Standard Gold Maintenance - 2 Year Add-on
7ZN7A04022	SM-MAINT-2TB-STD-GOLD4A	SvSAN 2TB Standard Gold Maintenance - 4 Year Add-on
2 TB storage capacity - Advanced License		
7ZN7A04023	SM-SvSAN-2TB-ADV-PLAT1	SvSAN 2TB Advanced License + 1 Year Platinum Maintenance

Lenovo PN	StorMagic PN	Stormagic Description
7ZN7A04024	SM-SvSAN-2TB-ADV-GOLD1	SvSAN 2TB Advanced License + 1 Year Gold Maintenance
7ZN7A04025	SM-MAINT-2TB-ADV-PLAT2A	SvSAN 2TB Advanced Platinum Maintenance - 2 Year Add-on
7ZN7A04026	SM-MAINT-2TB-ADV-PLAT4A	SvSAN 2TB Advanced Platinum Maintenance - 4 Year add-on
7ZN7A04027	SM-MAINT-2TB-ADV-GOLD2A	SvSAN 2TB Advanced Gold Maintenance - 2 Year Add-on
7ZN7A04028	SM-MAINT-2TB-ADV-GOLD4A	SvSAN 2TB Advanced Gold Maintenance - 4 Year Add-on
6 TB storage capacity - Standard License		
7ZN7A04029	SM-SvSAN-6TB-STD-PLAT1	SvSAN 6TB Standard License + 1 Year Platinum Maintenance
7ZN7A04030	SM-SvSAN-6TB-STD-GOLD1	SvSAN 6TB Standard License + 1 Year Gold Maintenance
7ZN7A04031	SM-MAINT-6TB-STD-PLAT2A	SvSAN 6TB Standard Platinum Maintenance - 2 Year Add-on
7ZN7A04032	SM-MAINT-6TB-STD-PLAT4A	SvSAN 6TB Standard Platinum Maintenance - 4 Year Add-on
7ZN7A04033	SM-MAINT-6TB-STD-GOLD2A	SvSAN 6TB Standard Gold Maintenance - 2 Year Add-on
7ZN7A04034	SM-MAINT-6TB-STD-GOLD4A	SvSAN 6TB Standard Gold Maintenance - 4 Year Add-on
6 TB storage capacity - Advanced License		
7ZN7A04035	SM-SvSAN-6TB-ADV-PLAT1	SvSAN 6TB Advanced License + 1 Year Platinum Maintenance
7ZN7A04036	SM-SvSAN-6TB-ADV-GOLD1	SvSAN 6TB Advanced License + 1 Year Gold Maintenance
7ZN7A04037	SM-MAINT-6TB-ADV-PLAT2A	SvSAN 6TB Advanced Platinum Maintenance - 2 Year Add-on
7ZN7A04038	SM-MAINT-6TB-ADV-PLAT4A	SvSAN 6TB Advanced Platinum Maintenance - 4 Year Add-on
7ZN7A04039	SM-MAINT-6TB-ADV-GOLD2A	SvSAN 6TB Advanced Gold Maintenance - 2 Year Add-on
7ZN7A04040	SM-MAINT-6TB-ADV-GOLD4A	SvSAN 6TB Advanced Gold Maintenance - 4 Year Add-on
12 TB storage capacity - Standard License		
7ZN7A04041	SM-SvSAN-12TB-STD-PLAT1	SvSAN 12TB Standard License + 1 Year Platinum Maintenance
7ZN7A04042	SM-SvSAN-12TB-STD-GOLD1	SvSAN 12TB Standard License + 1 Year Gold Maintenance
7ZN7A04043	SM-MAINT-12TB-STD-PLAT2A	SvSAN 12TB Standard Platinum Maintenance - 2 Year Add-on
7ZN7A04044	SM-MAINT-12TB-STD-PLAT4A	SvSAN 12TB Standard Platinum Maintenance - 4 Year Add-on
7ZN7A04045	SM-MAINT-12TB-STD-GOLD2A	SvSAN 12TB Standard Gold Maintenance - 2 Year Add-on
7ZN7A04046	SM-MAINT-12TB-STD-GOLD4A	SvSAN 12TB Standard Gold Maintenance - 4 Year Add-on
12 TB storage capacity - Advanced License		
7ZN7A04047	SM-SvSAN-12TB-ADV-PLAT1	SvSAN 12TB Advanced License + 1 Year Platinum Maintenance
7ZN7A04048	SM-SvSAN-12TB-ADV-GOLD1	SvSAN 12TB Advanced License + 1 Year Gold Maintenance
7ZN7A04049	SM-MAINT-12TB-ADV-PLAT2A	SvSAN 12TB Advanced Platinum Maintenance - 2 Year Add-on
7ZN7A04050	SM-MAINT-12TB-ADV-PLAT4A	SvSAN 12TB Advanced Platinum Maintenance - 4 Year Add-on
7ZN7A04051	SM-MAINT-12TB-ADV-GOLD2A	SvSAN 12TB Advanced Gold Maintenance - 2 Year Add-on
7ZN7A04052	SM-MAINT-12TB-ADV-GOLD4A	SvSAN 12TB Advanced Gold Maintenance - 4 Year Add-on

Lenovo PN	StorMagic PN	Stormagic Description
Unlimited storage capacity - Standard License		
7ZN7A04053	SM-SvSAN-UTB-STD-PLAT1	SvSAN UTB Standard License + 1 Year Platinum Maintenance
7ZN7A04054	SM-SvSAN-UTB-STD-GOLD1	SvSAN UTB Standard License + 1 Year Gold Maintenance
7ZN7A04055	SM-MAINT-UTB-STD-PLAT2A	SvSAN UTB Standard Platinum Maintenance - 2 Year Add-on
7ZN7A04056	SM-MAINT-UTB-STD-PLAT4A	SvSAN UTB Standard Platinum Maintenance - 4 Year Add-on
7ZN7A04057	SM-MAINT-UTB-STD-GOLD2A	SvSAN UTB Standard Gold Maintenance - 2 Year Add-on
7ZN7A04058	SM-MAINT-UTB-STD-GOLD4A	SvSAN UTB Standard Gold Maintenance - 4 Year Add-on
Unlimited storage capacity - Advanced License		
7ZN7A04059	SM-SvSAN-UTB-ADV-PLAT1	SvSAN UTB Advanced License + 1 Year Platinum Maintenance
7ZN7A04060	SM-SvSAN-UTB-ADV-GOLD1	SvSAN UTB Advanced License + 1 Year Gold Maintenance
7ZN7A04061	SM-MAINT-UTB-ADV-PLAT2A	SvSAN UTB Advanced Platinum Maintenance - 2 Year Add-on
7ZN7A04062	SM-MAINT-UTB-ADV-PLAT4A	SvSAN UTB Advanced Platinum Maintenance - 4 Year Add-on
7ZN7A04063	SM-MAINT-UTB-ADV-GOLD2A	SvSAN UTB Advanced Gold Maintenance - 2 Year Add-on
7ZN7A04064	SM-MAINT-UTB-ADV-GOLD4A	SvSAN UTB Advanced Gold Maintenance - 4 Year Add-on
Upgrades - Standard to Advanced		
7ZN7A04065	SM-SvSAN-2TB-STD-ADV-UPG	SvSAN 2TB Standard to Advanced Upgrade
7ZN7A04066	SM-SvSAN-6TB-STD-ADV-UPG	SvSAN 6TB Standard to Advanced Upgrade
7ZN7A04067	SM-SvSAN-12TB-STD-ADV-UPG	SvSAN 12TB Standard to Advanced Upgrade
7ZN7A04068	SM-SvSAN-UTB-STD-ADV-UPG	SvSAN Unlimited TB Standard to Advanced Upgrade
Upgrades - Capacity increases		
7ZN7A04069	SM-SvSAN-2TB-6TB-STD-UPG	SvSAN 2TB - 6TB Standard Capacity Upgrade
7ZN7A04070	SM-SvSAN-2TB-12TB-STD-UPG	SvSAN 2TB - 12TB Standard Capacity Upgrade
7ZN7A04071	SM-SvSAN-2TB-UTB-STD-UPG	SvSAN 2TB - Unlimited TB Standard Capacity Upgrade
7ZN7A04072	SM-SvSAN-2TB-6TB-ADV-UPG	SvSAN 2TB - 6TB Advanced Capacity Upgrade
7ZN7A04073	SM-SvSAN-2TB-12TB-ADV-UPG	SvSAN 2TB - 12TB Advanced Capacity Upgrade
7ZN7A04074	SM-SvSAN-2TB-UTB-ADV-UPG	SvSAN 2TB - Unlimited TB Advanced Capacity Upgrade
7ZN7A04075	SM-SvSAN-6TB-12TB-STD-UPG	SvSAN 6TB - 12TB Standard Capacity Upgrade
7ZN7A04076	SM-SvSAN-6TB-UTB-STD-UPG	SvSAN 6TB - Unlimited TB Standard Capacity Upgrade
7ZN7A04077	SM-SvSAN-6TB-12TB-ADV-UPG	SvSAN 6TB - 12TB Advanced Capacity Upgrade
7ZN7A04078	SM-SvSAN-6TB-UTB-ADV-UPG	SvSAN 6TB - Unlimited TB Advanced Capacity Upgrade
7ZN7A04079	SM-SvSAN-12TB-UTB-STD-UPG	SvSAN 12TB - Unlimited TB Standard Capacity Upgrade
7ZN7A04080	SM-SvSAN-12TB-UTB-ADV-UPG	SvSAN 12TB - Unlimited TB Advanced Capacity Upgrade

Standard and Advanced licenses

SvSAN is available with either a Standard and Advanced license. Advanced offers additional features and functions as listed in Table 4.

Table 4 Standard License vs Advanced License

Feature	Standard	Advanced
Minimum cluster size	2	2
Synchronous Mirroring/Storage High Availability	Yes	Yes
Stretched/Metro Cluster Support	Yes	Yes
Volume Migration	Yes	Yes
VSA Restore (VMware vSphere only)	Yes	Yes
Centralized management and monitoring	Yes	Yes
Remote shared quorum	Yes	Yes
I/O performance statistics	Yes	Yes
Multiple VSA GUI deployment and upgrade	Yes	Yes
Powershell script generation	Yes	Yes
SSD caching (read/write)	No	Yes
Memory-based caching – most frequently used mode	No	Yes
Memory-based caching – read ahead mode	No	Yes
Memory-based caching – data pinning mode	No	Yes
Intelligent automated tiering	No	Yes

Standard configuration template and customization

To speed up order processing and lower deployment risk, Lenovo and StorMagic have developed standardized configurations. Each configuration has a complete bill of materials and an assigned configuration number (CRN). This section shows the standard models as well as the allowable customization. These CRNs can be found in Lenovo's x-config and LESC configurators.

<https://lesc.lenovo.com>

The CRNs are currently available in the New and Popular Solutions section of LESC. The CRNs are also easily searchable by viewing the CRN catalogue for software defined storage solutions.

Customizing standard offering configurations

Configuration Reference Numbers (CRNs) provide a Deployment Ready Offering (DRO) out-of-the-box solution. The configurations can also be modified to change memory, network cards, and storage (number and type of drives, drive performance, capacity, RAID setup, etc.) based on requirements. Modifications are made in the LESC configurator.

The SvSAN VSA on each host will utilize 1 vCPU, 2GB RAM, and 21GB drive space.

Hypervisor support

StorMagic is a VMware TAP Elite partner and certified on all currently available versions of VMware vSphere. For information about the certification, see the VMware compatibility page:

<https://www.vmware.com/resources/compatibility/detail.php?deviceCategory=san&productid=18874&vc1=true>

Microsoft Hyper-V 2012 R2 is also fully supported.

SvSAN storage options

SvSAN fully supports all host storage RAID configurations, consisting of SATA or SAS HDDs or SSDs. PCIe flash can also be utilized.

SvSAN relies upon the performance of the underlying storage for the performance provided to guest virtual machines. This means that although dissimilar hardware is supported, having matching servers and configurations is recommended and is best practice.

If utilizing parity RAID, a battery-backed cache is recommended.

Best practice is to assign the storage to the software to manage and mirror as a raw device mapping of the hardware RAID LUN. Virtual drives, VHDXs, and VMDKs are also supported. For more information, see the Storage allocation methods section in the following SvSAN manual page:

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#configuration-options-vs.htm#3FTocPath%3DDeployment%20of%20SvSAN%7CvSphere%20deployment%7C_____2

Caching

SvSAN caching enables mixed-drive architectures with flash-based SSDs, providing high random I/O throughput and enabling fewer, high capacity—but slower—HDDs to be utilized. A white paper describing this functionality further can be downloaded from:

<http://www.stormagic.com/resource-articles/solid-state-disks-for-the-distributed-enterprise/>

External storage

External JBOD storage can also be managed by VSAs to mirror, should additional capacity be required. SvSAN customers range from mirroring 300GB to 150TB+.

Network cabling options

This section describes the different options for cabling SvSAN mirror interfaces. This is supported as either 1Gb, 10Gb, or a combination. Select the configuration that best meets the needs of your environment; SvSAN uses standard TCP/IP and will automatically load-balance traffic across Mirror Preferred flagged interfaces.

A direct-connected 10Gb network configuration for SAN traffic is optional for higher performance requirements. A redundant 1Gb VM Network/host management is shown in Figure 7 cabled to 1GbE switches, but network architectures are also customizable based on customer requirement.

Note: Physical switching is required to share StorMagic SvSAN storage to further compute-only or hyperconverged nodes.

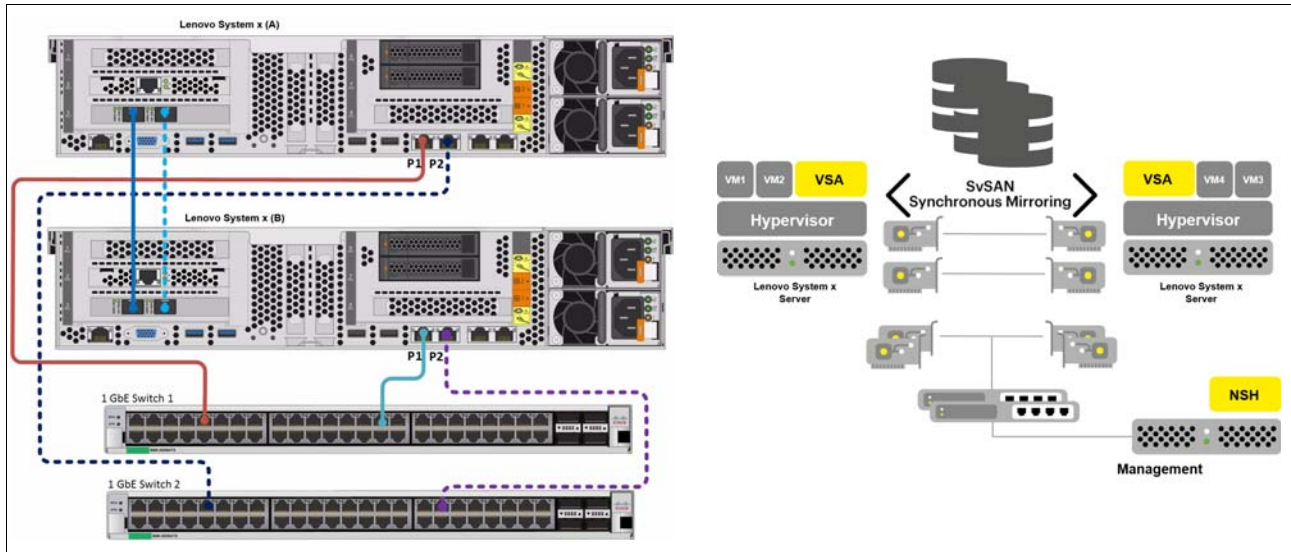


Figure 7 Example synchronous mirroring direct-connect networking topology

The example in Figure 8 on page 16 demonstrates a fully switched network configuration with jumbo frames and LACP/Etherchannel fully supported. It is also fully supported to segregate SAN traffic via VLANs. Network architectures are customizable based on customer requirements.

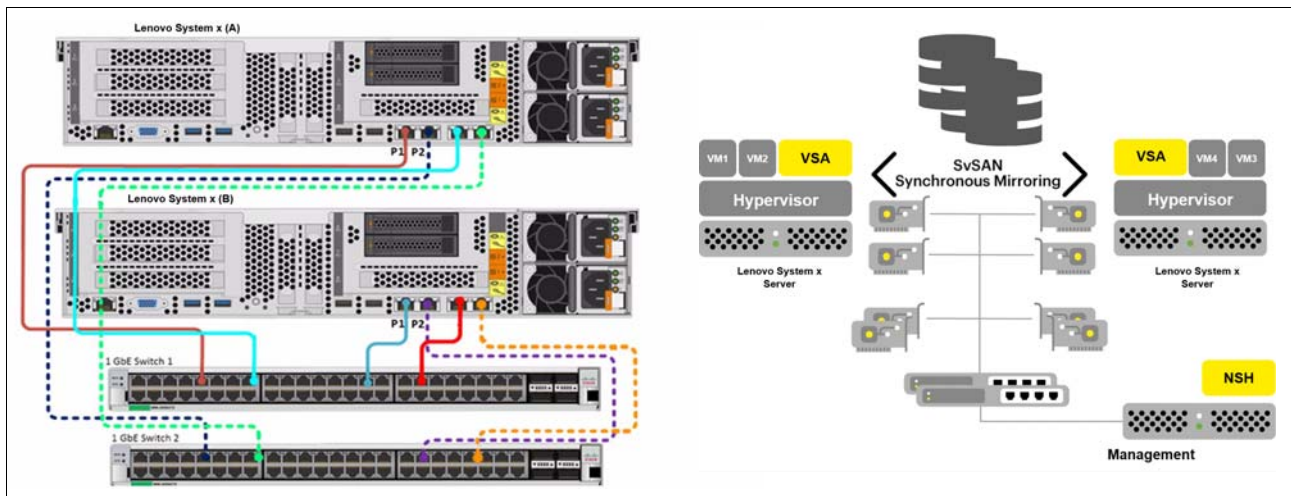


Figure 8 Example synchronous mirroring switch-connect networking topology

Systems management

SvSAN centralized management tools dramatically simplify the creation of a virtualized HA environment by enabling VSA deployment and datastore provisioning from wizard-based plugin.

The vCenter Dashboard, Figure 9, provides health status on all VSAs managed by the vCenter in an easy to view system.

The screenshot shows the 'StorMagic Dashboard' with two main sections: 'VSA Status' and 'Active Alerts'. The 'VSA Status' section includes a filter box and a summary bar with icons for All (2), Error (0), Warning (0), Healthy (2), Starting (0), Offline (0), and Unknown (0). Below this is a table with columns for State, Name, IPs, Serial, Host, and Last Seen. The 'Active Alerts' section also has a filter box and a table with columns for State and Message.

State	Name	IPs	Serial	Host	Last Seen
Healthy	VSAdemoesxi1.supprt.storma	192.168.1.3,192.168.2.3,10.1	AA59A915333E	demoesxi1.supprt.storma	Mon Jul 13 10:11:38 BST 2015
Healthy	VSAdemoesxi2.supprt.storma	10.10.0.137,192.168.1.4,192.	4A52B916F95C	demoesxi2.supprt.storma	Mon Jul 13 10:11:39 BST 2015

Figure 9 VMware vCenter Dashboard

The StorMagic tab, which appears on each data center within the vCenter inventory, provides wizard-based provisioning tools and a per-location management interface. See Figure 10 on page 17 and Figure 11 on page 18.

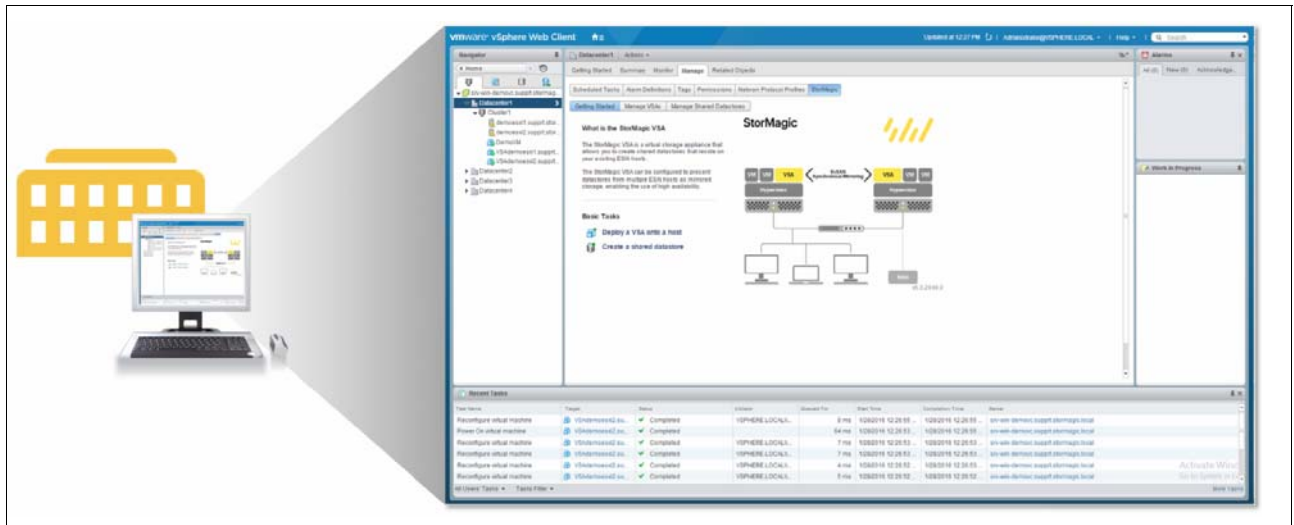


Figure 10 StorMagic Datacenter tab in the vCenter GUI

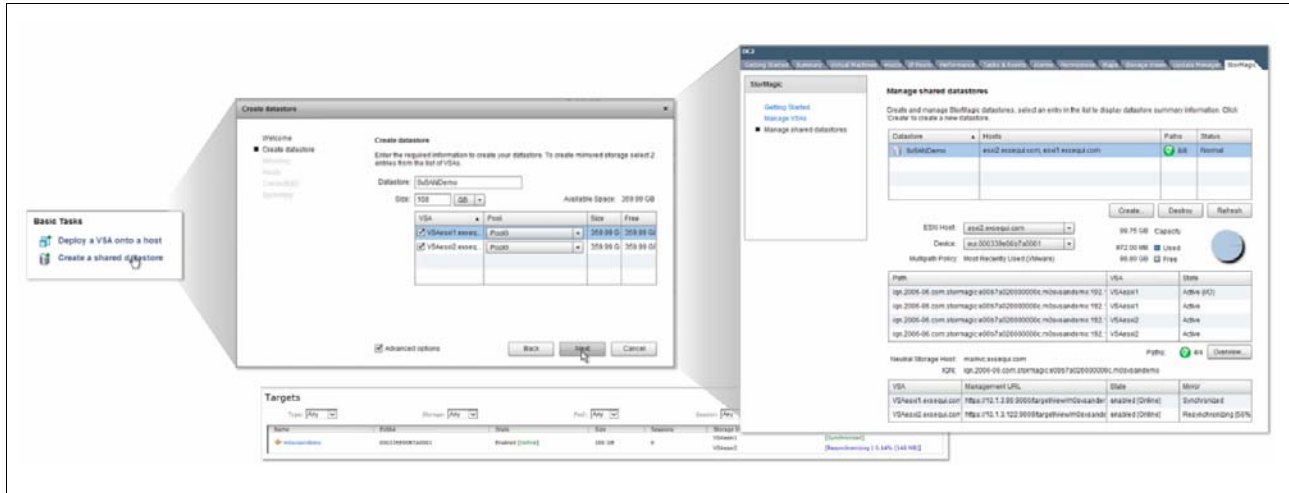


Figure 11 SvSAN datastore creation

For further granularity, each VSA presents a Web interface that provides visibility into the VSA firmware, networking configuration, datastores, and VSA events, as shown in Figure 12.

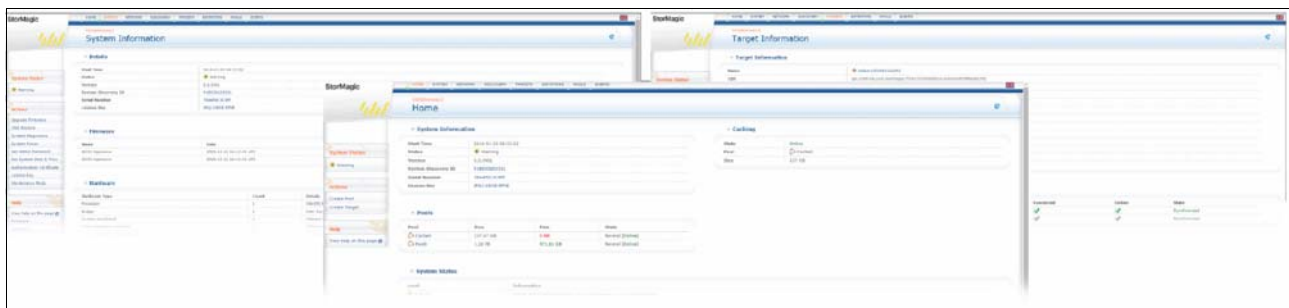


Figure 12 VSA Web interface management

An ESXi host failure event triggering a guest VM High Availability restart is shown in Figure 13 on page 18.

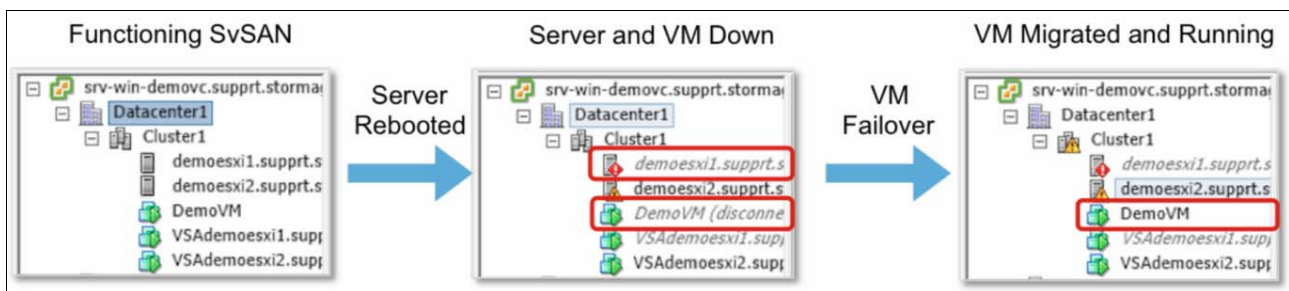


Figure 13 Failure Event View

Support options

StorMagic provides world-class support to ensure that customers and partners can quickly and effectively troubleshoot any difficulties that may arise. The tiered support program, SupportSuite, offers users year-round technical support and instant access to online tools, such as automated product updates and knowledgebase access.

Levels of StorMagic support

Choose from Gold or Platinum support for cover up to 24 hours a day, 7 days a week. You can view the full specifications of the Gold and Platinum support packages in the StorMagic Support Overview, available from:

http://stormagic.com/pdf/Support_policy_lifecycle.pdf

For support inquiries, please email support@stormagic.com.

Table 5 Levels of support

	Gold	Platinum
Hours of operation	9 hours a day, Monday - Friday	24 hours a day, 7 days a week ^a
Length of service	1, 3, or 5 years	1, 3, or 5 years
Product updates	Yes	Yes
Product upgrades	Yes	Yes
Access method	Email/web chat	Telephone/email/web chat
Response method	Telephone/email	Telephone/email
Remote support/webex	Yes	Yes
Access to knowledge base	Yes	Yes
Access to documentation	Yes	Yes
Disaster recovery assistance	No	Yes
Performance tuning	No	Yes
Upgrade assistance	No	Yes
SAN solution configuration	Yes	Yes
Maximum number of support administrators per contract	2	4
Number of support requests	Unlimited	Unlimited
Target response times:		
▶ Low	12 business hours	8 business hours
▶ Medium	8 business hours	4 business hours
▶ Critical	4 business hours	1 hour, 24 hours a day, 7 days a week, 365 days a year
Business hours	Monday - Friday	Monday – Friday
Europe	8am – 8pm (GMT/BST)	8am – 8pm (GMT/BST)
North America	5am – 5pm (CST/CDT)	5am – 5pm (CST/CDT)

a. Global, 24x7 support for critical issues

For more information:

- ▶ SvSAN Support Policy and Lifecycle:

http://stormagic.com/pdf/Support_policy_lifecycle.pdf

- ▶ StorMagic SvSAN Support Portal:
<http://support.stormagic.com>

Deployment examples

This section provides examples of deploying StorMagic.

2x node multi-site

Figure 14 on page 20 demonstrates a lean IT, 2x node branch office infrastructure with SvSAN. This enables centralized management with a lightweight, cost-effective entry point to virtualize at scale. As an example, the largest SvSAN customer runs SvSAN in ~2500 locations.

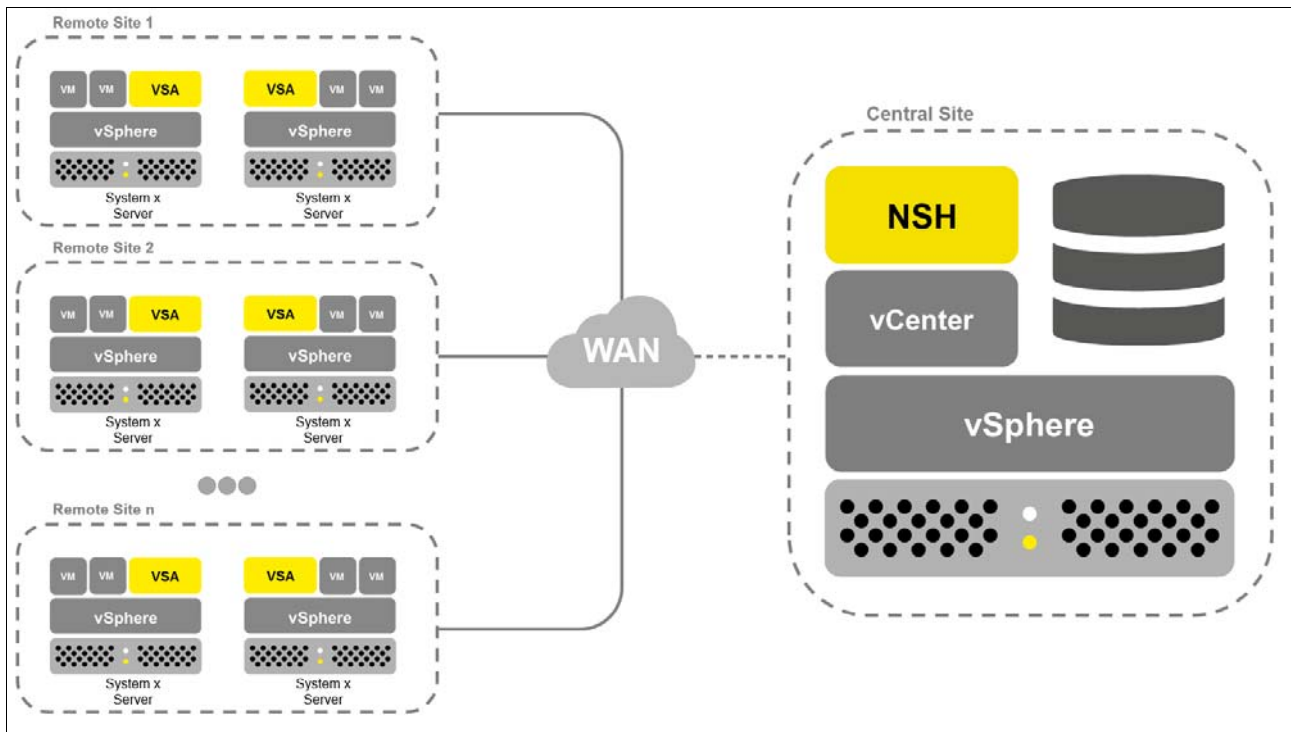


Figure 14 SvSAN 2x node multi-site overview

4x node scale out

Figure 15 demonstrates the ease of nondisruptive scale-out to 3 or more nodes. This enables a lean infrastructure starting point, with the ability to use SvSAN's live migration to seamlessly scale out to a multinode architecture.

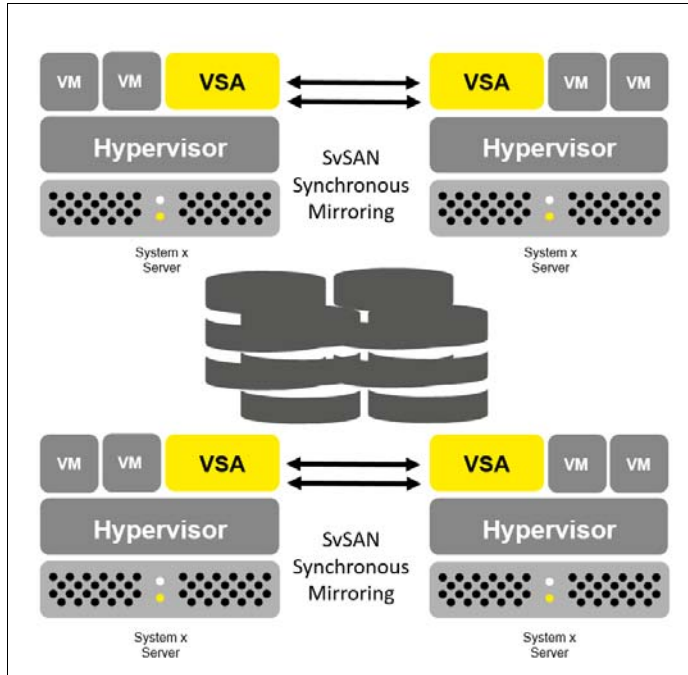


Figure 15 SvSAN 4x node architectural overview

SvSAN Deployment

This section provides step-by-step instruction for the solution setup.

In order to download the StorMagic SvSAN packages, register for a trial at:

<http://stormagic.com/trial>

Alternatively, all software packages are available for downloadable purchase from:

<http://support.stormagic.com>

Need help? The SVSAN product manual is available from <http://stormagic.com/manuals>

For additional information about deployment, contact support@stormagic.com.

An SvSAN deployment will consist of the following overall steps:

1. Configuring the RAID arrays on the server
2. Installing the hypervisor.
3. Installing the SvSAN software on the vCenter or deployment host.
4. Deploying the VSAs.
5. Creating the datastores.

The full solution stack, including hardware, hypervisor, and storage can be administered using the relevant management software, including Lenovo System x IMM2 (Integrated Management Module v2), Lenovo XClarity, VMware vCenter, or Microsoft System Center/MMC consoles and SvSAN's plugin and Web GUI.

StorMagic SvSAN is typically deployed at hardware refresh to lower the total cost of entry to a fully virtualized environment. However, It can easily be deployed as a software-only solution to existing hardware.

Configure the RAID arrays

The steps to configure the RAID arrays on the servers are as follows:

1. Configure the RAID array via Lenovo IMM2 to achieve a configuration similar to the one detailed in Figure 17 on page 23. ESXi/Hyper-V can exist in VD1 or on an SD Card or USB memory key.
2. Connect and login to the Lenovo IMM2 via the configured management IP address.
3. Select **Server Management** → **Local Storage** as shown in Figure 16 on page 22.

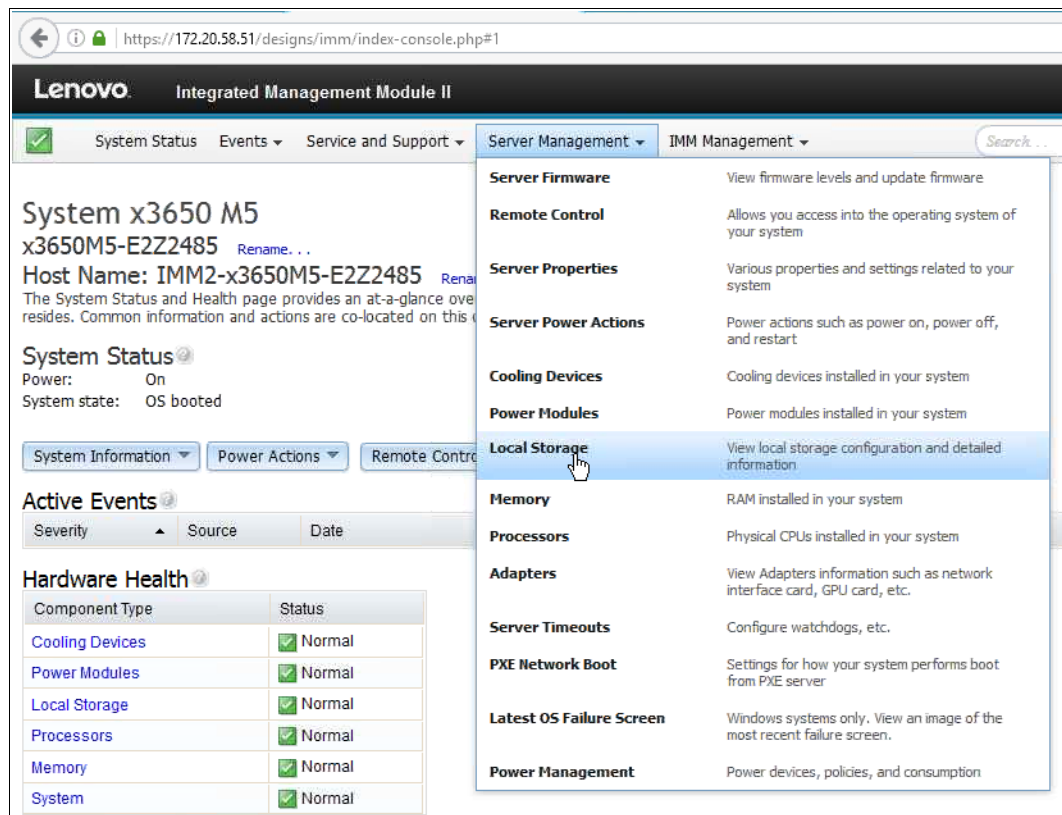


Figure 16 Lenovo IMM2 interface

- The physical resource tab will display available drives, with the example here using a 400GB SSD and 4x 900GB HDDs, Figure 17.

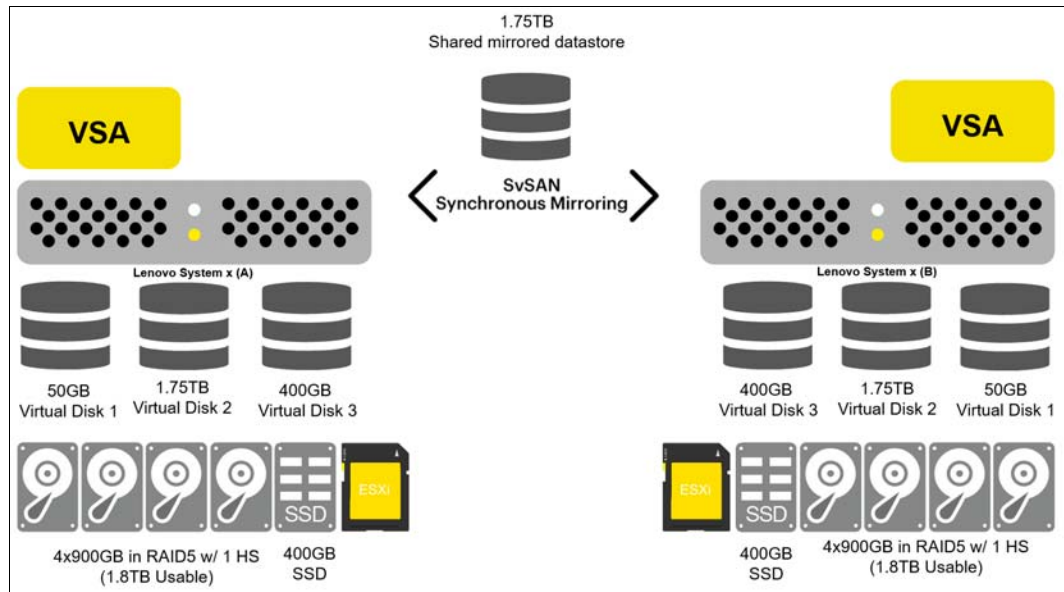


Figure 17 SvSAN 2x node example host overview

- The Local Storage view will display host controllers as well as drives available, per Figure 18 on page 23.

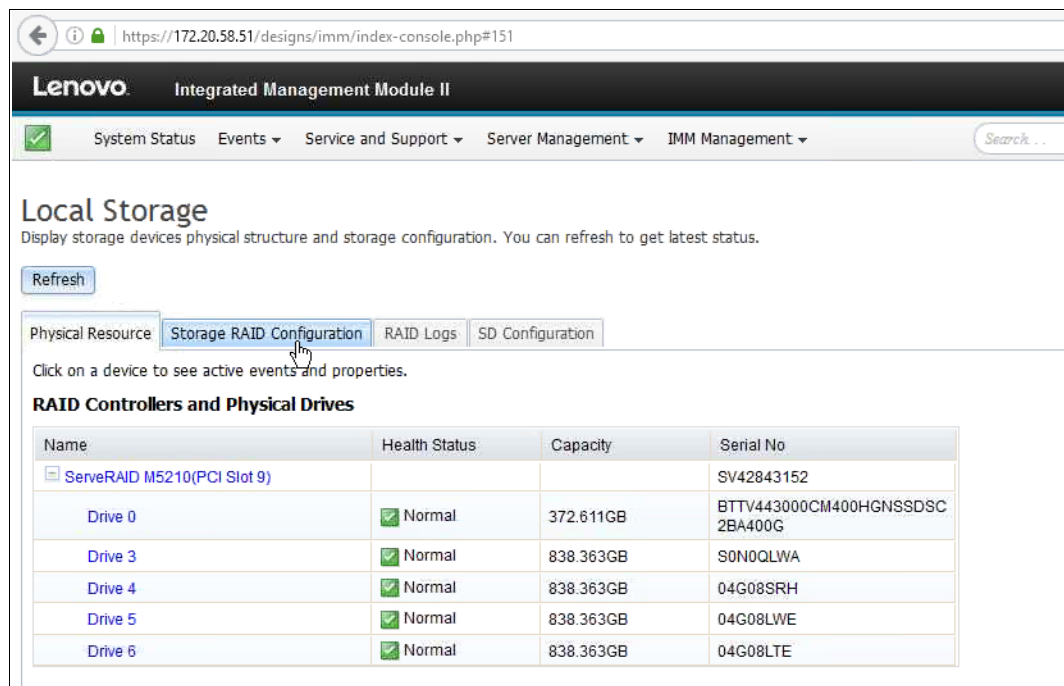


Figure 18 Lenovo IMM host storage view

6. Select **Storage RAID configuration** → **Create Volume**. The IMM2 shows configured storage volumes with the below blank ready to configure, Figure 19.

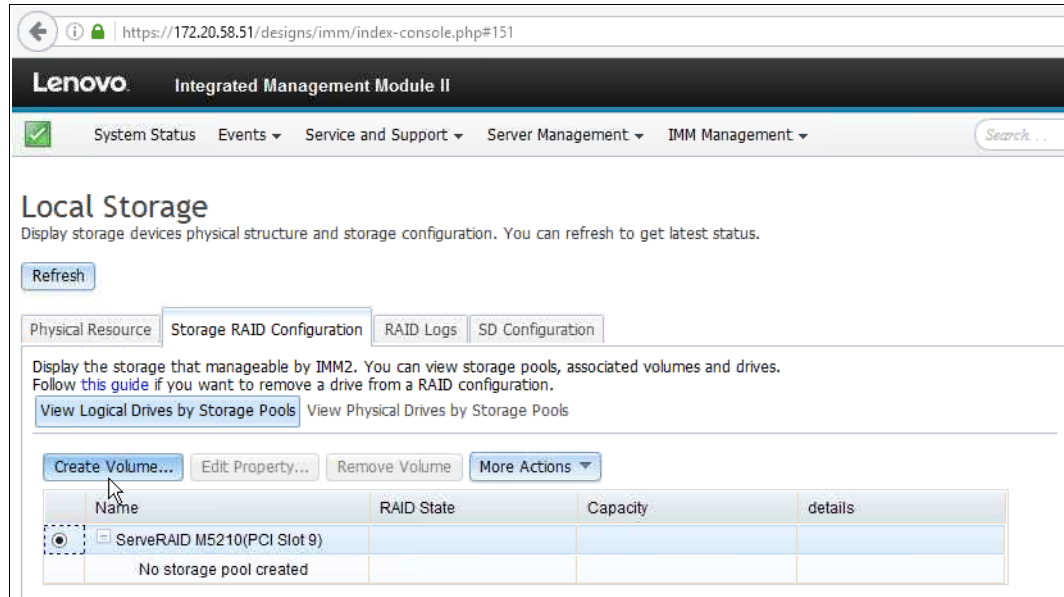


Figure 19 Lenovo IMM2 storage pool view

7. Create a single-drive RAID-0 array on the SSD to assign to the VSA via Raw Device Mapping as the cache device. First select the SSD to add to the RAID, Figure 20 on page 24.

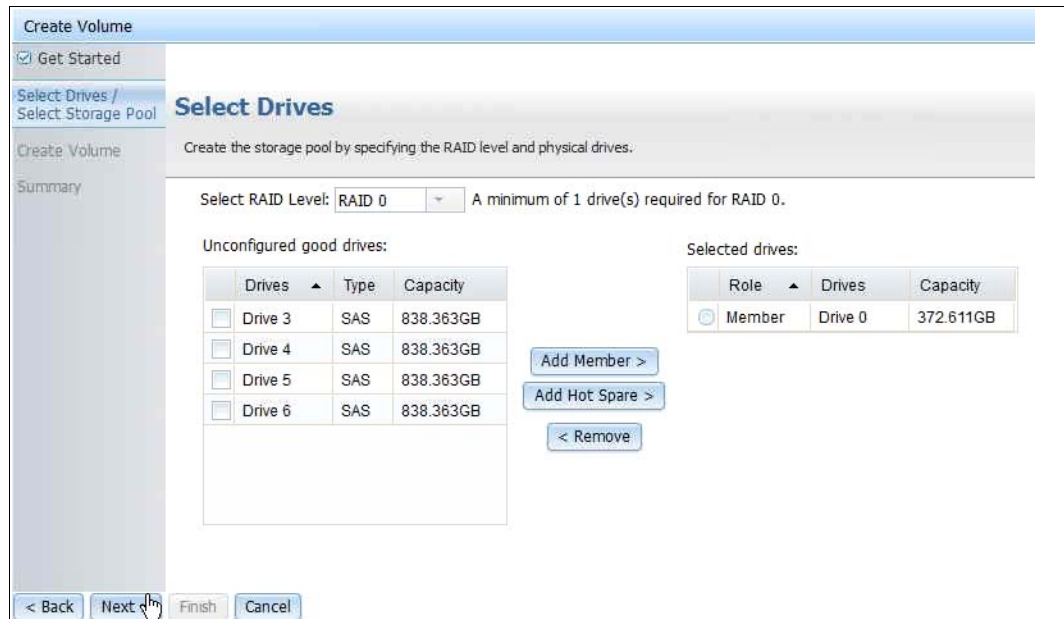


Figure 20 Lenovo IMM RAID#1 drive selection

- Name the cache virtual disk and configure its capacity as well as read/write policy. Configure these as per the controller recommendations. Typically this is write-through with SSD. See Figure 21.

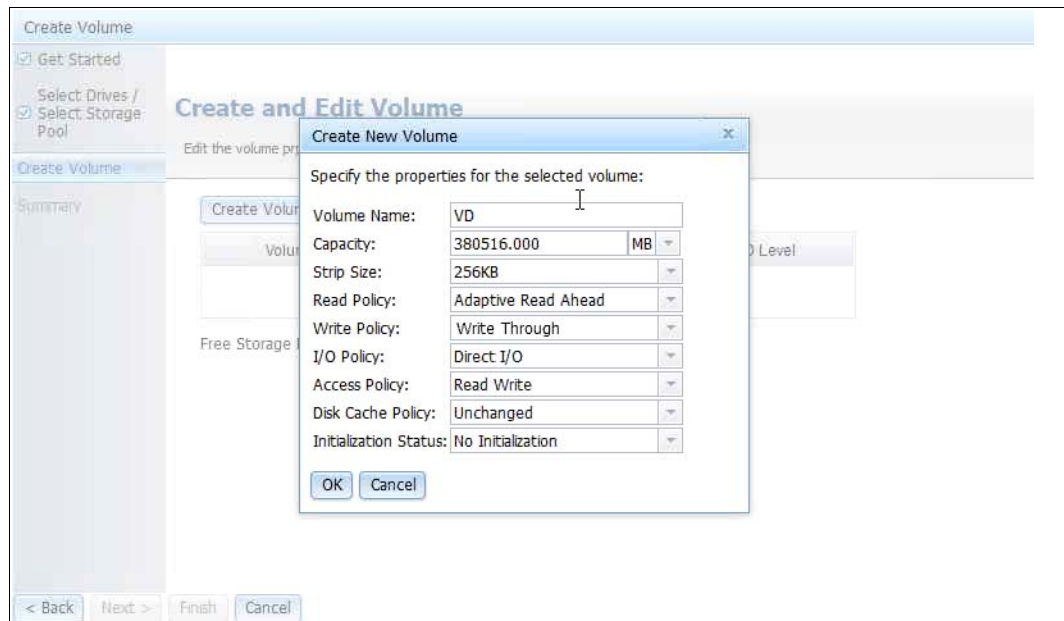


Figure 21 Lenovo IMM RAID#1 SvSAN cache device configuration (SSD no write through)

- Review the first RAID group and virtual disk configuration and complete, as shown in Figure 22 on page 25.

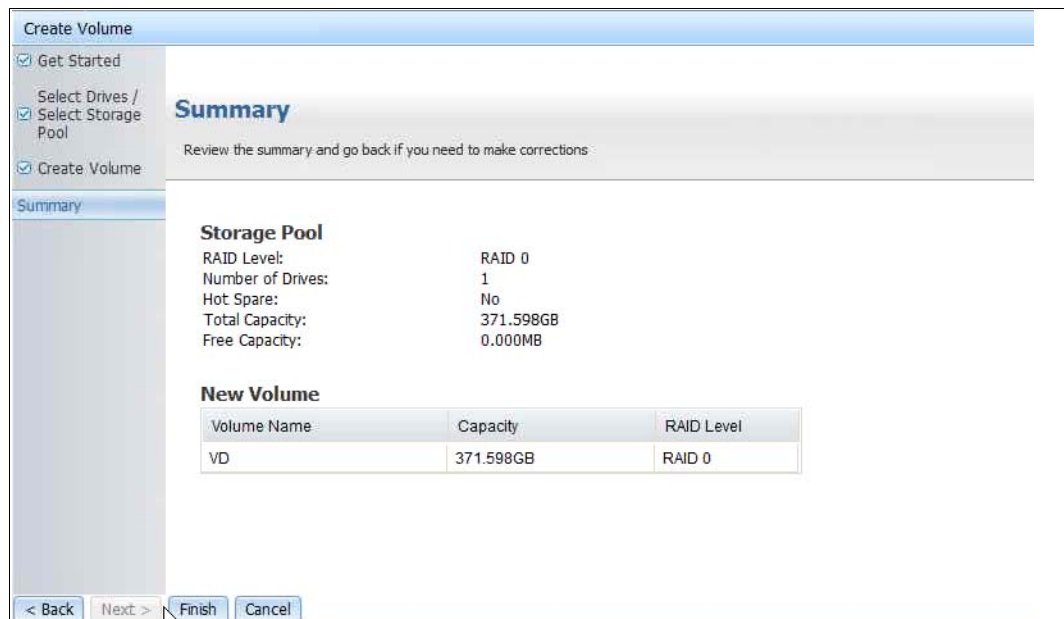


Figure 22 Lenovo IMM RAID#1 summary

10. Create a single RAID array using HDDs and split this into two virtual disks. Creating volume names and policies based on the selected RAID configuration is the final step before repeating the steps for the remaining unassigned storage components. Select the HDDs to add to this RAID group, Figure 23.

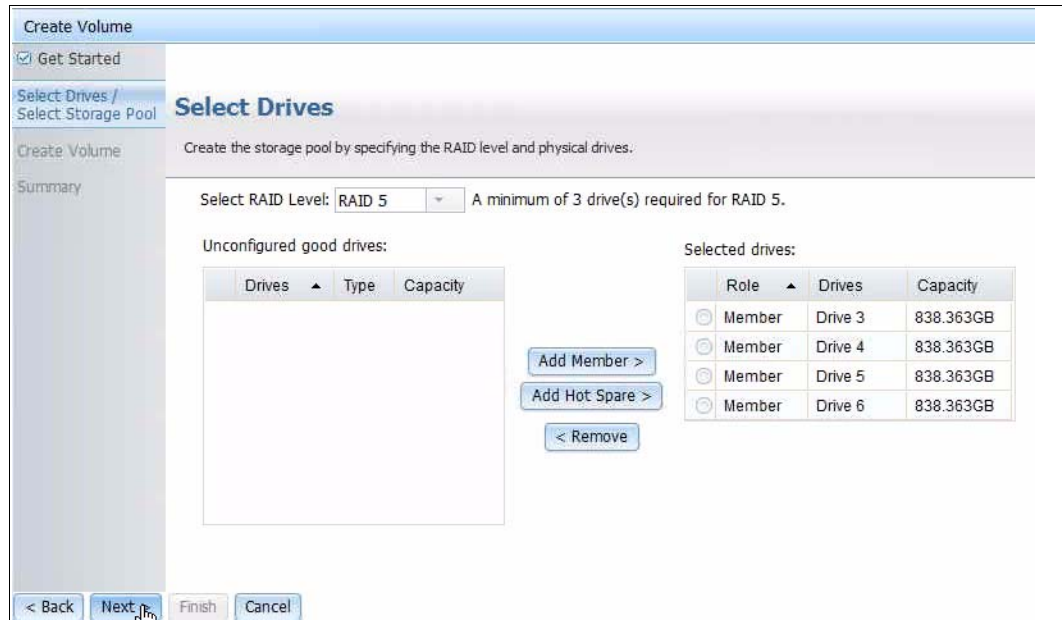


Figure 23 Lenovo IMM RAID#2 drive selection

SvSAN supports all underlying RAID configurations. If utilizing parity RAID it is recommended to have a flash cache with BBU/super capacitor to enable high write throughput.

11. Configure virtual disk 1 and provide a volume name. In this example, configuration ESXi is running on an SD card and this 50GB volume will provide a local VMFS Datastore for the VSA system disks.

In order to provide write performance select Write Back with BBU as the write policy, Figure 24.

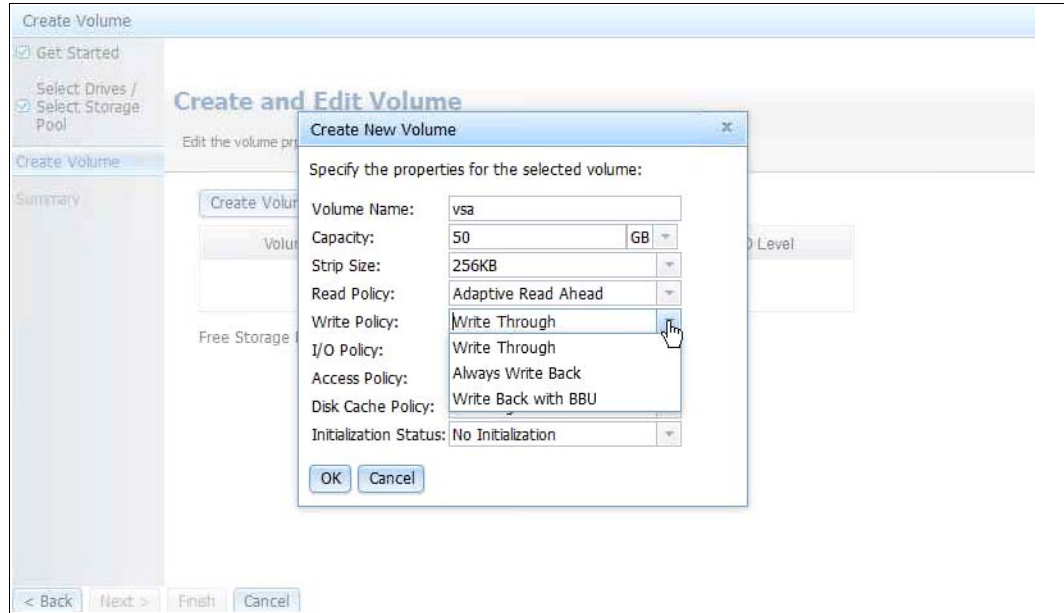


Figure 24 Lenovo IMM RAID#2 details view (virtual disk1)

12. Configure virtual disk 2 and provide a volume name. This configuration will utilize this virtual disk as the storage to assign to the VSA via pass-through or raw device mapping to manage and mirror, Figure 25.

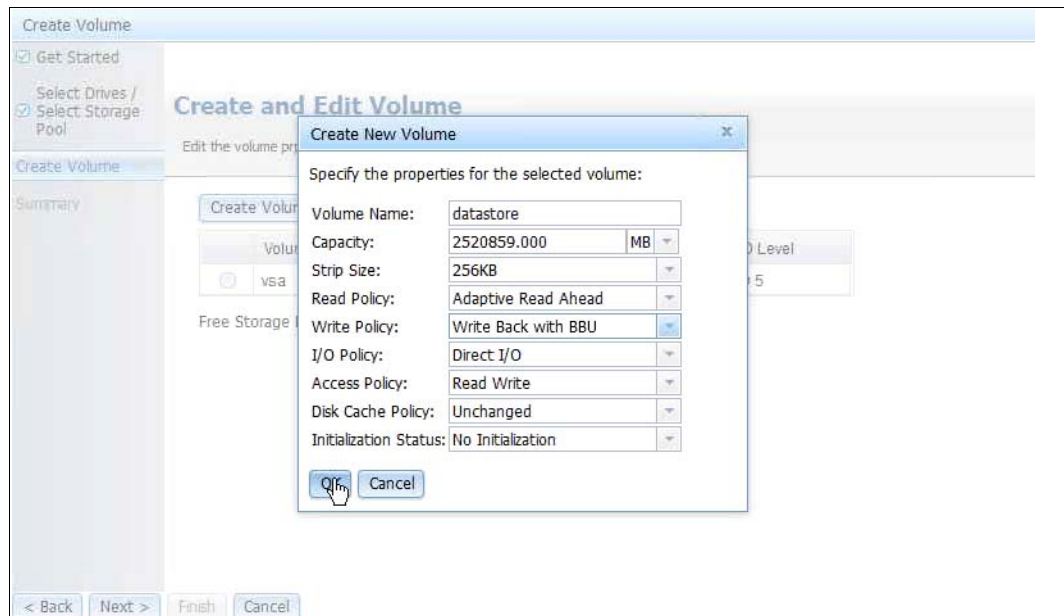


Figure 25 Lenovo IMM2 RAID#2 details view (virtual disk2)

13. Once the configuration is complete, select the created volumes to edit the details, as in Figure 26.

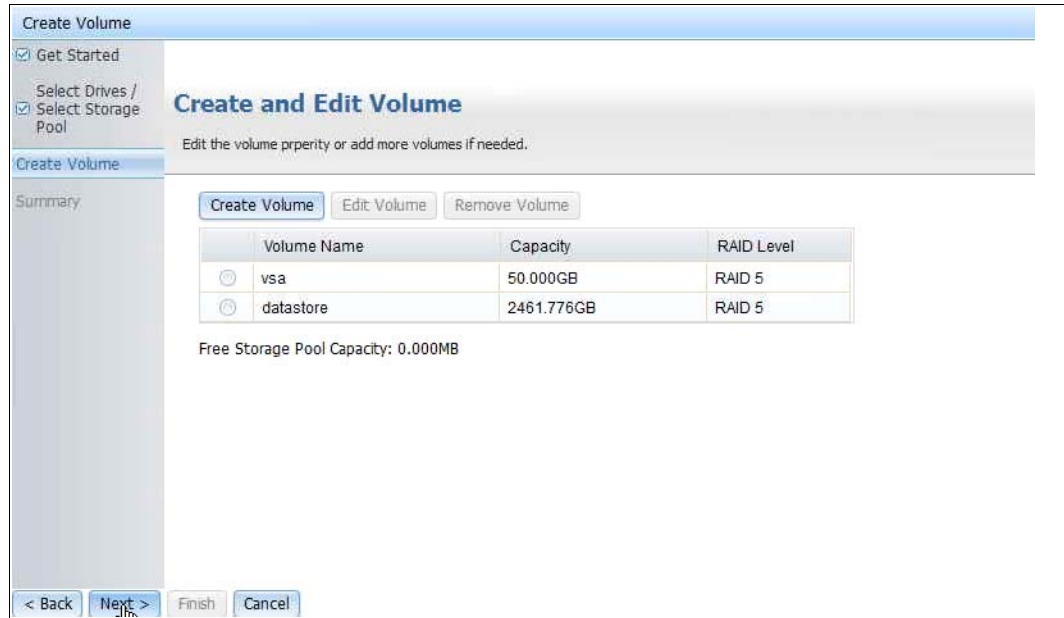


Figure 26 Lenovo IMM2 RAID#2 details view (VSA and RDM virtual disks)

14. Review the virtual volumes configured on this RAID group and complete, Figure 27.

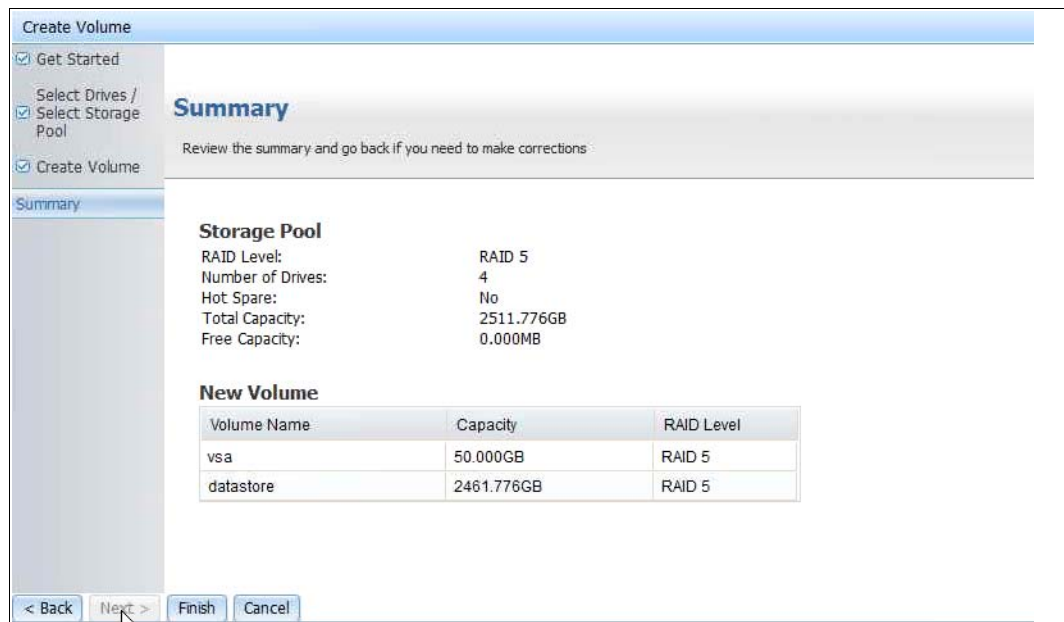


Figure 27 Summary page

15. The volume is now created successfully, as shown in Figure 28 on page 29.

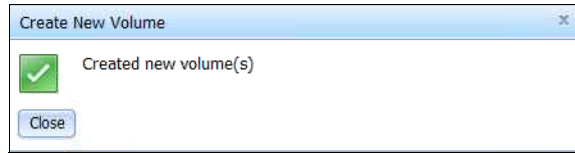


Figure 28 Lenovo IMM2 volume creation success

The full controller configuration is now displayed and is ready to be utilized within ESXi and SvSAN, Figure 29.

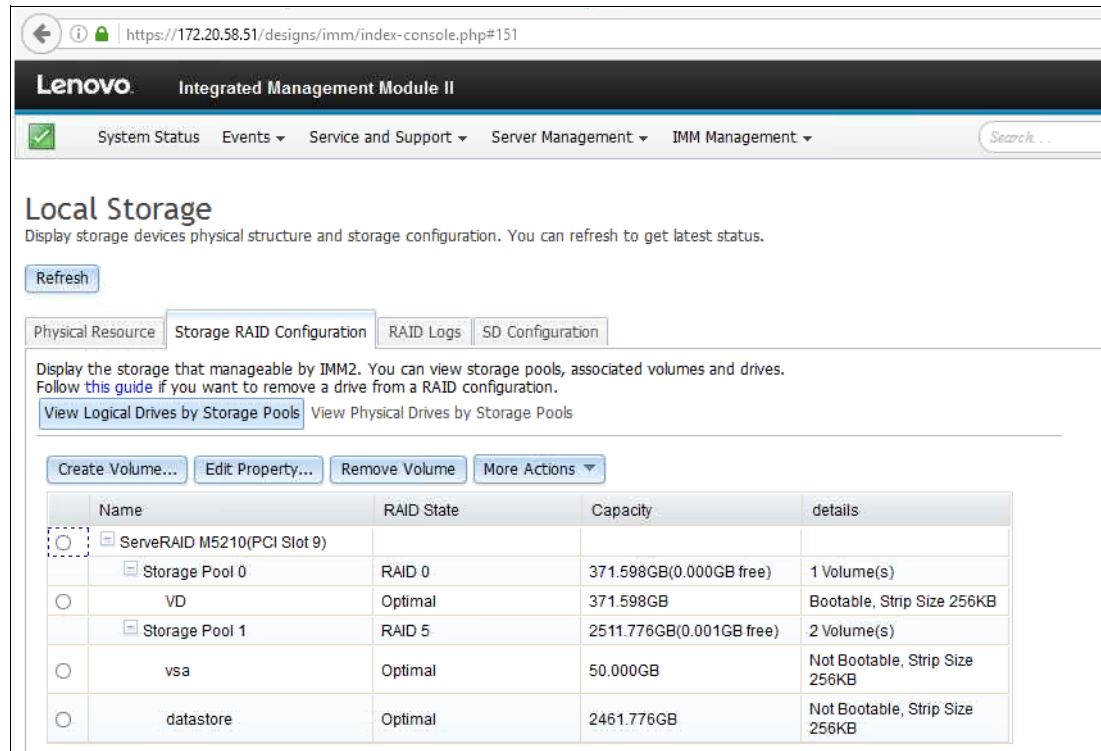


Figure 29 Lenovo IMM2 RAID configuration overview

Install the hypervisor

For information on installing vSphere and Hyper-V, see the following links:

- ▶ VMware vSphere (vCenter and ESXi):

<https://pubs.vmware.com/vsphere-60/topic/com.vmware.ICbase/PDF/vsphere-esxi-vcenter-server-60-installation-setup-guide.pdf>

- ▶ Microsoft Hyper-V:

[https://technet.microsoft.com/en-us/library/hh846766\(v=ws.11\).aspx](https://technet.microsoft.com/en-us/library/hh846766(v=ws.11).aspx)

Host file system and network configuration

With the host storage configured and ESXi installed on either the 50GB partition or the local SD/USB drive, configure the networking and format the 50GB with a VMFS file system, Figure 30 on page 30.

The screenshot shows the configuration of storage controllers in VMware ESXi. It includes a MegaRAID SAS Invader Controller (vmhba1) and an iSCSI Software Adapter (vmhba38). The details for vmhba1 show it is a MegaRAID SAS Invader Controller with 3 targets, 3 devices, and 3 paths. Below this, a table lists the storage devices presented to the controller.

Name	Runtime Name	Operational State	LUN	Type	Drive Type	Transport	Capacity	Owner	Hardware Acc
IBM Serial Attached SCSI Disk (naa...	vmhba1:C2:T2:L0	Mounted	0	disk	Non-SSD	Block Adapter	2.40 TB	NMP	Not supported
IBM Serial Attached SCSI Disk (naa...	vmhba1:C2:T1:L0	Mounted	0	disk	Non-SSD	Block Adapter	50.00 GB	NMP	Not supported
IBM Serial Attached SCSI Disk (naa...	vmhba1:C2:T0:L0	Mounted	0	disk	Non-SSD	Block Adapter	371.60 G	NMP	Not supported

Figure 30 VMware ESXi controller presented storage view

This 50GB VMFS will store the VSA VMDKs (512MB boot drive and 20GB journal drive) with the 2.4TB unformatted LUN available to be handed to the VSA during the VSA deployment wizard from the StorMagic plugin. This RDM can then be managed and mirrored, Figure 31.

The screenshot shows the VMFS Datastore view in VMware ESXi. It displays a single datastore named 'vsa' with a status of 'Normal'. The datastore is located on an IBM Serial Attached SCSI Disk (Non-SSD) and has a total capacity of 49.75 GB, with 48.80 GB of free space. The file system type is VMFS5.

Identification	Status	Device	Drive Type	Capacity	Free	Type
vsa	Normal	IBM Serial Attach...	Non-SSD	49.75 GB	48.80 GB	VMFS5

Figure 31 VMware ESXi VMFS Datastore view

SvSAN uses standard TCP/IP networking with LACP and Etherchannel being fully supported. Customers often cable directly or back to back, with a cross-over cable or similar, between the hosts as either 1Gb or 10Gb, as detailed in section 5. An example network configuration is shown in Figure 32.

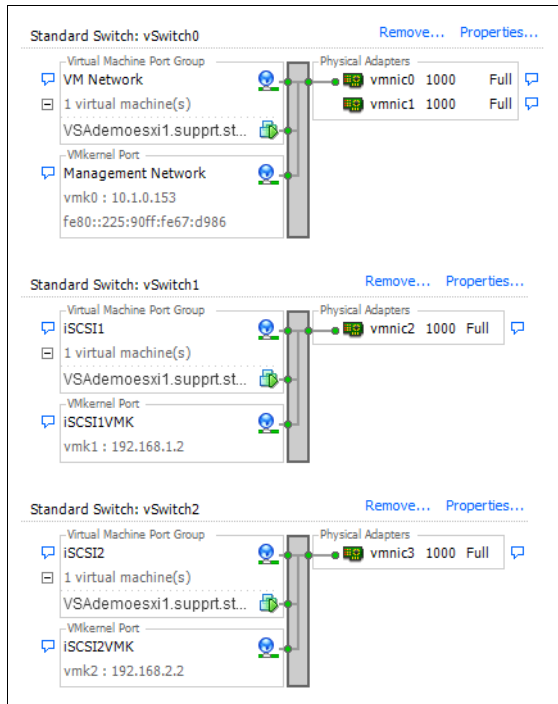


Figure 32 VMware ESXi networking example

The SvSAN software sets a default fixed local path policy. This enables reads to occur internally within the hosts,. Writes re load-balanced across the two iSCSI1 and iSCSI2 interfaces at 220 MB/s automatically, due to the mirror preferred flags. These can also be shared with other traffic, such as vMotion/Live Migration.

Install the plugin on vCenter or StorMagic Deployment Toolkit for Hyper-V

VMware vCenter provides a tool that enables management of ESXi hosts. This managing vCenter can exist on-premises on the hosts or in a centralized location.

SvSAN software is available for a 30-day trial at: <http://stormagic.com/trial>

Alternatively, customers can purchase and download from <http://support.stormagic.com>

To deploy VMware vCenter, please review the VMware and StorMagic documentation:

- ▶ VMware vCenter Deployment Guide:

<https://www.vmware.com/files/pdf/techpaper/vmware-vcenter-server6-deployment-guide.pdf>

- ▶ VMware vCenter Best Practices:

https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=2107948

- ▶ SvSAN vCenter Integration tools installation to a Windows vCenter:

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#installing-SvSAN-vs.htm%3FTocPath%3DDeployment%20of%20SvSAN%7CvSphere%20deployment%7C____3

- ▶ SvSAN vCenter Integration tools installation to a Linux vCSA:

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#vCenter-Appliance-plugin-installation.htm%3FTocPath%3DTechnical%20notes%7C____15

Installing the SvSAN deployment tools to Hyper-V utilizes the same package as a Windows vCenter installation. This deployment system can be remote or on-premises.

- ▶ Hyper-V:

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#installing-SvSAN-hv.htm%3FTocPath%3DDeployment%20of%20SvSAN%7CHyper-V%20deployment%7C____3

Deploy the VSAs

- ▶ VMware vCenter plugin:

VSAs are deployed via the StorMagic plugin displayed on the Datacenter object within the vCenter inventory. This provides a simple wizard process that can be scripted for large scale deployments using the PowerShell toolkit

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#deploying-VSAs-vs.htm%3FTocPath%3DDeployment%20of%20SvSAN%7CvSphere%20deployment%7C____4

- ▶ Microsoft Hyper-V:

The StorMagic Hyper-V deployment wizard appears within the start menu and enables a simple wizard to deploy VSAs to Hyper-V hosts; it can be scripted for large scale deployments using the PowerShell toolkit.

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#deploying-VSAs-hv.htm%3FTocPath%3DDeployment%20of%20SvSAN%7CHyper-V%20deployment%7C____4

Create the shared storage

- ▶ VMFS Datastore Creation for VMware via vCenter Plugin:

SvSAN presents iSCSI block LUNs mappable to any iSCSI software or hardware adapter. Shared VMFS datastores can be created via the StorMagic vCenter plugin wizard. This creates the targets, collates the host IQNs, populates the VSA iSCSI IPs to the host iSCSI software adapter SendTarget list, and rescans the hosts formats with a VMFS.

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#datastore-create-vs.htm%3FTocPath%3DDeployment%20of%20SvSAN%7CvSphere%20deployment%7C____7

- ▶ CSVFS Datastore Creation for Microsoft Hyper-V via VSA WebGUI:

In Hyper-V, shared datastores utilize the cluster shared volume file system. These are created by the VSA WebGUI.

http://www.stormagic.com/doc/svsan/5-3-update-1/en/#datastore-create-hv.htm%3FTocPath%3DDeployment%20of%20SvSAN%7CHyper-V%20deployment%7C____7

How to order

Lenovo Software Defined Storage (SDS) offerings with StorMagic are available through Lenovo distribution partners, such as Synnex. To get more information, email:

LenovoESG@synnex.com

- ▶ **Lenovo Distributors**

Any North American Lenovo Distributor can use this implementation guide to provide this solution. It is open to all registered Lenovo Distributors in the US and Canada.

- ▶ **Lenovo Business Partners**

Business Partners can use this implementation guide to build solutions using the standard configurations found in the LESC and x-config Lenovo configurators.

Resources

Lenovo resources

- ▶ **LESC:**

<https://lesc.lenovo.com/>

- ▶ **x-config:**

<https://lesc.lenovo.com/products/hardware/configurator/worldwide/bhui/asit/install.html>

- ▶ **Lenovo System x home page:**

<http://shop.lenovo.com/us/en/systems/servers/racks/systemx/>

- ▶ **Lenovo System x3250 M6 product guide**

<https://lenovopress.com/lp0096-lenovo-system-x3250-m6>

- ▶ **Lenovo System x3550 M5 product guide**

<https://lenovopress.com/tips1194-system-x3550-m5>

- ▶ **Lenovo System x3650 M5 product guide**

<https://lenovopress.com/tips1193-system-x3650-m5>

VMware resources

For more information on VMware vSphere and vCenter, visit www.vmware.com or see the following resources:

- ▶ **VMware ESXi**

<http://www.vmware.com/products/esxi-and-esx/overview>

- ▶ **vCenter Server information**

<http://www.vmware.com/products/vcenter-server/>

Microsoft resources

- ▶ **Microsoft Hyper-V**

<https://www.microsoft.com/en-us/server-cloud/solutions/virtualization.aspx>

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Changes in the November 2016 update:

- ▶ Minor corrections to Table 4 on page 14

Changes in the October 2016 update:

- ▶ Updated “SvSAN software and services part numbers” on page 11 with new part numbers and features
- ▶ Added section “Standard and Advanced licenses” on page 14

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