VMware vSphere Storage Appliance Installation and Configuration

vSphere Storage Appliance 1.0

vSphere 5.0

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Contents

VMware vSphere Storage Appliance Installation and Configuration

VMware vSphere Storage Appliance Installation and Configuration helps you install and configure VMware ESXi™, VMware vCenter Server™, and VMware vSphere® Storage Appliance to create a VSA cluster. A VSA cluster enables VMware vSphere® vMotion and VMware vSphere® High Availability without the need to install expensive SAN arrays.

Intended Audience

This book is intended for anyone who wants to enable vSphere vMotion and vSphere HA in their virtual environment. The information in this book is for experienced Windows system administrators who are new to virtual machine technology and datacenter operations and do not have the knowledge or experience in installing virtual and clustered environments.

Read *vSphere Basics* documentation for introduction to virtualization, ESXi, vCenter Server, virtual machines, clusters, vSphere vMotion, and vSphere HA.

Updated Information

This *vSphere Storage Appliance Installation and Configuration* is updated with each release of the product or when necessary.

This table provides the update history of *vSphere Storage Appliance Installation and Configuration*.

Revision	Description
000397-04	Added "VSA Cluster Disk Capacity," on page 19.
000397-03	The following topics have been updated to include information about added RAID5 and RAID6 support: ■ "VSA Cluster Capacity," on page 16 ■ "Hardware Requirements for ESXi in a VSA Cluster," on page 23 ■ "Configure RAID on an HP Server," on page 27 ■ "Configure RAID on a Dell Server," on page 27 ■ "VSA Automated Installer Requirements," on page 45 ■ "vSphere Storage Appliance Planning Checklist," on page 21
000397-02	"VSA Automated Installer Requirements," on page 45 no longer includes Python 2.7 64-bit as a requirement for VSA automated installation.
000397-01	Minor revisions.
000397-00	Initial release.

Introduction to vSphere Storage Appliance 1

VMware vSphere® Storage Appliance (VSA) is a VMware virtual appliance that packages SUSE Linux Enterprise Server 11 and storage clustering services. A VSA virtual machine runs on several ESXi hosts to abstract the storage resources that are installed on the hosts and to create a vSphere Storage Appliance cluster (VSA cluster).

This chapter includes the following topics:

What Is a VSA Cluster?

A VSA cluster leverages the computing and storage resources of several ESXi hosts and provides a set of datastores that are accessible by all hosts within the datacenter.

An ESXi host that runs a vSphere Storage Appliance and participates in a VSA cluster is a VSA cluster member. With vSphere Storage Appliance 1.0, you can create a VSA cluster with two or three VSA cluster members. The status of the VSA cluster is online only when more than half of the members are online.

A VSA cluster enables the following features:

- Shared datastores for all hosts in the datacenter
- Replica of each shared datastore
- vSphere vMotion and vSphere HA
- Hardware and software failover capabilities
- Replacement of a failed VSA cluster member
- Recovery of an existing VSA cluster

VSA Cluster Components

vSphere components together with the required hardware setup and configuration form a VSA cluster.

A VSA cluster requires the following vSphere and vSphere Storage Appliance components:

ESXi 5.0 Hosts	Two or three hosts with new installation of ESXi 5.0 can join a VSA cluster.
vCenter Server 5.0	A physical or virtual machine that runs vCenter Server 5.0 and manages all ESXi hosts that participate in the VSA cluster. If the machine is a virtual machine, it must not run on an ESXi host within the VSA cluster.
vSphere Client 5.0	An interface that enables users to connect remotely to vCenter Server or ESXi from any Windows computer and to manage the VSA cluster from the **VSA Manager** tab.
vSphere Storage Appliance	A VMware virtual appliance that runs SUSE Linux Enterprise Server 11 SP1 and a set of storage clustering services that perform the following tasks:

- Manage the storage capacity, performance, and data redundancy for the hard disks that are installed on the ESXi hosts

- Expose the disks of a host over the network

- Manage hardware and software failures within the VSA cluster

- Manage the communication between all instances of vSphere Storage Appliance, and between each vSphere Storage Appliance and the VSA Manager

Only one vSphere Storage Appliance can run on an ESXi host at a time.

VSA Manager	A vCenter Server 5.0 extension that you install on a vCenter Server machine. After you install it, you can see the **VSA Manager** tab in the vSphere Client. You can use VSA Manager to perform the following tasks:

- Deploy two or three vSphere Storage Appliance instances on two or three ESXi hosts to create a VSA cluster

- Mount as datastores the volumes that each vSphere Storage Appliance exports

- Monitor, maintain, and troubleshoot a VSA cluster

VSA Cluster Member	An ESXi host that runs a vSphere Storage Appliance. It is a functional member of a VSA cluster that exposes a datastore and maintains a datastore replica.
VSA Cluster Service	A Windows service that is installed with VSA Manager on the vCenter Server computer. The service is installed by default for all configurations, but is used in a VSA cluster with two members to act as a third member in case one of the VSA cluster members fails. In such a case, the Online status of two out of three members maintains the Online status of the cluster. The service does not provide storage volumes for the VSA datastores.

IMPORTANT VSA datastores continue operating with I/O, even if the VSA cluster service stops working. However, simultaneous failure of one of the VSA cluster members and of the VSA cluster service results in failure of the VSA datastores, and the status of the cluster changes to Offline.

|	
VSA Cluster Leader	A vSphere Storage Appliance that reports the status of the cluster to the VSA Manager. All members of the cluster participate in an election process through which they select the leader. The leader uses the cluster IP address to communicate with the VSA Manager.
Gigabit Ethernet Switches	Gigabit Ethernet switches provide the high-speed network backbone of the VSA cluster.

VSA Cluster Architecture

The architecture of a VSA cluster includes the physical servers that have local hard disks, ESXi as the operating system of the physical servers, and the vSphere Storage Appliance virtual machines that run clustering services to create volumes that are exported as the VSA datastores.

vSphere Storage Appliance supports the creation of a VSA cluster with two or three members. A vSphere Storage Appliance uses the hard disks of an ESXi host to create two volumes of the same size. It exports one of the volumes as a datastore. The other volume is a replica of the volume that is exported by another vSphere Storage Appliance from another host in the VSA cluster.

Figure 1-1. VSA Cluster with 2 ESXi Hosts
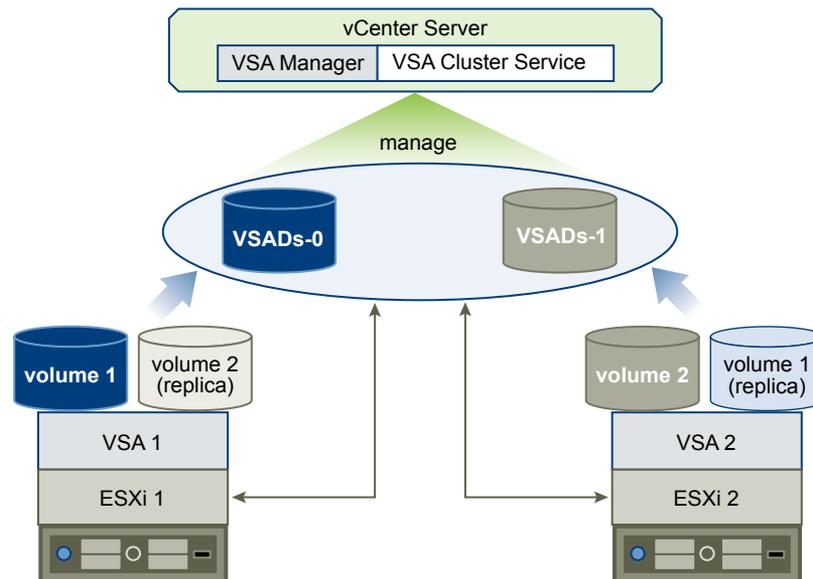
In a VSA cluster with two VSA cluster members, an additional service called VSA cluster service runs on the vCenter Server machine. The service participates as a member in the VSA cluster, but it does not provide storage. To remain online, a VSA cluster requires that more than half of the members are also online. If one instance of a vSphere Storage Appliance fails, the cluster can remain online only if the remaining VSA cluster member and the VSA cluster service are online.

A VSA cluster with 2 members has 2 VSA datastores and maintains a replica of each datastore.

A VSA cluster with 3 members has 3 VSA datastores and maintains a replica of each datastore. This configuration does not require the VSA cluster service running on the vCenter Server system.

Figure 1-2. VSA Cluster with 3 ESXi Hosts
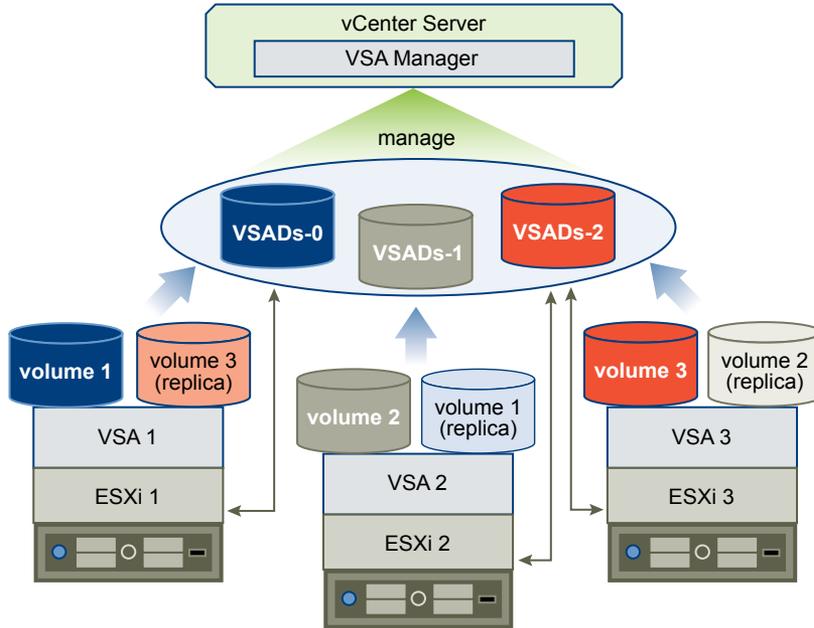
VSA Cluster Network Architecture

The physical network of a VSA cluster consists of Gigabit Ethernet switches and network interface cards (NICs) that are installed on each host.

Physical Network Architecture

All hosts in the VSA cluster must have two dual-port or four single-port network interface cards. You can use a single Gigabit Ethernet switch for the VSA cluster network. To ensure network redundancy, you should use two Gigabit Ethernet switches.

The following illustrations depict network redundancy in a VSA cluster with 2 and 3 members.

Figure 1-3. Network Redundancy in a VSA Cluster with 2 Members
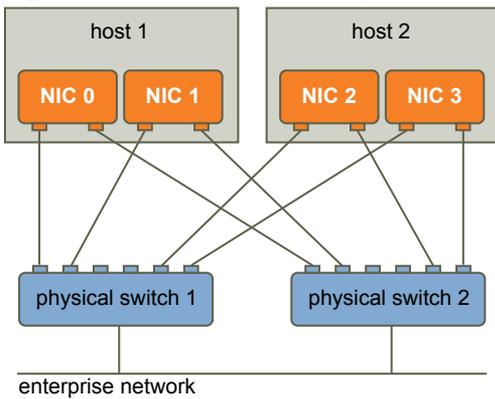
Figure 1-4. Network Redundancy in a VSA Cluster with 3 Members
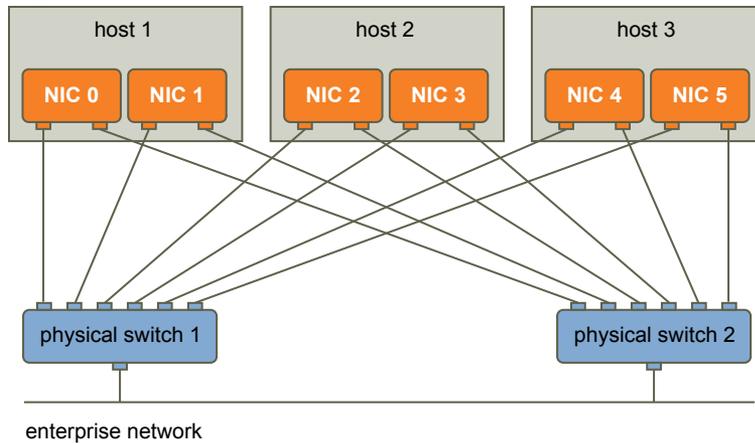
In a VSA cluster, the network traffic is divided into front-end and back-end traffic.

- Front-end network traffic

    - Communication between each VSA cluster member and the VSA Manager

    - Communication between ESXi and the VSA volumes

    - Communication between each VSA member cluster and the VSA cluster service

    - vMotion traffic between the hosts

- Back-end network traffic

    - Replication between a volume and its replica that resides on another host

    - Clustering communication between all VSA cluster members

Logical Network Architecture

Each vSphere Storage Appliance has two virtual NICs: one handles the front-end traffic, and the other handles back-end traffic. The back-end virtual NIC has an IP address from a private subnet. The front-end virtual NIC can have up to 3 assigned IP addresses.

- IP address for VSA management network

- IP address of the exported NFS volume

- IP address of the VSA cluster (assigned only when the VSA cluster member is elected as the cluster leader)

The IP address of the VSA cluster can move between VSA cluster members. It is assigned to the front-end virtual NIC of a VSA cluster member only when that VSA cluster member is elected as the cluster leader. If the cluster leader becomes unavailable, the VSA cluster IP address is assigned to another VSA cluster member that becomes the leader.

The VSA cluster installation creates two vSphere standard switches on each ESXi host to isolate front-end and back-end traffic. The physical NICs act as an uplink for each vSphere standard switch so that each NIC handles either front-end or back-end traffic. The standard switches use ESXi NIC teaming to provide link failover.

The following illustration depicts the logical network of a VSA cluster member that is the leader in the VSA cluster. The logical network of other VSA cluster members is the same with the exception of the assigned VSA cluster IP address.

Figure 1-5. Logical Network Architecture of a VSA Cluster Member
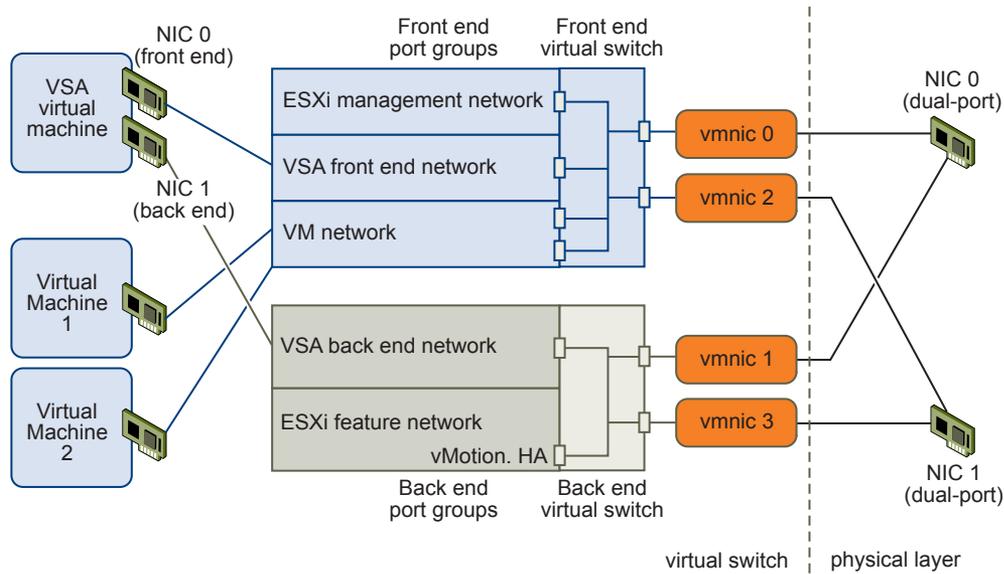
How a VSA Cluster Handles Failures

A VSA cluster provides automatic failover from hardware and software failures.

Each VSA datastore has two volumes. A VSA cluster member exports the main volume as the VSA datastore. Another VSA cluster member maintains the second volume as a replica. If a failure occurs to the hardware, network equipment, or the VSA cluster member of the main volume, the main volume becomes unavailable, and the replica volume takes its place without service interruption. After you fix the failure and bring the failed VSA cluster member back online, the member synchronizes the main volume with the replica to provide failover in case of further failures.

A VSA cluster provides automatic failover from the following failures:

■ Single physical NIC failure

■ Single physical switch failure

■ Single physical host failure

■ Single VSA cluster member failure

The following illustration depicts automatic failover in a VSA cluster with 2 members. The replica volume takes over the failed main volume. In this case, to make sure that more than half of the members are online, the VSA cluster service simulates a VSA cluster member.

Figure 1-6. Failover in a VSA Cluster with 2 Members
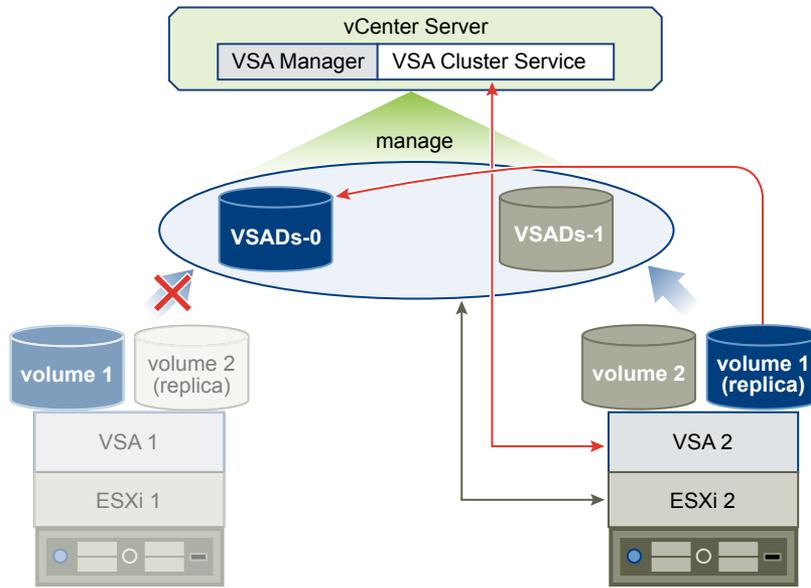
The following illustration depicts failover in a VSA cluster with 3 members.

Figure 1-7. Failover in a VSA Cluster with 3 Members
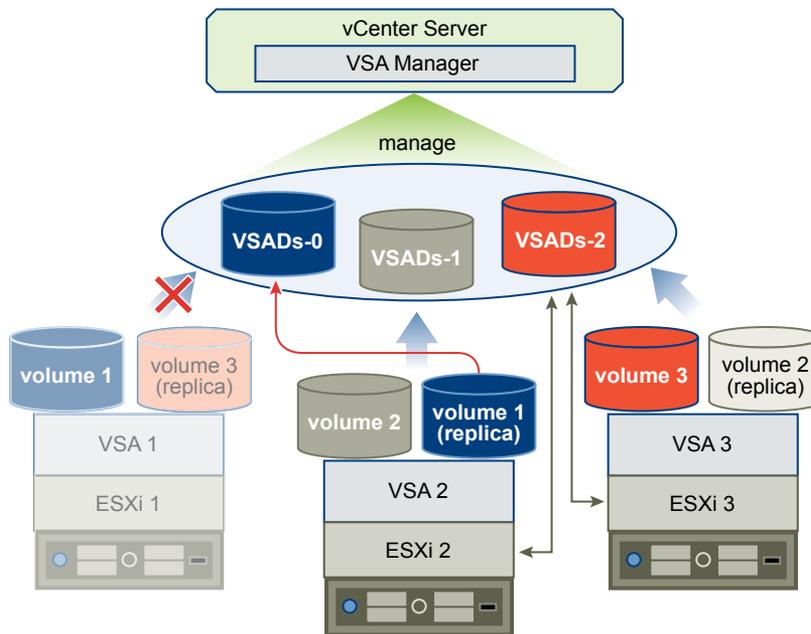
Differences Between VSA Clusters and Storage Area Networks

A VSA cluster is a virtual alternative to expensive SAN systems. While SAN systems provide centralized arrays of storage over a high-speed network, a VSA cluster provides a distributed array that runs across several physical servers and utilizes local storage that is attached to each ESXi host.

Centralized or Distributed Storage

SAN systems provide centralized arrays of storage that are managed by several storage processors. The vSphere Storage Appliance provides a distributed approach to storage, where the storage array is dispersed over several ESXi hosts and is accessible over the network.

Figure 1-8. Centralized Storage Arrays in Comparison with Distributed Shared Storage
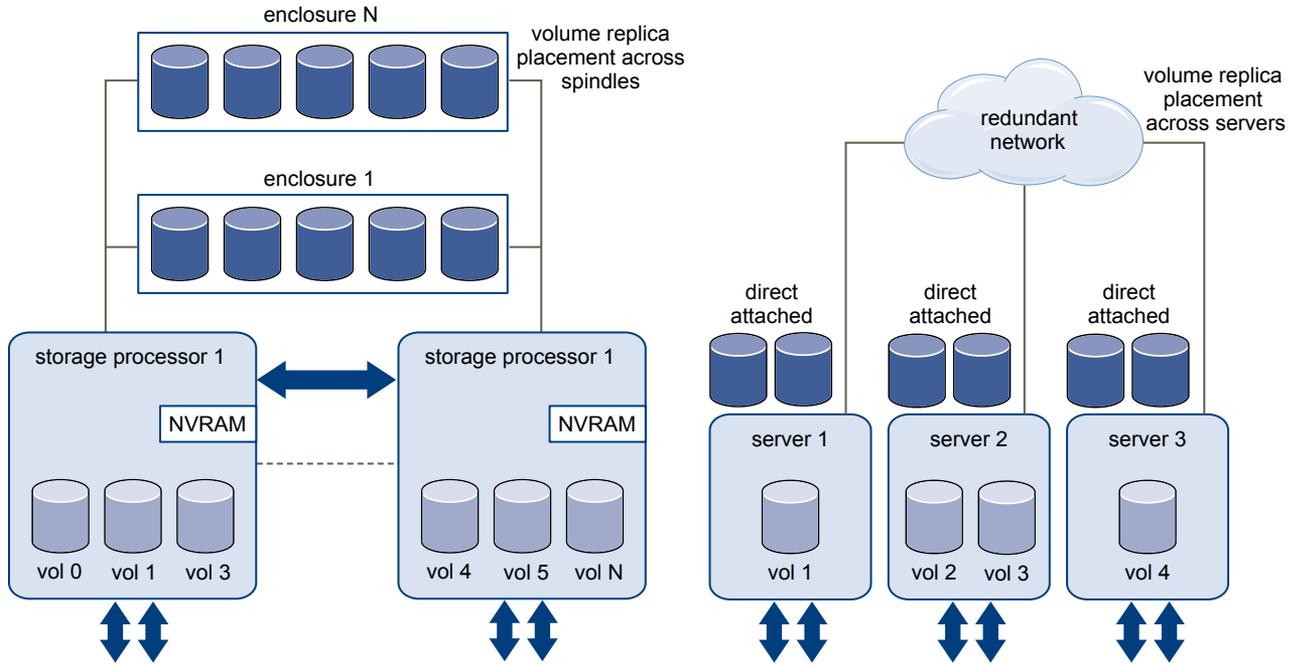
Local Storage or Networked Storage

Servers can access storage through local hard disks or through hard disks that are attached to NAS or SAN systems. A VSA cluster utilizes the hard disks that are local to each ESXi host.

Local storage	Local storage consists of internal hard disks located inside your ESXi host.
Networked storage	Networked storage consists of external storage systems that your ESXi host uses to store virtual machine files remotely. Typically, the host accesses these systems over a high-speed storage network.

VSA Cluster Capacity

The total capacity of a VSA cluster is the sum of the capacities of all VSA datastores. Depending on the RAID configuration of your VSA cluster, you use different algorithms to calculate VSA capacity.

The VSA datastore capacity is calculated after ESXi installation takes hard disk space for root, swap, and dump partitions and after VSA installation reserves 20GB or more for local virtual machine swap files. Because of this, calculations of the VSA cluster capacity are approximate.

Calculating Capacity of a VSA Cluster with RAID10 Configuration

This topic explains how to calculate the capacity of a VSA cluster with 4, 6, or 8 hard disks per ESXi host and a RAID10 configuration.

The capacity of the VSA cluster that uses this configuration depends on two variables.

■ Total hard disk capacity per ESXi host

■ Number of ESXi hosts in the VSA cluster (2 or 3)

The capacity of a VSA datastore equals the total hard disk capacity of the ESXi host divided by 4. This is due to the RAID10 configuration on each ESXi host and the mirroring of VSA volumes between VSA cluster members.

Determine the VSA datastore capacity by using the following formula.

```
VSA datastore capacity = hard disk capacity of an ESXi host / 4
```

Where

```
hard disk capacity of an ESXi host = the total capacity of the hard disks that are installed
internally on the ESXi host
```

If you create a VSA cluster with hosts that have different total hard disk capacities, the lowest hard disk capacity from all ESXi hosts becomes the basis for calculating the capacity of every VSA datastore. In such a situation, some of the total hard disk capacity remains unused.

Example: Calculating the VSA Cluster Capacity in a Cluster with 3 ESXi Hosts with 8TB Hard Disk Capacity Per Host

```
Hard disk capacity per ESXi host = 8TB
```

```
Total hard disk capacity of all ESXi hosts = 24TB
```

```
VSA datastore capacity = 8TB / 4 = 2TB
```

```
Total VSA cluster capacity = 2TB * 3 hosts = 6TB
```

Example: Calculating the VSA Cluster Capacity in a Cluster with 3 ESXi Hosts with Different Capacities

```
Hard disk capacity of ESXi host 1 = 6TB
```

```
Hard disk capacity of ESXi host 2 = 8TB
```

```
Hard disk capacity of ESXi host 3 = 8TB
```

```
Total hard disk capacity = 22TB
```

```
VSA datastore capacity = 6TB / 4 = 1.5TB
```

NOTE The lowest hard disk capacity of all ESXi hosts becomes the basis for determining the capacity of all VSA datastore.

```
Total VSA cluster capacity = 1.5TB * 3 hosts = 4.5TB
```

In this example, the VSA cluster capacity is only 4.5TB

NOTE Because this scenario underutilizes the hard disk space of the ESXi hosts that have more capacity, you should ensure that all ESXi hosts have the same hard disk capacity.

Calculate Capacity of a VSA Cluster with RAID5 and RAID6

This task explains how to calculate the capacity of a VSA cluster that uses hardware RAID5 or RAID6 configuration.

In this configuration, the capacity of the VSA cluster depends on the following variables:

- Number of hard disks in the hardware RAID set. The number of disks you can have in the RAID5 configuration is 4 to 8. In RAID6, the number of disks is 5 to 8. VMware recommends that you use RAID5 for SAS drives and RAID6 for SATA drives.

- Capacity of a hard disk in the hardware RAID set. For simplicity, assume that all hard disks are of equal capacity.

- Number of ESXi hosts in the VSA cluster (2 or 3).

Procedure

1   Calculate the storage capacity available on each ESXi host. The formula you use depends on your RAID configuration.

■   For RAID5, use the following formula. The number of disks you can have in the RAID5 configuration is 4 to 8.

total storage capacity per host = (number of hard disks in the RAID − 1) times hard disk capacity

■   For RAID6, use the following formula. The number of disks you can have in the RAID6 configuration is 5 to 8.

total storage capacity per host = (number of hard disks in the RAID − 2) times hard disk capacity

NOTE   If your hosts have different total storage capacities, the lowest value among all VSA cluster hosts becomes the basis for calculating the capacity of every VSA datastore. Some of the total storage capacity remains unused in this case.

2   Calculate the capacity of a RAID5 or RAID6 VSA datastore by using the following formula:

capacity of a VSA datastore = total storage capacity per host divided by 2

The value that you get is a combination of the storage efficiency of the hardware RAID5 or RAID6 configuration on each of the ESXi hosts and the mirroring of VSA volumes between VSA cluster members.

3   Calculate total capacity of a VSA cluster by using the following formula:

total VSA cluster capacity = capacity of a VSA datastore times number of hosts in the VSA cluster

Example: Calculating Capacity of a VSA Cluster with RAID5 or RAID 6 Configuration

For the RAID5 example, the following parameters are used:

■   Number of hard disks in the hardware RAID5 set: 8

■   Capacity of each hard disk: 500GB

■   Number of ESXi hosts in the VSA cluster: 3

```
total storage capacity per host = (8–1) * 500GB = 3.5TB
```

```
capacity of a VSA datastore = 3.5TB/2 = 1.75TB
```

```
total VSA cluster capacity = 1.75TB * 3 hosts = 5.25TB
```

For the RAID6 example, the following parameters are used:

■   Number of hard disks in the hardware RAID5 set: 8

■   Capacity of each hard disk: 1TB

■   Number of ESXi hosts in the VSA cluster: 3

```
total storage capacity per host = (8–2) * 1TB = 6TB
```

```
capacity of a VSA datastore = 6TB/2 = 3TB
```

```
total VSA cluster capacity = 3TB * 3 hosts = 9TB
```

VSA Cluster Disk Capacity

The RAID level you select for each ESXi host participating in a VSA cluster determines the number of disks per host and the maximum per disk capacity.

Table 1-1. VSA Cluster Disk Capacity

RAID Level	Number of Drives	Drive Capacity
10	8	2TB (SAS and SATA)
10	4	3TB (SAS and SATA)
5	4+1=5	2TB (SAS drives only)
6	4+2=6	2TB(SAS and SATA)
6	N/A (RAID 6 combination is not effective with 3TB drives)	3TB(SAS and SATA)

Install and Configure the VSA Cluster Environment

2

Before you can create a VSA cluster, you must prepare your environment by installing and configuring the hardware and software components.

This chapter includes the following topics:

vSphere Storage Appliance Planning Checklist

You should decide on the scale and capacity of the VSA cluster and also consider some setup limitations.

- Install vCenter Server on a physical host or as a virtual machine on an ESXi host that does not participate in a VSA cluster.
    - ESXi hosts cannot run virtual machines before creating the cluster.
    - vCenter Server must be installed and running before you create the VSA cluster.
    - If you run vCenter Server on a VSA datastore and the datastore goes offline, you might not be able to manage the VSA cluster due to the loss of access to vCenter Server and VSA Manager.

- Decide on 2- or 3-member VSA cluster. You cannot add another VSA cluster member to a running VSA cluster. For example, you cannot extend a 2-member VSA cluster with another member.

- Determine the capacity of the VSA cluster before installation.

    - vSphere Storage Appliance 1.0 does not support addition of storage to the VSA datastores and their replicas after the VSA cluster is installed.

    - The VSA cluster requires RAID volumes created from the physical disks. VMware recommends that you use RAID5, RAID6, or RAID10. The vSphere Storage Appliance uses RAID1 to maintain the VSA datastores' replicas. The capacity of the VSA datastores depends on the number of physical hard disks and the RAID configuration that you use. The actual realized capacities are calculated separately for RAID5, RAID6 and RAID10. For information, see "VSA Cluster Capacity," on page 16.

- Determine the number of virtual machines that will run in the VSA cluster.

    - Consider the vSphere HA admission control reservations when determining the number of virtual machines and the amount of resources that your cluster supports. vSphere HA admission control reserves 33% of all CPU and memory resources in a 3-member VSA cluster and 50% of all CPU and memory resources in a 2-member cluster. vSphere HA admission control makes the reservations to ensure that resources are available when virtual machines need to be restarted from a failed ESXi host onto a running ESXi host.

    - VSA datastores do not support VMX swapping. Because of this, you should reserve the configured memory of all non-VSA virtual machines that use VSA datastores so that you do not overcommit memory. For virtual machines that are not stored on the VSA datastores, you can skip this step. For more information about preventing memory overcommitment, see the *VMware vSphere Storage Appliance Administration* document.

VSA Cluster Requirements

Make sure that your environment meets the hardware and configuration requirements to create a VSA cluster.

Ensure that you have the hardware resources needed to install a VSA cluster.

- Physical or virtual machine on which to install vCenter Server. If you install vCenter Server on a virtual machine, the virtual machine must run on an ESXi host that participates in the VSA cluster.

- Two or three physical servers on which to install ESXi

- At least one Gigabit Ethernet switch

Hardware Requirements for vCenter Server in a VSA Cluster

Make sure that your run vCenter Server on a machine that meets the requirements for the VSA cluster.

You can install vCenter Server on a physical server or on a virtual machine. Make sure that the machine that you choose meets the vCenter Server hardware requirements to operate in a VSA cluster. If you choose to run vCenter Server on a virtual machine, that virtual machine cannot be hosted on an ESXi host that is running a vSphere Storage Appliance.

Table 2-1. Minimum Hardware Requirements for vCenter Server

vCenter Server Hardware	Requirement
CPU	Two 64-bit CPUs or one 64-bit dual-core processor.
Processor	2.0GHz or faster Intel 64 or AMD 64 processor. The Itanium (IA64) processor is not supported. Processor requirements might be higher if the database runs on the same machine.

Table 2-1. Minimum Hardware Requirements for vCenter Server (Continued)

vCenter Server Hardware	Requirement
Memory	4GB RAM. Memory requirements might be higher if the database runs on the same machine.
	vCenter Server includes several Java services: VMware VirtualCenter Management Webservices (Tomcat), Inventory Service, and Profile-Driven Storage Service. When you install vCenter Server, you select the size of your vCenter Server inventory to allocate memory for these services. The inventory size determines the maximum JVM heap settings for the services. You can adjust this setting after installation if the number of hosts in your environment changes. See the recommendations in Table 2.
Disk storage	4GB. Disk requirements might be higher if the vCenter Server database runs on the same machine. In vCenter Server 5.0, the default size for vCenter Server logs is 450MB larger than in vCenter Server 4.x. Make sure the disk space allotted to the log folder is sufficient for this increase.
Microsoft SQL Server 2008 R2 Express disk	Up to 2GB free disk space to decompress the installation archive. Approximately 1.5GB of these files are deleted after the installation is complete.
Networking	Gigabit connection recommended.

Table 2-2. Recommended JVM Heap Settings for vCenter Server

vCenter Server Inventory	VMware VirtualCenter Management Webservices (Tomcat)	Inventory Service	Profile-Driven Storage Service
Small inventory (1-100 hosts or 1-1000 virtual machines)	1GB	2GB	512MB
Medium inventory (100-400 hosts or 1000-4000 virtual machines)	2GB	4GB	1GB
Large inventory (More than 400 hosts or 4000 virtual machines)	3GB	6GB	2GB

NOTE Installing vCenter Server on a network drive or USB flash drive is not supported.

Hardware Requirements for ESXi in a VSA Cluster

You can have two or three ESXi hosts in a VSA cluster. Each host must meet the hardware configuration requirements to join a VSA cluster.

Table 2-3. VSA Cluster Requirements for ESXi Hosts

Hardware	VSA Cluster Requirements
Configuration	All ESXi hosts must have the same hardware configuration.
CPU	■ 64-bit x86 CPUs ■ 2GHz or higher per core

Table 2-3. VSA Cluster Requirements for ESXi Hosts (Continued)

Hardware	VSA Cluster Requirements
Memory	6GB, minimum 24GB, recommended 72GB, maximum supported and tested with vSphere Storage Appliance 1.0 1TB, maximum supported by ESXi 5.0
NIC	4 NIC ports must be available on each ESXi host. You can meet this requirements with one, two, three, or four Gigabit Ethernet NICs per ESXi host. To achieve NIC redundancy, you should have at least two Gigabit Ethernet adapters on an ESXi host. Installing more than two NICs depends on the availability of embedded NICs and additional PCI Express slots on the motherboard. The following NIC combinations are supported: 4 single-port NICs 2 dual-port NICs 2 single-port NICs and 1 dual-port NIC 1 quad-port NIC (does not provide NIC redundancy) You can have more than 4 NIC ports per ESXi host but not less than 4.
Hard disks	Supported configurations - hard disks of the same model and with the same capacity. The number of disks depends on the RAID configuration you use. 2TB maximum capacity per hard disk, supported 180GB minimum total hard disk space per ESXi host, required - All SATA disks or all SAS disks Non-supported configurations - A combination of SATA and SAS disks is not supported - JBOD is not supported
RAID controller	A RAID controller NOTE VMware recommends that you use RAID5, RAID6, or RAID10 configuration on the RAID controller of each ESXi host in the VSA cluster.

Software Configuration Required for ESXi in a VSA Cluster

Make sure that the ESXi hosts meet the software requirements to join a VSA cluster.

Table 2-4. ESXi Software Configuration Requirements for a VSA Cluster

Configuration	VSA Cluster Requirements
ESXi version	Each host must have ESXi 5.0 installed.
ESXi license	For trial installations of the VSA cluster, you can run ESXi in evaluation mode. For licensed installations, each ESXi must be licensed with a vSphere Essentials Plus license key or higher.
Cluster configuration	None of the ESXi hosts must participate in another cluster.
vSphere standard switch and port group configuration	Each ESXi host must have only the default vSphere standard switches or port groups that are created during installation. You must not configure any additional switches or port groups.
IP address	Each ESXi host must be assigned a unique static IP address that is in the same subnet as the vCenter Server IP address.
Virtual machines	Each ESXi host must have no deployed virtual machines.

Network Switch Requirements for a VSA Cluster

The VSA cluster network must have at least 1 dedicated Gigabit Ethernet switch that supports IEEE 802.1Q VLAN trunking.

You can have 2 dedicated switches to eliminate a single point of failure in the physical network. The switches must be configured to support the IP ranges of the front-end and back-end networks of the VSA cluster. To isolate front-end and back-end networks, you should use VLANs instead of physical isolation. VLAN isolation protects the VSA virtual NICs from Ethernet broadcast storms and malicious capturing and parsing of Ethernet frames.

You can configure two VLAN IDs on your switches to isolate traffic between the front-end and back-end networks. You can use the VLAN IDs in the VSA Installer and VSA Automated Installer to specify the VLAN IDs for the front-end and back-end networks. Using VLAN IDs is not mandatory.

NOTE   VLAN IDs can range from 1 to 4094. You cannot use 0 and 4095.

Table 2-5. VLAN ID Configuration for a VSA Cluster

VSA Cluster Network	Example VLAN ID
Front-end network	1337
Back-end network	3598

IP Address Requirements for a VSA Cluster

The VSA cluster network requires a number of static IP addresses in the subnet of the vCenter Server IP address. Depending on the number of hosts in the cluster and whether you choose to use DHCP for the vSphere feature network, the number of required static IP addresses varies.

The following table shows examples and the total number of static IP address that you need in the vCenter Server subnet for various VSA cluster configurations.

Table 2-6. Examples of Static IP Addresses for Different VSA Cluster Configurations

VSA Cluster Component	2-Member Cluster Without DHCP	2-Member Cluster With DHCP	3-Member Cluster Without DHCP	3-Member Cluster With DHCP
Number of static IP addresses in the vCenter Server subnet	11	9	14	11
Number of IP addresses in a private subnet for the back-end network	2	2	3	3
vCenter Server IP address	10.15.20.100	10.15.20.100	10.15.20.100	10.15.20.100
ESXi host 1 IP address	10.15.20.101	10.15.20.101	10.15.20.101	10.15.20.101
ESXi host 2 IP address	10.15.20.102	10.15.20.102	10.15.20.102	10.15.20.102
ESXi host 3 IP address	N/A	N/A	10.15.20.103	10.15.20.103

Table 2-6. Examples of Static IP Addresses for Different VSA Cluster Configurations (Continued)

VSA Cluster Component	2-Member Cluster Without DHCP	2-Member Cluster With DHCP	3-Member Cluster Without DHCP	3-Member Cluster With DHCP
VSA cluster IP address	10.15.20.103	10.15.20.103	10.15.20.104	10.15.20.104
VSA cluster service IP address	10.15.20.104	10.15.20.104	N/A	N/A
Management IP address for VSA 1	10.15.20.105	10.15.20.105	10.15.20.105	10.15.20.105
Datastore IP address for VSA 1	10.15.20.106	10.15.20.106	10.15.20.106	10.15.20.106
Back-end IP address for VSA 1	192.168.0.1	192.168.0.1	192.168.0.1	192.168.0.1
vSphere feature IP address for ESXi host 1	10.15.20.107	10.15.20.201, dynamically assigned IP address NOTE DHCP assigns an IP address according to the range of IP addresses assigned to the DHCP server.	10.15.20.107	10.15.20.201, dynamically assigned IP address NOTE DHCP assigns an IP address according to the range of IP addresses assigned to the DHCP server.
Management IP address for VSA 2	10.15.20.108	10.15.20.107	10.15.20.108	10.15.20.107
Datastore IP address for VSA 2	10.15.20.109	10.15.20.108	10.15.20.109	10.15.20.108
Back-end IP address for VSA 2	192.168.0.2	192.168.0.2	192.168.0.2	192.168.0.2
vSphere feature IP address for ESXi host 2	10.15.20.110	10.15.20.202, dynamically assigned IP address NOTE DHCP assigns an IP address according to the range of IP addresses assigned to the DHCP server.	10.15.20.110	10.15.20.202, dynamically assigned IP address NOTE DHCP assigns an IP address according to the range of IP addresses assigned to the DHCP server.
Management IP address for VSA 3	N/A	N/A	10.15.20.111	10.15.20.109
Datastore IP address for VSA 3	N/A	N/A	10.15.20.112	10.15.20.110

Table 2-6. Examples of Static IP Addresses for Different VSA Cluster Configurations (Continued)

VSA Cluster Component	2-Member Cluster Without DHCP	2-Member Cluster With DHCP	3-Member Cluster Without DHCP	3-Member Cluster With DHCP
Back-end IP address for VSA 3	N/A	N/A	192.168.0.3	192.168.0.3
vSphere feature IP address for ESXi host 3	N/A	N/A	10.15.20.113	10.15.20.203, dynamically assigned IP address NOTE DHCP assigns an IP address according to the range of IP addresses assigned to the DHCP server.

Configure RAID on a Dell Server

For Dell servers, you use the Dell PowerEdge RAID Controller (PERC) to create a RAID volume that uses all physical disks on a server.

NOTE   VMware recommends that you use RAID5 for SAS drives and RAID6 for SATA drives.

Procedure

1   Start or restart the Dell PowerEdge server.

2   Press Ctrl+R to access the Perc 6/I Integrated BIOS Configuration Utility.

The configuration utility opens and shows the **VD Mgmt** tab.

3   To create a new virtual disk, press F2 and select **Create New VD**.

4   Select an appropriate RAID configuration from the **RAID Level** drop-down menu.

VMware recommends that you use RAID 5, 6, or 10.

5   Under Physical Disks, select the hard disks that you want to include in the virtual disk.

6   Select **OK** and press Enter.

The virtual disk is created.

7   Expand the Disk Group option, and under Virtual Disks, select the newly created virtual disk and press F2 to open the Operations menu.

8   From the Operations menu, select **Initialization > Start Init.** to initialize the new virtual disk.

The new RAID volume is ready for use.

Configure RAID on an HP Server

Create a RAID logical volume that uses all physical disks on a server.

NOTE   VMware recommends that you use RAID5 for SAS drives and RAID6 for SATA drives.

Procedure

1   Start or restart the HP server.

2   At boot time, press F8 to enter the Integrated Lights-Out 2 setup.

3   Provide credentials at the login prompt.

4   Press Ctrl+S to open the Intel Boot Agent Setup Menu.

5   Press F8 to open the ROM Array Configuration menu.

    The Main Menu appears.

6   From the Main Menu, select **Create Logical Drive** and press Enter.

7   Select all physical disks under Available Physical Drives.

8   Select an appropriate RAID level under RAID Configurations.

    VMware recommends that you use RAID 5, 6, or 10.

9   Press Esc.

The HP RAID controller creates the RAID logical drive.

Configure VLAN IDs on the Ethernet Switches

To make use of traffic isolation, you should configure separate VLAN IDs for the front end and back end networks of the VSA cluster.

Procedure

1   Read the documentation for your Gigabit Ethernet switch for information about how to configure VLAN IDs.

2   Work with your network administrator to assign VLAN IDs for the front end and back end networks.

    A VLAN ID should range from 1 to 4094, as 0 and 4095 are not allowed.

The assigned VLAN IDs are ready to be assigned to the ESXi hosts and to the VSA cluster network.

ESXi Installation

Install ESXi 5.0 on each host that you plan to include in a VSA cluster.

Required Information for ESXi Installation

In an interactive installation, the system prompts you for the required system information. In a scripted installation, you must supply this information in the installation script.

For future use, note the values you use during the installation. These notes are useful if you must reinstall ESXi and reenter the values that you originally chose.

Table 2-7. Required Information for ESXi Installation

Information	Required or Optional	Default	Comments
Keyboard layout	Required	U.S. English	
VLAN ID	Optional	None	Range: 0 through 4094
IP address	Optional	DHCP	You can allow DHCP to configure the network during installation. After installation, you can change the network settings.
Subnet mask	Optional	Calculated based on the IP address	
Gateway	Optional	Based on the configured IP address and subnet mask	
Primary DNS	Optional	Based on the configured IP address and subnet mask	
Secondary DNS	Optional	None	

Table 2-7. Required Information for ESXi Installation (Continued)

Information	Required or Optional	Default	Comments
Host name	Required for static IP settings	None	vSphere Clients can use either the host name or the IP address to access the ESXi host.
Install location	Required	None	Must be at least 5GB if you install the components on a single disk.
Root password	Optional	None	The root password must contain between 6 and 64 characters.

Install ESXi Interactively

You use the ESXi CD/DVD or a USB flash drive to install the ESXi software onto a SAS, SATA, SCSI hard drive, or USB drive.

ESXi Embedded must not be on the host. ESXi Installable and ESXi Embedded cannot exist on the same host.

Prerequisites

- You must have the ESXi ISO file on CD or DVD. If you do not have the installation CD/DVD, you can create one.

- Verify that the server hardware clock is set to UTC. This setting is in the system BIOS.

- Verify that a keyboard and monitor are attached to the machine on which the ESXi software will be installed.

- Consider disconnecting your network storage. This action decreases the time it takes the installer to search for available disk drives. Note that when you disconnect network storage, any files on the disconnected disks are unavailable at installation.

  Do not disconnect a LUN that contains an existing ESX or ESXi installation. Do not disconnect a VMFS datastore that contains the Service Console of an existing ESX installation. These actions can affect the outcome of the installation.

- Gather the information required by the ESXi installation wizard. See "Required Information for ESXi Installation," on page 28.

Procedure

1   Insert the ESXi CD/DVD into the CD/DVD-ROM drive and restart the machine.

2   Set the BIOS to boot from the CD-ROM device.

    See your hardware vendor documentation for information on changing boot order.

3   On the Select a Disk page, select the drive on which to install ESXi and press Enter.

    Press F1 for information about the selected disk.

    ───

    NOTE   Do not rely on the disk order in the list to select a disk. The disk order is determined by the BIOS and might be out of order. This might occur on systems where drives are continuously being added and removed.

    ───

    If the disk you selected contains data, the Confirm Disk Selection page appears.

4   Select the keyboard type for the host.

    You can change the keyboard type after installation in the direct console.

5   Enter the root password for the host.

   You can leave the password blank, but to secure the system from the first boot, enter a password. You can change the password after installation in the direct console.

6   Press F11 to start the installation.

7   When the installation is complete, remove the installation CD or DVD.

8   Press Enter to reboot the host.

   If you are performing a new installation, or you chose to overwrite an existing VMFS datastore, during the reboot operation, VFAT scratch and VMFS partitions are created on the host disk.

9   Set the first boot device to be the drive on which you installed ESXi in Step 3.

   For information about changing boot order, see your hardware vendor documentation.

What to do next

Set up basic administration and network configuration for ESXi.

Configure the ESXi Hosts

You must configure the ESXi hosts before they can join the VSA cluster.

Log In to an ESXi Host

Log in to an ESXi host to configure it.

Procedure

1   Connect to the management interface of your ESXi host and run the remote console.

2   In the remote console window, press F2 and log in with root credentials.

   If you are logging in for the first time, the root password is empty.

The System Customization menu opens.

What to do next

Change the root password for the ESXi host.

Change the root Password of an ESXi Host

The root password is emtpy when you log in for the first time. To improve the security of your ESXi host, change the default password after you log in for the first time.

Procedure

1   In the System Customization menu of the ESXi host, use the keyboard arrows to select **Configure Password** and press Enter.

   The Configure Password dialog box appears.

2   Fill the required fields to change the password and press Enter.

Option	Action
Old Password	Type the old password of the ESXi host.
New Password	Type the new password for the ESXi host.
Confirm Password	Confirm the new password.

The root password for the ESXi host is changed.

What to do next

Configure the network settings of the ESXi host.

Assign a Static IP Address to an ESXi Host

Each ESXi host in the VSA cluster must have a unique static IP address that is in the same subnet as the vCenter Server IP address.

Prerequisites

Work with your network administrator to allocate the static IP addresses that are required by the VSA cluster.

Procedure

1   In the System Customization menu, select **Configure Management Network** and press Enter.

2   In the Configure Management Network menu, select **IP Configuration** and press Enter.

3   In the IP Configuration dialog box, select **Set static IP address and network configuration** and press the spacebar.

4   Type the static IP configuration in the corresponding text boxes and press Enter.

Network Field	Action
IP Address	Enter a static IP address for the ESXi host.
Subnet Mask	Enter the subnet mask of the network to which the static IP address belongs.
Default Gateway	Enter the gateway for the subnet.

5   Press Esc.

The Configure Management Network confirmation dialog box appears.

6   Press Y to restart the management network and apply the new static IP address.

ESXi configures the management network with the static IP address that you assigned.

Assign a VLAN ID to an ESXi Host

To isolate the management traffic of the ESXi hosts within the VSA cluster network, assign the same VLAN ID to each ESXi host that you want to add to the VSA cluster.

Prerequisites

Configure your Ethernet switches with the VLAN IDs that your ESXi hosts should use.

Procedure

1   In the System Customization menu, select **Configure Management Network** by using the keyboard arrows and press Enter.

2   In the Configure Management Network menu, select **VLAN (option)** and press Enter.

3   In the **VLAN ID** input text box, type the VLAN ID of the virtual LAN that your ESXi should use, and press Enter.

The VLAN ID for the ESXi host is set.

What to do next

Configure DNS on each ESXi host.

Specify a Hostname and DNS Servers for an ESXi Host

To enable DNS resolution on your ESXi hosts, add DNS servers to the ESXi network settings.

Procedure

1   In the Configure Management Network menu, select **DNS Configuration** and press Enter.

2   In the DNS Configuration dialog box, use the keyboard arrows to select **Use the following DNS server addresses and hostname** and press the spacebar.

3   Fill the required input fields to configure the DNS settings of the ESXi host and press Enter.

Option	Action
Primary DNS Server	Type the IP address of the primary DNS server of the ESXi host network.
Alternate DNS Server	Type the IP address of the secondary DNS server of the ESXi host network.
Hostname	Type the hostname of the ESXi host.

What to do next

You can test the network configuration of the ESXi host.

Test the Management Network of an ESXi Host

After you configure the ESXi host network settings, you can test the management network of the host to verify that it is working correctly.

Prerequisites

Configure the ESXi host IP address, VLAN ID, and DNS servers.

Procedure

1   In the System Customization menu, select **Test Management Network** and press Enter.

The Test Management Network dialog box appears. The dialog box contains the gateway IP address of the subnet and the DNS servers that you specified.

2   To test if the ESXi host management network, press Enter.

ESXi performs the following tests:

- pings the subnet gateway specified
- pings the primary DNS server specified
- pings the alternate DNS server specified
- resolves the hostname of the ESXi host

3   If any of the tests fail, verify that you specified the correct settings in the respective configuration menu and rerun the tests.

What to do next

Press Esc to log out of the ESXi system customization and close the remote console. You can now connect the configured ESXi hosts to a vCenter Server.

vCenter Server Installation

You install vCenter Server to manage the ESXi hosts and to install and monitor a VSA cluster.

Before you install vCenter Server, make sure your system meets the minimum hardware and software requirements. vCenter Server requires a database. vCenter Server uses Microsoft SQL Server 2008 R2 Express for small deployments with up to 5 hosts and 50 virtual machines. For larger deployments, VMware supports several Oracle and Microsoft SQL Server databases. Refer to the vSphere Compatibility Matrixes for the list of supported databases.

vCenter Server Prerequisites

Before installing vCenter Server, review the prerequisites.

■ Verify that you have a separate 64-bit physical server on which to install vCenter Server 5.0. You can also install ESXi 5.0 on that system and deploy vCenter Server in a virtual machine within the host. vCenter Server 5.0 cannot run as a virtual machine on an ESXi host that runs a vSphere Storage Appliance.

■ Verify that the physical server or virtual machine meets the hardware requirements for vCenter Server. For more information about the vCenter Server requirements, see "Hardware Requirements for vCenter Server in a VSA Cluster," on page 22.

■ Verify that you have vSphere Storage Appliance 1.0 installation DVD, or download the vCenter Server 5.0 installer from the VMware product page http://www.vmware.com/products/.

■ Verify that the fully qualified domain name (FQDN) of the system where you will install vCenter Server is resolvable. To check that the FQDN is resolvable, type **nslookup *your_vCenter_Server_fqdn*** at a command line prompt. If the FQDN is resolvable, the **nslookup** command returns the IP and name of the domain controller machine.

■ Verify that the host name of the machine that you are installing vCenter Server on complies with RFC 952 guidelines.

■ Verify that DNS reverse lookup returns a fully qualified domain name when queried with the IP address of the vCenter Server. When you install vCenter Server, the installation of the web server component that supports the vSphere Client fails if the installer cannot look up the fully qualified domain name of the vCenter Server from its IP address. Reverse lookup is implemented using PTR records. To create a PTR record, see the documentation for your vCenter Server host operating system.

■ Verify that no Network Address Translation (NAT) exists between the vCenter Server system and the hosts it will manage.

■ For small-scale deployments, VMware recommends installing the bundled SQL Server 2008 R2 Express database on one of the supported operating systems.

■ If the system that you use for your vCenter Server installation belongs to a workgroup rather than a domain, not all functionality is available to vCenter Server. If assigned to a workgroup, the vCenter Server system is not able to discover all domains and systems available on the network when using some features. To determine whether the system belongs to a workgroup or a domain, right-click **My Computer**. Click **Properties** and click the **Computer Name** tab. The **Computer Name** tab displays either a Workgroup label or a Domain label.

■ During the installation, verify that the connection between the machine and the domain controller is working.

■ Verify that the computer name is no more than 15 characters.

■ The NETWORK SERVICE account is required on the folder in which vCenter Server is installed and on the HKLM registry.

■ Verify that the DNS name of the machine matches the actual computer name.

- Make sure the system on which you are installing vCenter Server is not an Active Directory domain controller.

- On each system that is running vCenter Server, make sure that the domain user account has the following permissions:

    - **Member of the Administrators group**

    - **Act as part of the operating system**

    - **Log on as a service**

- Install vCenter Server, like any other network server, on a machine with a fixed IP address and well-known DNS name, so that clients can reliably access the service. Assign a static IP address and host name to the Windows server that will host the vCenter Server system. This IP address must have a valid (internal) domain name system (DNS) registration. Ensure that the ESXi host management interface has a valid DNS resolution from the vCenter Server and all vSphere Clients. Ensure that the vCenter Server has a valid DNS resolution from all ESXi hosts and all vSphere Clients. If you use DHCP instead of a static IP address for vCenter Server, make sure that the vCenter Server computer name is updated in the domain name service (DNS). Ping the computer name to test this connection. For example, if the computer name is host-1.company.com, run the following command in the Windows command prompt:

    ```
    ping host-1.company.com
    ```

    If you can ping the computer name, the name is updated in DNS.

Install vCenter Server

vCenter Server allows you to centrally manage hosts from either a physical or virtual Windows machine, and enables the management of a VSA cluster as well as the use of advanced features such as vSphere High Availability (HA), vSphere vMotion, and vSphere Storage vMotion.

A vCenter Server instance can manage only one instance of a VSA cluster.

Prerequisites

See "vCenter Server Prerequisites," on page 33.

vCenter Server requires the Microsoft .NET 3.5 SP1 Framework. If your system does not have it installed, the vCenter Server installer installs it. The .NET 3.5 SP1 installation might require Internet connectivity to download more files.

Procedure

1 In the software installer directory, double-click the autorun.exe file to start the installer.

2 Select **vCenter Server**™.

3 Follow the prompts in the installation wizard to choose the installer language, agree to the end user patent and license agreements, enter your user name, organization name, and license key.

   If you omit the license key, vCenter Server will be in evaluation mode, which allows you to use the full feature set for a 60-day evaluation period. After installation, you can enter the license key to convert vCenter Server to licensed mode.

4 Click **Install SQL Server 2008 Express instance (for small-scale deployments)**.

   This database is suitable for small deployments of up to 5 hosts and 50 virtual machines.

5 Select **Use SYSTEM Account** and click **Next**.

   The Fully Qualified Domain Name field displays the FQDN of the system that you are installing vCenter Server on. The vCenter Server installer checks that the FQDN is resolvable. If not, a warning message is displayed when you click **Next**. Change the entry to a resolvable FQDN. You must enter the FQDN, not the IP address.

6   Accept the default destination folders and click **Next**.

7   Select **Create a standalone VMware vCenter Server instance** and click **Next**.

8   For each component that you install, accept the default port numbers and click **Next**.

> ⚠ **CAUTION** Do not change the default vCenter Server ports, as it might lead to VSA upgrade failures.

9   Select the size of your vCenter Server inventory to allocate memory for several Java services that are used by vCenter Server.

This setting determines the maximum JVM heap settings for VMware VirtualCenter Management Webservices (Tomcat), Inventory Service, and Profile-Driven Storage Service. You can adjust this setting after installation if the number of hosts in your environment changes. See the recommendations in the *vCenter Server Hardware Requirements* topic in *System Requirements*.

10   Click **Install**.

Installation might take several minutes. Multiple progress bars appear during the installation of the selected components.

11   Click **Finish**.

What to do next

After you complete the installation, use the vSphere Client to connect to vCenter Server.

Install the vSphere Client

The vSphere Client enables you to connect to an ESXi host and to a vCenter Server system.

Prerequisites

■   In a Web browser application, enter the IP address of a vCenter Server or an ESXi host, and click **Download vSphere Client**.

■   Verify that you are a member of the Administrators group on the system.

■   Verify that the system has an Internet connection.

Procedure

1   Double-click the VMware–viclient*<build number>*.exe file to run the vSphere Client installer.

2   Follow the prompts in the wizard to complete the installation.

What to do next

Use the vSphere Client to connect to vCenter Server.

Create a Datacenter and Add Hosts to It

Before you create a VSA cluster, you must create a datacenter and add newly installed ESXi hosts in vCenter Server.

You can create a VSA cluster with two or three ESXi hosts. The number of available datastores in the VSA cluster equals the number of hosts that you add to it. Creating a cluster with three hosts makes the cluster more reliable and provides more datastore space.

You can skip this procedure, if you use the VSA Automated Installer.

Procedure

1   Log in to vCenter Server.

   a   Start vSphere Client.

   b   In the VMware vSphere Client dialog box, type the IP address or host name of your vCenter Server machine in the **IP address / Name** text box.

   c   Specify administrator credentials for vCenter Server in the **User name** and **Password** text boxes.

   d   Click **Login**.

2   Create a new datacenter.

   a   In vSphere Client, select **File > New > Datacenter**.

   A new datacenter object appears in the inventory.

   b   Enter a name for the datacenter and press Enter.

3   Add hosts to the new datacenter.

   a   Select the datacenter in the inventory.

   b   Select **File > New > Add Host**.

   c   On the Connection Settings page of the Add Host Wizard, enter the IP adress and root credentials of the ESXi host to add and click **Next**.

   d   On the Host Summary page, review the information about the host and click **Next**.

   e   On the Assign License page, select **Assign a new license key to this host** radio button if your ESXi host does not have an assigned license, and assign a new license.

   f   Click **Next**.

   g   On the Virtual Machine Location page, select the datacenter you created and click **Next**.

   h   On the Ready to Complete page, review your selections and click **Finish**.

   i   Repeat steps from a to h to add another ESXi host.

What to do next

You can now create the VSA cluster by running the VSA Installer wizard.

VSA Manager System and Software Requirements

Verify that the vCenter Server computer meets the hardware and software requirements to install VSA Manager.

Hardware Requirements

VSA Manager has the same hardware requirements as vCenter Server 5.0. For more information about the vCenter Server 5.0 hardware requirements, see vCenter Server and vSphere Client Hardware Requirements.

Supported Operating Systems

- Windows Server 2003 Standard, Enterprise, or Datacenter 64-bit (SP2 required)

- Windows Server 2003 R2 Standard, Enterprise, or Datacenter 64-bit (SP2 required)

- Windows Server 2008 Standard, Enterprise, or Datacenter 64-bit

- Windows Server 2008 Standard, Enterprise, or Datacenter 64-bit SP2

- Windows Server 2008 Standard, Enterprise, or Datacenter 64-bit R2

Software Requirements

You install VSA Manager on the vCenter Server system.

- vCenter Server 5.0

- vCenter Server 5.0 Java Runtime Environment 1.6 (installed during vCenter Server 5.0 installation)

- vCenter Server 5.0 Tomcat 6.0.18 (installed during vCenter Server 5.0 installation)

- Windows Installer 4.5 or higher

- Microsoft .NET Framework 3.5 SP1

- Internet Explorer 7 or higher

- Latest version of Adobe Flash for Internet Explorer

Hard Disk Space Requirements

Make sure that you have sufficient disk space to install VSA Manager.

Table 2-8. Hard Disk Space Requirements for VSA Manager Installation

File or Directory Used by VSA Manager Installer	Hard Disk Space Requirements
Installation executable `VMware-vsamanager-en-1.0.0-<build_number>.exe`	780MB
Temporary installation files ■ Windows Server 2003: `%USERPROFILE%\Local Settings\Temp` ■ Windows Server 2008: `%USERPROFILE%\AppData\Local\Temp`	2.3GB
VSA Manager installation directory ■ Windows Server 2003: `%PROGRAMFILES%\VMware\Infrastructure\VSA Manager` ■ Windows Server 2008: `%PROGRAMFILES%\VMware\Infrastructure\VSA Manager`	3.9MB
VSA Manager Web application archive ■ Windows Server 2003: `%PROGRAMFILES%\VMware\Infrastructure\tomcat\webapps\VSAManager.war` ■ Windows Server 2008: `%PROGRAMFILES%\VMware\Infrastructure\tomcat\webapps\VSAManager.war`	780MB
VSA Manager Web application installation directory ■ Windows Server 2003: `%PROGRAMFILES%\VMware\Infrastructure\tomcat\webapps\VSAManager\` ■ Windows Server 2008: `%PROGRAMFILES%\VMware\Infrastructure\tomcat\webapps\VSAManager\`	780MB
Total hard disk space required	4.7GB

Port Requirements

VSA Manager installation adds exceptions to the Windows Firewall. Make sure that the ports required by VSA Manager are available.

Table 2-9. Port Number Exceptions that VSA Manager adds to Windows Firewall

VSA Manager Service	TCP Port Number
VSA Manager - VSA Cluster Client Port	2181
VSA Manager - VSA Cluster Server Port	2888

Table 2-9. Port Number Exceptions that VSA Manager adds to Windows Firewall (Continued)

VSA Manager Service	TCP Port Number
VSA Manager - VSA Cluster Election Port	3888
VSA Manager - VSA Cluster Java Remote Method Invocation Port	2375

Windows Privileges Requirements

You must be a local Administrator to install and run the VSA Manager Installer.

Install VSA Manager

VSA Manager is a plug-in for vSphere Client that you use to create and manage a VSA cluster. VSA Manager also installs the VSA cluster service on the vCenter Server machine.

You can install VSA Manager only on a 64-bit Windows Server machine that runs vCenter Server 5.0.

Prerequisites

Download the VSA Manager Installer.

Procedure

1 On the vCenter Server machine, start the `VMware–vsamanager–en–version_number–build_number`.exe file.

2 Take appropriate action on the Welcome and End-User Patent Agreement pages.

3 Select **I accept the terms in the license agreement** and click **Next**.

   The vCenter Server Information page appears and VSA Manager installer automatically fills the vCenter Server IP address or host name, the Administrator user name, and the HTTPS port of the vCenter Server machine.

4 On the VMware vCenter Server Information page, verify that the vCenter Server IP address or host name is that of the local machine and click **Next**.

   ⚠ **Caution** Do not modify the vCenter Server ports because that might lead to upgrade failures.

5 On the License Information page, type a vCenter Server license key and click **Next**.

   The vCenter Server license key must include vSphere Storage Appliance as a feature. Otherwise, vSphere Storage Appliance runs in evaluation mode.

6 Click **Install** on the Ready to Install page.

   Wait for the wizard to complete the installation.

7 (Optional) To open the installation log, select the **Show the Windows Installer log** check box.

8 Click **Finish**.

VSA Manager plug-in is installed and registered with vCenter Server. The VSA cluster service is also installed, but is only used in a VSA cluster with two VSA cluster members. The next time you connect to the vCenter Server and select a datacenter from the vCenter Server inventory, the **VSA Manager** tab appears.

Note The **VSA Manager** tab might take some time to appear. If it does not appear, select **Plug-ins > Manage Plug-ins**, right-click **VSA Manager**, and select **Enable** to enable the **VSA Manager** tab.

What to do next

If the **VSA Manager** tab contents do not load and require that Adobe Flash Player is installed, download and install Adobe Flash Player on the system, and restart the vSphere Client.

You can use the **VSA Manager** tab to create the VSA cluster by using the VSA Installer wizard.

Uninstall VSA Manager

You can uninstall VSA Manager if you have deleted the VSA cluster and no longer use the plug-in for maintenance and monitoring.

When you uninstall VSA Manager while the VSA cluster is still running, the VSA Manager plug-in and the **VSA Manager** tab are removed from vCenter Server and the VSA cluster service is stopped and deleted. As a result, you can no longer use VSA Manager to monitor or reconfigure the VSA cluster. Also, in a 2-member VSA cluster, the VSA cluster service can no longer provide an additional vote in the election of the VSA cluster leader. In this case, the VSA cluster status might become Offline, and the cluster becomes unavailable.

IMPORTANT To ensure that a running 2-member VSA cluster is available and its status is Online, do not uninstall VSA Manager. If you have a 3-member VSA cluster, the VSA cluster continues working without interruption even if you uninstall VSA Manager.

To delete the VSA cluster, you must use the `cleanup.bat` script that is part of the VSA Manager installation.

Procedure

1   Open the list of programs on the Windows Server system that runs VSA Manager and vCenter Server.

Option	Description
Windows Server 2003	In Control Panel, select **Add or Remove Programs**.
Windows Server 2008	In Control Panel, under the Programs section select **Uninstall a Program**.

2   From the list of programs, select **VMware vSphere Storage Appliance Manager** and click **Uninstall**.

3   Click **Yes** in the confirmation dialog box.

The VSA Manager plug-in and the VSA cluster service are uninstalled. The **VSA Manager** tab no longer appears when you select a datacenter object.

Creating a VSA Cluster

3

After you install and configure the components of the VSA cluster, you can create a VSA cluster with the VSA Installer or VSA Automated Installer.

This chapter includes the following topics:

Manual Creation of the VSA Cluster

If you already have vCenter Server 5.0 installed, you can use the VSA Installer wizard to create the VSA cluster manually.

The VSA Installer wizard provides a graphical workflow to installing the VSA cluster. You use the wizard to accomplish a set of tasks.

1   Select a datacenter object for the VSA cluster

2   Select which hosts to include in the VSA cluster

3   Configure the network of the VSA cluster

4   Choose when to format the disks of the VSA cluster

After you complete the steps in the wizard, the VSA Installer performs a set of tasks that create the VSA cluster.

1   Configures the network of each ESXi host.

The installer creates a front-end and a back-end virtual switch on each ESXi instance to support the front-end and back-end networks of the cluster. The installer selects two uplink ports for each virtual switch from the four available NIC ports. As a result, each virtual switch has one primary and one redundant uplink.

2   Deploys a vSphere Storage Appliance on each ESXi host.

3   Configures each vSphere Storage Appliance to export one half of the ESXi storage space as a VSA datastore, and the other half as a replica of another VSA datastore.

- VSA 0 exports VSA datastore 0 and maintains a replica of VSA datastore 2.
- VSA 1 exports VSA datastore 1 and maintains a replica of VSA datastore 0.
- VSA 2 exports VSA datastore 2 and maintains a replica of VSA datastore 1.

4   Configures the network interfaces on each vSphere Storage Appliance to establish the front-end and back-end networks of the VSA cluster.

The VSA cluster members form the VSA cluster by establishing a process of electing a cluster leader. The cluster leader is the VSA cluster member that communicates with VSA Manager to report the status of the VSA cluster.

Create a VSA Cluster

You use the VSA Installer to deploy vSphere Storage Appliance and create a VSA cluster. A VSA cluster enables shared datastores that are connected to all hosts in the datacenter. The VSA Installer enables and configures vMotion and High Availability on the created VSA cluster.

Prerequisites

■   Make sure that the latest version of Adobe Flash is installed on the vCenter Server system.

■   Make sure that Internet Explorer 7 or higher is installed on the vCenter Server system.

■   Assign a static IP address to the vCenter Server system.

■   Ensure that you have the right number of static IP addresses available for you VSA cluster. For more information about IP address requriements, see "VSA Cluster Requirements," on page 22.

Procedure

1   Start the VSA Installer wizard.

a   In vSphere Client, select a datacenter that has two or more ESXi hosts and select the **VSA Manager** tab.

The VSA Installer wizard appears in the tab.

b   Click **Next**.

2   Review the vSphere features that the VSA cluster enables and click **Next**.

3   On the Datacenter page, select a datacenter for the VSA cluster and click **Next**.

4   On the Hosts page, select two or three ESXi hosts and click **Next**.

The wizard categorizes the hosts by CPU family. In a VSA cluster, you can include only hosts that have CPUs from the same CPU family.

If you select hosts from different CPU families or with different hardware configurations, the wizard informs you that the hosts cannot join the same VSA cluster.

5   On the Configure Network page, provide the IP addresses and configuration for the VSA cluster network, and click **Next**.

Table 3-1. VSA Cluster Network Configuration Values

Option	Action
VSA Cluster IP Address	Assign a static IP address for the VSA cluster. The VSA cluster IP address is assigned to the VSA cluster member that is the leader of the cluster. Do not use an IP address from the 192.168. private subnet.
VSA Cluster Service IP Address	Assign a static IP address for the VSA cluster service. The VSA cluster service runs on the vCenter Server system and is only used in a 2-member VSA cluster. Do not use an IP address from the 192.168.x.x private subnet.
Network of ESXi Host 1	
Management IP Address	Assign a static IP address for the management network of the VSA cluster member. Do not use an IP address from the 192.168. private subnet.

Table 3-1. VSA Cluster Network Configuration Values (Continued)

Option	Action
Datastore IP Address	Assign a static IP address for the NFS volume that is exported as a VSA datastore. Do not use an IP address from the 192.168. private subnet.
vSphere Feature IP Address	■ Select the **Use DHCP** check box to assign an IP address to the ESXi feature network. ■ Deselect the **Use DHCP** check box and assign a static IP address to the ESXi feature network.
Subnet Mask	The subnet mask for the vCenter Server IP address. The wizard detects the subnet mask. You cannot change it.
Gateway	The gateway in the subnet of the vCenter Server IP address. The wizard detects the gateway IP address and you cannot change it.
VLAN ID	Assign a VLAN ID for the management network.
Back-end IP Address	Assign a static IP address to the back-end network of the VSA cluster member. NOTE You cannot assign a back-end static IP address that is in a subnet different from 192.168.x.x.
Back-end Subnet Mask	The subnet mask for the back-end network. The wizard adds this value for the back-end private subnet and you cannot change it.
Back-end VLAN ID	Assign a VLAN ID to the back-end network.
Network of ESXi Host 2	
Management IP Address	Assign a static IP address for the management network of the VSA cluster member. Do not use an IP address from the 192.168. private subnet.
Datastore IP Address	Assign a static IP address for the NFS volume that is exported as a VSA datastore. Do not use an IP address from the 192.168. private subnet.
vSphere Feature IP Address	■ Select the **Use DHCP** check box to assign an IP address to the ESXi feature network. ■ Deselect the **Use DHCP** check box and assign a static IP address to the ESXi feature network.
Subnet Mask	The subnet mask for the vCenter Server IP address. The wizard detects the subnet mask. You cannot change it.
Gateway	The gateway in the subnet of the vCenter Server IP address. The wizard detects the gateway IP address and you cannot change it.
VLAN ID	Assign a VLAN ID for the management network.
Back-end IP Address	Assign a static IP address to the back-end network of the VSA cluster member. NOTE You cannot assign a back-end static IP address that is in a subnet different from 192.168.x.x.
Back-end Subnet Mask	The subnet mask for the back-end network. The wizard adds this value for the back-end private subnet and you cannot change it.
Back-end VLAN ID	Assign a VLAN ID to the back-end network.
Network of ESXi Host 3	
Management IP Address	Assign a static IP address for the management network of the VSA cluster member. Do not use an IP address from the 192.168. private subnet.
Datastore IP Address	Assign a static IP address for the NFS volume that is exported as a VSA datastore. Do not use an IP from the 192.168. private subnet.

Table 3-1. VSA Cluster Network Configuration Values (Continued)

Option	Action
vSphere Feature IP Address	■ Select the **Use DHCP** check box to assign an IP address to the ESXi feature network. ■ Deselect the **Use DHCP** check box and assign a static IP address to the ESXi feature network.
Subnet Mask	The subnet mask for the vCenter Server IP address. The wizard detects the subnet mask. You cannot change it.
Gateway	The gateway in the subnet of the vCenter Server IP address. The wizard detects the gateway IP address and you cannot change it.
VLAN ID	Assign a VLAN ID for the management network.
Back-end IP Address	Assign a static IP address to the back-end network of the VSA cluster member. Note You cannot assign a back-end static IP address that is in a subnet different from 192.168.x.x.
Back-end Subnet Mask	The subnet mask for the back-end network. The wizard adds this value for the back-end private subnet and you cannot change it.
Back-end VLAN ID	Assign a VLAN ID to the back-end network.

6 On the Format Disks page, select when to format the disks.

Option	Description
Format disks on first access	Disks are formatted after installation on first read or write.
Format disks immediately	Disks are formatted during the installation with zeroes. This requires additional time during the installation process.

7 Review the VSA cluster configuration on the Ready to Install page and click **Install**.

The Ready to Install page provides information about the ESXi hosts and the network configuration of each VSA cluster member.

8 In the Start Installation window, click **Yes** to confirm the creation of the VSA cluster.

The Installing Features page appears and shows the progress of the tasks that are required to create a VSA cluster.

Depending on the number of hosts that you selected, the VSA Installer wizard mounts two or three shared datastores on each ESXi host in the datacenter.

9 After the VSA Installer finishes creating the VSA cluster, click **Close**.

The **VSA Manager** tab shows information about the VSA datastores, VSA cluster members, and the configuration of the VSA cluster network.

10 (Optional) Collect VSA installation logs.

a Click **VSA Logs** anywhere in the wizard.

b In the Export VSA Logs dialog box, click **Download VSA Logs**.

c Navigate to a folder on the vCenter Server system and save the `.zip` file that contains the logs.

The VSA Installer wizard closes and the **VSA Manager** tab shows information about each datastore, VSA cluster member, and allows you to troubleshoot issues that might arise.

What to do next

Click the **Datastores** view and verify that all shared datastores have the same capacity and that their status is Online.

If the columns shows correct data, you can start creating virtual machines and storing their files on the shared datastores.

Automated Creation of a VSA Cluster

The VSA Automated Installer includes vCenter Server, vSphere Client, vSphere Storage Appliance, VSA Manager, and an installation script that installs all components and creates a VSA cluster.

VSA Automated Installer Requirements

You can run the VSA Automated Installer on Windows Server 2003 and Windows Server 2008. Make sure that your Windows Server installation meets the VSA Automated Installer requirements before proceeding with the installation.

■ Two or three physical servers that have ESXi installed and whose hard disks are configured in a RAID volume. VMware recommends that you use RAID5, RAID6, or RAID10 configuration.

NOTE For more information about ESXi hardware requirements, see "VSA Cluster Requirements," on page 22.

■ A physical or virtual machine that runs Windows Server 2003 or Windows Server 2008. If you use a virtual machine, the virtual machine must not run on an ESXi host that you intend to add to a VSA cluster.

■ The ESXi hosts and the Windows Server are the only running machines in the subnet

■ 6GB free hard disk space

■ Microsoft .NET Framework 3.5 SP1

■ Windows Installer 4.5

■ Internet Explorer 7 or higher (optional), required only for viewing information in the **VSA Manager** tab after the installation is completed

■ Latest version of Adobe Flash (optional), required only for viewing information in the **VSA Manager** tab after the installation is completed

Create a VSA Cluster with the VSA Automated Installer

To perform automated installation of the VSA cluster, you can use the automated installer script and enter the required parameters.

Prerequisites

Verify that your environment meets the requirements to perform automated installation as described in "VSA Automated Installer Requirements," on page 45.

Procedure

◆ On the Windows Server system, run the installation command from the automated installer package.

The following example shows how to install a VSA cluster with two ESXi hosts, with two specified VLAN IDs, and the specified VSA cluster IP address as the starting IP address from a range of free and incremented IP addresses.

```
install.exe –fv Front_End_VLAN_ID –bv Back_End_VLAN_ID –si VSA_Management_address –u
ESXi_root_user –p ESXi_root_password –ei ESXi_Host_1_IP ESXi_Host_2_IP ESXi_Host_3_IP
```

The VSA automated installer scans the subnet for ESXi hosts for available IP addresses and performs silent installation of the VSA cluster components.

- vCenter Server 5.0 (if not already installed on the Windows system)

- vSphere Client 5.0 (if not already installed on the Windows system)

- VSA Manager

- VSA cluster service (installed, but used only if 2 ESXi hosts are available in the subnet)

After all components are installed, the installer performs the tasks to install a VSA cluster.

1   Creates a datacenter and adds the ESXi hosts to it.

2   Updates the network configuration of the ESXi hosts.

3   Deploys the vSphere Storage Appliance onto the ESXi hosts.

4   Starts the VSA cluster service if only 2 ESXi hosts were present.

5   Powers on each instance of vSphere Storage Appliance and creates the VSA cluster.

6   Mounts the VSA datastores to each ESXi host in the datacenter.

IMPORTANT   Do not rerun the VSA automated installer after a VSA cluster has been created.

VSA Automated Installer Options

The VSA Automated Installer accepts a set of arguments and values that you can use to customize the VSA cluster installation.

The following table shows the options that you can use to run the VSA Automated Installer.

Table 3-2. install.exe Arguments

Parameters	Default Value	Description	Required or Optional
−p, −−esxPass <value>	No default value.	The root password of each ESXi host. The root password must be the same for all ESXi hosts.	Required
−u, −−esxUser <value>	No default value.	The root account. Use **root**.	Required
−ei, −−esxIPs <value>	No default value.	The IP addresses of the two or three hosts to use for the VSA cluster For example: **−ei 10.20.118.11 10.20.118.12 10.20.118.13**	Optional
−si, −−startIP <value>	No default value.	The first IP in the range used by the VSA cluster.	Optional
−fv, −−frontendVlanId <value>	0	The VLAN ID for the front-end network.	Optional
−bs, −−backendStartIP <value>	192.168.0.1	The start IP for the back-end network. The default value is 192.168.0.1. The back-end IP addresses must be in the 192.168.x.x private subnet.	Optional
−bn, −−backendNetmask <value>	255.255.255.0	The netmask for the back-end network.	Optional
−bv, −−backendVlanId <value>	0	The VLAN ID for the back-end network.	Optional
−vn, −−vmotionNetmask <value>	255.255.255.0	The netmask for the ESXi feature network.	Optional

Table 3-2. install.exe Arguments (Continued)

Parameters	Default Value	Description		Required or Optional
–vs, ––vmotionStartIP *<value>*	DHCP	The start IP for the ESXi feature network.		Optional
–vv, ––vmotionVlanId *<value>*	The same as the front-end VLAN ID.	The VLAN ID for the ESXi feature network.		Optional
–po, ––httpsPort *<value>*	443	HTTPS port of vCenter Server.		Optional
–nh, ––notConfigHACluster *<value>*	false	Determines whether to install HA cluster.		Optional
		false	Configures and installs HA cluster.	
		true	Does not configure and install HA cluster.	
–ez, ––eagerZero *<value>*	false	Determines whether to format the disks during installation or on first read or write operation to the disks.		Optional
		false	Formats the disks on first read or write operation after the installation process is completed.	
		true	Formats the disks during the installation process.	

Verify the VSA Datastores

After you create the VSA cluster, verify that the the correct number of VSA datastores appears in the vSphere Client.

Procedure

1   In the vSphere Client, select **View > Inventory > Datastores and Datastore Clusters**.

   The number of VSA datastores must match the number of ESXi hosts that you added to the VSA cluster.

2   Select each datastore and click the **Summary** tab.

3   Verify that all datastores have the same total, free, and used capacity in the Capacity panel.

4   Select each datastore and click the **Hosts** tab.

5   In the Datastore column verify that the status of each datastore is Mounted for each ESXi host in the datacenter.

   The Mounted status shows that each ESXi host has access to and can read and write on the matching datastore.

What to do next

You can start deploying virtual machines on the VSA datastores.

Delete a VSA Cluster

VSA Manager provides a cleanup script that you use to delete a VSA cluster if you no longer use it or to clean up the ESXi hosts configuration if you failed to create a VSA cluster and want to make another attempt.

You cannot delete the VSA cluster by uninstalling VSA Manager. To delete the VSA cluster, you must use the `cleanup.bat` script that is installed by VSA Manager.

Procedure

1 In Windows Server 2003 or 2008, start the Command Prompt.

2 In the Command Prompt, change directory to the directory of the `cleanup.bat` script.

   cd C:\Program Files\VMware\Infrastructure\tomcat\webapps\VSAManager\WEB-INF\test\tool

3 Run the `cleanup.bat` script and provide Administrator credentials for vCenter Server.

   cleanup.bat *user password*

   The `cleanup.bat` script unmounts and deletes the VSA datastores, stops and deletes the VSA virtual machines, and reverts the ESXi hosts to their default configuration. The script removes additional virtual switches and uplinks and preserves only the default port groups for the default virtual switch. After the process finishes, the ESXi hosts might appear with an alert icon in the vCenter Server inventory. This is because the script deletes the redundant uplinks for the default virtual switch. The **VSA Manager** tab shows a message that the VSA cluster is now unavailable.

4 Clear the uplink redundancy alarms for each ESXi host.

   a From the vCenter Server inventory, select an ESXi host that has an alert icon and select the **Alarms** tab.

   b In the **Alarms** tab, right click the **Network uplink redundancy lost** alert and select **Clear**.

   The alert icon disappears from the selected ESXi host.

   c Repeat the steps for the remaining ESXi hosts.

5 Refresh the **VSA Manager** tab by restarting the vSphere Client and the Tomcat Web service.

   a Quit the vSphere Client.

   b In the Command Prompt, type **net stop vctomcat** and press Enter to stop the Tomcat Web service.

   The Tomcat Web service stops.

   c In the Command Prompt, type **net start vctomcat** and press Enter to restart the Tomcat Web service.

   The Tomcat Web service starts.

   d Start the vSphere Client, select the VSA datacenter, and select the **VSA Manager** tab.

   The **VSA Manager** tab shows the VSA Installer wizard.

What to do next

You can now attempt to create a new VSA cluster with the same ESXi hosts.

Post-Installation Considerations for a VSA Cluster 4

When you have installed the VSA cluster, you can start deploying virtual machines on the ESXi hosts and use the VSA datastores. You can also ensure that the VSA cluster is running as expected by monitoring and administering it through VSA Manager.

- Review the **VSA Manager** interface and inspect the information that it provides.

- For information about deploying virtual machines, see the *vSphere Virtual Machine Administration* document.

- For each virtual machine that you deploy on the ESXi hosts that participate in the VSA cluster, ensure that you reserve the configured amount of memory. As VSA datastores do not support VMX swapping, this practice helps you to prevent memory overcommitment in the VSA cluster. For more information about preventing memory overcommitment, see the *VMware vSphere Storage Appliance Administration* document.

- For information about maintenance, monitoring, and troubleshooting the VSA cluster, see the *VMware vSphere Storage Appliance Administration* document.

Index