vSphere Upgrade

vSphere 5.1

This document supports the version of each product listed and supports all subsequent versions until the document is replaced by a new edition. To check for more recent editions of this document, see http://www.vmware.com/support/pubs.

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Contents

About vSphere Upgrade

vSphere Upgrade describes how to upgrade VMware vSphere™ to version 5.1.

To learn how to simplify and automate your datacenter upgrade, see the *vSphere Update Manager Installation and Administration Guide*.

If you want to move to vSphere 5.1 by performing fresh installations that do not preserve existing configurations, see the *vSphere Installation and Setup* documentation.

Intended Audience

vSphere Upgrade is for anyone who needs to upgrade from earlier versions of vSphere to vSphere 5.1. These topics are for experienced Microsoft Windows or Linux system administrators who are familiar with virtual machine technology and datacenter operations.

Updated Information

This *vSphere Upgrade* is updated with each release of the product or when necessary.

This table provides the update history of the *vSphere Upgrade*.

Revision	Description
EN-000806-02	■ Documented additional required ports for vCenter Single Sign-On: "Required Ports for vCenter Server," on page 23. ■ Documented an additional requirement for autodiscovery of Active Directory domain during vCenter Single Sign On installation: "Adding Active Directory and OpenLDAP Domains to vCenter Server 5.1," on page 34.
EN-000806-01	■ Added note about VMware Tools and vSphere Auto Deploy to topic: "About VMware Tools," on page 188. ■ Updated topic: "vCenter Server Upgrade Summary," on page 38 with information about supported upgrades to vCenter Server 5.1.0a. ■ Updated Table Table 4-2. ■ Updated topic: "Prerequisites for the vCenter Server Upgrade," on page 46. ■ Updated entry for Oracle in Table: Table 4-5. ■ Updated topic: "Best Practices for vCenter Server Upgrades," on page 45. ■ Updated and added topics to provide more information about installing vCenter Single Sign-On in basic, high availability, and multisite modes: "Separately Install vCenter Single Sign-On," on page 64 and subtopics. ■ Updated topic: "Install vCenter Single Sign-On as Part of a vCenter Server Simple Install," on page 60. ■ Added topic: "Confirm Active Directory Domains for vCenter Server Administrators," on page 78. ■ Added topic: "(Optional) Replicate Data Between Multisite Single Sign-On Instances in a New vCenter Server Deployment," on page 80. ■ Updated topic: "Upgrade vCenter Server in a Separate Upgrade," on page 81. ■ Updated topic: "vCenter Single Sign-On Deployment Modes," on page 31. ■ Updated topic: "Adding Active Directory and OpenLDAP Domains to vCenter Server 5.1," on page 34. ■ Updated topic: "How vCenter Single Sign-On Deployment Scenarios Affect Log In Behavior," on page 35 and subtopics. ■ Updated topic: "Required vCenter Single Sign-On Database Users," on page 45. ■ Updated topic "Required vCenter Single Sign-On Database Users," on page 45. ■ Added topic: "vCenter Single Sign-On Installation Fails," on page 83. ■ Added topic: "vCenter Single Sign-On Fails at Start Up or During Initialization," on page 84. ■ Added topic: "If Autodiscovery Fails During Single Sign-On Installation Manually Add Active Directory Domains," on page 84. ■ Updated the following topics to clarify that version 5.0.x vCenter Servers can only be linked with other 5.0.x vCenter Servers, and 5.1.x vCenter Servers can only be linked with other 5.1.x vCenter Servers: "Linked Mode Considerations for vCenter Server," on page 100, "Linked Mode Prerequisites for vCenter Server," on page 100, and "Join a Linked Mode Group After a vCenter Server Upgrade," on page 101.
EN-000806-00	Initial release.

About the Upgrade Process 1

Upgrading is a multistage process in which procedures must be performed in a particular order. Follow the process outlined in this high-level overview to ensure a smooth upgrade with a minimum of system downtime.

CAUTION Make sure that you understand the entire upgrade process before you attempt to upgrade. If you do not follow the safeguards, you might lose data and lose access to your servers. Without planning, you might incur more downtime than is necessary.

You must complete the upgrade process in a specific order because you can lose data and server access. Order is also important within each upgrade stage.

You can perform the upgrade process for each component in only one direction. For example, after you upgrade to vCenter Server 5.x, you cannot revert to vCenter Server 4.x. With backups and planning, you can restore your original software records.

You must complete one procedure before you move to the next procedure. Follow the directions within each procedure regarding the required sequence of minor substeps.

Because certain commands can simultaneously upgrade more than one stage, VMware recommends that you understand the irreversible changes at each stage before you upgrade your production environments.

To ensure that your datacenter upgrade goes smoothly, you can use vCenter Update Manager to manage the process for you.

vSphere upgrades proceed in the following sequence of tasks.

1. If your vSphere system includes VMware solutions or plug-ins, make sure they are compatible with the vCenter Server version that you are upgrading to. See the VMware Product Interoperability Matrix at http://www.vmware.com/resources/compatibility/sim/interop_matrix.php.
2. If you are upgrading vSphere components that are part of a VMware View environment, see "Upgrading vSphere Components Separately in a VMware View Environment," on page 214.
3. Make sure your system meets vSphere hardware and software requirements.

   See Chapter 3, "System Requirements," on page 13.
4. If your vSphere deployment includes vCenter Server, upgrade vCenter Server.

   See Chapter 4, "Upgrading to vCenter Server 5.1," on page 29.
5. If you use VMware Update Manager, upgrade VMware Update Manager.

   See Chapter 5, "Upgrading Update Manager," on page 113.
6. Upgrade your ESXi hosts.

See Chapter 6, "Upgrading and Migrating Your Hosts," on page 117. vSphere 5.1 provides several ways to upgrade hosts:

- Use vSphere Update Manager to perform an orchestrated upgrade of your ESXi hosts. See "Using vSphere Update Manager to Perform Orchestrated Host Upgrades," on page 139.
- Upgrade a single host at a time, interactively, from an ESXi ISO installer image stored on a CD, DVD, or USB flash drive. See "Upgrade or Migrate Hosts Interactively," on page 153.
- Use a script to perform an unattended upgrade for multiple hosts. See "Installing, Upgrading, or Migrating Hosts Using a Script," on page 155
- If a host was deployed using vSphere Auto Deploy, you can use Auto Deploy to upgrade the host by reprovisioning it. See "Using vSphere Auto Deploy to Reprovision Hosts," on page 168.
- Upgrade or patch ESXi 5.0 hosts by using `esxcli` commands. See "Upgrading Hosts by Using esxcli Commands," on page 173.

7 Reapply your host license.

See "Reapplying Licenses After Upgrading to ESXi 5.1," on page 186.

8 Upgrade virtual machines and virtual appliances, manually or by using VMware Update Manager to perform an orchestrated upgrade.

See Chapter 7, "Upgrading Virtual Machines," on page 187.

How vSphere 5.x Differs from vSphere 4.x

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vSphere 5.x is a major upgrade from vSphere 4.x.

The following changes from vSphere 4.x affect vSphere installation and setup. For a complete list of new features in vSphere 5.x, see the release notes for version 5.x releases.

Service Console is removed

ESXi does not include a Service Console. You can perform most tasks that you performed in the Service Console by using esxcli commands in the ESXi Shell, by using vCLI commands, and by using VMware PowerCLI commands. See *Command-Line Management in vSphere 5.0 for Service Console Users* and *Getting Started with vSphere Command-Line Interfaces*.

ESXi does not have a graphical installer

The graphical installer relied on the Service Console, which is not a part of ESXi. ESXi retains the text-based installer.

vSphere Auto Deploy and vSphere ESXi Image Builder CLI

Before ESXi 5.0, ESXi was installed on the physical disk of each ESXi host. With ESXi 5.x, you can load an ESXi image directly into memory by using vSphere Auto Deploy. You can provision and reprovision large numbers of ESXi hosts efficiently with vCenter Server, and manage ESXi updates and patching by using an image profile. You can save host configuration such as network or storage setup as a host profile and apply it to the host by using Auto Deploy. You can use ESXi Image Builder CLI to create ESXi installation images with a customized set of updates, patches, and drivers.

For complete information on using vSphere Auto Deploy and ESXi Image Builder PowerCLI, see the *vSphere Installation and Setup* documentation.

Changes in the ESXi installation and upgrade process

ESXi 5.x uses a single installer wizard for fresh installations and upgrades. ESXi 5.x also provides a new option for deploying ESXi directly into the host memory with vSphere Auto Deploy. The `vihostupdate` and `esxupdate` utilities are not supported for ESXi 5.x. You cannot upgrade or migrate from earlier ESX or ESXi versions to ESXi 5.x by using any command-line utility. After you have upgraded or migrated to ESXi 5.x, you can upgrade or patch ESXi 5.x hosts using vCLI `esxcli` commands.

IMPORTANT After you upgrade or migrate your host to ESXi 5.x, you cannot roll back to your version 4.x ESX or ESXi software. Back up your host before you perform an upgrade or migration, so that, if the upgrade or migration fails, you can restore your 4.x host.

See "ESXi 5.1 Upgrade Options," on page 124.

Installer caching

Instead of using a binary image to install the system, whatever bits were used at boot time are cached to the system. This caching reduces installation problems caused by accessing installation files across networks that are under load.

NOTE Scripted installations cannot PXE boot a server and then obtain the binary image from some other form of media.

Changes to partitioning of host disks

All freshly installed hosts in vSphere 5.x use the GUID Partition Table format instead of the MSDOS-style partition label. This change supports ESXi installation on disks larger than 2TB.

Newly installed vSphere 5.x hosts use VMFS5, an updated version of the VMware File System for vSphere 5.x. Unlike earlier versions, ESXi 5.x does not create VMFS partitions in second and successive disks.

Upgraded systems do not use GUID Partition Tables (GPT), but retain the older MSDOS-based partition label.

VMware vCenter Server Appliance

As an alternative to installing vCenter Server on a Windows machine, vSphere 5.x provides the VMware vCenter Server Appliance. The vCenter Server Appliance is a preconfigured Linux-based virtual machine optimized for running vCenter Server and associated services.

vSphere Web Client

The vSphere Web Client is a server application that provides a browser-based alternative to the traditional vSphere Client. You can use a Web browser to connect to the vSphere Web Client to manage an ESXi host through a vCenter Server.

vCenter Single Sign On

vSphere 5.1 introduces vCenter Single Sign On as part of the vCenter Server management infrastructure. This change affects vCenter Server installation, upgrading, and operation. Authentication by vCenter Single Sign On makes the VMware cloud infrastructure platform more secure by allowing the vSphere software components to communicate with each other through a secure token exchange mechanism, instead of requiring each component to authenticate a user separately with a directory service like Active Directory. See "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30.

System Requirements 3

Systems running vCenter Server and ESXi instances must meet specific hardware and operating system requirements.

If you are using Auto Deploy to provision ESXi hosts, see also the information about preparing for VMware Auto Deploy in the *vSphere Installation and Setup* documentation.

This chapter includes the following topics:

ESXi Hardware Requirements

Make sure the host meets the minimum hardware configurations supported by ESXi 5.1.

Hardware and System Resources

To install and use ESXi 5.1, your hardware and system resources must meet the following requirements:

- Supported server platform. For a list of supported platforms, see the *VMware Compatibility Guide* at http://www.vmware.com/resources/compatibility.
- ESXi 5.1 will install and run only on servers with 64-bit x86 CPUs.
- ESXi 5.1 requires a host machine with at least two cores.
- ESXi 5.1 supports only LAHF and SAHF CPU instructions.

- ESXi 5.1 requires the NX/XD bit to be enabled for the CPU in the BIOS.
- ESXi supports a broad range of x64 multicore processors. For a complete list of supported processors, see the VMware compatibility guide at http://www.vmware.com/resources/compatibility.
- ESXi requires a minimum of 2GB of physical RAM. Provide at least 8GB of RAM to take full advantage of ESXi features and run virtual machines in typical production environments.
- To support 64-bit virtual machines, support for hardware virtualization (Intel VT-x or AMD RVI) must be enabled on x64 CPUs.
- One or more Gigabit or 10Gb Ethernet controllers. For a list of supported network adapter models, see the *VMware Compatibility Guide* at http://www.vmware.com/resources/compatibility.
- Any combination of one or more of the following controllers:
  - Basic SCSI controllers. Adaptec Ultra-160 or Ultra-320, LSI Logic Fusion-MPT, or most NCR/Symbios SCSI.
  - RAID controllers. Dell PERC (Adaptec RAID or LSI MegaRAID), HP Smart Array RAID, or IBM (Adaptec) ServeRAID controllers.
- SCSI disk or a local, non-network, RAID LUN with unpartitioned space for the virtual machines.
- For Serial ATA (SATA), a disk connected through supported SAS controllers or supported on-board SATA controllers. SATA disks will be considered remote, not local. These disks will not be used as a scratch partition by default because they are seen as remote.

  NOTE You cannot connect a SATA CD-ROM device to a virtual machine on an ESXi 5.1 host. To use the SATA CD-ROM device, you must use IDE emulation mode.

Storage Systems

ESXi 5.1 supports installing on and booting from the following storage systems:

- SATA disk drives. SATA disk drives connected behind supported SAS controllers or supported on-board SATA controllers.

  Supported SAS controllers include:

  - LSI1068E (LSISAS3442E)
  - LSI1068 (SAS 5)
  - IBM ServeRAID 8K SAS controller
  - Smart Array P400/256 controller
  - Dell PERC 5.0.1 controller

  Supported on-board SATA include:

  - Intel ICH9
  - NVIDIA MCP55
  - ServerWorks HT1000

  NOTE ESXi does not support using local, internal SATA drives on the host server to create VMFS datastores that are shared across multiple ESXi hosts.

- Serial Attached SCSI (SAS) disk drives. Supported for installing ESXi 5.1 and for storing virtual machines on VMFS partitions.
- Dedicated SAN disk on Fibre Channel or iSCSI

- USB devices. Supported for installing ESXi 5.1.
- Software Fibre Channel over Ethernet (FCoE). See "Installing and Booting ESXi with Software FCoE," on page 138.

ESXi Booting Requirements

vSphere 5.1 supports booting ESXi hosts from the Unified Extensible Firmware Interface (UEFI). With UEFI you can boot systems from hard drives, CD-ROM drives, or USB media. Network booting or provisioning with VMware Auto Deploy requires the legacy BIOS firmware and is not available with UEFI.

ESXi can boot from a disk larger than 2TB provided that the system firmware and the firmware on any add-in card that you are using support it. See the vendor documentation.

NOTE Changing the boot type from legacy BIOS to UEFI after you install ESXi 5.1 might cause the host to fail to boot. In this case, the host displays an error message similar to: `Not a VMware boot bank`. Changing the host boot type between legacy BIOS and UEFI is not supported after you install ESXi 5.1.

Storage Requirements for ESXi 5.1 Installation

Installing ESXi 5.1 requires a boot device that is a minimum of 1GB in size. When booting from a local disk or SAN/iSCSI LUN, a 5.2GB disk is required to allow for the creation of the VMFS volume and a 4GB scratch partition on the boot device. If a smaller disk or LUN is used, the installer will attempt to allocate a scratch region on a separate local disk. If a local disk cannot be found the scratch partition, `/scratch`, will be located on the ESXi host ramdisk, linked to `/tmp/scratch`. You can reconfigure `/scratch` to use a separate disk or LUN. For best performance and memory optimization, VMware recommends that you do not leave `/scratch` on the ESXi host ramdisk.

To reconfigure `/scratch`, see the topic "Set the Scratch Partition from the vSphere Client" in the *vSphere Installation and Setup* documentation.

Due to the I/O sensitivity of USB and SD devices the installer does not create a scratch partition on these devices. As such, there is no tangible benefit to using large USB/SD devices as ESXi uses only the first 1GB. When installing on USB or SD devices, the installer attempts to allocate a scratch region on an available local disk or datastore. If no local disk or datastore is found, `/scratch` is placed on the ramdisk. You should reconfigure `/scratch` to use a persistent datastore following the installation.

In Auto Deploy installations, the installer attempts to allocate a scratch region on an available local disk or datastore. If no local disk or datastore is found `/scratch` is placed on ramdisk. You should reconfigure /scratch to use a persistent datastore following the installation.

For environments that boot from a SAN or use Auto Deploy, it is not necessary to allocate a separate LUN for each ESXi host. You can co-locate the scratch regions for many ESXi hosts onto a single LUN. The number of hosts assigned to any single LUN should be weighed against the LUN size and the I/O behavior of the virtual machines.

Recommendation for Enhanced ESXi Performance

To enhance performance, install ESXi on a robust system with more RAM than the minimum required and with multiple physical disks.

For ESXi system requirements, see "ESXi Hardware Requirements," on page 13.

Table 3-1. Recommendations for Enhanced Performance

System Element	Recommendation
RAM	ESXi hosts require more RAM than typical servers. Provide at least 8GB of RAM to take full advantage of ESXi features and run virtual machines in typical production environments. An ESXi host must have sufficient RAM to run concurrent virtual machines. The following examples are provided to help you calculate the RAM required by the virtual machines running on the ESXi host. Operating four virtual machines with Red Hat Enterprise Linux or Windows XP requires at least 3GB of RAM for baseline performance. This figure includes approximately 1024MB for the virtual machines, 256MB minimum for each operating system as recommended by vendors. Running these four virtual machines with 512MB RAM requires that the ESXi host have approximately 4GB RAM, which includes 2048MB for the virtual machines. These calculations do not take into account possible memory savings from using variable overhead memory for each virtual machine. See *vSphere Resource Management* .
Dedicated Fast Ethernet adapters for virtual machines	Place the management network and virtual machine networks on different physical network cards. Dedicated Gigabit Ethernet cards for virtual machines, such as Intel PRO 1000 adapters, improve throughput to virtual machines with high network traffic.
Disk location	Place all data that your virtual machines use on physical disks allocated specifically to virtual machines. Performance is better when you do not place your virtual machines on the disk containing the ESXi boot image. Use physical disks that are large enough to hold disk images that all the virtual machines use.
VMFS5 partitioning	The ESXi installer creates the initial VMFS volumes on the first blank local disk found. To add disks or modify the original configuration, use the vSphere Client. This practice ensures that the starting sectors of partitions are 64K-aligned, which improves storage performance. NOTE For SAS-only environments, the installer might not format the disks. For some SAS disks, it is not possible to identify whether the disks are local or remote. After the installation, you can use the vSphere Client to set up VMFS.
Processors	Faster processors improve ESXi performance. For certain workloads, larger caches improve ESXi performance.
Hardware compatibility	Use devices in your server that are supported by ESXi 5.1 drivers. See the *Hardware Compatibility Guide* at http://www.vmware.com/resources/compatibility.

ESXi Support for 64-Bit Guest Operating Systems

ESXi offers support for several 64-bit guest operating systems.

For a complete list of operating systems supported for ESXi, see the *VMware Compatibiity Guide* at http://www.vmware.com/resources/compatibility/search.php.

Hosts running virtual machines with 64-bit guest operating systems have the following hardware requirements:

- For AMD Opteron-based systems, the processors must be Opteron Rev E or later.

- For Intel Xeon-based systems, the processors must include support for Intel Virtualization Technology (VT). Many servers that include CPUs with VT support might have VT disabled by default, so you must enable VT manually. If your CPUs support VT ,but you do not see this option in the BIOS, contact your vendor to request a BIOS version that lets you enable VT support.

To determine whether your server has 64-bit VMware support, you can download the CPU Identification Utility from the VMware Web site.

Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client

The vCenter Server system is a physical machine or virtual machine with access to a supported database. The vCenter Server system must meet specific requirements. The vCenter Server machines must meet the hardware requirements.

vCenter Single Sign On, Inventory Service and vCenter Server Hardware Requirements

You can install vCenter Single Sign On, Inventory Service, and vCenter Server on the same host machine (as with vCenter Simple Install) or on different machines. Table 3-2 and Table 3-3 list the hardware requirements for Single Sign On and Inventory Service, running on separate host machines. If you install vCenter Single Sign On, vCenter Inventory Service, and vCenter Server on the same host machine, the Single Sign On and Inventory Service memory and disk storage requirements are in addition to the requirements for vCenter Server. See Table 3-4.

Table 3-2. Minimum Hardware Requirements for vCenter Single Sign On, Running on a Separate Host Machine from vCenter Server

vCenter Single Sign On Hardware	Requirement
Processor	Intel or AMD x64 processor with two or more logical cores, each with a speed of 2GHz.
Memory	3GB. Memory requirements might be higher if the vCenter Single Sign On database runs on the same host machine. If vCenter Single Sign On runs on the same host machine as vCenter Server, see Table 3-4.
Disk storage	2GB. Disk requirements might be higher if the vCenter Single Sign On database runs on the same host machine.
Network speed	1Gbps

Table 3-3. Minimum Hardware Requirements for vCenter Inventory Service, Running on a Separate Host Machine from vCenter Server

vCenter Inventory Service Hardware	Requirement
Processor	Intel or AMD x64 processor with two or more logical cores, each with a speed of 2GHz.
Memory	3GB. If vCenter Inventory Service runs on the same host machine as vCenter Server, see Table 3-4.
Disk storage	At least 60GB for medium- to large-sized inventories (more than 100 hosts or 1000 virtual machines). If vCenter Inventory Service runs on the same host machine as vCenter Server, see Table 3-4.
Network speed	1Gbps

Table 3-4. 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.
Memory	The amount of memory needed depends on your vCenter Server configuration. ■ If vCenter Server is installed on a different host machine than vCenter Single Sign On and vCenter Inventory Service, 4GB of RAM are required. ■ If vCenter Server, vCenter Single Sign On and vCenter Inventory Service are installed on the same host machine (as with vCenter Simple Install), 10GB of RAM are required. Memory requirements are higher if the vCenter Server database or vCenter Single Sign On database runs on the same machine as vCenter Server. vCenter Server includes several Java services: VMware VirtualCenter Management Webservices (tc Server), 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 3-5.
Disk storage	The amount of disk storage needed for the vCenter Server installation depends on your vCenter Server configuration. ■ If vCenter Server is installed on a different host machine than vCenter Single Sign On and vCenter Inventory Service, 4GB are required. ■ If vCenter Server, vCenter Single Sign On and vCenter Inventory Service are installed on the same host machine (as with vCenter Simple Install), at least 40-60GB of free disk space are required after installation, depending on the size of your inventory. 100GB are recommended, to allow for future growth of your inventory. Disk storage requirements are higher if the vCenter Server database or vCenter Single Sign On database runs on the same machine as vCenter Server, depending on the size of those databases. In vCenter Server 5.x, 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.
Network speed	1Gbps

The JVM heap settings for vCenter Server depend on your inventory size. See "Configuring VMware Tomcat Server Settings in vCenter Server 5.1," on page 102.

Table 3-5. JVM Heap Settings for vCenter Server

vCenter Server Inventory	VMware VirtualCenter Management Webservices (tc Server)	Inventory Service	Profile-Driven Storage Service
Small inventory (1-100 hosts or 1-1000 virtual machines)	1GB	3GB	512MB
Medium inventory (100-400 hosts or 1000-4000 virtual machines)	2GB	6GB	1GB
Large inventory (More than 400 hosts or 4000 virtual machines)	3GB	12GB	2GB

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

For the hardware requirements of your database, see your database documentation. The database requirements are in addition to the vCenter Server requirements if the database and vCenter Server run on the same machine.

VMware vCenter Server Appliance Hardware Requirements and Recommendations

IMPORTANT The embedded database is not configured to manage an inventory that contains more than 5 hosts and 50 virtual machines. If you use the embedded database with the vCenter Server Appliance, exceeding these limits can cause numerous problems, including causing vCenter Server to stop responding.

Table 3-6. Hardware Requirements for VMware vCenter Server Appliance

VMware vCenter Server Appliance Hardware	Requirement
Disk storage on the host machine	The vCenter Server Appliance requires at least 7GB of disk space, and is limited to a maximum size of 80GB. The vCenter Server Appliance can be deployed with thin-provisioned virtual disks that can grow to the maximum size of 80GB. If the host machine does not have enough free disk space to accommodate the growth of the vCenter Server Appliance virtual disks, vCenter Server might cease operation, and you will not be able to manage your vSphere environment.
Memory in the VMware vCenter Server Appliance	■ Very small inventory (10 or fewer hosts, 100 or fewer virtual machines): at least 4GB. ■ Small inventory (10-100 hosts or 100-1000 virtual machines): at least 8GB. ■ Medium inventory (100-400 hosts or 1000-4000 virtual machines): at least 16GB. ■ Large inventory (More than 400 hosts or 4000 virtual machines): at least 24GB.

Table 3-7. JVM Heap Settings for VMware vCenter Server Appliance

vCenter Server Appliance Inventory	VMware VirtualCenter Management Webservices (tc Server)	Inventory Service	Profile-Driven Storage Service
Small inventory (1-100 hosts or 1-1000 virtual machines)	1GB	3GB	512MB
Medium inventory (100-400 hosts or 1000-4000 virtual machines)	2GB	6GB	1GB
Large inventory (More than 400 hosts or 4000 virtual machines)	3GB	12GB	2GB

See "Configuring VMware Tomcat Server Settings in vCenter Server 5.1," on page 102.

vSphere Client Hardware Requirements and Recommendations

Make sure that the vSphere Client host machine meets the following requirements.

Table 3-8. vSphere Client Minimum Hardware Requirements and Recommendations

vSphere Client Hardware	Requirements and Recommendations
CPU	1 CPU
Processor	500MHz or faster Intel or AMD processor (1GHz recommended)
Memory	500MB (1GB recommended)
Disk Storage	1.5GB free disk space for a complete installation, which includes the following components: ■ Microsoft .NET 2.0 SP2 ■ Microsoft .NET 3.0 SP2 ■ Microsoft .NET 3.5 SP1 ■ Microsoft Visual J# Remove any previously installed versions of Microsoft Visual J# on the system where you are installing the vSphere Client. ■ vSphere Client If you do not have any of these components already installed, you must have 400MB free on the drive that has the `%temp%` directory. If you have all of the components already installed, 300MB of free space is required on the drive that has the `%temp%` directory, and 450MB is required for vSphere Client.
Networking	Gigabit connection recommended

vCenter Server and vSphere Client System Recommendations for Performance Based on Deployment Size

The number of hosts and powered-on virtual machines in your environment affects performance. Use the following system requirements as minimum guidelines for reasonable performance. For increased performance, you can configure systems in your environment with values greater than those listed here.

Processing requirements are listed in terms of hardware CPU cores. Only physical cores are counted. In hyperthreaded systems, logical CPUs do not count as separate cores.

IMPORTANT The recommended disk sizes assume default log levels. If you configure more detailed log levels, more disk space is required.

Table 3-9. Medium Deployment of Up to 50 Hosts and 500 Powered-On Virtual Machines

Product	Cores	Memory	Disk
vCenter Server	2	4GB	5GB
vSphere Client	1	1GB	1.5GB

Table 3-10. Large Deployment of Up to 300 Hosts and 3,000 Powered-On Virtual Machines

Product	Cores	Memory	Disk
vCenter Server	4	8GB	10GB
vSphere Client	1	1GB	1.5GB

Table 3-11. Extra-Large Deployment of Up to 1,000 Hosts and 10,000 Powered-On Virtual Machines

Product	Cores	Memory	Disk
vCenter Server	8	16GB	10GB
vSphere Client	2	1GB	1.5GB

vSphere Web Client Hardware Requirements

The vSphere Web Client has two components: A Java server and an Adobe Flex client application running in a browser.

Table 3-12. Hardware Requirements for the vSphere Web Client Server Component

vSphere Web Client Server Hardware	Requirement
Memory	At least 2GB: 1GB for the Java heap, and 1GB for ■ The resident code ■ The stack for Java threads ■ Global/bss segments for the Java process
CPU	2.00 GHz processor with 4 cores
Disk Storage	At least 2GB free disk space
Networking	Gigabit connection recommended

vCenter Server Software Requirements

Make sure that your operating system supports vCenter Server. vCenter Server requires a 64-bit operating system, and the 64-bit system DSN is required for vCenter Server to connect to its database.

For a list of supported operating systems, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility.

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

NOTE If your vCenter Server host machine uses a non-English operating system, install both the Microsoft .NET Framework 3.5 SP1 and Microsoft .NET Framework 3.5 Language Pack through Windows Update. Windows Update automatically selects the correct localized version for your operating system. The .NET Framework installed through the vCenter Server installer includes only the English version.

If you plan to use the Microsoft SQL Server 2008 R2 Express database that is bundled with vCenter Server, Microsoft Windows Installer version 4.5 (MSI 4.5) is required on your system. You can download MSI 4.5 from the Microsoft Web site. You can also install MSI 4.5 directly from the vCenter Server `autorun.exe` installer.

The VMware vCenter Server Appliance can be deployed only on hosts that are running ESX version 4.x or ESXi version 4.x or later.

vSphere Client and vSphere Web Client Software Requirements

Make sure that your operating system supports the vSphere Client.

The vSphere Client requires the Microsoft .NET 3.5 SP1 Framework. If it is not installed on your system, the vSphere Client installer installs it. The .NET 3.5 SP1 installation might require Internet connectivity to download more files.

The following browsers are supported for version 5.1 of the vSphere Web Client:

- Microsoft Internet Explorer 7, 8, and 9.
- Mozilla Firefox 3.6 and later.
- Google Chrome 14 and later.

The vSphere Web Client requires the Adobe Flash Player version 11.1.0 or later to be installed with the appropriate plug-in for your browser.

Providing Sufficient Space for System Logging

ESXi 5.x uses a new log infrastructure. If your host is deployed with Auto Deploy, or if you set up a log directory separate from the default location in a scratch directory on the VMFS volume, you might need to change your current log size and rotation settings to ensure that enough space for system logging exists.

All vSphere components use this infrastructure. The default values for log capacity in this infrastructure vary, depending on the amount of storage available and on how you have configured system logging. Hosts that are deployed with Auto Deploy store logs on a RAM disk, which means that the amount of space available for logs is small.

If your host is deployed with Auto Deploy, reconfigure your log storage in one of the following ways:

- Redirect logs over the network to a remote collector.
- Redirect logs to a NAS or NFS store.

You might also want to reconfigure log sizing and rotations for hosts that are installed to disk, if you redirect logs to nondefault storage, such as a NAS or NFS store.

You do not need to reconfigure log storage for ESXi hosts that use the default configuration, which stores logs in a scratch directory on the VMFS volume. For these hosts, ESXi 5.x autoconfigures logs to best suit your installation, and provides enough space to accommodate log messages.

Table 3-13. Recommended Minimum Size and Rotation Configuration for hostd, vpxa, and fdm Logs.

Log	Maximum Log File Size	Number of Rotations to Preserve	Minimum Disk Space Required
Management Agent (hostd)	10240KB	10	100MB
VirtualCenter Agent (vpxa)	5120KB	10	50MB
vSphere HA agent (Fault Domain Manager, fdm)	5120KB	10	50MB

For information about setting up and configuring syslog and a syslog server, setting up syslog from the host profiles interface, and installing vSphere Syslog Collector, see the *vSphere Installation and Setup* documentation.

Required Ports for vCenter Server

The VMware vCenter Server system must be able to send data to every managed host and receive data from every vSphere Client. To enable migration and provisioning activities between managed hosts, the source and destination hosts must be able to receive data from each other.

For information about ports required for the vCenter Server Appliance, see "Required Ports for the vCenter Server Appliance," on page 24.

VMware uses designated ports for communication. Additionally, the managed hosts monitor designated ports for data from the vCenter Server system. If a firewall exists between any of these elements and Windows firewall service is in use, the installer opens the ports during the installation. For custom firewalls, you must manually open the required ports. If you have a firewall between two managed hosts and you want to perform source or target activities, such as migration or cloning, you must configure a means for the managed hosts to receive data.

NOTE In Microsoft Windows Server 2008, a firewall is enabled by default.

Table 3-14. Ports Required for Communication Between Components

Port	Description
80	vCenter Server requires port 80 for direct HTTP connections. Port 80 redirects requests to HTTPS port 443. This redirection is useful if you accidentally use http://server instead of https://server. If you use a custom Microsoft SQL database (not the bundled SQL Server 2008 database) that is stored on the same host machine as the vCenter Server, port 80 is used by the SQL Reporting Service. When you install vCenter Server, the installer will prompt you to change the HTTP port for vCenter Server. Change the vCenter Server HTTP port to a custom value to ensure a successful installation. Microsoft Internet Information Services (IIS) also use port 80. See "Conflict Between vCenter Server and IIS for Port 80," on page 25.
389	This port must be open on the local and all remote instances of vCenter Server. This is the LDAP port number for the Directory Services for the vCenter Server group. The vCenter Server system needs to bind to port 389, even if you are not joining this vCenter Server instance to a Linked Mode group. If another service is running on this port, it might be preferable to remove it or change its port to a different port. You can run the LDAP service on any port from 1025 through 65535. If this instance is serving as the Microsoft Windows Active Directory, change the port number from 389 to an available port from 1025 through 65535.
443	The default port that the vCenter Server system uses to listen for connections from the vSphere Client. To enable the vCenter Server system to receive data from the vSphere Client, open port 443 in the firewall. The vCenter Server system also uses port 443 to monitor data transfer from SDK clients. If you use another port number for HTTPS, you must use *ip-address:port* when you log in to the vCenter Server system.

Table 3-14. Ports Required for Communication Between Components (Continued)

Port	Description
636	For vCenter Server Linked Mode, this is the SSL port of the local instance. If another service is running on this port, it might be preferable to remove it or change its port to a different port. You can run the SSL service on any port from 1025 through 65535.
902	The default port that the vCenter Server system uses to send data to managed hosts. Managed hosts also send a regular heartbeat over UDP port 902 to the vCenter Server system. This port must not be blocked by firewalls between the server and the hosts or between hosts.
903	Port 903 must not be blocked between the vSphere Client and the hosts. The vSphere Client uses this ports to display virtual machine consoles.
8080	Web Services HTTP. Used for the VMware VirtualCenter Management Web Services.
8443	Web Services HTTPS. Used for the VMware VirtualCenter Management Web Services.
60099	Web Service change service notification port
6501	Auto Deploy service
6502	Auto Deploy management
7005	vCenter Single Sign On
7009	vCenter Single Sign On
7080	vCenter Single Sign On
7444	vCenter Single Sign On HTTPS
9443	vSphere Web Client HTTPS
9090	vSphere Web Client HTTP
10080	vCenter Inventory Service HTTP
10443	vCenter Inventory Service HTTPS
10111	vCenter Inventory Service Management
10109	vCenter Inventory Service Linked Mode Communication

To have the vCenter Server system use a different port to receive vSphere Client data, see the *vCenter Server and Host Management* documentation.

For a discussion of firewall configuration, see the *vSphere Security* documentation.

Required Ports for the vCenter Server Appliance

The VMware vCenter Server system must be able to send data to every managed host and receive data from every vSphere Client. For migration and provisioning activities between managed hosts, the source and destination hosts must be able to receive data from each other.

For information about ports required for vCenter Server on Windows, see "Required Ports for vCenter Server," on page 23.

VMware uses designated ports for communication. Additionally, the managed hosts monitor designated ports for data from the vCenter Server system. The vCenter Server Appliance is preconfigured to use the ports listed in Table 3-15. For custom firewalls, you must manually open the required ports. If you have a firewall between two managed hosts and you want to perform source or target activities, such as migration or cloning, you must configure a means for the managed hosts to receive data.

Table 3-15. Ports Required for the vCenter Server Appliance

Port	Description
80	vCenter Server requires port 80 for direct HTTP connections. Port 80 redirects requests to HTTPS port 443. This redirection is useful if you accidentally use http://server instead of https://server.
443	The default port that the vCenter Server system uses to listen for connections from the vSphere Client. To enable the vCenter Server system to receive data from the vSphere Client, open port 443 in the firewall. The vCenter Server system also uses port 443 to monitor data transfer from SDK clients. If you use another port number for HTTPS, you must use *ip-address*:*port* when you log in to the vCenter Server system.
902	The default port that the vCenter Server system uses to send data to managed hosts. Managed hosts also send a regular heartbeat over UDP port 902 to the vCenter Server system. This port must not be blocked by firewalls between the server and the hosts or between hosts. Port 902 must not be blocked between the vSphere Client and the hosts. The vSphere Client uses this port to display virtual machine consoles.
8080	Web Services HTTP. Used for the VMware VirtualCenter Management Web Services.
8443	Web Services HTTPS. Used for the VMware VirtualCenter Management Web Services.
10080	vCenter Inventory Service HTTP
10443	vCenter Inventory Service HTTPS
10109	vCenter Inventory Service database
514	vSphere Syslog Collector server
1514	vSphere Syslog Collector server (SSL)
6500	Network coredump server (UDP)
6501	Auto Deploy service
6502	Auto Deploy management
9090	vSphere Web Client HTTP
9443	vSphere Web Client HTTPS
5480	vCenter Server Appliance Web user interface HTTPS
5489	vCenter Server Appliance Web user interface CIM service
22	System port for SSHD

To have the vCenter Server system use a different port to receive vSphere Client data, see the *vCenter Server and Host Management* documentation.

For a discussion of firewall configuration, see the *vSphere Security* documentation.

Conflict Between vCenter Server and IIS for Port 80

vCenter Server and Microsoft Internet Information Service (IIS) both use port 80 as the default port for direct HTTP connections. This conflict can cause vCenter Server to fail to restart after the installation of vSphere Authentication Proxy.

Problem

vCenter Server fails to restart after the installation of vSphere Authentication Proxy is complete.

Cause

If you do not have IIS installed when you install vSphere Authentication Proxy, the installer prompts you to install IIS. Because IIS uses port 80, which is the default port for vCenter Server direct HTTP connections, vCenter Server fails to restart after the installation of vSphere Authentication Proxy is complete. See "Required Ports for vCenter Server," on page 23.

Solution

- To resolve a conflict between IIS and vCenter Server for port 80, take one of the following actions.

Option	Description
If you installed IIS before installing vCenter Server	Change the port for vCenter Server direct HTTP connections from 80 to another value.
If you installed vCenter Server before installing IIS	Before restarting vCenter Server, change the binding port of the IIS default Web site from 80 to another value.

DNS Requirements for vSphere

You 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 and vSphere Web Clients. Ensure that the vCenter Server has a valid DNS resolution from all ESXi hosts and all vSphere Clients and vSphere Web Clients.

Ensure that the vCenter Server is installed on a machine that has a resolvable fully qualified domain name (FQDN). 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.

Ensure 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.

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 the 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.

Supported Remote Management Server Models and Minimum Firmware Versions

You can use remote management applications to install ESXi or for remote management of hosts.

Table 3-16. Supported Remote Management Server Models and Firmware Versions

Remote Controller Make and Model	Firmware Version	Java
Dell DRAC 6	1.54 (Build 15), 1.70 (Build 21)	1.6.0_24
Dell DRAC 5	1.0, 1.45, 1.51	1.6.0_20,1.6.0_203
Dell DRAC 4	1.75	1.6.0_23
HP ILO	1.81, 1.92	1.6.0_22, 1.6.0_23
HP ILO 2	1.8, 1.81	1.6.0_20, 1.6.0_23
IBM RSA 2	1.03, 1.2	1.6.0_22

Update Manager Hardware Requirements

You can run Update Manager on any system that meets the minimum hardware requirements.

Minimum hardware requirements for Update Manager vary depending on how Update Manager is deployed. If the database is installed on the same machine as Update Manager, requirements for memory size and processor speed are higher. To ensure acceptable performance, verify that your system meets the minimum hardware requirements.

Table 3-17. Minimum Hardware Requirements

Hardware	Requirements
Processor	Intel or AMD x86 processor with two or more logical cores, each with a speed of 2GHz
Network	10/100 Mbps
	For best performance, use a Gigabit connection between Update Manager and the ESX/ESXi hosts
Memory	2GB RAM if Update Manager and vCenter Server are on different machines
	4GB RAM if Update Manager and vCenter Server are on the same machine

Update Manager uses a SQL Server or Oracle database. You should use a dedicated database for Update Manager, not a database shared with vCenter Server, and should back up the database periodically. Best practice is to have the database on the same computer as Update Manager or on a computer in the local network.

Depending on the size of your deployment, Update Manager requires a minimum amount of free space per month for database usage. For more information about space requirements, see the *VMware vSphere Update Manager Sizing Estimator*.

For more information about ESXi 5.x and vCenter Server 5.x hardware requirements, see Chapter 3, “System Requirements,” on page 13.

Supported Operating Systems and Database Formats

Update Manager works with specific databases and operating systems.

The Update Manager server requires a 64-bit Windows system.

NOTE Make sure the system on which you are installing the Update Manager server is not an Active Directory domain controller.

The Update Manager plug-in requires the vSphere Client, and works with the same operating systems as the vSphere Client.

Update Manager scans and remediates Windows and Linux virtual machines for VMware Tools and virtual hardware upgrades.

The Update Manager server requires SQL Server or Oracle database. Update Manager can handle small-scale environments using the bundled SQL Server 2008 R2 Express. For environments with more than 5 hosts and 50 virtual machines, create either an Oracle or a SQL Server database for Update Manager. For large scale environments, you should set up the Update Manager database on a different computer than the Update Manager server and the vCenter Server database.

For detailed information about supported operating systems and database formats, see the *vSphere Compatibility Guide* at http://www.vmware.com/resources/compatibility/search.php.

For detailed information about supported database formats, see the *VMware Product Interoperability Matrixes* at http://www.vmware.com/resources/compatibility/sim/interop_matrix.php.

Upgrading to vCenter Server 5.1

4

The upgrade to vCenter Server 5.1 includes a database schema upgrade and an upgrade of the vCenter Server software.

vSphere 5.1 introduces vCenter Single Sign On service as part of the vCenter Server management infrastructure. This change affects vCenter Server installation, upgrading, and operation. See "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30.

This chapter includes the following topics:

Preparing for the Upgrade to vCenter Server

Before you upgrade to vCenter Server, make sure your system is properly prepared.

To ensure that your system is prepared for the upgrade, read all the subtopics in this section.

About the vCenter Server 5.1 Upgrade

VMware supports in-place upgrades on 64-bit systems from vCenter Server 4.x and vCenter Server 5.0.x to vCenter Server 5.1.

Unlike earlier versions, vCenter Server 5.1 does not support directly migrating an existing vCenter Server to a new machine during an upgrade to version 5.1. You can migrate an existing vCenter Server to a new machine during an upgrade to version 5.0, and then perform an in-place upgrade from version 5.0 to version 5.1. See "Upgrading to vCenter Server on a Different Machine," on page 51.

vCenter Server 5.1 can manage ESX 4.x/ESXi 4.x and ESXi 5.0.x hosts in the same cluster with ESXi 5.1 hosts. vCenter Server 5.1 cannot manage ESX 2.x or 3.x hosts.

NOTE You cannot upgrade a vCenter Server 4.x instance that is running on Windows XP Professional x64 Edition to vCenter Server 5.1, because vCenter Server 5.1 does not support Windows XP Professional x64.

vSphere 5.1 introduces vCenter Single Sign On service as part of the vCenter Server management infrastructure. This change affects vCenter Server installation, upgrading, and operation. See "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30.

How vCenter Single Sign On Affects vCenter Server Installation and Upgrades

vSphere 5.1 introduces the vCenter Single Sign On service as part of the vCenter Server management infrastructure. This change affects vCenter Server installation, upgrading, and operation.

Authentication by vCenter Single Sign-On makes the VMware cloud infrastructure platform more secure by allowing the vSphere software components to communicate with each other through a secure token exchange mechanism, instead of requiring each component to authenticate a user separately with a directory service like Active Directory.

For information about configuring vCenter Single Sign On, see *vSphere Security*.

How vCenter Single Sign-On Affects New vCenter Server Installations

In vSphere versions before vSphere 5.1, vCenter Server was installed in a single operation that also silently installed the Inventory Service on the same host machine.

For small vSphere deployments, vCenter Server 5.1 provides a vCenter Server Simple Install option that installs vCenter Single Sign-On, Inventory Service, and vCenter Server on the same host or virtual machine.

Alternatively, to customize the location and setup of each component, you can install the components separately by selecting the individual installation options, in the following order: vCenter Single Sign-On, Inventory Service, and vCenter Server. Each component can be installed in a different host or virtual machine.

For the first installation of vCenter Server with vCenter Single Sign-On, you must install all three components, Single Sign-On Server, Inventory Service, and vCenter Server, in the vSphere environment. In subsequent installations of vCenter Server in your environment, you do not need to install Single Sign-On. One Single Sign-On server can serve your entire vSphere environment. After you install vCenter Single Sign-On once, you can connect all new vCenter Server instances to the same authentication server. However, you must install a Inventory Service instance for each vCenter Server instance.

How vCenter Single Sign-On Affects vCenter Server Upgrades

When you upgrade to vCenter Server 5.1, the upgrade process installs vCenter Single Sign-On first and then upgrades vCenter Server.

In upgrades to vCenter Server versions earlier than vCenter Server 5.1, both the local operating system users and Active Directory users that are registered with vCenter Server before the upgrade continue to work with the upgraded vCenter Server. This behavior changes in vCenter Server 5.1.

In vCenter Server 5.1, if vCenter Single Sign-On is running on a virtual machine or physical machine that is joined to an Active Directory domain, Single Sign-On will automatically discover the existing Active Directory domain and add it as an identity source during the Single Sign-On installation process. If Single Sign-On is not running on a virtual machine or physical machine that is in the same domain as Active Directory, you must use the vSphere Web Client to log in to vCenter Server and add the Active Directory domain to Single Sign-On.

If you install vCenter Single Sign-On and vCenter Server on the same physical machine or virtual machine, Single Sign-On recognizes existing local operating system users. After the upgrade, you can log in to vCenter Server with a registered local operating system user ID.

If you install vCenter Single Sign-On and vCenter Server on different hosts or virtual machines, the former local operating system users who managed login access to vCenter Server are not available to Single Sign-On.

When you install vCenter Single Sign-On in multisite mode or clustered high availability mode, all pre-upgrade permissions for local operating system users are lost. In vCenter Server 5.1, the term "local operating system users" refers to those local users in the Single Sign-On host machine instead of the vCenter Server host machine or virtual machine.

After the upgrade, if no super administrator remains (the administrative user or group for the root folder), you must provide a valid user or group to be used as super administrator during installation. This situation can occur due to changes in user stores from pre-5.1 to 5.1 versions of vSphere.

vCenter Single Sign-On Deployment Modes

vCenter Server provides several ways to deploy vCenter Single Sign-On to best serve your vSphere environment

You can deploy vCenter Single Sign-On in one of three modes.

Basic Basic mode installs a standalone version of vCenter Single Sign-On. Multiple vCenter Server and Inventory Service instances can point to it. If the Single Sign-On server or the virtual machine hosting the server fails, administrators cannot access vCenter Server, but ESXi hosts continue to function normally. Multiple Active Directory and OpenLDAP instances can be added as identity sources.

High Availability Cluster Cluster mode installs two or more vCenter Single Sign-On instances in high availability mode. All instances use the same database and point to the same identity sources. Single Sign-On administrator users, when connected to vCenter Server through the vSphere Web Client, will see the primary Single Sign-On instance.

Multisite Multisite mode is designed for deployments with multiple physical locations. Installing a Single Sign-On instance at each site allows fast access to local authentication-related services. Each Single Sign-On instance is connected to the local instances of the AD (LDAP) servers and has its own database with local users and groups. In each datacenter, you can install Single Sign-On in standalone or clustered mode, pointing to the identity sources in that location.

Multisite deployment is useful when a single administrator needs to administer vCenter Server instances that are deployed on geographically dispersed sites. To view all vCenter Server instances from a single vSphere Web Client, you must configure the vCenter Server instances in Linked Mode.

NOTE Multisite Single Sign-On deployment is designed only for faster local access to authentication-related services. It does not provide failover between Single Sign-On servers on different sites. When the Single Sign-On instance on one site fails, its role is not taken over by a peer Single Sign-On instance on another site. All authentication requests on the failed site will fail, even if peer sites are fully functional.

In multisite Single Sign-On deployments, each site is represented by one Single Sign-On instance: one Single Sign-On server, or a high-availability cluster. The Single Sign-On site entry point is the machine that other sites communicate with. This is the only machine that needs to be visible from the other sites. In a clustered deployment, the entry point of the site is the machine where the load balancer is installed.

You can install the Single Sign-On nodes in a multisite deployment in any order. The Single Sign-On installer uses the terms primary and secondary only to distinguish between the node that is installed first and any node that is installed later and points to a previously installed node. Any node that is installed after the primary node can point to any node that is already installed. For example, the third node can point to either the first or second node.

For example, consider a corporation MyCompany, with offices in San Francisco, New York, and London. The New York site is the headquarters and connects with both the London and San Francisco sites. The London and San Francisco sites do not connect with each other. The MyCompany multisite Single Sign-On deployment would proceed in the following steps.

1. The administrators in London set up the first Single Sign-On instance.
2. The New York IT team sets up the second Single Sign-On instance, pointing it to the London instance.
3. The San Francisco IT team sets up the third Single Sign-On instance, pointing it to the New York instance.

vCenter Server instances in linked mode can be connected to different physical Single Sign-On servers, but must be connected to a single logical Single Sign-On server. A single logical Single Sign-On server can take any of the following forms.

- A single physical Single Sign-On server.
- Two nodes of a cluster. Effectively this is the same as a single physical Single Sign-On server because the nodes use the same Single Sign-On database.
- Two nodes in multisite mode.

vCenter Single Sign On Components

vCenter Single Sign On includes these components: STS (Security Token Service), an administration server, vCenter Lookup Service, and the RSA SSPI service.

When you install vCenter Single Sign-On, the following components are deployed.

STS (Security Token Service)	The STS service issues Security Assertion Markup Language (SAML) tokens. These security tokens pass information about a system user between an identity provider and a web service. This service enables a user who has logged on through vCenter Single Sign-On to use multiple web-service delivered applications without authenticating to each one.
Administration server	The Administration Server configures the vCenter Single Sign-On server and manages users and groups.
vCenter Lookup Service	The Lookup Service contains topology information about the vSphere infrastructure, enabling vSphere components to connect to each other securely.
RSA SSPI service	The Security Support Provider Interface is a Microsoft Windows-based API used to perform authentication against Security Support Providers such as NTLM and Kerberos.

vCenter Lookup Service

vCenter Lookup Service is a component of vCenter Single Sign On. Lookup Service registers the location of vSphere components so they can securely find and communicate with each other.

The vCenter Single Sign-On installer also deploys the VMware Lookup Service on the same address and port. The Lookup Service enables different components of vSphere to find one another in a secure way. When you install vCenter Server components after vCenter Single Sign-On, you must provide the Lookup Service URL. The Inventory Service and the vCenter Server installers ask for the Lookup Service URL and then contact the Lookup Service to find vCenter Single Sign-On. After installation, the Inventory Service and vCenter Server are registered in Lookup Service so other vSphere components, like the vSphere Web Client, can find them.

Setting the vCenter Server Administrator User

In vCenter Server 5.1 with vCenter Single Sign On, the way you set the vCenter Server administrator user depends on your vCenter Single Sign On deployment.

In vSphere versions before vSphere 5.1, vCenter Server administrators are the users that belong to the local operating system administrators group.

In vSphere 5.1, when you install vCenter Server, you must provide the default (initial) vCenter Server administrator user or group. For small deployments where vCenter Server and vCenter Single Sign-On are deployed on the same host machine, you can designate the local operating system group Administrators as vCenter Server administrative users. This option is the default. This behavior is unchanged from vCenter Server 5.0.

For larger installations, where vCenter Single Sign-On and vCenter Server are deployed on different hosts, you cannot preserve the same behavior as in vCenter Server 5.0. Instead, assign the vCenter Server administrator role to a user or group from an identity source that is registered in the vCenter Single Sign-On server: Active Directory, OpenLDAP, or the system identity source.

Adding Active Directory and OpenLDAP Domains to vCenter Server 5.1

In vCenter Server versions earlier than vCenter Server 5.1, vCenter Server adds Active Directory domains that the vCenter Server host or virtual machine is part of. In vCenter Server 5.1, vCenter Single Sign-On discovers those Active Directory domains that the vCenter Single Sign-On host or virtual machine is part of.

vCenter Single Sign-On adds those discovered Active Directory domains. Unlike earlier vCenter Server versions, which permit only one Active Directory domain at a time to be configured for vCenter Server, in vCenter Server 5.1 with Single Sign-On, you can add multiple Active Directory domains.

If you use Active Directory in your infrastructure and you want the Single Sign-On installer to add Active Directory automatically as a Single Sign-On identity source, the following requirements apply:

- You must log in as a domain user when you install Single Sign-On.
- You must install Single Sign-On on a machine joined to the Active Directory domain. In this case, all machines on which Single Sign-On servers will be installed must be joined to the same domain. The domain controllers might be different, but the Single Sign-On server will discover and add the local one.
- On the Single Sign-On host machine, the Active Directory machine account must have read permissions on the entire Active Directory and on the user and group attributes of the Active Directory.

vCenter Single Sign-On can also add multiple OpenLDAP domains, and you can configure vCenter Server to be available to users who are registered with these OpenLDAP repositories, enabling you to manage vCenter Server access without Active Directory.

For more information about vCenter Single Sign-On, see *vSphere Security*.

Authenticating to the vCenter Server 5.1 Environment

In vCenter Server 5.1, users authenticate through vCenter Single Sign On.

In vCenter Server versions earlier than vCenter Server 5.1, when a user connects to vCenter Server, vCenter Server authenticates the user by validating the user against an Active Directory domain or the list of local operating system users.

Because vCenter Server now has its own vCenter Single Sign-On server, you must create Single Sign-On users to manage the Single Sign-On server. These users might be different from the users that administer vCenter Server.

The default vCenter Single Sign-On administrator user ID is admin@System-Domain. You can create Single Sign-On administrator users with the Single Sign-On administration tool in the vSphere Web Client. You can associate the following permissions with these users: Basic, Regular, and Administrator.

Users can log in to vCenter Server with the vSphere Client or the vSphere Web Client.

- Using the vSphere Client, the user logs in to each vCenter Server separately. All linked vCenter Server instances are visible on the left pane of the vSphere Client. The vSphere Client does not show vCenter Server systems that are not linked to the vCenter Server that the user logged in to unless the user connects to those vCenter Server systems explicitly. This behavior is unchanged from vCenter Server versions earlier than version 5.1.
- Using the vSphere Web Client, users authenticate to vCenter Single Sign-On, and are connected to the vSphere Web Client. Users can view all the vCenter Server instances that the user has permissions on. After users connect to vCenter Server, no further authentication is required. The actions users can perform on objects depend on the user's vCenter Server permissions on those objects.

For vCenter Server versions earlier than vCenter Server 5.1, you must explicitly register each vCenter Server system with the vSphere Web Client, using the vSphere Web Client Administration Application.

For more information about vCenter Single Sign On, see *vSphere Security*.

How vCenter Single Sign-On Deployment Scenarios Affect Log In Behavior

The way that you deploy vCenter Single Sign-On and the type of user who installs vCenter Single Sign-On affects which administrator user accounts have privileges on the Single Sign-On server and on vCenter Server.

During the vCenter Server installation process, certain users are granted privileges to log in to vCenter Server and certain users are granted privileges to manage vCenter Single Sign-On. The vCenter Server administrator might not be the same user as the vCenter Single Sign-On administrator. This means that when you log in to the vSphere Web Client as the default Single Sign-On administrator (admin@System-Domain), you might not see any vCenter Server systems in the inventory. The inventory appears to be empty because you see only the systems upon which you have privileges in the vSphere Web Client.

This also means that when you log in to the vSphere Web Client as the default vCenter Server administrator, you might not see the vCenter Single Sign-On configuration tool. The configuration tool is not present because only the default vCenter Single Sign-On Administrator (admin@System-Domain) is allowed to view and manage vCenter Single Sign-On after installation. The Single Sign-On administrator can create additional administrator users if necessary.

Login Behavior When You Use vCenter Simple Install

The vCenter Simple Install process installs vCenter Single Sign-On, the Inventory Service, and vCenter Server on one system. The account you use when you run the Simple Install process affects which users have privileges on which components.

When you log in as a domain account user or local account user to install vCenter Server using vCenter Simple Install, the following behavior occurs upon installation.

- By default, users in the local operating system Administrators group can log in to the vSphere Web Client and vCenter Server. These users cannot configure Single Sign-On or view the Single Sign-On management interface in the vSphere Web Client.
- By default, the vCenter Single Sign-On administrator user is admin@System-Domain. This user can log in to the vSphere Web Client to configure Single Sign-On and add accounts to manage Single Sign-On if necessary. This user cannot view or configure vCenter Server.
- If you are logged in as a domain account user, the default Active Directory identity sources are discovered automatically during vCenter Single Sign On installation. If you are logged in as a local account user, Active Directory identity sources are not discovered automatically during vCenter Single Sign On installation.
- The local operating system (localos or *hostname*) users are added as an identity source.

Login Behavior When You Deploy vCenter Single Sign-On as a Standalone Server

Deploying vCenter Single Sign-On in Basic mode means that a standalone version of vCenter Single Sign-On is installed on a system. Multiple vCenter Server, Inventory Service, and vSphere Web Client instances can point to this standalone version of vCenter Single Sign-On.

In this deployment scenario, the installation process grants admin@System-Domain vCenter Server privileges by default. In addition, the installation process creates the user admin@System-Domain to manage vCenter Single Sign-On.

NOTE When you install vCenter Server components with separate installers, you can choose which account or group can log in to vCenter Server upon installation. Specify this account or group on the Single Sign-On Information page of the installer, in the following text box: **vCenter Server administrator recognized by vCenter Single Sign-On**. For example, to grant a group of domain administrators permission to log in to vCenter Server, type of name of the domain administrators group, such as Domain Admins@VCADSSO.LOCAL.

In high availablity and multisite Single Sign-On modes, there is no local operating system identity source. Therefore, it will not work if you enter **`Administrators`** or **`Administrator`** in the text box **vCenter Server administrator recognized by vCenter Single Sign-On**. **`Administrators`** is treated as the local operating system group Administrators, and **`Administrator`** is treated me as local operating system user Administrator.

Installing in Basic Mode as Domain Account User

When you log in as a domain account user to install vCenter Single Sign-On in basic mode, on a separate system from the Inventory Service and vCenter Server, the following behavior occurs upon installation.

- By default, the user admin@System-Domain can log in to the vSphere Web Client and vCenter Server.
- The default Active Directory identity sources are discovered.
- The local operating system (localos or *hostname*) users are added as an identity source.

Installing in Basic Mode as Local Account User

When you log in as a local account user to install vCenter Single Sign-On in basic mode, on a separate system from the Inventory Service and vCenter Server, the following behavior occurs upon installation.

- By default, the user admin@System-Domain can log in to the vSphere Web Client and vCenter Server.
- Active Directory identity sources are not discovered.
- The local operating system (localos or *hostname*) users are added as an identity source.

Login Behavior When You Install a Cluster of vCenter Single Sign-On Instances

Deploying vCenter Single Sign-On as a cluster means that two or more instances of vCenter Single Sign-On are installed in high availability mode. vCenter Single Sign-On high availability mode is not the same as vSphere HA. All instances of vCenter Single Sign-On use the same database and point to the same identity sources. Single Sign-On administrator users see the primary Single Sign-On instance when they connect to vCenter Server through the vSphere Web Client.

In this deployment scenario, the installation process grants admin@System-Domain vCenter Server privileges by default. In addition, the installation process creates the user admin@System-Domain to manage vCenter Single Sign-On.

Note When you install vCenter Server components with separate installers, you can choose which account or group can log in to vCenter Server upon installation. Specify this account or group on the Single Sign-On Information page of the installer, in the following text box: **vCenter Server administrator recognized by vCenter Single Sign-On**. For example, to grant a group of domain administrators permission to log in to vCenter Server, type of name of the domain administrators group, such as Domain Admins@VCADSSO.LOCAL.

In high availablity and multisite Single Sign-On modes, there is no local operating system identity source. Therefore, it will not work if you enter **`Administrators`** or **`Administrator`** in the text box **vCenter Server administrator recognized by vCenter Single Sign-On**. **`Administrators`** is treated as the local operating system group Administrators, and **`Administrator`** is treated me as local operating system user Administrator.

When you log in as a domain account user or local account user to install vCenter Single Sign-On in cluster mode, on a separate system from the Inventory Service and vCenter Server, the following behavior occurs upon installation.

- By default, the user admin@System-Domain can log in to the vSphere Web Client and vCenter Server.
- If you are logged in as a domain account user, the default Active Directory identity sources are discovered. If you are logged in as a local account user, Active Directory identity sources are not discovered.

Identity Sources for vCenter Server with vCenter Single Sign On

vCenter Server 5.1 with vCenter Single Sign On adds support for several new types of user repository.

vCenter Server versions earlier than version 5.1 supported Active Directory and local operating system users as user repositories. vCenter Server 5.1 supports the following types of user repositories as identity sources.

- Active Directory.
- OpenLDAP.
- Local operating system.
- System.

vCenter Single Sign-On identity sources are managed by Single Sign-On administrator users. You can attach multiple identity sources from each type to a single Single Sign-On server.

Each identity source has a name that is unique within the scope of the corresponding Single Sign-On server instance. There is always exactly one System identity source, named System-Domain.

There can be at most one local operating system identity source. On Linux systems, the identity source label is localOS. On Windows systems, the identity source label is the system's host name. The local operating system identity source can exist only in non-clustered Single Sign-On server deployments.

You can attach remote identity sources to a Single Sign-On server instance. Remote identity sources are limited to any of Active Directory, and OpenLDAP server implementations.

During Single Sign On installation, the installer can automatically discover Active Directory identity sources, if your system meets the appropriate prerequisites. See the section "Network Prerequisites" in "Prerequisites for the vCenter Server Upgrade," on page 46.

For more information about vCenter Single Sign On, see *vSphere Security*.

vCenter Server Upgrade Summary

The upgrade to vCenter Server 5.1 affects other software components of your datacenter.

Table 4-1 summarizes the effect on your datacenter components.

Table 4-1. Upgrading vCenter Server Components

Product	Component	Description
vCenter Server, vSphere Client, and vSphere Web Client	VI Client 1.x	Not supported.
	VirtualCenter Server 1.x	Not supported.
	VirtualCenter Server 2.0	Not supported.
	VirtualCenter Server 2.5	Not supported.
	VirtualCenter Server 2.5 Update 6	Upgrade by using the data migration tool to upgrade to vCenter Server 5.0.x on a different machine, and then perform an in-place upgrade to vCenter Server 5.1.x.
	vCenter Server 4.0	Upgrade in place if it is installed on a 64-bit system. If it is installed on a 32-bit system, upgrade by using the data migration tool to upgrade to vCenter Server 5.0.x on a different machine, and then perform an in-place upgrade to vCenter Server 5.1.x
	vSphere Client 4.0	Not supported.
	vCenter Server 4.1.x	In-place upgrade to vCenter Server 5.1.x.
	vSphere Client 4.1	Not supported.
	vCenter Server 5.0.x	In-place upgrade to vCenter Server 5.1.x.
	vCenter Server 5.1	In-place upgrade to vCenter Server 5.1.x.
	vCenter Client 5.0	Upgrade to vCenter Client 5.1.
	vSphere Web Client 5.0	Upgrade to vSphere Web Client 5.1.
	IBM DB2 database	Verify that your database is supported. Upgrade if necessary.
	Oracle database	Verify that your database is supported. Upgrade if necessary. Oracle 9i is no longer supported.
	SQL database	Verify that your database is supported. Upgrade if necessary.
	Linked Mode	You cannot join a vCenter Server to a Linked Mode group during the upgrade procedure. Join after the upgrade to vCenter Server is complete. If you are upgrading a version 5.0.x vCenter Server that is part of a Linked Mode group, it will not be removed from the group. If you are upgrading a pre-5.0 vCenter Server that is part of a Linked Mode group, it will be removed from the group. vCenter Server does not support Linked Mode groups that contain both version 5.x and pre-5.0 versions of vCenter Server. After all vCenter Servers in the group are upgraded to version 5.x, you can rejoin them.
ESX and ESXi	ESX 2.5 host	Not supported with vCenter Server 5.x
	VMFS2 volumes	Supported as read-only (deprecated).
	VM2 virtual machines	Upgrade (optional).
	VMDK2 virtual disk	Not supported with vCenter Server 5.x

Table 4-1. Upgrading vCenter Server Components (Continued)

Product	Component	Description
	ESX MUI	No change.
	VMware Tools	Upgrade (optional).
	ESX/ESXi 3.5 host	Not supported with vCenter Server 5.1. Upgrade to ESXi 5.1.
	ESX/ESXi 4.0 host	Upgrade to ESXi 5.1 (optional)
	ESX/ESXi 4.1 host	Upgrade to ESXi 5.1 (optional).
	ESXi 5.0 host	Upgrade to ESXi 5.1 (optional).
	VMFS3 volumes	No change.
	VM3 virtual machines	Upgrade (optional).
	VMDK3 virtual disk	Not supported with vCenter Server 5.x.
vSphere Auto Deploy	Auto Deploy 5.0 or 5.0.1	Upgrade to Auto Deploy 5.1. vCenter Server 5.1. You must upgrade Auto Deploy to version 5.1 for use with vCenter Server 5.1

Required Information for Installing or Upgrading vCenter Single Sign-On, Inventory Service, and vCenter Server

Prepare for the vCenter Server installation by recording the values that the vCenter Server system requires.

The vCenter Server installation wizard prompts you for the installation information. Keep a record of the values entered, in case you must reinstall vCenter Server. You can print this topic as a worksheet to record the information that you need for the installation or upgrade.

NOTE Depending on the type of installation or upgrade you are doing, some entries might not be required.

Table 4-2. Information Required for vCenter Single Sign-On Installation

Required Information	Default	Your Entry
Setup Language. This selection controls the language only for the installer.	English	
Single Sign-On deployment type. (Not applicable for Simple Install.) Create the primary node for a new vCenter Single Sign-On installation or an additional node to join to an existing high availability or multisite vCenter Single Sign-On installation.		
If you are creating the primary node for a new Single Sign-On installation, choose one of the following options. (Not applicable for Simple Install.) ■ Basic: the only node in a single node Single Sign-On installation, accessible by local system users. ■ The primary node for a new multinode high availability or multisite Single Sign-On installation.		
If you are creating an additional node to join to an existing high availability or multisite vCenter Single Sign-On installation, select one of the following options. (Not applicable for Simple Install.) ■ High availability: for scalability and availability. You can install multiple Single Sign-On servers and place them behind a load balancer. ■ Multisite: for large enterprises with multiple physical locations. Each physical site should have its own Single Sign-On cluster, to allow fast local Single Sign-On access.		

Table 4-2. Information Required for vCenter Single Sign-On Installation (Continued)

Required Information	Default	Your Entry
User name and password for the vCenter Single Sign-On administrator user account. You must use the same vCenter Single Sign-On user name and password name when you install vCenter Single Sign-On, and install or upgrade Inventory Service, vCenter Server, and the vSphere Web Client. IMPORTANT Be sure to record the password. If you need to restore the Single Sign-On configuration from a backup, the restore process requires the password you enter for the original Single Sign-On installation, even if you change the password later. The following characters are not supported in passwords: semicolon (;), double quotation mark ("), single quotation mark ('), circumflex (^), and backslash (\). Passwords must comply with Windows Group Policy Object (GPO) password policy.	admin@System-Domain	You cannot change the user name from the default during installation.
RSA_DBA password and RSA_USER password (for the bundled Microsoft SQL Server 2008 R2 Express database). If you are using the bundled database, the Sign-On installer creates the RSA_DBA and RSA_USER users, which are used to set up the Single Sign-On database schema and to perform certain steps after the installation. You must enter passwords for these users. The following characters are not supported in passwords: semicolon (;), double quotation mark ("), single quotation mark ('), circumflex (^), and backslash (\). Passwords must comply with Windows Group Policy Object (GPO) password policy.		
Database type (for an existing database). Supported version of Microsoft SQL, Oracle, or IBM DB2. See the VMware Product Interoperability Matrixes at http://partnerweb.vmware.com/comp_guide2/sim/interop_matrix.php? for supported versions.		
Database name (for an existing database).		The name of the existing database you created for Single Sign-On. The name can contain only alphanumeric characters.
Host name or IP address (for an existing database). The Single Sign-On database requires a static host name or IP address.		
Oracle SID (optional, for an existing Oracle database)		
Port (for an existing database). The Single Sign-On database requires a static port.	Microsoft SQL: 1433 Oracle: 1521 DB2: 50000	
Service name (for an existing Oracle database)		
Database user name (for an existing database). Enter the database user name of a user who has the required permissions. See "Required vCenter Single Sign-On Database Users," on page 45.		
Database password (for an existing database).		
Database user name (for an existing database). Enter the database user name of a user who has the required permissions. For a list of required permissions, see "Required vCenter Single Sign-On Database Users," on page 45.		

Table 4-2. Information Required for vCenter Single Sign-On Installation (Continued)

Required Information	Default	Your Entry
Database DBA user name (for an existing database). Enter the database user name of a user who has the required permissions. For a list of required permissions, see "Required vCenter Single Sign-On Database Users," on page 45.		
Database DBA password (for an existing database).		
JDBC URL (optional, for an existing database). JDBC connection information required if you are using an existing vCenter Single Sign-On database. If you are entering the JDBC URL, see "JDBC URL Formats for the vCenter Server Database," on page 54		
vCenter Single Sign-On Fully Qualified Domain Name or IP address.	The fully qualified host name of the current machine	The DNS machine name you entered for your IP.
SSPI service account information You can use the default Windows NetworkService account, or enter the account information for an administrator user.		If you plan to create a high availability Single Sign-On deployment, change this to an Active Directory user.
Destination folder. The folder in which to install vCenter Single Sign-On. The installation path cannot contain the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).	`C:\Program Files\VMware\Infrastructure`	
vCenter Single Sign-On HTTPS port.	7444	

Table 4-3. Information Required for Inventory Service Installation or Upgrade

Required Information	Default	Your Entry
Setup Language. This selection controls the language only for the installer.	English	
Destination folder. The folder to install Inventory Service in. The installation path cannot contain the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).	`C:\Program Files\VMware\Infrastructure`	
Fully Qualified Domain Name. The FQDN for the Inventory Service local system.		
vCenter Inventory Service HTTPS port.	10443	
vCenter Inventory Service management port.	10111	
vCenter Inventory Service Linked Mode communication port.	10109	

See "Required Ports for vCenter Server," on page 23.

Table 4-3. Information Required for Inventory Service Installation or Upgrade (Continued)

Required Information	Default	Your Entry
Inventory size. The inventory size of your vCenter Server deployment: ■ Small (less than 100 hosts or 1000 virtual machines. ■ Medium (100-400 hosts or 1000-4000 virtual machines. ■ Large (more than 400 hosts or 4000 virtual machines. 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 "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.		
User name for the vCenter Single Sign-On administrator user account. You must use the same vCenter Single Sign-On user name and password name when you install vCenter Single Sign-On, and install or upgrade Inventory Service, vCenter Server, and the vSphere Web Client.	admin@System-Domain	
Lookup Service URL. The Lookup Service URL takes the form https://*SSO_host_FQDN_or_IP*:7444/lookupservice/sdk, where 7444 is the default vCenter Single Sign-On HTTPS port number. If you enter a different port number when you install vCenter Single Sign-On, use that port number.		

Table 4-4. Information Required for vCenter Server Installation or Upgrade

Required Information	Default	Your Entry
Setup Language. This selection controls the language only for the installer.	English	
vCenter Server license key. If you omit the license key, vCenter Server is installed in evaluation mode. After you install vCenter Server, you can enter the vCenter Server license in the vSphere Client.		
Data source name (DSN). Required if you use an existing database. Not required if you are using the bundled Microsoft SQL Server 2008 Express database. Leading and trailing spaces are not supported. Remove spaces from the beginning or end of the DSN.		
Database user name. Database password.	Required to use an existing database. Not required if you are using the bundled database. Non-ASCII characters are not supported.	
JDBC URL for database. Required if you use an existing database. The vCenter Server installer should generate and validate the JDBC URL for the vCenter Server database. If the installer fails to connect to the database by using the generated JDBC URL, the installer prompts you to specify the JDBC URL. The format of the JDBC URL depends on the database that you are using. See "JDBC URL Formats for the vCenter Server Database," on page 54.v		

Table 4-4. Information Required for vCenter Server Installation or Upgrade (Continued)

Required Information	Default	Your Entry
vCenter Server Service account information. Can be the Microsoft Windows system account or a user-specified account. Use a user-specified account if you plan to use Microsoft Windows authentication for SQL Server.	Microsoft Windows system account	
Fully qualified domain name (FQDN) for the vCenter Server machine 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 appears. Change the entry to a resolvable FQDN. You must enter the FQDN, not the IP address.		
Standalone or join group. Join a Linked Mode group to enable the vSphere Client to view, search, and manage data across multiple vCenter Server systems.	Standalone	
Fully qualified domain name of Directory Services for the vCenter Server group. The FQDN of a remote instance of vCenter Server. Required if this instance of vCenter Server is joining a group. The local and remote instances will be members of a Linked Mode group.		
LDAP port for the Directory Services for the remote vCenter Server instance. The LDAP port of the remote instance. Required if this instance of vCenter Server is joining a Linked Mode group. See "Required Ports for vCenter Server," on page 23.	389	
vCenter Server HTTPS port.	443	
vCenter Server HTTP port.	80	
Heartbeat port (UDP) used for sending data to ESX/ESXi hosts.	902	
VMware VirtualCenter Management Webservices.	8080	
VMware VirtualCenter Management Webservices.	8443	
Web Services change service notification port.	60099	
LDAP port for the Directory Services for the local vCenter Server instance.	389	
SSL port for the Directory Services for the local vCenter Server instance.	636	

See "Required Ports for vCenter Server," on page 23.

Table 4-4. Information Required for vCenter Server Installation or Upgrade (Continued)

Required Information		Default	Your Entry
Ephemeral ports. Select **Increase the number of available ephemeral ports** if your vCenter Server manages hosts on which you will power on more than 2000 virtual machines simultaneously. This option prevents the pool of available ephemeral ports from being exhausted.			
Inventory size. The inventory size of your vCenter Server deployment: ■ Small (less than 100 hosts or 1000 virtual machines. ■ Medium (100-400 hosts or 1000-4000 virtual machines. ■ Large (more than 400 hosts or 4000 virtual machines. 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 "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.			
User name for the vCenter Single Sign-On administrator user account.	You must use the same vCenter Single Sign-On user name and password name when you install vCenter Single Sign-On, and install or upgrade Inventory Service, vCenter Server, and the vSphere Web Client.	admin@System-Domain	
Password for the vCenter Single Sign-On administrator user account.			
vCenter Server administrator recognized by vCenter Single Sign-On. The vCenter Server Administrator user or Users group who will have administrator privileges and can log in to vCenter Server after installation. You can also enter a domain user, in the form *user@domain_name* or a domain users group, in the form *domain_group@domain_name*.		If Single Sign-On is installed on the same host machine as vCenter Server: the local Administrators group. If Single Sign-On is installed on a different host machine than vCenter Server: admin@System-Domain.	
Lookup Service URL. The Lookup Service URL takes the form https://*SSO_host_FQDN_or_IP*:7444/lookupservice/sdk, where 7444 is the default vCenter Single Sign-On HTTPS port number. If you enter a different port number when you install vCenter Single Sign-On, use that port number.			

Table 4-4. Information Required for vCenter Server Installation or Upgrade (Continued)

Required Information	Default	Your Entry
Inventory Service URL. The inventory Service URL takes the form https://*Inventory_Service_host_FQDN_or_IP*:10443. 10443 is the default Inventory Service HTTPS port number. If you enter a different port number when you install Inventory Service, use that port number.		
Destination folder. The folder to install vCenter Server in. The installation path cannot contain the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).	`C:\Program Files\VMware\Infrastructure`	

Required vCenter Single Sign-On Database Users

When you use an existing database rather than the database bundled with vCenter Single Sign-On, the installation process requires database users with certain permissions.

When you install Single Sign-On installation using an existing database, the installer requires you to enter the user names and passwords of an existing database administrator and a database user.

When you install Single Sign-On with the bundled Microsoft SQL Server 2008 R2 Express database, the installer creates two users:

- A database administrator user (for example, RSA_DBA) and password, which are used to set up the Single Sign-On database schema.
- A database user (for example, RSA_USER) and password, which are used to perform certain steps after the installation.

The installer prompts you to enter the passwords for these users.

Best Practices for vCenter Server Upgrades

When you upgrade vCenter Server, you must understand and follow the best practices process for a successful upgrade.

To ensure that each upgrade is successful, follow these best practices:

1 Make sure that you understand the vCenter Server upgrade process, the effect of that process on your existing deployment, and the preparation required for the upgrade.

   - If your vSphere system includes VMware solutions or plug-ins, make sure they are compatible with the vCenter Server version that you are upgrading to. See the VMware Product Interoperability Matrix at http://www.vmware.com/resources/compatibility/sim/interop_matrix.php.
   - Read all the subtopics in "Preparing for the Upgrade to vCenter Server," on page 29.
   - Read the VMware vSphere 5.1.x Release Notes for known installation issues.
   - If your vSphere installation is in a VMware View environment, see "Upgrading vSphere Components Separately in a VMware View Environment," on page 214.

2 Prepare your system for the upgrade.

   - Make sure your system meets requirements for vCenter Server 5.1. See Chapter 3, "System Requirements," on page 13 and the VMware Compatibility Guide, at http://www.vmware.com/resources/compatibility/search.php.

- Verify that your existing database is supported for vCenter Server 5.1. See "vCenter Server Database Configuration Notes," on page 50 and the VMware Compatibility Guide, at http://www.vmware.com/resources/compatibility/search.php.
- Make sure that your vCenter Server database is prepared and permissions are correctly set. See the information about preparing vCenter server databases in the *vSphere Installation and Setup* documentation.
- Review the prerequisites for the upgrade. See "Prerequisites for the vCenter Server Upgrade," on page 46.

3 Back up your vCenter Server databases and SSL certificates
   - Make a full backup of the vCenter Server database and the vCenter Inventory Service database. For the vCenter Server database, see the vendor documentation for your vCenter Server database type. For the Inventory Service database, see the topics "Back Up the Inventory Service Database on Windows" and "Back Up the Inventory Service Database on Linux" in the *vSphere Installation and Setup* documentation.
   - Back up the SSL certificates that are on the vCenter Server system before you upgrade to vCenter Server 5.1. The default location of the SSL certificates is `%allusersprofile%\Application Data\VMware\VMware VirtualCenter`.
4 Stop the VMware VirtualCenter Server service.
5 Run the vCenter Host Agent Pre-Upgrade Checker, and resolve any issues. See "Run the vCenter Host Agent Pre-Upgrade Checker," on page 57.
6 Make sure that no processes are running that conflict with the ports that vCenter Server uses. See "Required Ports for vCenter Server," on page 23.
7 Run the vCenter Server upgrade.
8 Configure new vSphere 5.1 licenses.
9 Upgrade the vSphere Client and vSphere Web Client to version 5.1 to prevent compatibility problems that can interfere with the operation of the vSphere Client and vSphere Web Client. See "Upgrade the vSphere Client," on page 90 and "Install or Upgrade the vSphere Web Client," on page 91.
10 Review the topics in "After You Upgrade vCenter Server," on page 89 for post-upgrade requirements and options.

Prerequisites for the vCenter Server Upgrade

Before you begin the upgrade to vCenter Server, make sure you prepare the vCenter Server system and the database.

Prerequisites for Understanding and Preparing for the Upgrade Process

- vCenter Server 5.1 requires vCenter Single Sign On and Inventory Service. You must install or update these components in this order: vCenter Single Sign On, Inventory Service, and vCenter Server. Review the topics in the section "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30
- Review the release notes for known issues or special installation notes.
- Gather the information that is required to complete the installation wizard. See "Required Information for Installing or Upgrading vCenter Single Sign-On, Inventory Service, and vCenter Server," on page 39.
- Download the vCenter Server 5.1 installer from the VMware Web site.

System Prerequisites

- Verify that your system meets the requirements listed in "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17 and "vCenter Server Software Requirements," on page 21, and that the required ports are open, as discussed in "Required Ports for vCenter Server," on page 23.
- Review the Windows Group Policy Object (GPO) password policy for your system machines. The Single Sign On installation requires you to enter passwords that comply with GPO password policy.
- If your vSphere system includes VMware solutions or plug-ins, make sure they are compatible with the vCenter Server version that you are upgrading to. See the VMware Product Interoperability Matrix at http://www.vmware.com/resources/compatibility/sim/interop_matrix.php.
- If you do not intend to use evaluation mode, make sure that you have valid license keys for all purchased functionality. License keys from vSphere versions prior to version 5.0 are not supported in vCenter Server 5.x. If you do not have the license key, you can install in evaluation mode and use the vSphere Client or vSphere Web Client to enter the license key later.
- Close all instances of the VI Client, the vSphere Client, and the vSphere Web Client.
- Verify that the system on which you are upgrading vCenter Server is not an Active Directory primary or backup domain controller.
- Either remove any ESX Server 2.x or 3.x hosts from the vCenter Server inventory or upgrade these hosts to version 4.0 or later.
- Before you install or upgrade any vSphere product, synchronize the clocks of all machines on the vSphere network. See "Synchronizing Clocks on the vSphere Network," on page 53.
- Make sure that the computer name has 15 characters or fewer.
- Verify that the fully qualified domain name (FQDN) of the system where you will upgrade 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.
- Run the vCenter Host Agent Pre-Upgrade Checker.
- The installation path of the previous version of vCenter Server must be compatible with the installation requirements for Microsoft Active Directory Application Mode (ADAM/AD LDS). The installation path cannot contain any of the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%). If your previous version of vCenter Server does not meet this requirement, you must perform a clean installation of vCenter Server 5.1.
- Back up the SSL certificates that are on the vCenter Server system before you upgrade to vCenter Server 5.1. The default location of the SSL certificates is `%allusersprofile%\Application Data\VMware\VMware VirtualCenter`.
- Make sure that SSL certificate checking is enabled for all vSphere HA clusters. If certificate checking is not enabled when you upgrade, HA will fail to configure on the hosts. Select **Administration > vCenter Server Settings > SSL Settings > vCenter requires verified host SSL certificates**. Follow the instructions to verify each host SSL certificate and click **OK**.
- If the vCenter Server 4.x environment that you are upgrading includes Guided Consolidation 4.x, uninstall Guided Consolidation before upgrading to vCenter Server 5.1.
- Before the vCenter Server upgrade, in the Administrative Tools control panel of the vCenter Single Sign On instance that you will register vCenter Server to, verify that the vCenter Single Sign On and RSA SSPI services are started.

- You must log in as a member of the Administrators group on the host machine, with a user name that does not contain any non-ASCII characters.

Network Prerequisites

- Verify that DNS reverse lookup returns a fully qualified domain name when queried with the IP address of the vCenter Server. When you upgrade 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.
- If you use DHCP instead of a manually assigned (static) IP address for vCenter Server, make sure that the vCenter Server computer name is updated in the domain name service (DNS). Test this is by pinging the computer name. 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.
- 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.
- For the vCenter Single Sign On installer to automatically discover Active Directory identity sources, verify that the following conditions are met.
  - The Active Directory identity source must be able to authenticate the user who is logged in to perform the Single Sign On installation.
  - The DNS of the Single Sign On Server host machine must contain both lookup and reverse lookup entries for the domain controller of the Active Directory. For example, pinging *mycompany.com* should return the domain controller IP address for *mycompany*. Similarly, the `ping -a` command for that IP address should return the domain controller hostname. Avoid trying to correct name resolution issues by editing the hosts file. Instead, make sure that the DNS server is correctly set up.
  - The system clock of the Single Sign On Server host machine must be synchronized with the clock of the domain controller.

Prerequisites for All vCenter Server Databases

- If your database server is not supported by vCenter Server, perform a database upgrade to a supported version or import your database into a supported version. See "Supported Database Upgrades," on page 51.
- Perform a complete backup of the vCenter Server database before you begin the upgrade.

  To remove the DBO role, you can migrate all objects in the DBO schema to a custom schema. See the VMware knowledge base article at http://kb.vmware.com/kb/1036331.
- You must have login credentials, the database name, and the database server name that will be used by the vCenter Server database. The database server name is typically the ODBC System database source name (DSN) connection name for the vCenter Server database.
- Review "Supported Database Upgrades," on page 51.

Prerequisites for Microsoft SQL Databases

- To use a newly supported Microsoft SQL database, such as Microsoft SQL 2008, you do not need to perform a clean installation of vCenter Server if your existing database is also Microsoft SQL Server. For example, you can upgrade a Microsoft SQL Server 2000 database to Microsoft SQL Server 2005 or Microsoft SQL Server 2008 and then upgrade vCenter Server 4.0 or higher to vCenter Server 5.1. When you migrate the database from Microsoft SQL Server 2000 to Microsoft SQL Server 2005 or higher, set the compatibility level of the database to 90.
- JDK 1.6 must be installed on the vCenter Server machine. In addition, `sqljdbc4.jar` must be added to the CLASSPATH variable on the machine where vCenter Server is to be upgraded. If it is not installed on your system, the vCenter Server installer installs it. The JDK 1.6 installation might require Internet connectivity.
- Your system DSN must be using the SQL Native Client driver.
- Grant the following permissions to the vCenter user in the vCenter database:

```
GRANT ALTER ON SCHEMA :: <schema> to <user>;
GRANT REFERENCES ON SCHEMA :: <schema> to <user>;
GRANT INSERT ON SCHEMA :: <schema>  to <user>;
GRANT CREATE TABLE to <user>;
GRANT CREATE VIEW to <user>;
GRANT CREATE Procedure to <user>;
```

  Grant the following permissions to the user in the MSDB database:

```
GRANT SELECT on msdb.dbo.syscategories to <user>;
GRANT SELECT on msdb.dbo.sysjobsteps to <user>;
GRANT SELECT ON msdb.dbo.sysjobs to <user>;
GRANT EXECUTE ON msdb.dbo.sp_add_job TO <user>;
GRANT EXECUTE ON msdb.dbo.sp_delete_job TO <user>;
GRANT EXECUTE ON msdb.dbo.sp_add_jobstep TO <user>;
GRANT EXECUTE ON msdb.dbo.sp_update_job TO <user>;
GRANT EXECUTE ON msdb.dbo.sp_add_category TO <user>;
GRANT EXECUTE ON msdb.dbo.sp_add_jobserver TO <user>;
GRANT EXECUTE ON msdb.dbo.sp_add_jobschedule TO <user>;
```

Prerequisites for Oracle Databases

- To use a newly supported Oracle database, such as Oracle 11g, you do not need to perform a clean installation of vCenter Server if your existing database is also Oracle. For example, you can upgrade your existing Oracle 9i database to Oracle 10g or Oracle 11g and then upgrade vCenter Server 4.x to vCenter Server 5.1.
- The JDBC driver file must be included in the CLASSPATH variable.
- Either assign the DBA role or grant the following permissions to the user:

```
grant connect to <user>
grant resource to <user>
grant create view to <user>
grant create any sequence to <user>
grant create any table to <user>
grant create materialized view to <user>
grant execute on dbms_job to <user>
grant execute on dbms_lock to <user>
grant unlimited tablespace to <user> # To ensure sufficient space
```

  After the upgrade is complete, you can optionally remove the following permissions from the user profile: **create any sequence** and **create any table**.

By default, the **RESOURCE** role has the **CREATE PROCEDURE**, **CREATE TABLE**, and **CREATE SEQUENCE** privileges assigned. If the **RESOURCE** role lacks these privileges, grant them to the vCenter Server database user.

Prerequisite for IBM DB2 Databases

- To use a newly supported IBM DB2 database, you must use vCenter Server 4.0 Update 1 or higher. Previous releases of vCenter Server do not support DB2 databases.
- Grant the following permission to the user:

```
grant select on sysibmadm.applications to user <dbusername>
```

Prerequisite for the vCenter Single Sign On Database

- Create a vCenter Single Sign On database, unless you plan to install the bundled database.
- If you are using an existing database with your vCenter Single Sign-On installation or upgrade, make sure that the table spaces are named RSA_DATA and RSA_INDEX. Any other table space names will cause the vCenter Single Sign-On Installation to fail.
- If you are using an existing database for Single Sign On, to ensure that table space is created for the database, run the script `rsaIMSLite`*`DBName`*`SetupTablespaces.sql`. The script is included in the vCenter Server installer download package, at *`vCenter Server Installation directory`*`\Single Sign On\DBScripts\SSOServer\Schema\`*`your_existing_database`*. You can run the script prior to the vCenter Server upgrade, or during the upgrade, when you are prompted by the Single Sign On installer. You can leave the installer to run the script, and resume the installer after you run the script.
- If you are using an existing database for Single Sign On, you must create a database user (RSA_USER) and database administrator (RSA_DBA) to use for the Single Sign On database installation and setup. To create these users, run the script `rsaIMSLite`*`DBName`*`SetupUsers.sql`. The script is included in the vCenter Server installer download package, at *`vCenter Server Installation directory`*`\SSOServer`.

vCenter Server Database Configuration Notes

After you choose a supported database type, make sure you understand any special configuration requirements.

Table 4-5 is not a complete list of databases supported with vCenter Server. For information about specific database versions and service pack configurations supported with vCenter Server, see the VMware Product Interoperability Matrixes. This topic is intended only to provide special database configuration notes not listed in the Product Interoperability Matrixes.

NOTE vCenter Update Manager also requires a database. VMware recommends that you use separate databases for vCenter Server and vCenter Update Manager.

---

vCenter Server databases require a UTF code set.

See also "Supported Database Upgrades," on page 51.

Table 4-5. Configuration Notes for Databases Supported with vCenter Server

Database Type	Configuration Notes
IBM DB2	If the database is not local to the vCenter Server system, install the IBM Data Server Runtime Client. Install the IBM DB2 native client according to the IBM instructions for your DB2 version. Ensure that the DB2 binaries directory (typically `C:\Program Files\IBM\SQLLIB\BIN`) is in the system path. DB2 might be installed at a different location. You might need to restart the Microsoft Windows machine for the service to recognize the change in the environment variable. Ensure that the machine has a valid ODBC data source name (DSN) entry. **Note** This database is not supported for the vCenter Server Appliance.
Microsoft SQL Server 2008 R2 Express	Bundled database that you can use for small deployments of up to 5 hosts and 50 virtual machines. You cannot install the bundled database during an upgrade to vCenter Server. To use the bundled database, Microsoft SQL Server 2008 R2 Express must be already installed or you must perform a clean installation of vCenter Server. **Note** This database is not supported for the vCenter Server Appliance.
Microsoft SQL Server 2005	Ensure that the machine has a valid ODBC DSN entry. **Note** This database is not supported for the vCenter Server Appliance.
Microsoft SQL Server 2008	Ensure that the machine has a valid ODBC DSN entry. **Note** This database is not supported for the vCenter Server Appliance.
Oracle	Ensure that the machine has a valid ODBC DSN entry. After you complete the vCenter Server installation, take the following steps: ■ Apply the latest patch to the Oracle client and server. ■ Copy the Oracle JDBC driver (ojdbc14.jar or ojdbc5.jar) to the vCenter Server installation directory, in the `tomcat\lib` subdirectory: *`vCenter install location`*`\Infrastructure\tomcat\lib`. The vCenter Server installer attempts to copy the Oracle JDBC driver from the Oracle client location to the vCenter Server installation directory. If the Oracle JDBC driver is not found in the Oracle client location, the vCenter Server installer prompts you to copy the file manually. You can download the file from the oracle.com Web site.

Upgrading to vCenter Server on a Different Machine

Instead of performing an in-place upgrade to vCenter Server, you might want to use a different machine for your upgrade. Because vCenter Server 5.x requires a 64-bit platform, you cannot upgrade from a version of vCenter Server installed on a 32-bit platform.

The vCenter Server 5.0 installation media include a data migration tool. When you upgrade to version 5.0, you can use this tool to migrate configuration information such as port settings, SSL certificates, and license information from your existing vCenter Server host. This data migration tool is not supported for vCenter Server 5.1. You cannot directly migrate an existing vCenter Server to a different machine during an upgrade to version 5.1. You can migrate an existing vCenter Server to a different machine during an upgrade to version 5.0, and then perform an in-place upgrade from version 5.0 to version 5.1. See the version 5.0 *vSphere Upgrade* documentation.

Supported Database Upgrades

When you upgrade to vCenter Server 5.1, make sure that the upgraded version supports your database.

Table 4-6 lists the database types that you can use with vCenter Server 5.1. For a list of the specific database versions supported for each type, see the VMware Product Interoperability Matrix at http://www.vmware.com/resources/compatibility/sim/interop_matrix.php.

Table 4-6. vCenter Server Upgrade Scenarios for Each Database Type

Database Type	Supported in vCenter Server 5.1	Supported Upgrade
IBM DB2 9.5	No	After you upgrade to a database server that is supported by vCenter Server, you can install or upgrade to vCenter Server.
IBM DB2 9.7	Yes (not supported by vSphere Update Manager)	You can upgrade to vCenter Server 5.1 from vCenter Server 4.0 Update 3, Center Server 4.1 Update 1, and vCenter Server 5.0.x.
Experimental MSDE database	No	After you upgrade to a database server that is supported by vCenter Server, you can install or upgrade to vCenter Server.
MS SQL Server 2000	No	After you upgrade to a database server that is supported by vCenter Server, you can install or upgrade to vCenter Server.
MS SQL Server 2005 Express	No	You can upgrade to vCenter Server 5.1. vCenter Server will retain the same MS SQL database version and engine (MS SQL 2005).
MS SQL Server 2005	Yes	You can install or upgrade to vCenter Server.
MS SQL Server 2008 Express	Yes	You can upgrade to vCenter Server 5.1 from vCenter Server 5.0. vCenter Server 5.0 is the first release that supports Microsoft SQL Server 2008 Express.
MS SQL Server 2008	Yes	You can install or upgrade to vCenter Server.
Oracle 9i	No	After you upgrade to a database server that is supported by vCenter Server, you can install or upgrade to vCenter Server.
Oracle 10g	Yes	You can install or upgrade to vCenter Server.
Oracle 11g	Yes	You can install or upgrade to vCenter Server.

Configure vCenter Server to Communicate with the Local Database

The machine on which you install or upgrade to vCenter Server must have a computer name that is 15 characters or fewer. If your database is located on the same machine on which vCenter Server will be installed, and you have recently changed the name of this machine to comply with the name-length requirement, make sure the vCenter Server DSN is configured to communicate with the new name of the machine.

Changing the vCenter Server computer name impacts database communication if the database server is on the same computer with vCenter Server. If you changed the machine name, you can verify that communication remains intact.

The name change has no effect on communication with remote databases. You can skip this procedure if your database is remote.

NOTE The name-length limitation applies to the vCenter Server system. The data source name (DSN) and remote database systems can have names with more than 15 characters.

Check with your database administrator or the database vendor to make sure all components of the database are working after you rename the server.

Prerequisites

- Make sure the database server is running.
- 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.

Procedure

1 Update the data source information, as needed.

2 Verify the data source connectivity.

Synchronizing Clocks on the vSphere Network

Before you install vCenter Single Sign On, install the vSphere Web Client, or deploy the vCenter Server appliance, make sure all machines on the vSphere network have their clocks synchronized.

If the clocks on vCenter Server network machines are not synchronized, SSL certificates, which are time-sensitive, might not be recognized as valid in communications between network machines. Unsynchronized clocks can result in authentication problems, which can cause the vSphere Web Client installation to fail or prevent the vCenter Server Appliance vpxd service from starting.

Synchronize ESX and ESXi Clocks with a Network Time Server

Before you install vCenter Single Sign On, the vSphere Web Client, or the vCenter Server appliance, make sure all machines on the vSphere network have their clocks synchronized.

Procedure

1 From the vSphere Web Client, connect to the vCenter Server.

2 Select the host in the inventory.

3 Select the **Manage** tab.

4 Select **Settings**.

5 Select **Time Configuration**.

6 Click **Edit**.

7 Select **Use Network Time Protocol (Enable NTP Client)**.

8 Set the NTP Service Status and NTP Service Startup Policy.

9 Enter the IP addresses of the NTP servers to synchronize with.

The host synchronizes with the NTP servers as specified in your settings.

Synchronize the vCenter Server Appliance Clock with an NTP Server

Before you deploy the vCenter Server Appliance or install vCenter Single Sign On on Windows, make sure all machines on the network have their clocks synchronized. Unsynchonized clocks can cause installation and authentication errors.

On systems joined to a Windows domain, the vCenter Server Appliance clock is synchronized automatically with the domain controller. On other systems, you can enable synchronizing the clock through VMware Tools. See the *Installing and Configuring VMware Tools Guide*. As an alternative, you can use this procedure.

Procedure

1 Log into the vCenter Server Appliance as root.

2 From a command line, enter the following commands to configure and start an NTP client.

```
yast2 ntp-client add server=your_chosen_time_server
yast2 ntp-client enable
```

3 Enter the following command to request immediate synchronization with the time server.

```
sntp -P no -r your_chosen_time_server
```

The vCenter Server Appliance clock is synchronized with the NTP server.

Configure a Windows NTP Client for Network Clock Synchronization

The clocks of all servers on the vSphere network must be synchronized. You can configure a Windows NTP client as a source for clock synchronization on Windows servers.

Use the registry editor on the Windows server to make the configuration changes.

Procedure

1 Enable NTP mode.

   a Go to the registry setting HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Parameters

   b Set the Type value to **NTP**.

2 Enable the NTP client.

   a Go to the registry setting HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\Config

   b Set the AnnounceFlags value to **5**.

3 Enter the upstream NTP servers to synchronize from.

   a Go to the registry setting HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders.

   b Set the NtpServer value to a list of at least three NTP servers.

   For example, you might set the value to 0x1 1.pool.ntp.org,0x1 2.pool.ntp.org,0x1 3.pool.ntp.org.

4 Specify a 150-minute update interval.

   a Go to the registry setting HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W32Time\TimeProviders\NtpClient,

   b Set the SpecialPollInterval value to **900**.

5 Restart the W32time service for the changes to take effect.

JDBC URL Formats for the vCenter Server Database

The vCenter Server installer generates and validates the JDBC URL for the vCenter Server database. If the installer fails to connect to the database using the generated JDBC URL, the installer will prompt you to specify the JDBC URL.

JDBC URL Notes for All Databases

NOTE The domain name cannot contain the exclamation point character (!). Java interprets the exclamation point as a jar file separator.

JDBC URL Formats for Microsoft SQL Server Databases

For Microsoft SQL Server databases, you can use the following example JDBC URLs as a model:

- Connect to default (unnamed) SQL Server instance by host name:

  jdbc:sqlserver://*host*;databaseName=*database*

- Connect to named instance by host name and instance name:

  jdbc:sqlserver://*host*;instanceName=*instance*;databaseName=*database*

- Connect to SQL Server by host name and port:

  jdbc:sqlserver://*host*:*port*;databaseName=*database*

- Connect by port:

  jdbc:sqlserver://localhost:1422;databaseName\=VIM_VCDB (user name, password, and database type to be passed separately)

- Connect to local server with integrated security:

  jdbc:sqlserver://localhost\\SQLEXP_VIM;databaseName=VIM_VCDB;integratedSecurity=true

- Connect to local server without integrated security:

  jdbc:sqlserver://localhost\\SQLEXP_VIM;databaseName\=VIM_VCDB (user name, password, and database type to be passed separately)

VMware vCenter Server JDBC configuration for Microsoft SQL Server might not work by default with direct IPv6 addresses. You must use one of the following forms:

- Use the host name form for a standard Type-4 JDBC URL (recommended):

  jdbc:sqlserver://*database-fully-qualified-host-name*:*port*

- Use direct IPv6 address format:

  jdbc:sqlserver://;serverName=[*IPv6-address*]

For more information about JDBC URL formatting for MS SQL databases, including port and instance configuration options, see the msdn.microsoft.com Web site. At the time of this topic's publication, the information was available at http://msdn.microsoft.com/en-us/library/ms378428.aspx.

JDBC URL Formats for Oracle Databases

For Oracle databases, you can use the following example JDBC URLs as a model:

- This format requires host name and address, port (default 1521) and service name (for example, "oracle.world"):

  jdbc:oracle:thin:@*host*:*port*/*service*

- This format requires host name and address, port (default 1521) and SID (for example, "ORCL"):

  jdbc:oracle:thin:@*host*:*port*:*SID*

- This format is for a fully configured Oracle client with Oracle Net, which is useful for non-TCP configuration or Oracle RAC (real application clusters):

  jdbc:oracle:thin:@*tnsname*

- The following example is for an Oracle RAC with a thin driver, without the full Oracle client installed:

  jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=rac1-vip)(PORT=1521))
  (ADDRESS=(PROTOCOL=TCP)(HOST=rac2-vip)(PORT=1521))(LOAD_BALANCE=yes)(FAILOVER=ON)
  (CONNECT_DATA=(SERVER=DEDICATED)(SERVICE_NAME=RAC.DBTEAM)(FAILOVER_MODE=(BACKUP=rac1)
  (TYPE=SELECT)(METHOD=BASIC)))))

  In this example, **rac1-vip** is first node virtual IP, **rac2-vip** is second node virtual IP, **RAC.DBTEAM** is RAC DB service name, and **rac1** is name of failover node.

For more information about JDBC URL formatting for Oracle databases, see the oracle.com Web site. At the time of this topic's publication, the information was available at http://download.oracle.com/docs/cd/B28359_01/java.111/b31224/urls.htm/BEIJFHHB

JDBC URL Formats for IBM DB2 Databases

For IBM DB2 databases, you can use the following example JDBC URLs as a model:

- This format requires host name and address, port (for example, 50000) and database name (as created at the server):

  jdbc:db2://*host*:*port*/*database*

- This format is for a fully configured DB2 client (namely "IBM Data Server Client"), where ***database*** is the local database alias. This example is useful for non-TCP configurations:

  jdbc:db2:*database*

For more information about JDBC URL formatting for IBM DB2 databases, see the publib.boulder.ibm.com Web site.

DNS Load Balancing Solutions and vCenter Server Datastore Naming

vCenter Server 5.x uses different internal identifiers for datastores than earlier versions of vCenter Server. This change affects the way that you add shared NFS datastores to hosts and can affect upgrades to vCenter Server 5.x.

vCenter Server versions before version 5.0 convert datastore host names to IP addresses. For example, if you mount an NFS datastore by the name \\nfs-datastore\folder, pre-5.0 vCenter Server versions convert the name nfs-datastore to an IP address like 10.23.121.25 before storing it. The original nfs-datastore name is lost.

This conversion of host names to IP addresses causes a problem when DNS load balancing solutions are used with vCenter Server. DNS load balancing solutions themselves replicate data and appear as a single logical datastore. The load balancing happens during the datastore host name-to-IP conversion by resolving the datastore host name to different IP addresses, depending on the load. This load balancing happens outside vCenter Server and is implemented by the DNS server. In vCenter Server versions before version 5.0, features like vMotion do not work with such DNS load balancing solutions because the load balancing causes one logical datastore to appear as several datastores. vCenter Server fails to perform vMotion because it cannot recognize that what it sees as multiple datastores are actually a single logical datastore that is shared between two hosts.

To solve this problem, vCenter Server versions 5.0 and later do not convert datastore names to IP addresses when you add datastores. This enables vCenter Server to recognize a shared datastore, but only if you add the datastore to each host by the same datastore name. For example, vCenter Server does not recognize a datastore as shared between hosts in the following cases.

- The datastore is added by IP address to host1 and by *hostname* to host2.
- The datastore is added by *hostname* to host1, and by *hostname.vmware.com* to host2.

For vCenter Server to recognize a datastore as shared, you must add the datastore by the same name to every host.

Datastore Names and Upgrades to vCenter Server 5.x

In vCenter Server versions before version 5.0, vCenter Server database stores datastore paths in the old format, as IP addresses. The upgrade to vCenter Server 5.x converts these paths to the new format. If you use a DNS load balancing solution with shared datastores, before you upgrade to vCenter Server 5.x, make sure that every shared datastore is mounted on each of its hosts with the same name.

The upgrade to vCenter Server 5.x might also fail from a lack of sufficient memory if you use a DNS load balancing solution with shared datastores. In a large vCenter Server database, the conversion of datastore paths to the new format can require a large amount of memory. See the VMware Knowledge Base article at http://kb.vmware.com/kb/2015055.

About the vCenter Host Agent Pre-Upgrade Checker

The vCenter Host Agent Pre-Upgrade Checker produces a report showing known issues that might prevent a successful upgrade of the vCenter Host Agent software.

To ensure a successful upgrade to vCenter Server 5.x, you must diagnose and fix any potential problems on the managed ESX/ESXi hosts. You can run the vCenter Host Agent Pre-Upgrade Checker for in-place upgrades from vCenter Server 4.x to vCenter Server 5.x.

vCenter Host Agent runs on all managed ESX/ESXi hosts. This software coordinates actions received from vCenter Server. When you add a host to vCenter Server, the agent is installed on the physical ESX/ESXi host. When you upgrade to vCenter Server 5.x, the agent residing on each ESX/ESXi host must be upgraded as well.

During a vCenter Server upgrade, the existing agent software is uninstalled and the updated agent software is installed in its place. If the upgrade fails, the updated agent software might not be installed and the host might become unreachable by vCenter Server 4.x or 5.x. To avoid this condition, you can run the vCenter Host Agent Pre-Upgrade Checker before you try to upgrade to vCenter Server 5.x.

The vCenter Host Agent Pre-Upgrade Checker checks to make sure that the agent software is ready to be upgraded. Some of the checks include checking to make sure that the host is reachable, the disk space is sufficient, the network is functioning, the file system is intact, and required patches are applied. Each time you run the tool, the system queries VMware.com and downloads any new updates for the tool. This action ensures that as new upgrade issues are discovered, the tool remains as useful as possible.

Important A successful vCenter Host Agent pre-upgrade check does not guarantee a successful upgrade to vCenter Server 5.x. An upgrade to vCenter Server involves multiple components, and the tool checks only one component: the vCenter Host Agent. Also, the tool checks only known issues. Other issues might be present that the tool does not check.

The vCenter Host Agent Pre-Upgrade Checker does not fix the reported issues. You must resolve the reported issues manually and rerun the tool to verify that the issues are resolved.

For the procedure to run the vCenter Host Agent Pre-Upgrade Checker, see "Run the vCenter Host Agent Pre-Upgrade Checker," on page 57.

Run the vCenter Host Agent Pre-Upgrade Checker

The vCenter Host Agent Pre-Upgrade Checker reports known issues that might prevent a successful upgrade of the vCenter Host Agent software.

For more information about the vCenter Host Agent Pre-Upgrade Checker, see "About the vCenter Host Agent Pre-Upgrade Checker," on page 57.

Prerequisites

- Verify that the ESX/ESXi hosts are managed by vCenter Server.
- Verify that the vCenter Host Agent software is running on each managed ESX/ESXi host.
- Verify that you have Internet connectivity from the vCenter Server system. This allows new updates to be applied to the tool and allows you to view the reports and the Knowledge Base (KB) articles associated with the reports.

Procedure

1 On the vCenter Server system you are upgrading from, download the vCenter Server 5 installation package or insert the vCenter Server 5 installation DVD.

2 Take one of the following actions to start the Pre-Upgrade Checker.

- In the installation package or on the DVD, navigate to `\vpx\agentupgradecheck` and run the `AgentUpgradeChecker.exe` executable file.
- Start the vCenter Server installer `autorun.exe` and select **vCenter Host Agent Pre-Upgrade Checker** from the **Utility** list.

3 Select the DSN for the vCenter Server system you are upgrading from and select the login credentials that are appropriate for that DSN.

If you are not sure which credential type to select, check which authentication type is configured for the DSN (**Control Panel > Administrative Tools > ODBC Data Sources > System DSN**).

4 If the DSN requires a login for the credential type in use, enter a user name and password and click **Next**.

5 Select an option for scanning all hosts or specific hosts.

Option	Action
Scan all of the hosts	Select **Standard Mode** and click **Next**.
Specify hosts to scan	a Select **Custom Mode** and click **Next**. b Select the hosts to scan and click **Next**. To select all hosts in a cluster, double-click the cluster.

6 Click **Run Precheck**.

The tool takes 30-40 seconds for each host.

7 When the check is complete, click **Next**.

8 View the pre-upgrade reports.

- To view the report for an individual host, click the link next to the host name.
- To view a summary report for all hosts, click **View Report**.

You have a list of issues to resolve before you upgrade to vCenter Server 5.

What to do next

From the report, use the linked KB articles to research and resolve the issues for each host. After you resolve the issues, rerun the vCenter Host Agent Pre-Upgrade Checker. Repeat this process until you resolve all the reported issues, and proceed with your upgrade to vCenter Server 5.

Downtime During the vCenter Server Upgrade

When you upgrade vCenter Server, downtime is required for vCenter Server.

Expect downtime for vCenter Server as follows:

- The upgrade requires vCenter Server to be out of production for 40-50 minutes, depending on the size of the database. The database schema upgrade takes approximately 10-15 minutes of this time. This estimate does not include host reconnection after the upgrade.

  If Microsoft .NET Framework is not installed on the machine, a reboot is required before starting the vCenter Server installation.

- VMware Distributed Resource Scheduler does not work while the upgrade is in progress. VMware HA does work during the upgrade.

Downtime is not required for the ESX/ESXi hosts that vCenter Server is managing, or for virtual machines that are running on the hosts.

Download the vCenter Server Installer

You must download the installer for vCenter Server, the vSphere Client, and associated vCenter components and support tools.

Procedure

1 Download the zip file for vCenter Server from the VMware downloads page at http://www.vmware.com/support/.

2 Extract the files from the zip archive.

Microsoft SQL Database Set to Unsupported Compatibility Mode Causes vCenter Server Installation or Upgrade to Fail

vCenter Server installation with a Microsoft SQL database fails when the database is set to compatibility mode with an unsupported version.

Problem

The following error message appears: `The DB User entered does not have the required permissions needed to install and configure vCenter Server with the selected DB. Please correct the following error(s): %s`

Cause

The database version must be supported for vCenter Server. For SQL, even if the database is a supported version, if it is set to run in compatibility mode with an unsupported version, this error occurs. For example, if SQL 2008 is set to run in SQL 2000 compatibility mode, this error occurs.

Solution

- Make sure the vCenter Server database is a supported version and is not set to compatibility mode with an unsupported version. See the VMware Product Interoperability Matrixes at http://partnerweb.vmware.com/comp_guide2/sim/interop_matrix.php?.

Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1

vSphere 5.1 requires you to install vCenter Single Sign On and upgrade Inventory Service before you can upgrade to vCenter Server 5.1. You can install vCenter Single Sign On, and upgrade Inventory Service and vCenter Server all on a single host machine using the vCenter Server Simple Install option. This option is appropriate for small deployments.

Alternatively, you can install vCenter Single Sign On, and upgrade Inventory Service and vCenter Server, separately to customize the location and configuration of the components. See "Separately Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade vCenter Server," on page 64 and "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30.

Prerequisites

See "Prerequisites for the vCenter Server Upgrade," on page 46.

Procedure

1 Install vCenter Single Sign-On as Part of a vCenter Server Simple Install on page 60

Create the only node in a basic vCenter Single Sign-On installation.

2 Install or Upgrade vCenter Inventory Service as Part of vCenter Server Simple Install on page 61

You can install vCenter Single Sign On, vCenter Inventory Service, and vCenter Server together on a single host machine using the vCenter Server Simple Install option. This option is appropriate for small deployments.

3 Upgrade to vCenter Server 5.1 as Part of a Simple Install on page 61

You can upgrade vCenter Server as part of a Simple Install after you install vCenter Single Sign On and upgrade Inventory Service.

Install vCenter Single Sign-On as Part of a vCenter Server Simple Install

Create the only node in a basic vCenter Single Sign-On installation.

For more information about vCenter Single Sign-On, see "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30 and the *vSphere Security* documentation.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- See the first topic in this multitopic task: "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59.
- See "Prerequisites for the vCenter Server Upgrade," on page 46.

Procedure

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

2 Select **VMware® vCenter™ Simple Install**, and click **Install**.

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

4 Set the password for the vCenter Single Sign-On administrator account.

The password must have at least eight characters, at least one lowercase character, one uppercase character, one number, and one special character.

5 Select the database type for vCenter Single Sign-On.

6 If you are using an existing database, to ensure that table space is created for the database, run the script `rsaIMSLite<DBName>SetupTablespaces.sql`. The script is located at *`vCenter Server Installation directory`*`\Single Sign On\DBScripts\SSOServer\Schema\`*`your_existing_database`*.

You can leave the installer to run the script, and resume the installer from this panel.

7 If you are using the bundled Microsoft SQL Server 2008 R2 Express database, enter the passwords for a Single Sign-On database administrator and database user. The installer uses these credentials to create the users in the database.

The password must comply with Windows Group Policy Object (GPO) password policies for your local operating system and AD domain. The password must be 32 characters or less. The following characters are not supported in passwords: semicolon (;), double quotation mark ("), single quotation mark ('), circumflex (^), and backslash (\). Passwords must comply with Windows Group Policy Object (GPO) password policy.

8 If you are using an existing database, enter the JDBC connection information.

9 Enter the FQDN or IP address for the vCenter Single Sign-On host machine.

10 (Optional) Enter the SSPI service account information.

You can use the default Windows NetworkService account, or enter the account information for an administrator user. This step applies only if you logged in as a domain account user to install Single Sign-On.

11 Select the folder in which to install vCenter Single Sign-On.

The installation path cannot contain any of the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).

12 Accept or change the HTTPS port for vCenter Single Sign-On.

13 Click **Install.**

vCenter Single Sign-On is installed, and the vCenter Inventory Service installation or upgrade wizard starts.

What to do next

Install or upgrade vCenter Inventory Service. See "Install or Upgrade vCenter Inventory Service as Part of vCenter Server Simple Install," on page 61.

Install or Upgrade vCenter Inventory Service as Part of vCenter Server Simple Install

You can install vCenter Single Sign On, vCenter Inventory Service, and vCenter Server together on a single host machine using the vCenter Server Simple Install option. This option is appropriate for small deployments.

This task continues the vCenter Server upgrade using Simple Install from the task "Install vCenter Single Sign-On as Part of a vCenter Server Simple Install," on page 60.

If Inventory Service is installed on the computer, this procedure upgrades Inventory Service.

Prerequisites

- See the first topic in this multitopic task: "Upgrade to vCenter Server 5.1 as Part of a Simple Install," on page 61.
- See "Prerequisites for the vCenter Server Upgrade," on page 46.

Procedure

1 If you are upgrading or reinstalling an existing instance of Inventory Service, choose whether to keep the existing database or replace it with a new empty database.

2 Click **Install**.

Inventory Service is upgraded, and the vCenter Server upgrade wizard starts.

What to do next

Upgrade vCenter Server. Proceed to "Upgrade to vCenter Server 5.1 as Part of a Simple Install," on page 61.

Upgrade to vCenter Server 5.1 as Part of a Simple Install

You can upgrade vCenter Server as part of a Simple Install after you install vCenter Single Sign On and upgrade Inventory Service.

This procedure continues the vCenter Server upgrade using Simple Install from the subtask "Install or Upgrade vCenter Inventory Service as Part of vCenter Server Simple Install," on page 61

Alternatively, you can install vCenter Single Sign On, upgrade Inventory Service, and upgrade vCenter Server separately to customize the location and configuration of the components. See "Separately Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade vCenter Server," on page 64.

If an earlier version of vCenter Server is on your machine, the vCenter Server installer detects and upgrades it. If the upgrade fails, no automatic rollback occurs to the previous vCenter Server version.

In-place upgrade to vCenter 5.1 is not supported on Microsoft Windows XP.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- See the first topic in this multitopic task: "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59.
- See "Prerequisites for the vCenter Server Upgrade," on page 46.

Procedure

1 (Optional) Enter your license key.

IMPORTANT If you do not enter a license key, your license will expire. After the installation, you can connect to the vCenter Server and reenter the license key.

2 Enter or confirm your database credentials.

3 Select whether to upgrade the vCenter Server database.

- Select **Upgrade existing vCenter Server database** to continue with the upgrade to vCenter Server.
- Select **Do not upgrade existing vCenter Server database** if you do not have a backup copy of your database.

  You cannot continue the upgrade.

4 Click **I have taken a backup of the existing vCenter Server database and SSL certificates**.

5 Select how to upgrade vCenter Agent.

Option	Description
Automatic	To automatically upgrade vCenter Agent on all the hosts in the vCenter Server inventory.
Manual	If one of the following applies: ■ You need to control the timing of vCenter Agent upgrades on specific hosts. ■ vCenter Agent is installed on each host in the inventory to enable vCenter Server to manage the host. vCenter Agent must be upgraded when vCenter Server is upgraded.

vCenter Agent is installed on each host in the inventory to enable vCenter Server to manage the host. vCenter Agent must be upgraded when vCenter Server is upgraded.

6 Select the account for the vCenter Service to run in.

Option	Description
SYSTEM Account	Select the **Use SYSTEM account** check box, type the fully qualified domain name of the vCenter Server host, and click **Next**. You cannot use the SYSTEM account if you are using the bundled database or SQL Server with Windows authentication.
User-specified account	Deselect the **Use SYSTEM account** check box, type the account password and the fully qualified domain name of the vCenter Server host, and click **Next**.

7 Accept or change the port numbers to connect to vCenter Server.

8 (Optional) Select **Increase the number of available ephemeral ports**.

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 topic vCenter Server Hardware Requirements.

10 Enter the information to register vCenter Server with vCenter Single Sign-On.

The vCenter Single Sign-On administrator user name is admin@System-Domain, and the password must match the password you entered when you installed vCenter Single Sign-On. The Lookup Service URL takes the form https://*SSO_host_FQDN_or_IP*:7444/lookupservice/sdk, where 7444 is the default vCenter Single Sign-On HTTPS port number. Your entry should match the entry you made when you installed vCenter Single Sign-On. If you entered a different port number when you installed vCenter Single Sign-On, use that port number.

NOTE If you installed vCenter Single Sign-On in a vCenter Server Appliance, you can enter the Single Sign-On administrator user as root@localos. In this case, the password is the root password of the vCenter Server Appliance. The Lookup Service URL takes the form https://*vCenter_Appliance_IP_or_host_name*:{7444}/lookupservice/sdk.

11 Enter the Inventory Service URL.

The Inventory Service URL takes the form https://*Inventory_Service_host_FQDN_or_IP*:10443. 10443 is the default Inventory Service HTTPS port number. If you entered a different port number when you installed Inventory Service, use that port number here.

The vCenter Simple Install is complete.

What to do next

Upgrade the vSphere Client and vSphere Web Client to version 5.1. This step prevents compatibility problems that might interfere with the proper operation of the vSphere Client and vSphere Web Client. See "Upgrade the vSphere Client," on page 90 and "Install or Upgrade the vSphere Web Client," on page 91. Review the topics in "After You Upgrade vCenter Server," on page 89 for other postupgrade actions you might want to take.

Separately Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade vCenter Server

You can install vCenter Single Sign On, upgrade Inventory Service, and upgrade vCenter Server separately to customize the location and configuration of the components.

Alternatively, you can install vCenter Single Sign On, upgrade Inventory Service, and upgrade vCenter Server together on a single host machine using the vCenter Simple Install option. This option is appropriate for small deployments. See "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59.

Prerequisites

See "Prerequisites for the vCenter Server Upgrade," on page 46

Procedure

1 Separately Install vCenter Single Sign-On on page 64

You can install vCenter Single Sign-On in a basic, high availability, or multisite deployment.

2 Install or Upgrade the vSphere Web Client on page 77

The vSphere Web Client lets you connect to a vCenter Server system to manage an ESXi host through a browser.

3 Confirm Active Directory Domains for vCenter Server Administrators on page 78

After you install vCenter Single Sign-On, confirm that any vCenter Server administrators in existing Active Directory (AD) domains are recognized by Single Sign-On.

4 Install or Upgrade vCenter Inventory Service in a Separate Installation on page 79

You can install vCenter Single Sign On, vCenter Inventory Service, and vCenter Server separately to customize the location and configuration of the components.

5 (Optional) Replicate Data Between Multisite Single Sign-On Instances in a New vCenter Server Deployment on page 80

Automatic replication of data between Single Sign-On sites is not supported in a multisite deployment. After you install or make a change to one of the Single Sign-On instances, you must perform a manual data export and import operation with a command-line tool.

6 Upgrade vCenter Server in a Separate Upgrade on page 81

You can upgrade vCenter Server separately after installing vCenter Single Sign On, and upgrading Inventory Service.

Separately Install vCenter Single Sign-On

You can install vCenter Single Sign-On in a basic, high availability, or multisite deployment.

To understand the Single Sign-On basic, high availability, and multisite deployment options, see "vCenter Single Sign-On Deployment Modes," on page 31.

Alternatively, you can install or upgrade vCenter Single Sign-On, vCenter Inventory Service, and vCenter Server together on a single host machine using the vCenter Server Simple Install option. This option is appropriate for small deployments. See "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59.

Prerequisites

- Review "Prerequisites for the vCenter Server Upgrade," on page 46.
- Review "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30.

Procedure

- Choose one of the following vCenter Single Sign-On deployments.
  - "Separately Install vCenter Single Sign-On in a Basic Deployment," on page 65.
  - "Install and Configure vCenter Single Sign-On for a High Availability Deployment," on page 66.
  - "Install and Configure vCenter Single Sign-On for a Multisite Deployment," on page 73.

Separately Install vCenter Single Sign-On in a Basic Deployment

Create the only node in a basic vCenter Single Sign-On installation.

Before you install Single Sign-On in basic mode, consider carefully the future requirements for the deployment to determine whether a multisite or high availability deployment is appropriate. If you install a Single Sign-On instance in basic mode, you cannot later promote the instance to a high availability or multisite node.

To install vCenter Single Sign-On in high availability mode, see "Install and Configure vCenter Single Sign-On for a High Availability Deployment," on page 66. To install vCenter Single Sign-On in multisite mode, see "Install and Configure vCenter Single Sign-On for a Multisite Deployment," on page 73.

These instructions let you install vCenter Single Sign-On only. You must install vCenter Single Sign-On and upgrade Inventory Service before upgrading vCenter Server. For simple deployments, you can install vCenter Single Sign-On, upgrade Inventory Service, and upgrade vCenter Server together on a single host machine using the vCenter Server Simple Install option. See "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59.

For more information about vCenter Single Sign-On, see "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30 and the *vSphere Security* documentation.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- Review "vCenter Single Sign-On Deployment Modes," on page 31.
- See the first topic in this multitopic task: "Separately Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade vCenter Server," on page 64.
- See "Prerequisites for the vCenter Server Upgrade," on page 46

Procedure

1. In the software installer directory, double-click the `autorun.exe` file to start the installer.
2. Select **vCenter™Single Sign On** and click **Install**.
3. Follow the prompts in the installation wizard to choose the installer language, and agree to the end user patent and license agreements.
4. Select **Create the primary node for a new Single Sign On installation**.
5. Select **Install basic vCenter Single Sign On**.
6. Set the password for the vCenter Single Sign-On administrator account.

   The password must have at least eight characters, at least one lowercase character, one uppercase character, one number, and one special character.
7. Select the database type for vCenter Single Sign-On.

8 If you are using an existing database, to ensure that table space is created for the database, run the script `rsaIMSLite<DBName>SetupTablespaces.sql`. The script is located at *`vCenter Server Installation directory`*`\Single Sign On\DBScripts\SSOServer\Schema\`*`your_existing_database`*.

   You can leave the installer to run the script, and resume the installer from this panel.

9 If you are using an existing database for Single Sign On, and you have not already done so, create a database user (RSA_USER) and database administrator (RSA_DBA), by running the script `rsaIMSLite`*`DBName`*`SetupUsers.sql`. The script is included in the vCenter Server installer download package, at *`vCenter Server Installation directory`*`\SSOServer`.

   You can leave the installer to run the script, and resume the installer from this panel.

10 If you are using the bundled Microsoft SQL Server 2008 R2 Express database, enter the passwords for a Single Sign-On database administrator and database user. The installer uses these credentials to create the users in the database.

   The password must comply with Windows Group Policy Object (GPO) password policies for your local operating system and AD domain. The password must be 32 characters or less. The following characters are not supported in passwords: semicolon (;), double quotation mark ("), single quotation mark ('), circumflex (^), and backslash (\). Passwords must comply with Windows Group Policy Object (GPO) password policy.

11 If you are using an existing database, enter the JDBC connection information.

12 Enter the FQDN or IP address for the vCenter Single Sign-On host machine.

13 (Optional) Enter the SSPI service account information.

   You can use the default Windows NetworkService account, or enter the account information for an administrator user. This step applies only if you logged in as a domain account user to install Single Sign-On.

14 Select the folder in which to install vCenter Single Sign-On.

   The installation path cannot contain any of the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).

15 Accept or change the HTTPS port for vCenter Single Sign-On.

16 Click **Install.**

vCenter Single Sign-On is installed.

What to do next

Back up the vCenter Single Sign-On configuration and database. See "Back Up the vCenter Single Sign On Configuration," on page 97.

Upgrade Inventory Service. See "Install or Upgrade vCenter Inventory Service in a Separate Installation," on page 79.

Install and Configure vCenter Single Sign-On for a High Availability Deployment

In high availability mode, two nodes work with the same database, data, and user stores to ensure that vCenter Single Sign-On is not a single point of failure.

NOTE When configured for high availability, vCenter Single Sign-On cannot cannot authenticate local OS Windows users. However, it can authenticate Active Domain users.

Prerequisites

- Review Prerequisites for the vCenter Server Upgrade.

Procedure

1 Prepare Virtual or Physical Machines for vCenter Single Sign-On High Availability on page 67

Configuring vCenter Single Sign-On for high availability requires two machines. One machine acts as the primary node, and the other as the backup node. When configured for high availability, both nodes work with the same database, use the same data, and have the same user stores

2 Install the First Node in a High Availability Installation on page 68

Create the first node in a vCenter Single Sign-On installation for high availability.

3 Install an Additional Node in an Existing High Availability vCenter Server Single Sign-On Installation on page 68

Create an additional vCenter Single Sign-On node for an existing high availability vCenter Single Sign-On installation.

4 Configure the Load Balancing Software on page 69

You can configure any SSL-aware load balancer (physical or virtual) to act as load balancing software with Single Sign-On, increasing availability.

5 Configure Single Sign-On Load Balancing on page 70

Configure the load balancing software. Because Single Sign-On sends and receives sensitive information, configure the load balancing software for SSL.

6 Update the Lookup Service Records on page 71

When you configure Single Sign-On for high availability, update the Lookup Service records to ensure that the load balancer can connect to the Single Sign-On nodes.

Prepare Virtual or Physical Machines for vCenter Single Sign-On High Availability

Configuring vCenter Single Sign-On for high availability requires two machines. One machine acts as the primary node, and the other as the backup node. When configured for high availability, both nodes work with the same database, use the same data, and have the same user stores

Procedure

1 Obtain or create two virtual machines.

- Create two virtual machines running a Windows guest operating system.
- Obtain two physical machines running a Windows operating system.

2 Create a DNS entry for each virtual machine.

3 (Optional) If you use Active Directory and want vCenter Single Sign-On to discover it automatically, do the following tasks.

- Put both machines in the same Active Directory domain.
- Assign administrative permissions on both machines to the Active Directory domain user with which you run the installation.

The machines are ready to become vCenter Single Sign-On nodes.

What to do next

Install vCenter Single Sign-On to create the nodes.

Install the First Node in a High Availability Installation

Create the first node in a vCenter Single Sign-On installation for high availability.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

For more information about vCenter Single Sign-On, see "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30 and the *vSphere Security* documentation.

Prerequisites

- Review Prerequisites for the vCenter Server Upgrade.

Procedure

1. In the software installer directory, double-click the `autorun.exe` file to start the installer.
2. Select **vCenter™Single Sign-On** and click **Install**.
3. Follow the prompts in the installation wizard to choose the installer language, and agree to the end user patent and license agreements.
4. Select **Create the primary node for a new Single Sign-On installation**.
5. Select the Single Sign-On type, **Create the primary node for a new Single Sign-On installation**.
6. Set the password for the vCenter Single Sign-On administrator account.
7. Select the database type for vCenter Single Sign-On.
8. Select the database type for vCenter Single Sign-On.
   a. If you are using the bundled Microsoft SQL Server 2008 R2 Express database, enter the passwords for a Single Sign-On database administrator and database user. The installer uses these credentials to create the users in the database.
   b. If you are using an existing database, enter the JDBC connection information.
9. Enter the FQDN or IP address for the vCenter Single Sign-On host machine.
10. (Optional) Enter the SSPI service account information.

    You can use the default Windows NetworkService account, or enter the account information for an administrator user. This step applies only if you logged in as a domain account user to install Single Sign-On.
11. Select the folder in which to install vCenter Single Sign-On.
12. Accept or change the HTTPS port for vCenter Single Sign-On.
13. Click **Install.**

Install an Additional Node in an Existing High Availability vCenter Server Single Sign-On Installation

Create an additional vCenter Single Sign-On node for an existing high availability vCenter Single Sign-On installation.

To create the only node in a basic vCenter Single Sign-On installation, see "Separately Install vCenter Single Sign-On in a Basic Deployment," on page 65.

If you are installing Single Sign-On on a multisite installation, see "Install an Additional Node for a Multisite vCenter Single Sign-On Installation," on page 75

Prerequisites

See the previous steps in this multitask topic, "Install and Configure vCenter Single Sign-On for a High Availability Deployment," on page 66

Procedure

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

2 In the Single Sign On Deployment Type panel, select **Join an existing Single Sign On installation**.

3 Select the Single Sign-On type, and enter the connection information for the existing primary node of the Single Sign-On installation that you are adding this node to.

By default, the Single Sign-On port is 7444. If you assigned a different port when you installed Single Sign-On, use that port.

4 Click **Install**.

What to do next

Continue to the next task, "Configure the Load Balancing Software," on page 69.

Configure the Load Balancing Software

You can configure any SSL-aware load balancer (physical or virtual) to act as load balancing software with Single Sign-On, increasing availability.

You define four paths in the load balancer configuration, one for each Single Sign-On interface: STS, Group Check, Lookup Service (all high availability nodes), and the SSO Admin SDK (primary node only). Sensitive information such as passwords are passed to and from vCenter Single Sign-On. Configure the Apache HTTPD software for SSL and use only SSL ports as proxies to the Single Sign-On server.

Prerequisites

NOTE This is provided as an example of configuring your load balancing software using Apache HTTPD. Other load balancers will be configured in a different way.

Verify that you have two Single Sign-On nodes and Apache HTTPD set up as a load balancer. For information about setting up your load balancing software, see KB article 2034157.

Procedure

- Define the paths, configure the proxy-related and load balancer-related directives.

  Add the VirtualHost entry at the end of the `httpd-ssl.conf` file, or you can update an existing VirtualHost entry.

  NOTE You might encounter errors using 64-bit Microsoft Windows operating systems. Update the following value in the `conf/extra/httpd-ssl.conf file`: `SSLSessionCache "shmcb:C:/PROGRA\~2/Apache Software Foundation/Apache2.2/logs/ssl_scache (5120000)`

What to do next

"Update the HTTPD Configuration with SSL Certificates," on page 70.

Update the HTTPD Configuration with SSL Certificates

Continuing with the Apache HTTPD load balancer example, after configuring the Apache HTTPD server, configure HTTPD to use SSL certificates.

Prerequisites

NOTE This example describes using Apache HTTPD as your load balancer. Other load balancers will be configured differently.

Verify that you have the custom certificates.

Procedure

1 In a text editor, locate and open `conf/extra/httpd-ssl.conf`.

2 Type the location of your SSL server certificate.

```
SSLCertificateFile "C:/Program Files (x86)/Apache Software
Foundation/Apache2.2/conf/certs/server.crt"
```

3 Type the SSL server private key for your custom load balancer certificate.

```
SSLCertificateKeyFile "C:/Program Files (x86)/Apache Software
Foundation/Apache2.2/conf/certs/server.key"
```

4 Type the file that contains the entire certificate chain (or if you have only the leaf and root, you can provide the CA).

```
SSLCertificateChainFile "C:/Program Files (x86)/Apache Software
Foundation/Apache2.2/conf/certs/ca/cacert.pem"
```

5 To ensure that clients can authenticate to the server, type the following directive.

```
SSLVerifyClient none
```

6 Restart the Apache server.

What to do next

Update the LookUp Service records.

Configure Single Sign-On Load Balancing

Configure the load balancing software. Because Single Sign-On sends and receives sensitive information, configure the load balancing software for SSL.

Prerequisites

- You must have created both a primary and a backup Single Sign-On node.
- You must have a supported load balancing software program installed.

Procedure

1 Configure node affinity for the machine on which the primary node is installed.

2 Add entries for the following Single Sign-On services.

Table 4-7. Service Entries

Service	Map	On node
Groupcheck	`/groupcheck` to `/sso-adminserver`	both
LookupService	`/lookupservice`	both

Table 4-7. Service Entries (Continued)

Service	Map	On node
Security Token Service	`/ims`	both
Admin server	`/sso-adminserver` to `/sso-adminserver`	primary only

NOTE Because Groupcheck is present on both of the nodes but Admin server is only present on the primary node, do not use the same path for Groupcheck and Admin server.

What to do next

"Update the Lookup Service Records," on page 71

Update the Lookup Service Records

When you configure Single Sign-On for high availability, update the Lookup Service records to ensure that the load balancer can connect to the Single Sign-On nodes.

Procedure

1 Copy the root certificate of the certificate chain that issued the SSL certificate for the load balancing software to the machine on which Single Sign-On `node1` (the primary node) is installed.

2 From a terminal window, on each of the systems where Single Sign-On is installed, perform the following steps.

   a Set the *JAVA_HOME* variable.

   By default, VMware products install JRE in `C:\Program Files\VMware\Infrastructure\jre`.

   b Check your firewall settings to ensure that connections to the load balancing software are possible.

   c List the services in the directory where you installed Single Sign-On.

   If you installed the software in the default location, run the following command to change to the directory.

   ```
   cd /d C:\Program Files\VMware\Infrastructure\SSOServer\ssolscli
   ```

   Get the list of services.

   ```
   ssolscli listServices https://primary_node_hostname:7444/lookupservice/sdk
   ```

3 From the list of services, locate the `Group Check`, `SSO Admin`, and `Security Token Service (STS)` services and determine the `Type`.

Table 4-8. Service type

Type	URN
Groupcheck	urn:sso:groupcheck
Admin	urn:sso:admin
Security Token Service	urn:sso:sts

4 Create a properties file for each service, naming the files `gc.properties`, `admin.properties`, and `sts.properties`, respectively.

The URIs specified for the Single Sign-On Admin and Group Check are the ones that you specified in the load balancing software configuration.

An example `.properties` file looks similar to this one.

```
[service]
friendlyName=STS for Single Sign On
version=1.0
ownerId=
type=urn:sso:sts
description=Security Token Service of Single Sign On server

[endpoint0]
uri=https://location_of_your_load_balancer:configured port/ims/STSService?wsdl
ssl=C:\location_of_pem\cacert.pem
protocol=wsTrust
```

5 Locate the serviceId for each of the three services.

The service ID is located in serviceId on the list of services you created.

6 Using a plain text editor, create a service ID file for each service.

Table 4-9. File names

Service	File name
sts.properties	`sts_id`
gc.properties	`gc_id`
admin.properties	`admin_id`

The service ID file contains only the service ID and must not contain any other data.

The following is an example of the contents of the `sts_id` file.

```
{D46D4BFD-CC5B-4AE7-87DC-5CD63A97B194}:7
```

7 For each service, run the following commands.

```
SingleSignOn install dir\ssolscli\ssolscli updateService
 -d Lookup Service URL -u sso administrator name -p
sso administrator password -si serviceid_file
-ip service.properties
```

The following code is an example of the contents of the `sts_id` file.

```
C:\Program Files\VMware\Infrastructure\SSOServer\ssolscli\ssolscli
updateService -d https://primary_sso_node configured_port/
lookupservice/sdk -u admin@System-Domain -p VMware123
-si sts_id -ip sts.properties
```

What to do next

Upgrade Inventory Service. See "Install or Upgrade vCenter Inventory Service in a Separate Installation," on page 79.

Note During the installation of vCenter Server, vSphere Web Client, and the Inventory service, you must provide the address of the new load balanced hostname for Lookup Service. The address should be in the form https://*load balancer fqdn*:*configured port*/*configured path*.

Install and Configure vCenter Single Sign-On for a Multisite Deployment

The vCenter Single Sign-On multisite configuration is designed for deployments with multiple physical locations. Installing a Single Sign-On instance at each site allows fast access to local authentication-related services. Each Single Sign-On instance is connected to the local instances of the AD (LDAP) servers and has its own database with local users and groups.

For more information about vCenter Single Sign-On, see "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30 and the *vSphere Security* documentation.

For more information about multisite deployment mode, see "vCenter Single Sign-On Deployment Modes," on page 31.

To install vCenter Single Sign-On in high availability mode, see "Install and Configure vCenter Single Sign-On for a High Availability Deployment," on page 66. To install vCenter Single Sign-On in basic mode, see "Separately Install vCenter Single Sign-On in a Basic Deployment," on page 65.

These instructions let you install vCenter Single Sign-On only. You must install vCenter Single Sign-On and upgrade Inventory Service before upgrading vCenter Server. For simple deployments, you can install vCenter Single Sign-On, upgrade Inventory Service, and upgrade vCenter Server together on a single host machine using the vCenter Server Simple Install option. See "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59.

After you install Single Sign-On, no connectivity between the Single Sign-On servers is necessary, because there is no automatic replication of data between Single Sign-On instances.

There are no components in the vSphere suite that communicate with multiple Single Sign-On servers. Each vSphere component should be configured to communicate with its local Single Sign-On instance for faster access.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- Review "Prerequisites for the vCenter Server Upgrade," on page 46.

Procedure

1 Install the First Node in a Multisite vCenter Single Sign-On Installation on page 73

   Create the first vCenter Single Sign-On node for a multisite vCenter Single Sign-On installation.

2 Install an Additional Node for a Multisite vCenter Single Sign-On Installation on page 75

   Create an additional vCenter Single Sign-On node for a multisite vCenter Single Sign-On installation.

Install the First Node in a Multisite vCenter Single Sign-On Installation

Create the first vCenter Single Sign-On node for a multisite vCenter Single Sign-On installation.

Prerequisites

- Review "vCenter Single Sign-On Deployment Modes," on page 31.
- Review "Separately Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade vCenter Server," on page 64.
- See "Prerequisites for the vCenter Server Upgrade," on page 46

Procedure

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

2 Select **vCenter™Single Sign On** and click **Install**.

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

4 In the vCenter Single Sign On Deployment Type wizard panel, select **Create the primary node for a new Single Sign On installation**.

5 In the panel that asks you to select single node type, select **Create the primary node for a new Single Sign On installation**.

6 Set the password for the vCenter Single Sign-On administrator account.

The password must have at least eight characters, at least one lowercase character, one uppercase character, one number, and one special character.

7 Select the database type for vCenter Single Sign-On.

8 If you are using an existing database, to ensure that table space is created for the database, run the script `rsaIMSLite<DBName>SetupTablespaces.sql`. The script is located at *`vCenter Server Installation directory`*`\Single Sign On\DBScripts\SSOServer\Schema\`*`your_existing_database`*.

You can leave the installer to run the script, and resume the installer from this panel.

9 If you are using an existing database for Single Sign On, and you have not already done so, create a database user (RSA_USER) and database administrator (RSA_DBA), by running the script `rsaIMSLite`*`DBName`*`SetupUsers.sql`. The script is included in the vCenter Server installer download package, at *`vCenter Server Installation directory`*`\SSOServer`.

You can leave the installer to run the script, and resume the installer from this panel.

10 If you are using the bundled Microsoft SQL Server 2008 R2 Express database, enter the passwords for a Single Sign-On database administrator and database user. The installer uses these credentials to create the users in the database.

The password must comply with Windows Group Policy Object (GPO) password policies for your local operating system and AD domain. The password must be 32 characters or less. The following characters are not supported in passwords: semicolon (;), double quotation mark ("), single quotation mark ('), circumflex (^), and backslash (\). Passwords must comply with Windows Group Policy Object (GPO) password policy.

11 If you are using an existing database, enter the JDBC connection information.

12 Enter the FQDN or IP address for the vCenter Single Sign-On host machine.

13 (Optional) Enter the SSPI service account information.

You can use the default Windows NetworkService account, or enter the account information for an administrator user. This step applies only if you logged in as a domain account user to install Single Sign-On.

14 Select the folder in which to install vCenter Single Sign-On.

The installation path cannot contain any of the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).

15 Accept or change the HTTPS port for vCenter Single Sign-On.

16 Click **Install.**

The first Single Sign-On multisite node is installed.

Install an Additional Node for a Multisite vCenter Single Sign-On Installation

Create an additional vCenter Single Sign-On node for a multisite vCenter Single Sign-On installation.

Prerequisites

- Install the first node in the multisite vCenter Single Sign-On installation. See "Install the First Node in a Multisite vCenter Single Sign-On Installation," on page 73.
- Review "vCenter Single Sign-On Deployment Modes," on page 31.
- See "Prerequisites for the vCenter Server Upgrade," on page 46.

Procedure

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

2 Select **vCenter™Single Sign On** and click **Install**.

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

4 In the Single Sign On Deployment Type panel, select **Join an existing Single Sign On installation**.

5 Select **Multisite**.

6 Enter the information to point this additional node to the primary Single Sign-On node.

NOTE If the primary node is a high-availability cluster, enter the address of the primatry node load balancer.

---

   a Enter the FQDN or IP address of the primary node.

   b Enter the HTTPS port of the primary node.

   c Enter the password for the vCenter Single Sign-On administrator account of the primary node: **`admin@System-Domain`**.

7 Set the password for the vCenter Single Sign-On administrator account.

   The password must have at least eight characters, at least one lowercase character, one uppercase character, one number, and one special character.

8 Select the database type for vCenter Single Sign-On.

9 If you are using an existing database, to ensure that table space is created for the database, run the script `rsaIMSLite<DBName>SetupTablespaces.sql`. The script is located at *`vCenter Server Installation directory`*`\Single Sign On\DBScripts\SSOServer\Schema\`*`your_existing_database`*.

   You can leave the installer to run the script, and resume the installer from this panel.

10 If you are using the bundled Microsoft SQL Server 2008 R2 Express database, enter the passwords for a Single Sign-On database administrator and database user. The installer uses these credentials to create the users in the database.

   The password must comply with Windows Group Policy Object (GPO) password policies for your local operating system and AD domain. The password must be 32 characters or less. The following characters are not supported in passwords: semicolon (;), double quotation mark ("), single quotation mark ('), circumflex (^), and backslash (\). Passwords must comply with Windows Group Policy Object (GPO) password policy.

11 If you are using an existing database, enter the JDBC connection information.

12 Enter the FQDN or IP address for the vCenter Single Sign-On host machine.

13 (Optional) Enter the SSPI service account information.

You can use the default Windows NetworkService account, or enter the account information for an administrator user. This step applies only if you logged in as a domain account user to install Single Sign-On.

14 Select the folder in which to install vCenter Single Sign-On.

The installation path cannot contain any of the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).

15 Accept or change the HTTPS port for vCenter Single Sign-On.

16 Click **Install.**

17 Select the Single Sign-On type, and enter the connection information for the existing primary node of the Single Sign-On installation that you are adding this node to.

By default, the Single Sign-On port is 7444. If you assigned a different port when you installed Single Sign-On, use that port.

18 Set the password for the vCenter Single Sign-On administrator account.

The password must have at least eight characters, at least one lowercase character, one uppercase character, one number, and one special character.

19 Select the database type for vCenter Single Sign-On.

20 If you are using an existing database, enter the credentials of a Single Sign-On database administrator with the appropriate permissions (for example, MSSQL database administrators require DBO and SYSADMIN permissions). The installer uses these credentials to create the users RSA_DBA and RSA_USER.

21 If you are using an existing database, enter the JDBC connection information.

22 Enter the FQDN or IP address for the vCenter Single Sign-On host machine.

23 (Optional) Enter the SSPI service account information.

You can use the default Windows NetworkService account, or enter the account information for an administrator user. This step applies only if you logged in as a domain account user to install Single Sign-On.

24 Select the folder in which to install vCenter Single Sign-On.

The installation path cannot contain any of the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).

25 Accept or change the HTTPS port for vCenter Single Sign-On.

26 Click **Install.**

The additional vCenter Single Sign-On Node is installed.

What to do next

Repeat this procedure for each additional multisite node.

NOTE After you install Single Sign-On and Inventory Service at each of the multisite nodes, replicate the Single Sign-On data between the nodes. See "(Optional) Replicate Data Between Multisite Single Sign-On Instances in a New vCenter Server Deployment," on page 80.

Upgrade Inventory Service. See "Install or Upgrade vCenter Inventory Service in a Separate Installation," on page 79.

Install or Upgrade the vSphere Web Client

The vSphere Web Client lets you connect to a vCenter Server system to manage an ESXi host through a browser.

If an earlier version of the vSphere Web Client is installed, this procedure upgrades the vSphere Web Client to version 5.1.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- Download the vCenter Server installer.
- Verify that the system has an Internet connection.
- Verify that the system meets the software requirements for the vSphere Web Client. See "vSphere Client and vSphere Web Client Software Requirements," on page 22.
- Before you install or upgrade any vSphere product, synchronize the clocks of all machines on the vSphere network. See "Synchronizing Clocks on the vSphere Network," on page 53.
- Install vCenter Single Sign On, and install or upgrade Inventory Service and vCenter Server to version 5.1.
- Verify that the vSphere Web Client and vCenter Server are registered to the same vCenter Single Sign On server, to ensure that the vSphere Web Client can access the vCenter Server inventory.
- Close all browsers before installing or uninstalling the vSphere Web Client.
- Log in as a member of the Administrators group on the host machine, with a user name that does not contain any non-ASCII characters.
- If you are upgrading the vSphere Web Client, and you plan to use it with any version 5.0.x vCenter Server instance that was registered to a version 5.0 vSphere Web Client without accepting the SSL thumbprint, see "Version 5.1 vSphere Web Client Fails to Connect to Version 5.0.x vCenter Server," on page 92.

Procedure

1. In the software installer directory, double-click the `autorun.exe` file to start the installer.
2. Select **VMware vSphere® Web Client** and click **Install**.
3. Follow the prompts in the installation wizard to choose the installer language, and agree to the end user patent and license agreements.
4. Accept or change the default port settings.

5 Enter the information to register the vSphere Web Client with vCenter Single Sign On.

The vCenter Single Sign On administrator user name is admin@System-Domain, and the password must match the password you entered for the administrator user when you installed vCenter Single Sign On. The Lookup Service URL takes the form https://*SSO_host_FQDN_or_IP*:7444/lookupservice/sdk, where 7444 is the default vCenter Single Sign On HTTPS port number. Your entry should match the entry you made when you installed vCenter Single Sign On. If you entered a different port number when you installed vCenter Single Sign On, use that port number.

NOTE If you installed vCenter Single Sign On in a vCenter Server Appliance, you can enter the Single Sign On Admin user as root@localos. In this case, the password is the root password of the vCenter Server Appliance. The Lookup Service URL takes the form https://*vCenter_Appliance_IP_or_host_name*:{7444}/lookupservice/sdk.

6 Click **Install**.

7 Start the vSphere Web Client by doing one of the following actions.

- In a browser, go to https://*vSphere_Web_Client_host_name_or_IP*:9443/vsphere-client.
- From the Windows Start menu, select **Programs > VMWare > VMware vSphere Web Client > vSphere Web Client**.

Confirm Active Directory Domains for vCenter Server Administrators

After you install vCenter Single Sign-On, confirm that any vCenter Server administrators in existing Active Directory (AD) domains are recognized by Single Sign-On.

If your administrators are AD users, they are migrated to Single Sign-On during a Single Sign On installation or upgrade, provided that Single Sign-On can find the AD domains. In the following circumstances, your local operating system users are not migrated to the new environment, and you will have to create new administrative users:

- Single Sign-On is deployed on a different machine from vCenter Server.
- Single Sign-On is deployed as a primary node in a high availability or multisite installation.

Prerequisites

- Install vCenter Single Sign-On.
- Install or upgrade the vSphere Web Client to the current version.

Procedure

1 Log in to the vSphere Web Client as the Single Sign-On administrator: **`admin@system-domain`**.

2 Make sure that you can access all the AD domains containing your vCenter Server administrators.

3 If you cannot access an AD domain, correct the problem and use the vSphere Web Client to add the AD domain.

See "If Autodiscovery Fails During Single Sign-On Installation Manually Add Active Directory Domains," on page 84 and VMware Knowledge Base article http://kb.vmware.com/kb/2035934.

4 Assign one of the AD users as a Single Sign-On administrator.

5 Log out of the vSphere Web Client and log back in as the new Single Sign-On administrator user.

If you are able to connect successfully, you have configured Single Sign-On correctly.

Install or Upgrade vCenter Inventory Service in a Separate Installation

You can install vCenter Single Sign On, vCenter Inventory Service, and vCenter Server separately to customize the location and configuration of the components.

These instructions upgrade vCenter Inventory Service only. You must install vCenter Single Sign On before upgrading Inventory Service and vCenter Server. For simple deployments, you can install vCenter Single Sign On, upgrade Inventory Service, and upgrade vCenter Server together on a single host machine using the vCenter Server Simple Install option. See "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59.

If vCenter Inventory Service is already installed on the computer, this procedure upgrades Inventory Service.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- See the first topic in this multitopic task: "Separately Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade vCenter Server," on page 64.
- See "Prerequisites for the vCenter Server Upgrade," on page 46

Procedure

1. In the software installer directory, double-click the `autorun.exe` file to start the installer.
2. Select **VMware® vCenter™ Inventory Service** and click **Install.**
3. Follow the prompts in the installation wizard to choose the installer language, and agree to the end user patent and license agreements.
4. Accept or change the default installation folder.

   The installation path cannot contain any of the following characters: non-ASCII characters, commas (,), periods (.), exclamation points (!), pound signs (#), at signs (@), or percentage signs (%).
5. Enter the fully qualified domain name for the Inventory Service host machine.
6. If you are upgrading or reinstalling an existing instance of Inventory Service, choose whether to keep the existing database or replace it with a new empty database.
7. Accept or change the default values for Inventory Service port numbers.
8. 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 topic vCenter Server Hardware Requirements.

9 Enter the information to register Inventory Service with vCenter Single Sign-On.

The vCenter Single Sign-On administrator user name is admin@System-Domain, and the password must match the password you entered when you installed vCenter Single Sign-On. The Lookup Service URL takes the form https://*SSO_host_FQDN_or_IP*:7444/lookupservice/sdk, where 7444 is the default vCenter Single Sign-On HTTPS port number. Your entry should match the entry you made when you installed vCenter Single Sign-On. If you entered a different port number when you installed vCenter Single Sign-On, use that port number.

NOTE If you installed vCenter Single Sign-On in a vCenter Server Appliance, you can enter the Single Sign-On administrator user as root@localos. In this case, the password is the root password of the vCenter Server Appliance. The Lookup Service URL takes the form https://*vCenter_Appliance_IP_or_host_name*:{7444}/lookupservice/sdk.

10 Click **Install Certificates**.

11 Click **Install**.

Inventory Service is upgraded

What to do next

Upgrade vCenter Server. See "Upgrade vCenter Server in a Separate Upgrade," on page 81.

(Optional) Replicate Data Between Multisite Single Sign-On Instances in a New vCenter Server Deployment

Automatic replication of data between Single Sign-On sites is not supported in a multisite deployment. After you install or make a change to one of the Single Sign-On instances, you must perform a manual data export and import operation with a command-line tool.

The data to replicate includes local users and groups and the configuration of the STS server. Because this data rarely changes, you can schedule replications once a day or week, as appropriate. For specific instructions about manually replicating data between servers in a multisite Single Sign-On deployment, see the *vSphere Security* documentation.

These steps represent an accumulative change replication. Changes to one node are transported only to the node where the next changes will occur. After the last planned change is done, changes have been propagated to all nodes.

Alternatively, you can execute the replication sequentially. After a change in one node occurs, replicate it to all other nodes before making a change on any other node. During setup of the virtual infrastructure on each site, the better practice is to use the accumulative approach, which needs fewer steps, as the changes are planned and executed in a relatively short time span. For regular, ongoing operations, use the sequential approach.

CAUTION To ensure that data remains in sync during the manual replication process, do not make any changes to the data to be replicated, for example adding or deleting identity sources or local users.

This procedure completely overrides the state of the target node. You must perform manual transport of replication data sequentially. This means that changes on a node are propagated to all other nodes in the deployment before changes occur on any other nodes.

Prerequisites

- Verify that you have vCenter Single Sign-On administrator privileges on the vCenter Single Sign-On systems where you export or import the replication data.
- Install vCenter Single Sign-On and vCenter Inventory Service for each site in the multisite configuration before vCenter Server is installed.

Procedure

1 Install vCenter Server in the first site.

2 Export the Single Sign-On data from the first site and copy it to the second site.

3 Import the Single Sign-On data to the second site.

   a Log in to the vCenter Single Sign-On system where you will apply the change.

   b Navigate to the directory *SSO install directory*`sso-replication-cli`

   c Run `repl_tool.cmd` with the following parameters to import the replication state file.

   `import -f` *`file`* `-u` *`admin_user_name`* `[-p` *`password`*`]`

   Enter the following command-line parameters in the order listed.

Parameter	Value
mode	Import.
file	Relative or absolute path to a file from which the data is imported.
admin_user_name	Name of a valid vCenter Single Sign-On administrator user.
password	Optional. If you do not enter the password, you are prompted for a password when you run the command.

4 Install vCenter Server in the second site.

5 Following the procedure in steps Step 2 and Step 3, export the single Sign-On data from the second site and import it to the third site

6 Repeat the procedures in steps Step 4 and Step 5 for each succeeding site in the multisite configuration.

Single Sign-On data has been propagated to all nodes.

Upgrade vCenter Server in a Separate Upgrade

You can upgrade vCenter Server separately after installing vCenter Single Sign On, and upgrading Inventory Service.

Alternatively, You can upgrade vCenter Server as part of a Simple Install. See "Using Simple Install to Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade to vCenter Server 5.1," on page 59 and "How vCenter Single Sign On Affects vCenter Server Installation and Upgrades," on page 30.

This procedure requires downtime for the vCenter Server that you are upgrading. You do not need to turn off virtual machines.

If an earlier version of vCenter Server is on your machine, the vCenter Server installer detects and upgrades it. If the upgrade fails, no automatic rollback occurs to the previous vCenter Server version.

In-place upgrade to vCenter 5.1 is not supported on Microsoft Windows XP.

Note vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- See "Prerequisites for the vCenter Server Upgrade," on page 46
- See the first topic in this multitopic task: "Separately Install vCenter Single Sign On, Upgrade Inventory Service, and Upgrade vCenter Server," on page 64.

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, and agree to the end user patent and license agreements.

4 Enter or confirm your database credentials.

5 Select whether to upgrade the vCenter Server database.

- Select **Upgrade existing vCenter Server database** to continue with the upgrade to vCenter Server.
- Select **Do not upgrade existing vCenter Server database** if you do not have a backup copy of your database.

  You cannot continue the upgrade.

6 Click **I have taken a backup of the existing vCenter Server database and SSL certificates**.

7 Select how to upgrade vCenter Agent.

Option	Description
Automatic	To automatically upgrade vCenter Agent on all the hosts in the vCenter Server inventory.
Manual	If one of the following applies: ■ You need to control the timing of vCenter Agent upgrades on specific hosts. ■ vCenter Agent is installed on each host in the inventory to enable vCenter Server to manage the host. vCenter Agent must be upgraded when vCenter Server is upgraded.

vCenter Agent is installed on each host in the inventory to enable vCenter Server to manage the host. vCenter Agent must be upgraded when vCenter Server is upgraded.

8 Select the account for the vCenter Service to run in.

Option	Description
SYSTEM Account	Select the **Use SYSTEM account** check box, type the fully qualified domain name of the vCenter Server host, and click **Next**. You cannot use the SYSTEM account if you are using the bundled database or SQL Server with Windows authentication.
User-specified account	Deselect the **Use SYSTEM account** check box, type the account password and the fully qualified domain name of the vCenter Server host, and click **Next**.

9 Accept or change the port numbers to connect to vCenter Server.

10 (Optional) Select **Increase the number of available ephemeral ports**.

11 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 topic vCenter Server Hardware Requirements.

12 Enter the information to register vCenter Server with vCenter Single Sign-On.

The vCenter Single Sign-On administrator user name is admin@System-Domain, and the password must match the password you entered when you installed vCenter Single Sign-On. The Lookup Service URL takes the form https://*SSO_host_FQDN_or_IP*:7444/lookupservice/sdk, where 7444 is the default vCenter Single Sign-On HTTPS port number. Your entry should match the entry you made when you installed vCenter Single Sign-On. If you entered a different port number when you installed vCenter Single Sign-On, use that port number.

NOTE If you installed vCenter Single Sign-On in a vCenter Server Appliance, you can enter the Single Sign-On administrator user as root@localos. In this case, the password is the root password of the vCenter Server Appliance. The Lookup Service URL takes the form https://*vCenter_Appliance_IP_or_host_name*:{7444}/lookupservice/sdk.

---

13 Enter the Inventory Service URL.

The Inventory Service URL takes the form https://*Inventory_Service_host_FQDN_or_IP*:10443. 10443 is the default Inventory Service HTTPS port number. If you entered a different port number when you installed Inventory Service, use that port number here.

14 Click **Install**.

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

The vCenter installation is complete.

What to do next

Upgrade the vSphere Client and vSphere Web Client to version 5.1. This step prevents compatibility problems that might interfere with the proper operation of the vSphere Client and vSphere Web Client. See "Upgrade the vSphere Client," on page 90, and "Install or Upgrade the vSphere Web Client," on page 91. Review the topics in "After You Upgrade vCenter Server," on page 89 for other postupgrade actions you might want to take.

vCenter Single Sign-On Installation Fails

In a Windows environment, vCenter Single Sign-On installation might fail for several reasons.

Problem

The vCenter Single Sign-On installation fails in a Windows environment.

Cause

Multiple causes of an installation failure.

Solution

1 Verify that all installation setup prerequisites are met.

At the time the installation fails, the installer displays a message similar to `####: Installation failed due to....`

2 At a command line, run the following command to gather a vCenter Single Sign-On support bundle.

```
C:\Windows\System32\cscript.exe "SSO Server\scripts\sso-support.wsf" /z
```

3 Click **OK**

4 View the logs in *SSO Server*`\utils\logs\imsTrace.log, install.log` and `%TEMP%\vminstall.log` for details about the failure and possible solutions.

vCenter Single Sign-On Fails at Start Up or During Initialization

Several problems can cause vCenter Single Sign-On to fail at start up or during initialization.

Problem

vCenter Single Sign-On fails either at start up or during initialization.

Cause

Startup or initialization failures occur in the following situations.

- If your database server is on the same machine as vCenter Single Sign-On, in some cases restarting your machine might cause vCenter Single Sign-On to start before the database server is initialized.
- If you use an external database server, it is possible that the database is not accessible.
- If you use an external database server, the database server login password might have expired or been changed and not updated in vCenter Single Sign-On. Database log-in accounts do not expire using the embedded Microsoft SQL Server Express Database.

Solution

- If vCenter Single Sign-On starts before the database server is initialized, manually restart vCenter Single Sign-On.
- The database server must be accessible using the IP address or FQDN that you used when you installed vCenter Single Sign-On.
  a Find the properties file at *SingleSignOn_Server*`\webapps\lookupservice\WEB-INF\classes\config.properties` and confirm that the IP address or FQDN is correct.
  b Make any needed changes.
- Verify that the database that vCenter Single Sign-On is configured for use.
  a At a command line, type ***SingleSignOn_server*`\utils\ssocli manage-secrets -a listallkeys`**
  b When prompted, type the master password.
  c To update the configuration, type **`ssocli configure-riat -a configure-db`**.

If Autodiscovery Fails During Single Sign-On Installation Manually Add Active Directory Domains

A failure of autodiscovery during vCenter Single Sign-On installation on a machine with a Windows operating system can require you to manually add Active Directory domains.

Problem

vCenter Single Sign-On installation can fail to see Active Domains if autodiscovery fails.

Cause

Autodiscovery failure occurs for several reasons. Some causes are configuration errors with DNS and reverse lookup, trust issues, and certificate problems.

Solution

1 Verify that the network prerequisites are met as described in *vSphere Installation and Setup*.

2 Verify that the DNS configuration is correct.

View the logs at *Single_Sign_On_Server*\utils\logs\discover-is.log and imsTrace.log, or at a command line type ***Single_Sign_On_Server*\utils\ssocli configure-riat -a discover-is** and follow the prompts. If log messages include an error similar to

```
WARNING: Discovered address 'hostname/ip' does not
map to the same host in reverse lookup.
Host: 'another_hostname/same ip
```

review the domain controller host DNS configuration and make necessary changes.

3 To expose any connectivity and trust problems, force the server to leave and then rejoin the domain.

4 If your controllers have SSL enabled on LDAP services, verify that the SSL certificate is still valid.

5 If autodiscovery fails, add the Active Directory domain to vCenter Single Sign-On using the vSphere Web Client.

Updating vCenter Server with Service Packs

VMware provides service packs to update the vCenter Server 5.1 software and third-party components.

vCenter Server service pack releases can include updates to vCenter Server, Inventory Service, vCenter Single Sign On, and Profile-Driven Storage Service.

vCenter Server 5.1 service packs will be available from the VMware Web site. The service pack update process updates files and registry settings required by vCenter Server, and restart Windows services that are stopped during the update.

NOTE Installing an update on Windows Server 2008 or later with User Account Control (UAC) turned on requires Administrator privileges. The logged in user must be Administrator, or an Administrators group member whose privileges are elevated to the Administrator level. See "Elevate Administrators Group Privileges to Administrator Level in Windows Server 2008," on page 85.

Elevate Administrators Group Privileges to Administrator Level in Windows Server 2008

Installing a vCenter Server update on Windows Server 2008 or later with User Account Control (UAC) turned on requires the logged in user to have Administrator-level privileges. You can elevate the privileges of Administrators group members to the Administrator level.

Alternatively, you can turn off UAC in the User Accounts control panel, and turn it back on after the update is complete.

Procedure

1 In the Administrative Tools control panel, double-click **Local Security Policy**.

2 Under Local Policies, select **Security Options**.

3 Double-click **User Account Control: Run all administrators in Admin Approval Mode**.

4 Select **Disabled** and click **OK.**

All members of the Administrators group can install the update.

What to do next

After you install the update, you can reenable User Account Control: Run all administrators in Admin Approval Mode.

Upgrade the VMware vCenter Server Appliance

For upgrades to the vCenter Server Appliance, you can deploy a new version of the appliance and import the network identity of your existing vCenter Server Appliance.

VMware product versions are numbered with up to three digits, for example, vCenter Server Appliance 5.0.1. A release that changes the first or second digit involves major changes in the software, which requires an upgrade from the previous version. A release that changes only the third digit indicates a smaller change, requiring only an update or patch. This procedure describes an upgrade to the vCenter Server Appliance from version 5.0.x to version 5.1.

For updates to the vCenter Server Appliance, for example, from version 5.0 to version 5.0.1, see "Update the VMware vCenter Server Appliance from a VMware.com Repository," on page 87, "Update the VMware vCenter Server Appliance from a Zipped Update Bundle," on page 88, and "Update the VMware vCenter Server Appliance from the CD-ROM Drive," on page 88.

Versions 5.0.1 and 5.1 of the vCenter Server Appliance use PostgreSQL for the embedded database instead of IBM DB2, which was used in vCenter Server Appliance 5.0. If you use the embedded database with the vCenter Server Appliance, when you upgrade from version 5.0 to version 5.1, the embedded IBM DB2 database is migrated to a PostgreSQL database. The configuration state of your existing database is preserved and the schema is upgraded to be compatible with vCenter Server Appliance 5.1.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- Verify that the clocks of all machines on the vSphere network are synchronized. See "Synchronizing Clocks on the vSphere Network," on page 53.
- Back up the vCenter Server database.

Procedure

1. Deploy the new version of the vCenter Server Appliance.

   The new appliance has a default network configuration, and the vCenter Server service is unconfigured and disabled.

2. Connect to both the old and new appliances in separate browser windows.
3. In the new appliance, start the vCenter Server Setup wizard, and accept the end user license agreement.
4. In the new appliance, in the Configure Options panel, select **Upgrade from previous version**.
5. (Optional) Configure the vCenter Server Appliance to use an external vCenter Single Sign On instance instead of the default embedded Single Sign On.
   a. Click **Configure SSO**.
   b. On the SSO Settings page, set SSO deployment type to **external**.
   c. Enter the information for the Single Sign On instance.

      The external Single Sign On instance must be hosted on another vCenter Server Appliance. It cannot be hosted on a Windows machine.
6. In the new appliance, click **Next**.
7. In the old appliance, in the **Appliance Upgrade** tab, select **source** for the appliance role, and click **Set role**.

8 In the old appliance, click **Establish Trust**.

9 In the new appliance, copy the local appliance key.

10 In the old appliance, paste the local appliance key into the **Remote appliance key** field, and click **Import remote key**.

11 In the old appliance, copy the local appliance key.

12 In the new appliance, paste the local appliance key into the **Remote appliance key** field and click **Next**.

13 In the new appliance, click **Next**.

The new appliance shuts down the old appliance and assumes the network identity of the old appliance. If the old appliance was configured to use dynamic addressing, the new appliance will also use dynamic addressing. When the import is complete, the new vCenter Server Appliance starts.

14 Review the list of hosts managed by the source appliance and make sure that the hosts you want the new appliance to manage are checked.

15 Review the pre-upgrade check of the source appliance hosts and correct any errors before proceeding.

16 Confirm that you have taken a backup or snapshot of the source appliance and external database, and click **Next**.

17 When the upgrade is complete, click **Close**.

The vCenter Server Appliance is upgraded and the new appliance will reboot.

Update the VMware vCenter Server Appliance from a VMware.com Repository

You can set the vCenter Server Appliance to update itself automatically from a public repository on the VMware.com Web site when VMware releases a new update.

To update the vCenter Server Appliance from a zipped update bundle that you download to your own internal repository, see "Update the VMware vCenter Server Appliance from a Zipped Update Bundle," on page 88. To update the vCenter Server Appliance from the virtual CD-ROM drive of the appliance, see "Update the VMware vCenter Server Appliance from the CD-ROM Drive," on page 88. For major upgrades to the vCenter Server Appliance, see "Upgrade the VMware vCenter Server Appliance," on page 86.

Prerequisites

- Verify that the clocks of all machines on the vSphere network are synchronized. See "Synchronizing Clocks on the vSphere Network," on page 53.
- Back up the vCenter Server database.

Procedure

1 Open the management vCenter Virtual Appliance Web interface on port 5480.

2 In the **Update** tab, click **Settings**.

3 (Optional) Under **Automatic Updates**, set and schedule the vCenter Server Appliance to check for and install updates.

4 Under **Update Repository**, select **Use Default Repository**.

The default repository is set to the correct VMware.com URL.

5 Click **Save Settings**.

6 Click **Status**.

7 Under **Actions**, click **Check Updates** or **Install Updates**.

Update the VMware vCenter Server Appliance from a Zipped Update Bundle

If your Internet access is restricted, you can set up your own internal repository for updates, instead of getting updates from a VMware public repository. You can download updates as a zipped update bundle.

To update the vCenter Server Appliance from a VMware public repository, see "Update the VMware vCenter Server Appliance from a VMware.com Repository," on page 87. To update the vCenter Server Appliance from the virtual CD-ROM drive of the appliance, see "Update the VMware vCenter Server Appliance from the CD-ROM Drive," on page 88. For major upgrades to the vCenter Server Appliance, see "Upgrade the VMware vCenter Server Appliance," on page 86.

Prerequisites

- Verify that the clocks of all machines on the vSphere network are synchronized. See "Synchronizing Clocks on the vSphere Network," on page 53.
- Back up the vCenter Server database.

Procedure

1. Download the zipped updated bundle from the VMware.com Web site.
2. On your chosen Web server, create a repository directory under the root: for example, `vc_update_repo`.
3. Extract the zipped bundle into the repository directory.

   The extracted files are in two subdirectories: `manifest` and `package-pool`.
4. Open the management vCenter Virtual Appliance Web interface on port 5480.
5. In the **Update** tab, click **Settings**.
6. Select **Use Specified Repository**.
7. For the Repository URL, enter the URL of the repository you created.

   For example, if the repository directory is `vc_update_repo`, the URL should be similar to the following URL: `http://web_server_name.your_company.com/vc_update_repo`
8. Click **Save Settings**.
9. Click **Status**.
10. Under **Actions**, click **Install Updates**.

The update is installed.

Update the VMware vCenter Server Appliance from the CD-ROM Drive

You can update the vCenter Server Appliance from an ISO file that the appliance reads from the virtual CD-ROM drive.

To update the vCenter Server Appliance from a zipped update bundle that you download to your own internal repository, see "Update the VMware vCenter Server Appliance from a Zipped Update Bundle," on page 88. To update the vCenter Server Appliance from a VMware public repository, see "Update the VMware vCenter Server Appliance from a VMware.com Repository," on page 87. For major upgrades to the vCenter Server Appliance, see "Upgrade the VMware vCenter Server Appliance," on page 86.

Prerequisites

- Verify that the clocks of all machines on the vSphere network are synchronized. See "Synchronizing Clocks on the vSphere Network," on page 53.

- Back up the vCenter Server database.

Procedure

1 Download the update ISO file from the VMware.com Web site.

2 Connect the vCenter Server Appliance CD-ROM drive to the ISO file you downloaded.

3 Open the management vCenter Virtual Appliance Web interface on port 5480.

4 In the **Update** tab, click **Settings**.

5 Under **Update Repository**, select **Use CD-ROM Updates**.

6 Click **Save Settings**.

7 Click **Status**.

8 Under **Actions**, click **Install Updates**.

vCenter Server Upgrade Fails When Unable to Stop Tomcat Service

A vCenter Server upgrade can fail when the installer is unable to stop the Tomcat service.

Problem

If the vCenter Server installer cannot stop the Tomcat service during an upgrade, the upgrade fails with an error message similar to `Unable to delete VC Tomcat service`. This problem can occur even if you stop the Tomcat service manually before the upgrade, if some files that are used by the Tomcat process are locked.

Solution

1 From the Windows **Start** menu, select **Settings > Control Panel > Administrative Tools > Services**.

2 Right-click **VMware VirtualCenter Server** and select **Manual**.

3 Right-click **VMware vCenter Management Webservices** and select **Manual**.

4 Reboot the vCenter Server machine before upgrading.

This releases any locked files that are used by the Tomcat process, and enables the vCenter Server installer to stop the Tomcat service for the upgrade.

Solution

Alternatively, you can restart the vCenter Server machine and restart the upgrade process, but select the option not to overwrite the vCenter Server data.

After You Upgrade vCenter Server

After you upgrade to vCenter Server, consider the postupgrade options and requirements.

- To view the database upgrade log, open `%TEMP%\VCDatabaseUpgrade.log`.
- Install the vSphere Client and the vSphere Web Clientand make sure that you can access the vCenter Server instance.
- Upgrade any additional modules that are linked to this instance of vCenter Server, such as vSphere Update Manager.
- On the VMware Web site, log in to your account page to access the license portal. From the license portal, upgrade your vCenter Server license. Using the vSphere Client or the vSphere Web Client, assign the upgraded license key to the vCenter Server 5.1 host.
- For Oracle databases, copy the Oracle JDBC Driver (`ojdbc14.jar` or `ojdbc5.jar`) to the`[VMware vCenter Server]\tomcat\lib` folder.

- For SQL Server databases, if you enabled bulk logging for the upgrade, disable it after the upgrade is complete.
- Optionally, join the vCenter Server system to a Linked Mode group.
- Optionally, upgrade or migrate the ESXi or ESX hosts in the vCenter Server inventory to ESXi 5.1.
- If it is not enabled, enable SSL certification checking for all vSphere HA clusters. SSL certification checking is required to configure HA on the hosts. In vCenter Server, select **Administration > vCenter Server Settings > SSL Settings > vCenter requires verified host SSL certificates**. Follow the instructions to verify each host SSL certificate and click **OK**. If necessary, reconfigure HA on the hosts.

Download the vSphere Client

The vSphere Client is a Windows program that you can use to configure the host and to operate its virtual machines. You can download vSphere Client from any host.

Prerequisites

Verify that you have the URL of the host, which is the IP address or host name.

The system must have an Internet connection.

Procedure

1 From a Windows machine, open a Web browser.

2 Enter the URL or IP address for the vCenter Server or host.

For example, `http://exampleserver.example.com` or `http://xxx.xxx.xxx.xxx`.

3 Click **Download vSphere Client** under Getting Started.

4 Click **Save** to download the vSphere Client installer.

The vSphere Client installer is downloaded to the system.

What to do next

Install the vSphere Client.

Upgrade the vSphere Client

Virtual machine users and vCenter Server administrators must use the vSphere Client 5.1 to connect to vCenter Server 5.1 or to connect directly to ESX 5.1 hosts.

You can install the VI Client 2.5, the vSphere Client 4.x, and the vSphere Client 5.1 on the same machine. After you upgrade vCenter Server, be sure to upgrade the vSphere Client to the same version to avoid compatibility problems that might interfere with the proper operation of the vSphere Client.

The vSphere Client upgrade operation requires no downtime. You do not need to power off virtual machines or clients.

Prerequisites

- Verify that you have the vCenter Server installer or the vSphere Client installer.
- Verify that you are a member of the Administrators group on the system.
- Verify that the system has an Internet connection.

Procedure

1 (Optional) Use **Add/Remove Programs** from the Windows Control Panel to remove any previous vCenter Server client.

You do not need to remove earlier versions of vCenter Server clients. These are useful if you need to connect to legacy hosts.

2 Run the vSphere Client installer.

- Start the vCenter Server installer. In the software installer directory, double-click the `autorun.exe` file and select **vSphere® Client™**.
- If you downloaded the vSphere Client, double-click the `VMware-viclient-build number.exe` file.

After you install the vSphere Client 5.1, you can connect to vCenter Server using the domain name or IP address of the Windows machine on which vCenter Server is installed and the user name and password of a user on that machine.

What to do next

Use the vSphere Client to connect to the vCenter Server IP address with your Windows login user name and password. Use the login credentials appropriate to the Windows machine on which vCenter Server is installed. The vCenter Server user name and password might be different than the user name and password you use for ESXi.

If the vSphere Client displays security alerts and exceptions when you log in or perform some operations, such as opening performance charts or viewing the **Summary** tab, this might mean that your Internet Explorer (IE) security settings are set to High. If your IE security settings are set to High, enable the **Allow scripting of Internet Explorer web browser control** setting in IE.

If you cannot connect to the vCenter Server system, you might need to start the VMware VirtualCenter Server service manually. To start the service, in the **Settings** menu, select **Control Panel > Administrative Tools > Services > VMware VirtualCenter Server**. The machine might require several minutes to start the service.

Install or Upgrade the vSphere Web Client

The vSphere Web Client lets you connect to a vCenter Server system to manage an ESXi host through a browser.

If an earlier version of the vSphere Web Client is installed, this procedure upgrades the vSphere Web Client to version 5.1.

NOTE vCenter Server 5.1 supports connection between vCenter Server and vCenter Server components by IP address only if the IP address is IPV4-compliant. To connect to a vCenter Server system in an IPv6 environment, you must use the fully qualified domain name (FQDN) or host name of the vCenter Server. The best practice is to use the FQDN, which works in all cases, instead of the IP address, which can change if assigned by DHCP.

Prerequisites

- Download the vCenter Server installer.
- Verify that the system has an Internet connection.
- Verify that the system meets the software requirements for the vSphere Web Client. See "vSphere Client and vSphere Web Client Software Requirements," on page 22.
- Before you install or upgrade any vSphere product, synchronize the clocks of all machines on the vSphere network. See "Synchronizing Clocks on the vSphere Network," on page 53.
- Install vCenter Single Sign On, and install or upgrade Inventory Service and vCenter Server to version 5.1.

- Verify that the vSphere Web Client and vCenter Server are registered to the same vCenter Single Sign On server, to ensure that the vSphere Web Client can access the vCenter Server inventory.
- Close all browsers before installing or uninstalling the vSphere Web Client.
- Log in as a member of the Administrators group on the host machine, with a user name that does not contain any non-ASCII characters.
- If you are upgrading the vSphere Web Client, and you plan to use it with any version 5.0.x vCenter Server instance that was registered to a version 5.0 vSphere Web Client without accepting the SSL thumbprint, see "Version 5.1 vSphere Web Client Fails to Connect to Version 5.0.x vCenter Server," on page 92.

Procedure

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

2 Select **VMware vSphere® Web Client** and click **Install**.

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

4 Accept or change the default port settings.

5 Enter the information to register the vSphere Web Client with vCenter Single Sign On.

The vCenter Single Sign On administrator user name is admin@System-Domain, and the password must match the password you entered for the administrator user when you installed vCenter Single Sign On. The Lookup Service URL takes the form https://*SSO_host_FQDN_or_IP*:7444/lookupservice/sdk, where 7444 is the default vCenter Single Sign On HTTPS port number. Your entry should match the entry you made when you installed vCenter Single Sign On. If you entered a different port number when you installed vCenter Single Sign On, use that port number.

NOTE If you installed vCenter Single Sign On in a vCenter Server Appliance, you can enter the Single Sign On Admin user as root@localos. In this case, the password is the root password of the vCenter Server Appliance. The Lookup Service URL takes the form https://*vCenter_Appliance_IP_or_host_name*:{7444}/lookupservice/sdk.

---

6 Click **Install**.

7 Start the vSphere Web Client by doing one of the following actions.

- In a browser, go to https://*vSphere_Web_Client_host_name_or_IP*:9443/vsphere-client.
- From the Windows Start menu, select **Programs > VMWare > VMware vSphere Web Client > vSphere Web Client**.

Version 5.1 vSphere Web Client Fails to Connect to Version 5.0.x vCenter Server

The version 5.1 vSphere Web Client fails to connect to a version 5.0.x vCenter Server.

Problem

This problem is accompanied by the error message `Failed to verify the SSL certificate for one or more vCenter Server Systems: vCenter_5.0_IP`

Cause

This problem occurs if the version 5.0.x vCenter Server is registered with a version 5.0 vSphere Web Client without accepting the SSL thumbprint, and then the vSphere Web Client is upgraded to version 5.1.

Solution

1 If you have not upgraded the vSphere Web Client to version 5.1, take the following steps.

   a Unregister the vCenter Server from the version 5.0 vSphere Web Client.

   b Reregister the vCenter Server to the version 5.0 vSphere Web Client and in the Certificate Warning panel, select the check box **Install this certificate and do not display any security warnings for this server** and click **Ignore**.

   For instructions about registering and unregistering vCenter Server from a vSphere Web Client, see the *vCenter Server and Host Management* documentation

2 If you have upgraded the vSphere Web Client to version 5.1, take the following steps.

   a Unregister the vCenter Server from the version 5.1 vSphere Web Client.

   b Reregister the vCenter Server to the version 5.1 vSphere Web Client.

   For instructions about registering and unregistering vCenter Server from a vSphere Web Client, see the *vCenter Server and Host Management* documentation

Install a Local Copy of vSphere Web Client Help

If you do not have internet access from the system you use to access the vSphere Web Client, you can download and deploy a local copy of the online Help.

By default, vSphere Web Client accesses online Help on the Web. This allows the client to access the most up-to-date version of the Help content.

If you download and deploy Help locally, the local copy is not updated when new Help is published to the Web. If you deploy local Help, check the download location periodically for updates.

For instructions for downloading and deploying vSphere Web Client online Help locally, see http://kb.vmware.com/kb/2030344.

Install or Upgrade vSphere ESXi Dump Collector

You can configure ESXi to dump the vmkernel memory to a network server, rather than to a disk, when the system has encountered a critical failure. Install vSphere ESXi Dump Collector to collect such memory dumps over the network.

If an earlier version of the Dump Collector is installed on your system, this procedure upgrades the Dump Collector to version 5.1.

NOTE In the vCenter Server Appliance, the ESXi Dump Collector is installed and enabled by default. These instructions apply to Windows-based deployments.

For instructions on configuring ESXi to dump kernel memory to the network server, see the information about configuring the ESXi Dump Collector with esxcli in the *vSphere Installation and Setup* documentation.

The Dump Collector is most useful for datacenters where ESXi hosts are configured using the Auto Deploy process, so it might not have local storage. You can also install the Dump Collector for ESXi hosts that do have local storage, as an additional location where vmkernel memory dumps can be redirected when critical failures occur.

You can install the Dump Collector on the same machine as the associated vCenter Server, or on a different machine that has network connection to the vCenter Server. ESXi Dump Collector does not support vSphere distributed switches in ESXi 5.x.

The Dump Collector service binds to an IPv4 address for communication with vCenter Server, and does not support IPv6. The vCenter Server can be on a host machine in an IPv4-only, IPv4/IPv6 mixed-mode, or IPv6-only network environment, but the machine that connects to the vCenter Server through the vSphere Client must have an IPv4 address for the Dump Collector service to work.

Prerequisites

- Verify that you have administrator privileges
- Verify that the host machine has Windows Installer 3.0 or later.
- Verify that the host machine has a supported processor and operating system. The Dump Collector supports the same processors and operating systems as vCenter Server. See "vCenter Server Software Requirements," on page 21 and "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.
- Verify that the host machine has a valid IPv4 address. You can install the Dump Collector on a machine in an IPv4-only or IPv4/IPv6 mixed-mode network environment, but you cannot install the Dump Collector on a machine in an IPv6-only environment.
- If you are using a network location for the Dump Collector repository, make sure the network location is mounted.

Gather the following information to complete the installation or upgrade:

- The location to install the Dump Collector to, if you are not using the default location.
- The location for the Dump Collector repository where the dump files will be stored.
- (Optional) The maximum size for the Dump Collector repository. The specified network location must have at least that much free space.
- Whether to install the Dump Collector as a standalone instance or to integrate the Dump Collector with a vCenter Server. The Dump Collector is not supported for integration with vCenter Server versions earlier than version 5.0.
- If the Dump Collector is integrated with a vCenter Server, the address and credentials for the vCenter Server: IP address or name, HTTP port, user name, and password.
- The Dump Collector server port, if you are not using the default setting.
- The host name or IP address to identify the Dump Collector on the network.

Procedure

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

2 Select **VMware vSphere®ESXi™Dump Collector** and click **Install**.

3 Follow the wizard prompts to complete the installation or upgrade.

Install or Upgrade vSphere Syslog Collector

Install the vSphere Syslog Collector to enable ESXi system logs to be directed to a server on the network, rather than to a local disk.

If an earlier version of the Syslog Collector is installed on your system, this procedure upgrades the Syslog Collector to version 5.1.

You can install the Syslog Collector on the same machine as the associated vCenter Server, or on a different machine that has network connection to the vCenter Server. The Syslog Collector service binds to an IPv4 address for communication with vCenter Server, and does not support IPv6. The vCenter Server can be on a host machine in an IPv4-only, IPv4/IPv6 mixed-mode, or IPv6-only network environment, but the machine that connects to the vCenter Server through the vSphere Client must have an IPv4 address for the Syslog Collector service to work.

Prerequisites

- Verify that you have administrator privileges.
- Verify that the host machine has Windows Installer 3.0 or later.
- Verify that the host machine has a supported processor and operating system. The Syslog Collector supports the same processors and operating systems as vCenter Server. See "vCenter Server Software Requirements," on page 21 and "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.
- Determine whether to install the Syslog Collector as a standalone instance or to integrate the Syslog Collector with a vCenter Server. The Syslog Collector is not supported for integration with vCenter Server versions earlier than version 5.0.
- Verify that the host machine has a valid IPv4 address. You can install the Syslog Collector on a machine in an IPv4-only or IPv4/IPv6 mixed-mode network environment, but you cannot install the Syslog Collector on a machine in an IPv6-only environment.

Gather the following information to complete the installation or upgrade:

- The location to install the Syslog Collector to, if you are not using the default location.
- The location for the Syslog Collector repository where the syslog files will be stored.
- (Optional) The maximum size for the Syslog Collector repository. The specified network location must have at least that much free space.
- (Optional) The maximum number of Syslog Collector log rotations to keep.
- If the Syslog Collector is integrated with a vCenter Server, the address and credentials for the vCenter Server: IP address or name, HTTP port, user name, and password.
- The Syslog Collector server port, if you are not using the default setting, and whether to use TCP and UDP protocols for this port.
- The Syslog Collector server SSL port, if you are not using the default setting, and whether to use secure connection (SSL) for this port.
- The host name or IP address to identify the Syslog Collector on the network.

Procedure

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

2 Select **VMware vSphere® Syslog Collector** and click **Install**.

3 Follow the wizard prompts to complete the installation or upgrade.

Install or Upgrade vSphere Auto Deploy

Install vSphere Auto Deploy to provision and customize physical hosts by loading the ESXi image directly into memory. You can provision and reprovision hundreds of ESXi hosts efficiently with vCenter Server.

If an earlier version of Auto Deploy is installed on your system, this procedure upgrades Auto Deploy to version 5.1.

You must install the Auto Deploy server separately for each instance of vCenter Server that you plan to use the Auto Deploy with. Auto Deploy is not supported with vCenter Server versions earlier than version 5.0. Using vCenter Server 5.1 with Auto Deploy 5.0 is not supported. You must upgrade Auto Deploy to version 5.1 for use with vCenter Server 5.1. Auto Deploy supports both IPv4 and IPv6. However, Auto Deploy uses a PXE boot infrastructure that supports only IPv4. You can use Auto Deploy in a mixed IPv4-IPv6 environment or an IPv4-only environment, but not in an IPv6-only environment.

Prerequisites

- Verify that you have administrator privileges
- Verify that the host machine has Windows Installer 3.0 or later.
- Verify that the host machine has a supported processor and operating system. Auto Deploy supports the same processors and operating systems as vCenter Server.

Gather the following information to complete the installation or upgrade:

- The location to install Auto Deploy in, if you are not using the default location.
- The location for the Auto Deploy repository. Do not use a network share for the repository.
- (Optional) The maximum size for the Auto Deploy repository. Best practice is to allocate 2GB to have enough room for four image profiles and some extra space. Each image profile requires approximately 350MB. Determine how much space to reserve for the Auto Deploy repository by considering how many image profiles you expect to use. The specified disk must have at least that much free space.
- The address and credentials of the vCenter Server that you are installing the Auto Deploy feature for: IP address or name, HTTP port, user name, and password.
- The Auto Deploy server port, if you are not using the default setting.
- The host name or IP address to identify Auto Deploy on the network.

Procedure

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

2 Select **VMware vSphere® Auto Deploy** and click **Install**.

3 Follow the wizard prompts to complete the installation or upgrade.

Install or Upgrade VMware vSphere Authentication Proxy

Install vSphere Authentication Proxy to enable ESXi hosts to join a domain without using Active Directory credentials. vSphere Authentication Proxy enhances security for PXE-booted hosts and hosts that are provisioned using Auto Deploy, by removing the need to store Active Directory credentials in the host configuration.

If an earlier version of the vSphere Authentication Proxy is installed on your system, this procedure upgrades the vSphere Authentication Proxy to version 5.1.

You can install vSphere Authentication Proxy on the same machine as the associated vCenter Server, or on a different machine that has network connection to the vCenter Server. The vSphere Authentication Proxy is not supported with vCenter Server versions earlier than version 5.0.

The vSphere Authentication Proxy service binds to an IPv4 address for communication with vCenter Server, and does not support IPv6. The vCenter Server can be on a host machine in an IPv4-only, IPv4/IPv6 mixed-mode, or IPv6-only network environment, but the machine that connects to the vCenter Server through the vSphere Client must have an IPv4 address for the vSphere Authentication Proxy service to work.

Prerequisites

- Install vSphere Auto Deploy. See "Install or Upgrade vSphere Auto Deploy," on page 95.
- Verify that you have administrator privileges.
- Verify that the host machine has Windows Installer 3.0 or later.
- Verify that the host machine has a supported processor and operating system. vSphere Authentication Proxy supports the same processors and operating systems as vCenter Server. See "vCenter Server Software Requirements," on page 21 and "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.

- Verify that the host machine has a valid IPv4 address. You can install vSphere Authentication Proxy on a machine in an IPv4-only or IPv4/IPv6 mixed-mode network environment, but you cannot install vSphere Authentication Proxy on a machine in an IPv6-only environment.
- If you are installing vSphere Authentication Proxy on a Windows Server 2008 R2 host machine, download and install the Windows hotfix described in Windows KB Article 981506 on the support.microsoft.com Web site. If this hotfix is not installed, the Authentication Proxy Adapter fails to initialize. This problem is accompanied by error messages in `camadapter.log` similar to `Failed to bind CAM website with CTL` and `Failed to initialize CAMAdapter.`

Gather the following information to complete the installation or upgrade:

- The location to install vSphere Authentication Proxy, if you are not using the default location.
- The address and credentials for the vCenter Server that vSphere Authentication Proxy will connect to: IP address or name, HTTP port, user name, and password.
- The host name or IP address to identify vSphere Authentication Proxy on the network.

Procedure

1 On the host machine where you will install the vSphere Authentication Proxy service, install the .NET Framework 3.5.

2 Install vSphere Auto Deploy.

  You do not have to install Auto Deploy on the same host machine as the vSphere Authentication Proxy service.

3 Add the host machine where you will install the authentication proxy service to the domain.

4 Use the Domain Administrator account to log in to the host machine.

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

6 Select **VMware vSphere® Authentication Proxy** and click **Install**.

7 Follow the wizard prompts to complete the installation or upgrade.

  During installation, the authentication service registers with the vCenter Server instance where Auto Deploy is registered.

When you install the vSphere Authentication Proxy service, the installer creates a domain account with appropriate privileges to run the authentication proxy service. The account name begins with the prefix `CAM–` and has a 32-character, randomly generated password associated with it. The password is set to never expire. Do not change the account settings.

What to do next

Configure ESXi to use vSphere Authentication Proxy to join a domain. See the *vSphere Security* documentation.

Back Up the vCenter Single Sign On Configuration

Maintain a current backup of the Single Sign On configuration. If your Single Sign On instance is corrupted, you can restore the backup to ensure continued vSphere access for vCenter Server and vCenter Server components.

Back up the Single Sign On configuration in the following circumstances.

- After you install, update, or change the location of a vCenter Single Sign On instance.
- When the `node.pkg` file is modified. The `node.pkg` file is modified when you take either of the following actions.
  - Change Single Sign On database information, such as the database host name or port.

- Change the Single Sign On password that was created for the administrator user admin@System-Domain when Single Sign On was originally installed. This original password is required when you restore a Single Sign On backup.

For a complete backup, you must also back up your Single Sign On database. See the documentation for your database type.

Procedure

- On the vCenter Single Sign On host machine, take one of the following actions.

Option	Description
From the Windows user interface	a Go to **Programs > VMware**. b Right-click **Generate vCenter Single Sign On backup bundle** and select **Run as administrator**.
From a command prompt	a Right-click the **Command Prompt** icon or menu item, and select **Run as administrator**. b Change directory to `C:\Program Files\VMware\Infrastructure\SSOServer\scripts`. If you installed Single Sign On in a location other than the default `C:\Program Files`, adjust the path. c Type `cscript sso-backup.wsf /z` and press Enter.

The vCenter Single Sign On configuration is backed up as `Single Sign On.zip` on the Desktop of the host machine. To restore a vCenter Single Sign On backup, see "Restore a vCenter Single Sign On Single or Primary Node Instance to a New Host Machine," on page 98.

Restore a vCenter Single Sign On Single or Primary Node Instance to a New Host Machine

If your vCenter Single Sign On single node or primary node instance is corrupted, you can restore a backup to ensure continued vSphere access for vCenter Server and vCenter Server components.

Prerequisites

- Verify that you have a current backup of your vCenter Single Sign On configuration. See "Back Up the vCenter Single Sign On Configuration," on page 97.
- Prepare a host machine for the restored Single Sign On instance. The host machine can be a physical machine or a virtual machine. It must satisfy the hardware requirements for Single Sign On. See "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.
- Verify that the vCenter Single Sign On database is accessible from the host machine.
- Verify that you have the original administrator password for the vCenter Single Sign On instance that you are restoring.
- Verify that you have the account name and password for the RSA SSPI service and vCenter Single Sign On service of the vCenter Single Sign On instance that you are restoring.
- Download the vCenter Server installer from the VMware downloads page at http://www.vmware.com/support/ to the new host machine.

Procedure

1. Copy the backup file `Single Sign On.zip` to the new host machine in the directory `C:\Temp\SSO Recovery`.

2 Rename the new host with the same Fully Qualified Domain Name (FQDN) as the Single Sign On server that you created the backup from.

3 If the Single Sign On instance that you created the backup from was in a workgroup, and was installed using its IPv4 address, make sure that the new host machine has the same static IP address.

   DHCP is not supported.

4 Verify that the DNS of the new host is forward and reverse resolvable.

5 On the vCenter Single Sign On host machine, in the VMware vCenter Server installation directory, double-click the `autorun.exe` file to start the installer.

6 Select **vCenter™Single Sign On** and click **Install**.

7 Follow the prompts in the installation wizard to choose the installer language, and agree to the end user patent and license agreements.

8 Select **Recover installed instance of vCenter Single Sign On from a backup**.

9 Browse to and select the `Single Sign On.zip` file.

10 Enter the original administrator password for the old Single Sign On instance.

   You must use the password that was created for the admin@System-Domain user when Single Sign On was originally installed, even if you have changed that password.

11 Make sure that the RSA SSPI service is logged on to the same account as in the Single Sign On instance that you created the backup from.

12 Follow the wizard prompts to complete the Single Sign On restoration.

The vCenter Single Sign On single or primary node instance is restored.

What to do next

If there are any Single Sign On high availability backup nodes associated with the primary node that you restored, make sure that the RSA SSPI service logs on to the same account in the primary node and all high availability backup nodes.

From the vSphere Web Client, log in to the vCenter Server instances that are registered to the Single Sign On instance to verify that you have working access to them.

Enable IPv6 Support for vCenter Inventory Service

vCenter Inventory Service does not support binding on IPv6 interfaces by default. When you install vCenter Server, vCenter Inventory Service supports only IPv4 by default. You can enable IPv6 support for vCenter Inventory Service by modifying the Inventory Service `dataservice.properties` file.

Procedure

1 Stop the vCenter Inventory Service.

   a From the Administrative Tools control panel, select **Services**.

   b Right-click **vCenter Inventory Service** and select **Stop**.

2 In a text editor, open the file:*`Inventory_Service_installation_directory`*`/lib/server/config/dataservice.properties`.

3 Change the line `dataservice.nio.enabled = true` to `dataservice.nio.enabled = false`

4 Restart the vCenter Inventory Service.

IPv6 support for vCenter Inventory Service is enabled.

Linked Mode Considerations for vCenter Server

Consider several issues before you configure a Linked Mode group.

Before you configure a Linked Mode group, consider the following issues.

- If you are upgrading a version 5.0.x vCenter Server that is part of a Linked Mode group, it will not be removed from the group. If you are upgrading a pre-5.0 vCenter Server that is part of a Linked Mode group, it will be removed from the group. vCenter Server does not support Linked Mode groups that contain both version 5.x and pre-5.0 versions of vCenter Server. Similarly, vCenter Server does not support Linked Mode groups that contain both version 5.1.x and 5.0.x versions of vCenter Server. vCenter Server 5.0.x can be joined in a Linked Mode group only with other instances of vCenter Server 5.0.x. vCenter Server 5.1.x can be joined in a Linked Mode group only with other instances of vCenter Server 5.1.x. After all vCenter Servers in the group are upgraded to version 5.0.x or all vCenter Servers in the group are upgraded to version 5.1.x, you can rejoin them.
- Each vCenter Server user sees the vCenter Server instances on which they have valid permissions.
- When you set up your vCenter Server Linked Mode group, you must install the first vCenter Server as a standalone instance because you do not yet have a remote vCenter Server machine to join. Subsequent vCenter Server instances can join the first vCenter Server or other vCenter Server instances that have joined the Linked Mode group.
- If you join a vCenter Server to a standalone instance that is not part of a domain, you must add the standalone instance to a domain and add a domain user as an administrator.
- The vCenter Server instances in a Linked Mode group do not need to have the same domain user login. The instances can run under different domain accounts. By default, they run as the LocalSystem account of the machine on which they are running, which means that they are different accounts.
- During vCenter Server installation, if you enter an IP address for the remote instance of vCenter Server, the installer converts it into a fully qualified domain name.

CAUTION If you need to uninstall and reinstall vCenter Server on more than one member of a Linked Mode group, do so with a single vCenter Server at a time. Uninstalling and reinstalling multiple linked vCenter Servers at the same time is not supported, and can cause errors that prevent vCenter Server from connecting to vCenter Inventory Service. If it is necessary to uninstall and reinstall multiple linked vCenter Servers at the same time, isolate them from the Linked Mode group first, and rejoin them to the Linked Mode group after the reinstallation is complete.

Linked Mode Prerequisites for vCenter Server

Prepare the vCenter Server system for joining a Linked Mode group.

Before joining a vCenter Server to a Linked Mode group, review "Linked Mode Considerations for vCenter Server," on page 100.

All the requirements for standalone vCenter Server systems apply to Linked Mode systems.

The following requirements apply to each vCenter Server system that is a member of a Linked Mode group:

- vCenter Server does not support Linked Mode groups that contain both version 5.x and pre-5.0 versions of vCenter Server. Similarly, vCenter Server does not support Linked Mode groups that contain both version 5.1.x and 5.0.x versions of vCenter Server. vCenter Server 5.0.x can be joined in a Linked Mode group only with other instances of vCenter Server 5.0.x. vCenter Server 5.1.x can be joined in a Linked Mode group only with other instances of vCenter Server 5.1.x. After all vCenter Servers in the group are upgraded to version 5.0.x or all vCenter Servers in the group are upgraded to version 5.1.x, you can rejoin them.
- Make sure that all vCenter Servers in a Linked Mode group are registered to the same vCenter Single Sign On server.

- To join a Linked Mode group the vCenter Server must be in evaluation mode or licensed as a Standard edition. vCenter Server Foundation and vCenter Server Essentials editions do not support Linked Mode.
- DNS must be operational for Linked Mode replication to work.
- The vCenter Server instances in a Linked Mode group can be in different domains if the domains have a two-way trust relationship. Each domain must trust the other domains on which vCenter Server instances are installed.
- When adding a vCenter Server instance to a Linked Mode group, the installer must be run by a domain user who is an administrator on both the machine where vCenter Server is installed and the target machine of the Linked Mode group.
- All vCenter Server instances must have network time synchronization. The vCenter Server installer validates that the machine clocks are not more than five minutes apart. See "Synchronizing Clocks on the vSphere Network," on page 53.

Join a Linked Mode Group After a vCenter Server Upgrade

After you upgrade to vCenter Server 5.x, you can join the system to a Linked Mode group. A Linked Mode group allows you to log in to any single instance of vCenter Server in the group and view and manage the inventories of all the vCenter Server systems in the group.

Prerequisites

See "Linked Mode Prerequisites for vCenter Server," on page 100.

NOTE vCenter Server does not support Linked Mode groups that contain both version 5.x and pre-5.0 versions of vCenter Server. Similarly, vCenter Server does not support Linked Mode groups that contain both version 5.1.x and 5.0.x versions of vCenter Server. vCenter Server 5.0.x can be joined in a Linked Mode group only with other instances of vCenter Server 5.0.x. vCenter Server 5.1.x can be joined in a Linked Mode group only with other instances of vCenter Server 5.1.x. After all vCenter Servers in the group are upgraded to version 5.0.x or all vCenter Servers in the group are upgraded to version 5.1.x, you can rejoin them.

Procedure

1. From the **Start** menu, select **All Programs > VMware > vCenter Server Linked Mode Configuration**.
2. Click **Next**.
3. Select **Modify linked mode configuration** and click **Next**.
4. Click **Join vCenter Server instance to an existing linked mode group or another instance** and click **Next**.
5. Type the server name and LDAP port number of any remote vCenter Server that is or will be a member of the group and click **Next**.

   If you enter an IP address, the installer converts it to a fully qualified domain name.

6 If the vCenter Server installer detects a role conflict, select how to resolve the conflict.

A conflict results if the joining system and the Linked Mode group each contain a role with the same name but with different privileges.

Option	Description
Yes, let VMware vCenter Server resolve the conflicts for me	Click **Next**. The role on the joining system is renamed to *vcenter_namerole_name* where *vcenter_name* is the name of the vCenter Server system that is joining the Linked Mode group and *role_name* is the name of the original role.
No, I'll resolve the conflicts myself	To resolve the conflicts manually: a Using the vSphere Client, log in to the vCenter Server system that is joining the Linked Mode group using an account with Administrator privileges. b Rename the conflicting role. c Close the vSphere Client session and return to the vCenter Server installer. d Click **Back**, and click **Next**. The installation continues without conflicts.

7 Click **Finish**.

vCenter Server restarts. Depending on the size of your inventory, the change to Linked Mode might take from a few seconds to a few minutes to complete.

The vCenter Server instance is now part of a Linked Mode group. It might take several seconds for the global data (such as user roles) that are changed on one machine to be visible on the other machines. The delay is usually 15 seconds or less. It might take a few minutes for a new vCenter Server instance to be recognized and published by the existing instances, because group members do not read the global data very often.

After you form a Linked Mode group, you can log in to any single instance of vCenter Server and view and manage the inventories of all the vCenter Servers in the group.

What to do next

For information about Linked Mode groups, see the *vCenter Server and Host Management* documentation.

Configuring VMware Tomcat Server Settings in vCenter Server 5.1

Starting with vCenter Server 5.1, VMware Tomcat Server settings can no longer be configured through the Windows user interface. vCenter Server 5.1 uses VMware vFabric tc Server, an enterprise version of Apache Tomcat 7. Tomcat version 7 does not provide a control panel in the Windows user interface. Instead, you configure Tomcat by editing configuration files manually.

You can adjust the JVM maximum heap size for vCenter Server, vCenter Single Sign On, vCenter Inventory Service, and Profile-Driven Storage Service. For JVM heap size recommendations, see "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.

Settings for Java options are stored in the following files.

- vCenter Server. *installation_directory*\VMware\Infrastructure\tomcat\conf\wrapper.conf
- vCenter Single Sign On. *installation_directory*\VMware\Infrastructure\SSOServer\conf\wrapper.conf
- vCenter Inventory Service. *installation_directory*\VMware\Infrastructure\Inventory Service\conf\wrapper.conf
- Profile-Driven Storage Service. *installation_directory*\VMware\Infrastructure\Profile-Driven Storage\conf\wrapper.conf

Table 4-10. vCenter Server and vCenter Single Sign On Java Maximum JVM Heap Size Setting in the `wrapper.conf` Files

Java Option	Setting and Default Value
`-Xmx`*`size`* The maximum JVM heap size, in megabytes. This setting controls the maximum size of the Java heap. Tuning this parameter can reduce the overhead of garbage collection, improving server response time and throughput. For some applications, the default setting for this option is too low, resulting in a high number of minor garbage collections.	`wrapper.java.additional.9="-Xmx1024M"`

Table 4-11. Inventory Service and Profile-Driven Storage Service Java Maximum JVM Heap Size Setting in the `wrapper.conf` Files

Java Option	Setting and Default Value
`maxmemory`*`size`* The maximum JVM heap size, in megabytes. This setting controls the maximum size of the Java heap. Tuning this parameter can reduce the overhead of garbage collection, improving server response time and throughput. For some applications, the default setting for this option is too low, resulting in a high number of minor garbage collections.	Inventory Service: `wrapper.java.maxmemory=2048` Profile-Driven Storage Service: `wrapper.java.maxmemory=1024`

vCenter Server and Single Sign On security and port settings are stored in the following files.

- vCenter Server. *`installation_directory`*`\VMware\Infrastructure\tomcat\conf\server.xml` and *`installation_directory`*`\VMware\Infrastructure\tomcat\conf\catalina.properties`
- vCenter Single Sign On. *`installation_directory`*`\VMware\Infrastructure\SSOServer\conf\server.xml` and *`installation_directory`*`\VMware\Infrastructure\SSOServer\conf\catalina.properties`

Table 4-12. vCenter Server Port and Security Settings in the `server.xml` and `catalina.properties` Files

vCenter Server Port or Security Setting	Setting and Default Value
Base shutdown port	base.shutdown.port=8003
Base JMX port. The listener implemented by the com.springsource.tcserver.serviceability.rmi.JmxSocketListener class is specific to tc Server. This listener enables JMX management of tc Server, and is the JMX configuration that the AMS management console uses to manage tc Server instances. The port attribute specifies the port of the JMX server that management products, such as AMS, connect to. The variable *${jmx.port}* is set to 6969 in the default `catalina.properties` file. The bind attribute specifies the host of the JMX server. By default, this attribute is set to the localhost (127.0.0.1). The default -1 setting disables the port.	base.jmx.port=-1
Web services HTTPS	bio-vmssl.http.port=8080
Web services HTTPS	bio-vmssl.https.port=8443
SSL certificate	bio-vmssl.keyFile.name=C:\ProgramData\VMware\VMware VirtualCenter\SSL\rui.pfx
SSL certificate password	bio-vmssl.SSL.password=testpassword
AJP port	bio-vmssl.ajp.port=8009

Table 4-13. vCenter Single Sign On Port and Security Settings in the `server.xml` and `catalina.properties` Files

vCenter Single Sign On Port or Security Setting	Setting and Default Value
Base shutdown port	base.shutdown.port=7005
Base JMX port. The listener implemented by the com.springsource.tcserver.serviceability.rmi.JmxSocketListener class is specific to tc Server. This listener enables JMX management of tc Server, and is the JMX configuration that the AMS management console uses to manage tc Server instances. The port attribute specifies the port of the JMX server that management products, such as AMS, connect to. The variable *${jmx.port}* is set to 6969 in the default `catalina.properties` file. The bind attribute specifies the host of the JMX server. By default, this attribute is set to the localhost (127.0.0.1). The default -1 setting disables the port.	base.jmx.port=-1
HTTP port	ajp-vm.http.port=7080
HTTPS port	ajp-vm.https.port=7444
AJP port	ajp-vm.ajp.port=7009

See *Getting Started with vFabric tc Server* and *vFabric tc Server Administration* at https://www.vmware.com/support/pubs/vfabric-tcserver.html.

You can manage the Windows services for vCenter Server and vCenter Single Sign On from the Administrative Tools control panel, under Services. The Windows service for vCenter Server is listed as VMware VirtualCenter Management Webservices.

Set the Maximum Number of Database Connections After a vCenter Server Upgrade

By default, a vCenter Server creates a maximum of 50 simultaneous database connections. If you configure this value to less than 50 in the previous version of vCenter Server and then perform the upgrade to vCenter Server 5.x, the upgrade restores the default setting of 50. If you configure this value to more than 50 in the previous version of vCenter Server, after the upgrade to vCenter Server 5.x, the system retains the previous value. You can reconfigure the nondefault setting.

You might want to increase the number of database connections if the vCenter Server frequently performs many operations and performance is critical. You might want to decrease this number if the database is shared and connections to the database are costly. Do not change this value unless your system has one of these problems.

Perform this task before you configure the authentication for your database. For more information about configuring authentication, see the documentation for your database.

Procedure

1 From a vSphere Client host that is connected to a vCenter Server system, select **Administration > vCenter Server Configuration**.

2 Click **Database**.

3 In the **Current vCenter Server** menu, select the appropriate server.

4 In **Maximum number**, type the number.

5 Restart the vCenter Server.

The new database setting takes effect.

Restore vCenter Server

You can restore the previous vCenter Server configurations if you have a full backup of your vCenter database and the previous VirtualCenter and vCenter SSL certificates.

Prerequisites

Iin the event of a system failure or disaster, you might need some or all of the following items to restore VirtualCenter and its components. Follow your company disaster recovery guidelines for storage and handling of these items.

- Installation media for the same version of vCenter Server that you are restoring.
- Database backup files.
- SSL files found in: `%ALLUSERSPROFILE%\Application Data\VMware\VMware VirtualCenter\SSL` on the vCenter systems.
- Notes from the original installation regarding the selections, settings, and information used.
- `vpxd.cfg` files.
- vCenter Server and ESX/ESXi license keys.

Procedure

1 Uninstall vCenter Server.

2 Restore the previous version of the vCenter Server database from the backup.

See your database documentation.

3 Reinstall your original version of vCenter Server, selecting the restored database during the installation process.

4 Verify that the license server is running if one was in use in the original installation.

5 Restore the VirtualCenter SSL certificate folder and `vpxd.cfg` to the `%ALLUSERSPROFILE%\Application Data\VMware\VMware VirtualCenter` directory.

6 Make sure the system DSN points to the database.

Upgrading Datastore and Network Permissions

In previous releases of vCenter Server, datastores and networks inherited access permissions from the datacenter. In vCenter Server 4.0 and later, datastores and networks have their own set of privileges that control access to them. You might have to assign privileges manually, depending on the access level you require.

In vCenter Server 5.x, users are granted the No Access role on all new managed objects, including datastores and networks. This means, by default, users cannot view or perform operations on them. All existing objects in vCenter Server maintain their permissions after the upgrade. To determine whether to assign permissions to existing datastores and networks, the upgrade process uses the datacenter's **Read-only** privilege.

- **Read-only** privilege is nonpropagating (not inherited by child objects). VMware assumes that access privileges should not be assigned to datastores and networks. You must update your roles to include the new datastore and network privileges. These privileges are required for users to view and perform operations on these objects.
- **Read-only** privilege is propagating (inherited by child objects). VMware assumes that access privileges should be assigned to datastores and networks so that users can view them and perform basic operations that require access. The default minimum privileges are assigned during the upgrade process.

  After the upgrade process, if your roles require users to have more privileges, for example, the ability to delete a datastore or network, update your permission roles.

Table 4-14. Datastore and Network Permission Requirements

Object	Before Upgrade Privilege	After Upgrade Privilege	Action Required to Enable Access
Datastore	Nonpropagating Read-only	No Access	Assign access privileges for datastores or datastore folders.
	Propagating Read-only	**Allocate Space**	None.
Network	Nonpropagating Read-only	No Access	Assign access privileges for networks or network folders.
	Propagating Read-only	**Assign Network**	None.

NOTE The **Read-only** propagating permission on a datacenter, as well as all other permissions you have set, will continue to work as expected after the upgrade.

Datastore Privileges

In VMware vSphere 5.x, datastores have their own set of access control privileges. As a result, you might need to reconfigure your permissions to grant the new datastore privileges. This is required if you have nonpropagating **Read-only** permission set on the datacenter for users.

Table 4-15. Datastore Privileges

Privilege Name	Actions Granted to Users	Affects	Pair with Object	Effective on Object
Allocate Space	Allocate space on a datastore for a virtual machine, snapshot, or clone.	hosts, vCenter Servers	datastores	datastores, virtual disks
Browse Datastore	Browse files on a datastore, including CD-ROM or Floppy media and serial or parallel port files. In addition, the browse datastore privilege allows users to add existing disks to a datastore.	hosts, vCenter Servers	datastores	datastores, datastore folders, hosts, virtual machines
Delete Datastore	Remove a datastore.	hosts, vCenter Servers	datastores	datastores, datastore folders
Delete Datastore File	Delete a file in the datastore.	hosts, vCenter Servers	datastores	datastores
File Management	Carry out file operations in the datastore browser.	hosts, vCenter Servers	datastores	datastores
Move Datastore	Move a datastore between folders in the inventory. **NOTE** Privileges are required on both the source and destination objects.	vCenter Servers	datastore, source and destination object	datastores, datastore folders
Rename Datastore	Rename a datastore.	hosts, vCenter Servers	datastores	datastores

Update Datastore Permissions

You must change **Read-only** nonpropagating datastore permissions to propagating datastore permissions in order for users to access the datastores. You can assign datastore permissions on datastores or folders containing datastores.

Prerequisites

Before performing the upgrade procedure, determine which users need access to each datastore and which privileges each user needs. If necessary, define new datastore roles or modify the **Database Consumer** sample role. This sample role assigns the **Allocate Space** privilege to the datastore, which enables users to perform basic virtual machine operations, such as creating clones and taking snapshots. In addition, organize your datastores in folders that coincide with users' access needs.

NOTE The **Read-only** propagating permission on a datacenter, in addition to all permissions you have set, will be kept intact after the datastore permissions upgrade.

Procedure

1 Log in to vSphere Client as an administrator.

2 On the Home page, click **Datastores** to display the datastores in the inventory.

3 Select the datastore or datastore folder and click the **Permissions** tab.

4 Right-click in the **Permissions** tab and from the context pop-up menu, choose **Add Permission**.

5 In the **Assigned Role** pane, assign a role.

- To assign specific datastore privileges defined in a role by your company, choose the custom role.
- To migrate read-only nonpropagating datacenter permissions to propagating datastore permissions, choose **Datastore Consumer (sample)**. This role assigns the **Allocate Space** privilege to users, which is required so that users can consume space on the datastores on which this role is granted. In order to perform a space-consuming operation, such as creating a virtual disk or taking a snapshot, the user must also have the appropriate virtual machine privileges granted for these operations.
- To assign **Read-only** datastore privileges, choose **Read-only**.

  This role enables users to browse the datastore without giving them other datastore privileges. For example, choose **Read-only** for users who need to attach CD/DVD-ROM ISO images to a datastore.

6 Select **Propagate to Child Objects**.

7 In the Users and Groups pane, click **Add**.

8 Select the users and groups for whom to add the role.

  To select multiple names, control-click each additional name.

9 Click **OK**.

  All users are added to the **Users and Groups** list for this role.

10 Click **OK**.

The datastore is saved with the new permissions.

NOTE You need to set up permissions for new datastores that you create. By default, new datastores are created under the datacenter folder in the inventory. You can move it into a datastore folder, as appropriate.

Network Privileges

In VMware vSphere 4.0 and higher, networks have their own set of access control privileges. As a result, you might need to reconfigure your permissions to grant the new network privileges. This is required if you have nonpropagating **Read-only** permission set on the datacenter.

Table 4-16 lists the default network privileges that, when selected for a role, can be paired with a user and assigned to a network.

Table 4-16. Network Privileges

Privilege Name	Actions Granted to Users	Affects	Pair with Object	Effective on Object
Assign Network	Assign a network to a virtual machine.	VCenter Servers	virtual machine	network, virtual machine
Configure Network	Configure a network.	hosts, vCenter Servers	network, network folder	networks, virtual machines
Delete Network	Remove a network.	hosts, vCenter Servers	datacenter	datacenters
Move Network	Move a network between folders in the inventory. NOTE Privileges are required on both the source and destination objects.	hosts, vCenter Servers	network, source and destination	networks

Update Network Permissions

You must change **Read-only** nonpropagating network permissions to propagating network permissions in order for users to access the networks. You can assign network permissions on networks or folders containing networks.

Before performing the update procedure, determine the network organization for virtual machines, hosts, and users. If necessary, define new networking roles or modify the **Network Consumer** sample role. This sample role assigns the **Assign Network** privilege. In addition, group your networks in folders that coincide with your organizational needs.

NOTE The **Read-only** propagating permission on a datacenter, in addition to all permissions you have set, will be kept intact after the network permissions upgrade.

Procedure

1 Log in to vSphere Client as an administrator.

2 On the Home page, click **Networking** to display the networks in the inventory.

3 Select the network or network folder and click the **Permissions** tab.

4 Right-click in the **Permissions** tab and from the context menu, choose **Add Permission**.

5 In the **Assigned Role** pane, do one of the following:

- To assign specific network privileges defined in a role by your company, choose the custom role.

  NOTE The **Read-only** propagating permission on a datacenter, in addition to all permissions you have set, will be kept intact after the upgrade.

- To migrate read-only nonpropagating datacenter permissions to propagating network permissions, choose **Network Consumer (sample)**. This role assigns the **Assign Network**privilege to users, which is required so that users can associate a virtual machine's vNIC or host's NIC with the network on which this role is granted. This requires the appropriate permissions for the assignment are also granted on the virtual machines or hosts.

6 Select **Propagate to Child Objects**.

7 In the **Users and Groups** pane, click **Add**.

8 Select the users and groups for whom to add the role.

  To select multiple names, control-click each additional name.

9 Click **OK**.

  All users are added to the **Users and Groups** list for this role.

10 Click **OK**.

New networks that you create are added under the datacenter by default.

NOTE You need to set up permissions for new networks that you create. By default, new networks are created under the datacenter folder in the inventory. You can move it into a network folder, as appropriate.

Configuring VMware Tomcat Server Settings in vCenter Server 5.1

Starting with vCenter Server 5.1, VMware Tomcat Server settings can no longer be configured through the Windows user interface. vCenter Server 5.1 uses VMware vFabric tc Server, an enterprise version of Apache Tomcat 7. Tomcat version 7 does not provide a control panel in the Windows user interface. Instead, you configure Tomcat by editing configuration files manually.

You can adjust the JVM maximum heap size for vCenter Server, vCenter Single Sign On, vCenter Inventory Service, and Profile-Driven Storage Service. For JVM heap size recommendations, see "Hardware Requirements for vCenter Server, vCenter Single Sign On, vSphere Client, and vSphere Web Client," on page 17.

Settings for Java options are stored in the following files.

- vCenter Server. *installation_directory*\VMware\Infrastructure\tomcat\conf\wrapper.conf
- vCenter Single Sign On. *installation_directory*\VMware\Infrastructure\SSOServer\conf\wrapper.conf
- vCenter Inventory Service. *installation_directory*\VMware\Infrastructure\Inventory Service\conf\wrapper.conf
- Profile-Driven Storage Service. *installation_directory*\VMware\Infrastructure\Profile-Driven Storage\conf\wrapper.conf

Table 4-17. vCenter Server and vCenter Single Sign On Java Maximum JVM Heap Size Setting in the `wrapper.conf` Files

Java Option	Setting and Default Value
`-Xmx`*`size`* The maximum JVM heap size, in megabytes. This setting controls the maximum size of the Java heap. Tuning this parameter can reduce the overhead of garbage collection, improving server response time and throughput. For some applications, the default setting for this option is too low, resulting in a high number of minor garbage collections.	`wrapper.java.additional.9="-Xmx1024M"`

Table 4-18. Inventory Service and Profile-Driven Storage Service Java Maximum JVM Heap Size Setting in the `wrapper.conf` Files

Java Option	Setting and Default Value
`maxmemory`*`size`* The maximum JVM heap size, in megabytes. This setting controls the maximum size of the Java heap. Tuning this parameter can reduce the overhead of garbage collection, improving server response time and throughput. For some applications, the default setting for this option is too low, resulting in a high number of minor garbage collections.	Inventory Service: `wrapper.java.maxmemory=2048` Profile-Driven Storage Service: `wrapper.java.maxmemory=1024`

vCenter Server and Single Sign On security and port settings are stored in the following files.

- vCenter Server. *`installation_directory`*`\VMware\Infrastructure\tomcat\conf\server.xml` and *`installation_directory`*`\VMware\Infrastructure\tomcat\conf\catalina.properties`
- vCenter Single Sign On. *`installation_directory`*`\VMware\Infrastructure\SSOServer\conf\server.xml` and *`installation_directory`*`\VMware\Infrastructure\SSOServer\conf\catalina.properties`

Table 4-19. vCenter Server Port and Security Settings in the `server.xml` and `catalina.properties` Files

vCenter Server Port or Security Setting	Setting and Default Value
Base shutdown port	base.shutdown.port=8003
Base JMX port. The listener implemented by the com.springsource.tcserver.serviceability.rmi.JmxSocketListener class is specific to tc Server. This listener enables JMX management of tc Server, and is the JMX configuration that the AMS management console uses to manage tc Server instances. The port attribute specifies the port of the JMX server that management products, such as AMS, connect to. The variable *${jmx.port}* is set to 6969 in the default `catalina.properties` file. The bind attribute specifies the host of the JMX server. By default, this attribute is set to the localhost (127.0.0.1). The default -1 setting disables the port.	base.jmx.port=-1
Web services HTTPS	bio-vmssl.http.port=8080
Web services HTTPS	bio-vmssl.https.port=8443
SSL certificate	bio-vmssl.keyFile.name=C:\ProgramData\VMware\VMware VirtualCenter\SSL\rui.pfx
SSL certificate password	bio-vmssl.SSL.password=testpassword
AJP port	bio-vmssl.ajp.port=8009

Table 4-20. vCenter Single Sign On Port and Security Settings in the `server.xml` and `catalina.properties` Files

vCenter Single Sign On Port or Security Setting	Setting and Default Value
Base shutdown port	base.shutdown.port=7005
Base JMX port. The listener implemented by the com.springsource.tcserver.serviceability.rmi.JmxSocketListener class is specific to tc Server. This listener enables JMX management of tc Server, and is the JMX configuration that the AMS management console uses to manage tc Server instances. The port attribute specifies the port of the JMX server that management products, such as AMS, connect to. The variable *${jmx.port}* is set to 6969 in the default `catalina.properties` file. The bind attribute specifies the host of the JMX server. By default, this attribute is set to the localhost (127.0.0.1). The default -1 setting disables the port.	base.jmx.port=-1
HTTP port	ajp-vm.http.port=7080
HTTPS port	ajp-vm.https.port=7444
AJP port	ajp-vm.ajp.port=7009

See *Getting Started with vFabric tc Server* and *vFabric tc Server Administration* at https://www.vmware.com/support/pubs/vfabric-tcserver.html.

You can manage the Windows services for vCenter Server and vCenter Single Sign On from the Administrative Tools control panel, under Services. The Windows service for vCenter Server is listed as VMware VirtualCenter Management Webservices.

Upgrading Update Manager 5

You can upgrade Update Manager 1.0 Update 6, Update Manager 4.x and Update Manager 5.0 to Update Manager 5.1.

You can install Update Manager 5.1 only on a 64-bit operating system.

If you are running an earlier version of Update Manager on a 32-bit platform, you cannot perform an in-place upgrade to Update Manager 5.1. You must use the data migration tool that is provided with Update Manager 5.0 installation media to move your Update Manager system from 32-bit operating system to Update Manager 5.0 on a 64-bit operating system, and then perform an in-place upgrade from version 5.0 to version 5.1. For detailed information how to use the data migration tool, see the *Installing and Administering VMware vSphere Update Manager* documentation for Update Manager 5.0.

When you upgrade Update Manager, you cannot change the installation path and patch download location. To change these parameters, you must install a new version of Update Manager rather than upgrade.

Previous versions of Update Manager use a 512-bit key and self-signed certificate and these are not replaced during upgrade. If you require a more secure 2048-bit key, you can either perform a fresh installation of Update Manager 5.1, or use the Update Manager Utility to replace the existing certificate.

Scheduled tasks for virtual machine patch scan and remediation are not removed during the upgrade. After the upgrade, you can edit and remove scheduled scan tasks that exist from previous releases. You can remove existing scheduled remediation tasks but you cannot edit them.

Virtual machine patch baselines are removed during the upgrade. Existing scheduled tasks that contain them run normally and ignore only the scanning and remediation operations that use virtual machine patch baselines.

You must upgrade the Update Manager database during the Update Manager upgrade. You can select whether to keep your existing data in the database or to replace it during the upgrade.

This chapter includes the following topics:

Upgrade the Update Manager Server

To upgrade an instance of Update Manager that is installed on a 64-bit machine, you must first upgrade vCenter Server to a compatible version.

The Update Manager 5.1 release allows upgrades from Update Manager 1.0 Update 6, Update Manager 4.x and Update Manager 5.0.

Prerequisites

- Ensure that you grant the database user the required set of privileges. See the *Preparing the Update Manager Database* chapter in *Installing and Administering VMware vSphere Update Manager*.
- Stop the Update Manager service and back up the Update Manager database. The installer upgrades the database schema, making the database irreversibly incompatible with previous Update Manager versions.

Procedure

1 Upgrade vCenter Server to a compatible version.

NOTE The vCenter Server installation wizard warns you that Update Manager is not compatible when vCenter Server is upgraded.

If prompted, you must restart the machine that is running vCenter Server. Otherwise, you might not be able to upgrade Update Manager.

2 In the software installer directory, double-click the `autorun.exe` file at `C:\installer_location`, and select **vSphere Update Manager**.

If you cannot launch the `autorun.exe` file, browse to locate the `UpdateManager` folder and run `VMware-UpdateManager.exe`.

3 Select a language and click **OK**.

4 In the upgrade warning message, click **OK**.

5 Review the Welcome page and click **Next**.

6 Read the patent agreement and click **Next**.

7 Accept the terms in the license agreement and click **Next**.

8 Review the support information, select whether to delete old upgrade files, select whether to download updates from the default download sources immediately after installation, and click **Next**.

If you deselect **Delete the old host upgrade files from the repository**, you retain files that you cannot use with Update Manager 5.1.

If you deselect **Download updates from default sources immediately after installation**, Update Manager downloads updates once daily according to the default download schedule or immediately after you click **Download Now** on the Download Settings page. You can modify the default download schedule after the installation is complete.

9 Type the vCenter Server system credentials and click **Next**.

To keep the Update Manager registration with the original vCenter Server system valid, keep the vCenter Server system IP address and enter the credentials from the original installation.

10 Type the database password for the Update Manager database and click **Next**.

The database password is required only if the DSN does not use Windows NT authentication.

11 On the Database Upgrade page, select **Yes, I want to upgrade my Update Manager database** and **I have taken a backup of the existing Update Manager database**, and click **Next**.

12 (Optional) On the Database re-initialization warning page, select to keep your existing remote database if it is already upgraded to the latest schema.

If you replace your existing database with an empty one, you lose all of your existing data.

13 Specify the Update Manager port settings, select whether you want to configure the proxy settings, and click **Next**.

   Configure the proxy settings if the computer on which Update Manager is installed has access to the Internet.

14 (Optional) Provide information about the proxy server and port, specify whether the proxy should be authenticated, and click **Next**.

15 Click **Install** to begin the upgrade.

16 Click **Finish**.

You upgraded the Update Manager server.

What to do next

Upgrade the Update Manager Client plug-in.

Upgrade the Update Manager Client Plug-In

The Update Manager server and the Update Manager Client plug-in must be of the same version.

Prerequisites

Upgrade the Update Manager server.

Procedure

1 Connect the vSphere Client to a vCenter Server system with which Update Manager is registered.

2 Select **Plug-ins > Manage Plug-ins**.

3 In the Plug-in Manager window, click **Download and install** for the VMware vSphere Update Manager extension.

4 Complete the Update Manager Client installation, and click **Finish**.

   The status for the Update Manager extension is displayed as Enabled.

5 Click **Close** to close the Plug-in Manager window.

The icon for the Update Manager Client plug-in is displayed on the vSphere Client Home page.

Upgrading and Migrating Your Hosts 6

After you upgrade vCenter Server, and vSphere Update Manager if you are using Update Manager, upgrade or migrate VMware ESX 4.x and ESXi 4.x hosts, or update ESXi 5.0.x hosts, to ESXi 5.x.

These topics are intended for administrators who are upgrading ESX, ESXi, and virtual machines from ESX 4.x/ESXi 4.x, or updating ESXi 5.0.x, to ESXi 5.x.

This chapter includes the following topics:

Preparing to Upgrade Hosts

For a successful upgrade of your hosts, understand and prepare for the changes that are involved.

Best Practices for ESXi Upgrades and Migrations

When you upgrade or migrate hosts, you must understand and follow the best practices process for a successful upgrade or migration.

For a successful upgrade or migration, follow these best practices:

1. Make sure that you understand the ESXi upgrade process, the effect of that process on your existing deployment, and the preparation required for the upgrade.
   - If your vSphere system includes VMware solutions or plug-ins, make sure they are compatible with the vCenter Server version that you are upgrading to. See the VMware Product Interoperability Matrix at http://www.vmware.com/resources/compatibility/sim/interop_matrix.php.
   - Read "Preparing to Upgrade Hosts," on page 117 to understand the changes in configuration and partitioning between ESX/ESXi 4.x and ESXi 5.x, the upgrade and migration scenarios that are supported, and the options and tools available to perform the upgrade or migration.
   - Read the VMware vSphere 5.1 Release Notes for known installation issues.
   - If your vSphere installation is in a VMware View environment, see "Upgrading vSphere Components Separately in a VMware View Environment," on page 214.
2. Prepare your system for the upgrade.
   - Make sure your current ESX or ESXi version is supported for migration or upgrade. See "Supported Upgrades to ESXi 5.1," on page 126.

- Make sure your system hardware complies with ESXI 5.1 requirements. See Chapter 3, "System Requirements," on page 13 and the VMware Compatibility Guide, at http://www.vmware.com/resources/compatibility/search.php. Check for system compatibility, I/O compatibility (network and HBA cards), storage compatibility, and backup software compatibility.
- Make sure that sufficient disk space is available on the host for the upgrade or migration. Migrating from ESX 4.x to ESXi 5.x requires 50MB of free space on your VMFS datastore.
- If a SAN is connected to the host, detach the fibre before continuing with the upgrade or migration. Do not disable HBA cards in the BIOS.

  NOTE This step does not apply to ESX hosts that boot from the SAN and have the Service Console on the on the SAN LUNs. You can disconnect LUNs that contain the VMFS datastore and do not contain the Service Console.

3 Back up your host before performing an upgrade or migration, so that, if the upgrade fails, you can restore your host.

   IMPORTANT Once you have upgraded or migrated your host to ESXi 5.x, you cannot roll back to your version 4.x ESX or ESXi software.

4 Depending on the upgrade or migration method you choose, you might need to migrate or power off all virtual machines on the host. See the instructions for your upgrade or migration method.

5 After the upgrade or migration, test the system to ensure that the upgrade or migration completed successfully.

6 Reapply your host licenses. See "Reapplying Licenses After Upgrading to ESXi 5.1," on page 186.

7 Consider setting up a syslog server for remote logging, to ensure sufficient disk storage for log files. Setting up logging on a remote host is especially important for hosts with limited local storage. Optionally, you can install the vSphere Syslog Collector to collect logs from all hosts. See "Providing Sufficient Space for System Logging," on page 22. For information about setting up and configuring syslog and a syslog server, setting up syslog from the host profiles interface, and installing vSphere Syslog Collector, see the *vSphere Installation and Setup* documentation.

8 If the upgrade or migration was unsuccessful, and you backed up your host, you can restore your host.

Files and Configuration Settings Affected by the Migration or Upgrade from ESX 4.x or ESXi 4.x to ESXi 5.x

The migration or upgrade from ESX 4.x or ESXi 4.x to ESXi 5.x does not migrate all host configuration files and settings.

After the upgrade, you must reconfigure some host settings.

Migrating ESX 4.x Files and Settings to ESXi 5.x

The upgrade process preserves as much of the ESX host configuration as possible. However, because of the architectural differences between ESX 4.x and ESXi 5.x architecture, many configuration files cannot be migrated when you select the **Migrate** option in the ESXi installation or upgrade wizard.

Pertinent VMware files, such as `/etc/vmware/esx.conf` are migrated, but many existing settings such as third-party agents and scripts, cannot be migrated.

NOTE If a 4.x host contains customizations, such as third-party VIBS or drivers, upgrading with the standard VMware installer ISO will result in the loss of those customizations, and possibly an unstable system. Use ESXi Image Builder CLI to create a customized ESXi installer ISO file that includes the VIBs or drivers. See the information on Image Builder in the *vSphere Installation and Setup* documentation.

Table 6-1. Files Migrated During Migration or Upgrade to ESXi

File Migrated	Comments
/etc/sfcb/sfcb.cfg	Migrated.
/var/lib/sfcb/registration/repository/root/interop/*	Migrated.
/etc/logrotate.conf	Not migrated. ESXi Logrotation is incompatible with prior versions.
/etc/localtime	Not migrated. Timezones are not supported in ESXi.
/etc/ntp.conf	Migrated.
/etc/ntp.drift	Migrated.
/etc/ntp.keys	Migrated.
/etc/syslog.conf	Migrated for ESXi, not migrated for ESX.
/etc/security/access.conf	Migrated. Needed for PAM configurations.
/etc/security/login.map	
/etc/sysconfig/network	Migrated. Service Console virtual NICs (vswifs) will be converted to ESXi virtual NICs. (vmks)
/etc/sysconfig/ntp	Not migrated.
/etc/sysconfig/xinetd	Not migrated.
/etc/sysconfig/console/*	Not migrated.
/etc/sysconfig/i18n	Not migrated. i18n is not supported in ESXi
/etc/sysconfig/clock	Not migrated. Timezones are not supported in ESXi.
/etc/sysconfig/crond	Not migrated.
/etc/sysconfig/syslog	Not migrated. The syslog daemon is incompatible with prior versions.
/etc/sysconfig/keyboard	Migrated. Any entries not supported will default to English.
/etc/sysconfig/mouse	Not migrated. No mouse support in ESXi.
/etc/sysconfig/static-routes	Migrated.
/etc/sysconfig/static-routes-ipv6	Migrated.
/etc/sysconfig/network-scripts/route-$device	Migrated.
/etc/ssh	Not migrated. See "SSH Configuration Affected by Upgrading or Migrating to ESXi 5.x," on page 121.
/etc/nsswitch.conf	Migrated. Used generically for various configurations, most helpful for Active Directory authentication.
/etc/yp.conf	Not migrated. NIS is not supported in ESXi.
/etc/krb.conf	Needed for Likewise to have Active Directory support.
/etc/krb.realms	
/etc/krb5.conf	
/etc/krb5.acl	
/etc/krb5.keytab	
/etc/krb5.log	
/etc/krb5.mkey	
/etc/login.defs	Not migrated. This file controls settings like maildir, password aging controls, uid and gid min/max settings, and the user deletion command.

Table 6-1. Files Migrated During Migration or Upgrade to ESXi (Continued)

File Migrated	Comments
/etc/pam.d/*	Partially migrated. Needed for authentication and authorization. **Note** Custom edits made to settings in /etc/pam.d/system-auth in ESX 4.x are reset to the default values by the upgrade to ESXi 5.x. To maintain the custom values, reset them manually after the upgrade.
/etc/hosts.allow	Not migrated.
/etc/hosts.deny	Not migrated.
/etc/ldap.conf	Not migrated. LDAP is not supported in ESXi.
/etc/openldap	
/etc/sudoers	Not migrated. SUDO is not supported in ESXi.
/etc/snmp/snmpd.conf	Migrated to /etc/vmware/snmp.xml.
/usr/local/etc/	Not migrated.
/etc/rc.d/rc*.d/*	Not migrated. ESX and ESXi rc.d scripts are incompatible.
/etc/xinetd.conf	Not migrated. xinetd is not supported in ESXi.
/etc/motd	Migrated. A note is appended saying the system was upgraded to ESX 5.x
/etc/likewise/*	Migrated. Used for Likewise configurations.
/etc/vmware/vmkiscsid/*	Migrated.
etc/vmware/init/*	Not migrated. Init scripts are incompatible.
/etc/vmware/esx.conf	Migrated.
/etc/vmware/pci*	Not migrated.
/etc/vmware/simple.map	Not migrated. A new simple.map file is generated.
/etc/vmware/license.cfg	Not migrated. The valuation mode timer is be reset on upgrades.
/etc/vmware/vmware.lic	Not migrated. ESXi 5.x upgrades are reset to evaluation mode.
/etc/vmware/hostd/*	Migrated.
/etc/vmware/hostd/config.xml	Not migrated. This file is currently incompatible with ESXi.
/etc/vmware/hostd/proxy.xml	Not migrated. This file is currently incompatible with ESXi.
/etc/vmware/vmauth/authentication.conf	Migrated. Used for Likewise configurations.
/etc/vmware/vmauth/provider.xml	
/etc/hosts	Migrated.
/etc/resolv.conf	Migrated.
/usr/lib/vmware	Not migrated.
/etc/fstab	Partially migrated. Only NFS entries will be migrated to ESXi.
/etc/passwd	Partially migrated. Only the root user password will be saved, if possible.
/etc/shadow	
/etc/groups	Not migrated.

Firewall Configuration Changes After Migration or Upgrade to ESXi 5.x

The migration or upgrade from ESX/ESXi 4.x to ESXi 5.x results in several changes to the host firewall configuration.

When you migrate from ESX 4.x to ESXi 5.x, the ESX 4.x rulesets list is replaced by the new rulesets list in ESXi 5.x. The following configuration from the `/etc/vmware/esx.conf` file is preserved:

- The existing enabled/disabled status.
- The allowedip added by `esxcfg-firewall`.

Ruleset files that are added by the user and customized firewall rules created in ESX 4.x. are not preserved after the migration. In the first boot after the migration, for those rulesets that don't have entries in the ESX 4.x `/etc/vmware/esx.conf` file, the ESXi 5.x firewall loads the default enabled status.

After the migration to ESXi 5.x, the default block policy is set to false (PASS all traffic by default) on ESXi 5.x only when both blockIncoming and blockOutgoing values of the default policy are false in the ESX 4.x `/etc/vmware/esx.conf` file. Otherwise the default policy is to deny all traffic.

Custom ports that were opened by using the ESX/ESXi 4.1 `esxcfg-firewall` command do not remain open after the upgrade to ESXi 5.x. The configuration entries are ported to the `esx.conf` file by the upgrade, but the corresponding ports are not opened. See the information about ESXi firewall configuration in the *vSphere Security* documentation.

Important The ESXi firewall in ESXi 5.x does not allow per-network filtering of vMotion traffic. Therefore, you must install rules on your external firewall to ensure that no incoming connections can be made to the vMotion socket.

Resource Pool Settings Affected by the Upgrade from ESX 4.x to ESXi 5.x

After the upgrade to ESXi 5.x, ESX 4.x resource pool settings might be insufficient to start all virtual machines in the pool.

The upgrade to ESXi 5.x affects the amount of memory available to the host system. As a result, in resource pools that are set to use nearly all of the resources available, some virtual machines might not have enough resources to start after the upgrade. When this happens, a system alert will be issued. You can find this alert by pressing Alt + F11 in the ESXi direct console. Reconfigure the resource pools to solve the problem.

SSH Configuration Affected by Upgrading or Migrating to ESXi 5.x

The host SSH configuration is migrated only for upgrades from ESXi 4.1 or ESXi 5.0 x to ESXi 5.x

SSH configuration is not migrated for ESX 4.x hosts or ESXi 4.0 hosts. For these hosts, SSH access is disabled during the upgrade or migration process. You can reenable SSH access in the direct console. See the information on enabling SSH access in the *vSphere Installation and Setup* documentation.

Networking Changes in ESXi 5.x

Some ESX 4.x and ESXi 4.x network settings stored in `/etc/sysconfig/network` are migrated in the upgrade or migration to ESXi 5.x. In the migration to ESXi 5.x, ESX Service Console virtual NICs (vswifs) are converted to ESXi virtual NICs (vmks).

The distributed port group or dvPort that the virtual NICs connect to is also migrated. The Service Console port group is renamed as the Management Network port group. When vswifs are migrated to vmks, they are numbered to follow any existing vmk in sequence. For example, if the version 4.x ESX host has virtual NICs vmk0, vmk1, and vswif0, after the migration the new ESXi configuration will be vmk0, vmk1, and vmk2, where vmk2 is the management interface.

When virtual NICs are configured to use DHCP, a setting controls whether DHCP sets the default route and host name in addition to installing an IPv4 address. In ESX this setting is PEERDNS. In ESXi, the setting is DhcpDNS. The PEERDNS value for ESX Service Console virtual NICs is migrated to the DhcpDNS setting for the ESXi virtual NICs. The DhcpDNS setting preserves the ESX configuration for default route and host name as well as the IPv4 address.

The migration from ESX 4.x to ESXi 5.x also preserves manually assigned IPv4 and IPv6 addresses, default route, and host-specific IPv4 and IPv6 routes.

When you upgrade from ESXi 4.x to ESXi 5.x, the default maximum number of ports for a virtual switch changes from 64 to 128. To keep the same maximum number of ports that you have in ESXi 4.x, set the value explicitly before you upgrade, using the vSphere Client.

ESX hosts have two IP stacks, one for the vmkernel and one for the Service Console. Because ESXi hosts have only one IP stack, the migration cannot preserve both ESX default routes. After migration, the ESX Service Console default route becomes the single ESXi default route, replacing the vmkernel route. The change to a single ESXi default route might cause loss of connectivity for routed nonmanagement traffic that originates from vmkernel. To restore vmkernel networking, you can configure static routes in addition to the default route.

All vswif interfaces are migrated to vmk interfaces. If a conflict is detected between two interfaces, one is left in disabled state. The upgrade disables any conflicting kernel IP addressing in favor of the management interface.

The migration to ESXi 5.x disables any existing vmk virtual NIC that meets the following conditions.

- The vmk virtual NIC has a manually configured (static) IP address.
- The IP address is in the same subnet as a vswif virtual NIC that is being migrated to a switch containing the vmk virtual NIC.
- The vmk and vswif NICs are both on the same virtual switch.

For example, if vswif0, with IP address 192.0.2.1/24 on vswitch1, is migrated to a switch containing vmk0, with IP address 192.0.2.2/24, also on vswitch1, after the migration, vmk0 will be disabled.

ESX 4.x Service Console Port Group Removed in Migration to ESXi 5.x

Because ESXi 5.x has no Service Console, migrating from ESX 4.x to ESXi 5.x removes the Service Console port group.

After the migration to ESXi 5.x, a new port group, the Management Network port group, is created.

If any of your ESX hosts require the Service Console port group to support an existing service, you can write a firstboot script to recreate the port group after the migration. See the information on the `%firstboot` command in "Installation and Upgrade Script Commands," on page 157.

Partitioning Changes from ESX 4.x to ESXi 5.x

The ESXi partition scheme used in ESXi 5.x differs from that of earlier ESX and ESXi versions. ESXi 5.x does not have the Service Console partition found in ESX.

How these changes affect your host depends on whether you are upgrading to ESXi 5.x or performing a fresh installation.

Partitioning in New ESXi 5.x Installations

In new installations, several new partitions are created for the boot banks, the scratch partition, and the locker. New ESXi 5.x installations use GUID Partition Tables (GPT) instead of MSDOS-based partitioning.

The partition table is fixed as part of the binary image, and is written to the disk at the time the system is installed. The ESXi installer leaves the scratch and VMFS partitions blank, and ESXi creates them when the host is rebooted for the first time after installation or upgrade. The scratch partition is 4GB. The rest of the disk is formatted as a VMFS5 partition.

NOTE The installer can create multiple VFAT partitions. The VFAT designation does not always indicate that the partition is a scratch partition. In some cases, a VFAT partition can lie idle.

Partitioning in Upgraded ESXi 5.x Hosts

Upgraded systems do not use GUID Partition Tables (GPT), but retain the older MSDOS-based partition label.

For most ESXi 4.x hosts, the partition table is not rewritten in the upgrade to ESXi 5.x. The partition table is rewritten for systems that have lopsided bootbanks. Lopsided boot banks can occur in systems that are upgraded from ESXi 3.5 to ESXi 4.x, and then upgraded directly to ESXi 5.x.

For ESX hosts, the partitioning structure is changed to resemble that of an ESXi 4.x host. The VMFS3 partition is retained and a new MSDOS-based partition table overwrites the existing partition table.

For ESX hosts, any data stored in custom user created partitions inside the Service Console is not preserved in the migration to ESXi 5.x.

Upgraded hosts do not have a scratch partition. Instead, the scratch directory is created and accessed off of the VMFS volume. Each of the other partitions, such as the bootbanks, locker and vmkcore are identical to that of any other system.

In upgraded hosts, the VMFS partition is not upgraded from VMFS3 to VMFS5. ESXi 5.x is compatible with VMFS3 partitions. You can upgrade the partition to VMFS5 after the host is upgraded to ESXi 5.x. See the information on upgrading datastores to VMFS5 in the *vSphere Storage* documentation.

Upgraded hosts, which keep the older MSDOS-based partitioning, do not support installing ESXi on a single physical disk or LUN larger than 2TB. To install ESXi on a disk or LUN larger than 2TB, you must do a fresh installation.

NOTE The ESXi 5.x installer cannot detect ESX 2.x instances or VMFS2 datastores. You cannot migrate ESX 2.x instances to ESXi 5.x or preserve VMFS2 datastores in an upgrade to ESXi 5.x. Instead, perform a fresh installation of ESXi 5.x.

For the VMFS partition on the disk to be preserved during an upgrade to ESXi 5.x, the partition must be physically located after the boot partition, which is partition 4, and the extended partition on the disk (8192 + 1835008 sectors). Any system that has a VMFS partition after the 1843200 sector mark can keep that VMFS partition, regardless of whether it was initially installed with ESX 3.5 or 4.x.

For systems in which the VMFS partition is placed on a different drive from the boot drive, the entire contents of the boot drive is overwritten during the upgrade. Any extra data on the disk is erased.

ESXi 5.1 Upgrade Options

VMware provides several ways to upgrade ESX/ESXi hosts.

vSphere Update Manager

vSphere Update Manager is software for upgrading, migrating, updating, and patching clustered hosts, virtual machines, and guest operating systems. Update Manager orchestrates host and virtual machine upgrades. If your site uses vCenter Server, VMware recommends that you use Update Manager. For instructions about conducting an orchestrated host upgrade, see "Using vSphere Update Manager to Perform Orchestrated Host Upgrades," on page 139. For instructions about conducting an orchestrated virtual machine upgrade, see "Perform an Orchestrated Upgrade of Virtual Machines with vSphere Update Manager," on page 191. For complete documentation about Update Manager, see the *Installing and Administering VMware vSphere Update Manager*.

Upgrade or migrate interactively using an ESXi installer ISO image on CD/DVD or USB flash drive

You can run the ESXi 5.1 installer from a CD/DVD or USB flash drive to do an interactive upgrade or migration. This method is appropriate for deployments with a small number of hosts. The installer works the same as for a fresh installation, but if you select a target disk that already contains an ESX/ESXi 4.x or ESXi 5.0.x installation, the installer upgrades the host to 5.1, and gives you the option to migrate some existing host settings and configuration files, and preserve the existing VMFS datastore. See "Upgrade or Migrate Hosts Interactively," on page 153.

Perform a scripted upgrade

You can upgrade or migrate hosts from version 4.x ESXi and ESX and version 5.0.x ESXi to ESXi 5.1 by invoking an update script, for an efficient, unattended upgrade. Scripted upgrades provide an efficient way to deploy multiple hosts. You can use a script to upgrade ESXi from a CD, DVD or USB flash drive, or by PXE-booting the installer. You can also call a script from an interactive installation. See "Installing, Upgrading, or Migrating Hosts Using a Script," on page 155.

vSphere Auto Deploy

Auto Deploy is a new feature in vSphere 5.x. After an ESXi 5.x host is deployed with Auto Deploy, you can use Auto Deploy to reprovision the host and reboot it with a new image profile that contains an ESXi upgrade or patch, a host configuration profile, and, optionally, third-party drivers or management agents provided by VMware partners. You can build custom images by using ESXi Image Builder CLI. See "Using vSphere Auto Deploy to Reprovision Hosts," on page 168.

esxcli

You can upgrade and apply patches to ESXi 5.x hosts using the `esxcli` command-line utility for ESXi. You cannot use `esxcli` to upgrade ESX/ESXi 4.x hosts to ESXi 5.x. This utility requires the vSphere CLI. See "Upgrading Hosts by Using esxcli Commands," on page 173.

The `esxupdate` and `vihostupdate` utilities are not supported for ESXi 5.x upgrades.

Table 6-2. ESXi 5.x Upgrade Methods

Upgrade Method	Upgrade from ESX or ESXi 4.x to ESXi 5.x	Upgrade or Patch from ESXi 5.0.x to ESXi 5.1
vSphere Update Manager	yes	yes
Interactive upgrade from CD, DVD, or USB drive	yes	yes
Scripted upgrade	yes	yes

Table 6-2. ESXi 5.x Upgrade Methods (Continued)

Upgrade Method	Upgrade from ESX or ESXi 4.x to ESXi 5.x	Upgrade or Patch from ESXi 5.0.x to ESXi 5.1
vSphere Auto Deploy	no	yes, if the ESXi 5.0.x host was deployed using Auto Deploy
esxcli	no	yes

Upgrading Hosts That Have Third-Party Custom VIBs

When you upgrade a host that contains custom VIBs, the upgrade displays an error message unless the same VIBs are included in the upgrade ISO file.

A host can have custom VIBs installed, for example, for third-party drivers or management agents. For example, ESX/ESXi 4.x hosts can contain Cisco Nexus 1000V VEMs or EMC PowerPath modules. The ESXi 5.x architecture differs from ESX/ESXi 4.x so that customized third-party software packages (VIBs) cannot be migrated when you upgrade from ESX/ESXi 4.x to ESXi 5.x. When you upgrade a 4.x host with custom VIBs that are not in the upgrade ISO, the ESXi installer displays an error message that lists the missing VIBs.

To migrate the third-party customizations as part of the host upgrade, use ESXi Image Builder to create a custom ESXi ISO image that includes the missing VIBs. For information about using Image Builder to make a custom ISO, see the information about Using ESXi Image Builder in the *vSphere Installation and Setup* documentation.

To upgrade a version 4.x ESX/ESXi host, without including the third-party software, you can take one of the following actions.

- Remove the third-party software. If you are using vSphere Update Manager, select the option to remove third-party software modules during the remediation process. For information about upgrading with vSphere Update Manager, see *Installing and Administering VMware vSphere Update Manager*.
- Override the error message during the host upgrade by selecting the Force Migrate option.

CAUTION Using either of these two options might cause the upgraded host to not boot properly, to exhibit system instability, or to lose functionality. Ensure that your system does not have any critical dependence on third-party VIBs that requires resolution on first boot and cannot be resolved later. For example, your system might require custom drivers for NICs that you are booting from.

If you are upgrading a 5.0.x host, supported custom VIBs on the host that are not included in the ESXi installer ISO are migrated. If the host or the installer .ISO contains a VIB that creates a conflict and prevents the upgrade, an error message identifies the offending VIB. You can remove the VIB and retry the upgrade, or use ESXI Image Builder CLI to create a custom installer .ISO that resolves the conflict. The `forcemigrate` option is not available.

If you are upgrading a host running ESX/ESXi 4.1 Upgrade 1 or ESX/ESXi 4.0 Upgrade 3, you will see the error message for the VIBs listed in Table 6-3, even if you have never installed any custom VIBs. If you are sure that the proper functioning or your system does not depend on those VIBs, you can choose to ignore the warnings and continue with the upgrade.

Table 6-3. ESX/ESXi 4.0 U3 and 4.1 U1 Third-Party VIBs That Cannot Be Migrated to ESXi 5.x.

ESX/ESXi Release	Bulletin ID	VIB ID
4.1 Upgrade 1	ESX410-201101224-UG	cross_vmware-esx-drivers-net-vxge_400.2.0.28.21239-1OEM If your system does not include any hardware that requires this Neterion driver, you can ignore the error message.
4.1 Upgrade 1	ESX410-201101223-UG	cross_vmware-esx-drivers-scsi-3w-9xxx_400.2.26.08.036vm40-1OEM If your system does not include any hardware that requires this 3ware driver, you can ignore the error message.
4.0 Upgrade 3	ESX400-201105213-UG	cross_vmware-esx-drivers-scsi-3w-9xxx_400.2.26.08.036vm40-1OEM If your system does not include any hardware that requires this 3ware driver, you can ignore the error message.

Supported Upgrades to ESXi 5.1

You can upgrade an ESXi 5.0 host directly to ESXi 5.1, and in most cases, you can migrate an ESX 4.x or upgrade an ESXi 4.x host directly to ESXi 5.1.

The details and level of support for an upgrade or migration from version 4.x ESX and ESXi hosts, and version 5.0.x ESXi hosts, to ESXi 5.1 depend on the host to be upgraded and the upgrade method that you use.

The following ESX/ESXi 4.x and ESXi 5.0 versions are supported for upgrade to ESXi version 5.1.

- ESX/ESXi 4.0, 4.0 U1, 4.0 U2, 4.0 U3, 4.0 U4
- ESX/ESXi 4.1, 4.1 U1, 4.1 U2, 4.1 U3
- ESXi 5.0, 5.0 U1

Table 6-4. Supported Scenarios for Upgrade or Migration to ESXi 5.1

Scenario for Upgrade or Migration to ESXi 5.1	Support
3.x ESX and ESXi hosts	Not supported for direct upgrade. You must upgrade version 3.x ESX and ESXi hosts to ESX or ESXi version 4.x before you can upgrade them to ESXi 5.1. See the vSphere 4.x upgrade documentation. Alternatively, you might find it simpler and more cost effective to do a fresh installation of ESXi 5.1
4.x ESX host that was upgraded from ESX 3.x with a partition layout incompatible with ESXi 5.x	Not supported. The VMFS partition cannot be preserved. Upgrading or migration is possible only if there is at most one VMFS partition on the disk that is being upgraded and the VMFS partition must start after sector 1843200. Perform a fresh installation. To keep virtual machines, migrate them to a different system.
4.x ESX or ESXi host, migration or upgrade with vSphere Update Manager	Supported. See "Using vSphere Update Manager to Perform Orchestrated Host Upgrades," on page 139 and the *Installing and Administering VMware vSphere Update Manager* documentation.

Table 6-4. Supported Scenarios for Upgrade or Migration to ESXi 5.1 (Continued)

Scenario for Upgrade or Migration to ESXi 5.1	Support
4.x ESX or ESXi host, interactive migration or upgrade	Supported. See "Upgrade or Migrate Hosts Interactively," on page 153. The installer wizard offers the choice to upgrade or perform a fresh installation. If you upgrade, ESX partitions and configuration files are converted to be compatible with ESXi.
4.x ESX or ESXi host, scripted upgrade	Supported. See "Installing, Upgrading, or Migrating Hosts Using a Script," on page 155. In the upgrade script, specify the particular disk to upgrade on the system. If the system cannot be upgraded correctly because the partition table is incompatible, the installer displays a warning and does not proceed. In this case, perform a fresh installation. Upgrading or migration is possible only if there is at most one VMFS partition on the disk that is being upgraded and the VMFS partition must start after sector 1843200.
4.x ESX host on a SAN or SSD	Partially supported. You can upgrade the host as you would a normal ESX 4.x host, but no provisions will be made to optimize the partitions on the disk. To optimize the partition scheme on the host, perform a fresh installation.
4.x ESX host, missing Service Console `.vmdk` file, interactive migration from CD or DVD, scripted migration, or migration with vSphere Update Manager	Not supported. The most likely reasons for a missing Service Console are that the Service Console is corrupted or that the VMFS volume is not available, which can occur if the VMFS was installed on a SAN and the LUN is not accessible. In this case, on the disk selection screen of the installer wizard, if you select a disk that has an existing ESX 4.x installation, the wizard prompts you to perform a clean installation.
4.x ESX or ESXi host, asynchronously released driver or other third-party customizations, interactive migration from CD or DVD, scripted migration, or migration with vSphere Update Manager	Supported with ESXi Image Builder CLI. If a 4.x host contains customizations, such as third-party VIBS or drivers, upgrading with the standard VMware installer ISO will result in the loss of those customizations, and possibly an unstable system. See "Upgrading Hosts That Have Third-Party Custom VIBs," on page 125. You can ESXi Image Builder CLI to create a customized ESXi installer ISO file that includes the VIBs or drivers. See the information on Image Builder in the *vSphere Installation and Setup* documentation.
5.x ESXi host, asynchronously released driver or other third-party customizations, interactive upgrade from CD or DVD, scripted upgrade, or upgrade with vSphere Update Manager	Supported. When you upgrade an ESXi 5.x host that has custom VIBs to version 5.1, the custom VIBs are migrated. See "Upgrading Hosts That Have Third-Party Custom VIBs," on page 125.
5.0.x ESXi host	Methods supported for direct upgrade to ESXi 5.1 are: ■ vSphere Update Manager. ■ Interactive upgrade from CD, DVD, or USB drive. ■ Scripted upgrade. ■ Auto Deploy. If the ESXi 5.0 host was deployed using Auto Deploy, you can use Auto Deploy to reprovision the host with an ESXi 5.1 image. ■ esxcli.

Using Manually Assigned IP Addresses for Upgrades and Migrations Performed with vSphere Update Manager

If you are using vSphere Update Manager to upgrade or migrate a host from ESX/ESXi 4.x to ESXi 5.x, you must use manually assigned IP addresses for the hosts. Manually assigned IP addresses also referred to as static IP addresses.

DHCP IP addresses can cause problems during host upgrades or migrations performed with Update Manager. If a host loses its DHCP IP address during an upgrade or migration because the lease period configured on the DHCP server expires, Update Manager loses connectivity to the host. In this case, even if the host upgrade or migration is successful, Update Manager reports the upgrade or migration as failed, because it cannot connect to the host. To prevent this scenario, use manually assigned IP addresses for your hosts.

Media Options for Booting the ESXi Installer

The ESXi installer must be accessible to the system on which you are installing ESXi.

The following boot media are supported for the ESXi installer:

- Boot from a CD/DVD. See "Download and Burn the ESXi Installer ISO Image to a CD or DVD," on page 128.
- Boot from a USB flash drive. See "Format a USB Flash Drive to Boot the ESXi Installation or Upgrade," on page 128.
- PXE boot from the network. "PXE Booting the ESXi Installer," on page 132
- Boot from a remote location using a remote management application. See "Using Remote Management Applications," on page 139

Download and Burn the ESXi Installer ISO Image to a CD or DVD

If you do not have an ESXi installation CD/DVD, you can create one.

You can also create an installer ISO image that includes a custom installation script. See "Create an Installer ISO Image with a Custom Installation or Upgrade Script," on page 131.

Procedure

1 Download the ISO image for ESXi from the VMware download page at http://www.vmware.com/download/.

2 Burn the ISO image to a CD or DVD.

Format a USB Flash Drive to Boot the ESXi Installation or Upgrade

You can format a USB flash drive to boot the ESXi installation or upgrade.

These instructions assume that you are performing the procedure on a Linux machine and that the USB flash drive is detected by the operating system as `/dev/sdb`.

NOTE The `ks` file containing the installation script cannot be located on the same USB flash drive that you are using to boot the installation or upgrade.

Prerequisites

From the VMware Web site, download the ESXi ISO image `VMware-VMvisor-Installer-`*`5.x.x`*`-`*`XXXXXX`*`.x86_64.iso`, including the file `isolinux.cfg`,where *`5.x.x`* is the version of ESXi you are installing, and *`XXXXXX`* is the build number of the installer ISO image.

Procedure

1 If your USB flash drive is not detected as `/dev/sdb`, or you are not sure how your USB flash drive is detected, determine how it is detected.

   a In a terminal window, run the following command.

   ```
   tail –f /var/log/messages
   ```

   This command displays current log messages in the terminal window.

   b Plug in your USB flash drive.

   The terminal window displays several messages identifying the USB flash drive, in a format similar to the following message.

   ```
   Oct 25 13:25:23 ubuntu kernel: [  712.447080] sd 3:0:0:0: [sdb] Attached SCSI removable disk
   ```

   In this example, "[sdb]" identifies the USB device. If your device is identified differently, use that identification, without the brackets, in place of sdb, in this procedure.

2 Create a partition table on the USB flash device.

   ```
   /sbin/fdisk /dev/sdb
   ```

   a Type `d` to delete partitions until they are all deleted.

   b Type `n` to create primary partition 1 that extends over the entire disk.

   c Type `t` to set the type to an appropriate setting for the FAT32 file system, such as **c**.

   d Type `a` to set the active flag on partition 1.

   e Type `p` to print the partition table.

   The result should be similar to the following text:

   ```
   Disk /dev/sdb: 2004 MB, 2004877312 bytes
   255 heads, 63 sectors/track, 243 cylinders
   Units = cylinders of 16065 * 512 = 8225280 bytes
      Device Boot      Start         End      Blocks   Id  System
   /dev/sdb1   *           1         243     1951866    c  W95 FAT32 (LBA)
   ```

   f Type `w` to write the partition table and quit.

3 Format the USB flash drive with the Fat32 file system.

   ```
   /sbin/mkfs.vfat –F 32 –n USB /dev/sdb1
   ```

4 Run the following commands.

   ```
   /path_to_syslinux–3.86_directory/syslinux–3.86/bin/syslinux /dev/sdb1
   cat /path_to_syslinux–3.86_directory/syslinux–3.86/usr/share/syslinux/mbr.bin > /dev/sdb
   ```

5 Mount the USB flash drive.

   ```
   mount /dev/sdb1 /usbdisk
   ```

6 Mount the ESXi installer ISO image.

   ```
   mount –o loop VMware–VMvisor–Installer–5.x.x–XXXXXX.x86_64.iso /esxi_cdrom
   ```

7 Copy the contents of the ISO image to `/usbdisk`.

   ```
   cp –r /esxi_cdrom/* /usbdisk
   ```

8 Rename the `isolinux.cfg` file to `syslinux.cfg`.

   ```
   mv /usbdisk/isolinux.cfg /usbdisk/syslinux.cfg
   ```

9 In the file /usbdisk/syslinux.cfg, change the line APPEND –c boot.cfg to APPEND –c boot.cfg –p 1.

10 Unmount the USB flash drive.

```
umount /usbdisk
```

11 Unmount the installer ISO image.

```
umount /esxi_cdrom
```

The USB flash drive can now boot the ESXi installer.

Create a USB Flash Drive to Store the ESXi Installation Script or Upgrade Script

You can use a USB flash drive to store the ESXi installation script or upgrade script that is used during scripted installation or upgrade of ESXi.

When multiple USB flash drives are present on the installation machine, the installation software searches for the installation or upgrade script on all attached USB flash drives.

The instructions in this procedure assume that the USB flash drive is detected as /dev/sdb.

NOTE The ks file containing the installation or upgrade script cannot be located on the same USB flash drive that you are using to boot the installation or upgrade.

Prerequisites

- Linux machine
- ESXi installation or upgrade script, the ks.cfg kickstart file
- USB flash drive

Procedure

1 Attach the USB flash drive to a Linux machine that has access to the installation or upgrade script.

2 Create a partition table.

```
/sbin/fdisk /dev/sdb
```

a Type d to delete partitions until they are all deleted.

b Type n to create primary partition 1 that extends over the entire disk.

c Type t to set the type to an appropriate setting for the FAT32 file system, such as **c**.

d Type a to set the active flag on partition 1.

e Type p to print the partition table.

The result should be similar to the following text:

```
Disk /dev/sdb: 2004 MB, 2004877312 bytes
255 heads, 63 sectors/track, 243 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1   *           1         243     1951866    c  W95 FAT32 (LBA)
```

f Type w to write the partition table and quit.

3 Format the USB flash drive with the Fat32 file system.

```
/sbin/mkfs.vfat –F 32 –n USB /dev/sdb1
```

4 Mount the USB flash drive.

```
mount /dev/sdb1 /usbdisk
```

5 Copy the ESXi installation script to the USB flash drive.

```
cp ks.cfg /usbdisk
```

6 Unmount the USB flash drive.

The USB flash drive contains the installation or upgrade script for ESXi.

What to do next

When you boot the ESXi installer, point to the location of the USB flash drive for the installation or upgrade script. See "Enter Boot Options to Start an Installation or Upgrade Script," on page 155 and "About PXE Configuration Files," on page 134.

Create an Installer ISO Image with a Custom Installation or Upgrade Script

You can customize the standard ESXi installer ISO image with your own installation or upgrade script. This enables you to perform a scripted, unattended installation or upgrade when you boot the resulting installer ISO image.

See also "About Installation and Upgrade Scripts," on page 157 and "About the boot.cfg File," on page 165.

Prerequisites

- Linux machine.
- The ESXi ISO image `VMware-VMvisor-Installer-`*`5.x.x-XXXXXX`*`.x86_64.iso`,where *`5.x.x`* is the version of ESXi you are installing, and *`XXXXXX`* is the build number of the installer ISO image.
- Your custom installation or upgrade script, the `ks_cust.cfg` kickstart file.

Procedure

1 Download the ESXi ISO image from the VMware Web site.

2 Mount the ISO image into a folder:

```
mount -o loop VMware-VMvisor-Installer-5.x.x-XXXXXX.x86_64.iso /esxi_cdrom_mount
```

XXXXXX is the ESXi build number for the version that you are installing or upgrading to.

3 Copy the contents of `cdrom` to another folder:

```
cp -r /esxi_cdrom_mount /esxi_cdrom
```

4 Copy the kickstart file to `/esxi_cdrom`

```
cp ks_cust.cfg /esxi_cdrom
```

5 (Optional) Modify the `boot.cfg` file to specify the location of the installation or upgrade script using the `kernelopt` option.

This step makes the installation or upgrade completely automatic, without the need to specify the kickstart file during the installation or upgrade.

6 Recreate the ISO image:

```
mkisofs -relaxed-filenames -J -R -o custom_esxi.iso -b isolinux.bin -c boot.cat -no-emul-boot
-boot-load-size 4 -boot-info-table /esxi_cdrom
```

The ISO image now includes your custom installation or upgrade script.

What to do next

Install ESXi from the ISO image.

PXE Booting the ESXi Installer

You use the preboot execution environment (PXE) to boot a host and launch the ESXi installer from a network interface.

ESXi 5.x is distributed in an ISO format that is designed to install to flash memory or to a local hard drive. You can extract the files and boot using PXE.

PXE uses DHCP and Trivial File Transfer Protocol (TFTP) to boot an operating system over a network.

PXE booting requires some network infrastructure and a machine with a PXE-capable network adapter. Most machines that are capable of running ESXi have network adapters that are able to PXE boot.

Note Ensure that the Auto Deploy server has an IPv4 address. PXE booting is supported only with IPv4.

About the TFTP Server, PXELINUX, and gPXE

Trivial File Transfer Protocol (TFTP) is similar to the FTP service, and is typically used only for network booting systems or loading firmware on network devices such as routers.

Most Linux distributions include a copy of the tftp-hpa server. If you require a supported solution, purchase a supported TFTP server from your vendor of choice.

If your TFTP server will run on a Microsoft Windows host, use tftpd32 version 2.11 or later. See http://tftpd32.jounin.net/. Earlier versions of tftpd32 were incompatible with PXELINUX and gPXE.

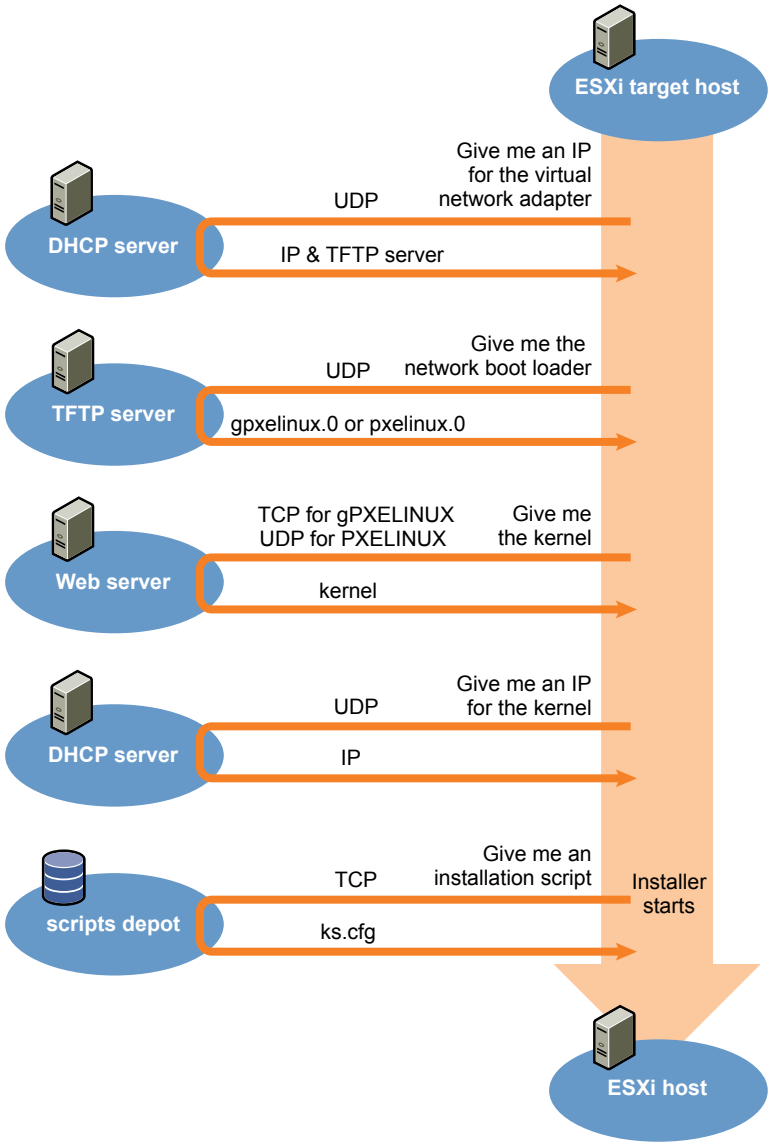
You can also acquire a TFTP server from one of the packaged appliances on the VMware Marketplace.

The PXELINUX and gPXE environments allow your target machine to boot the ESXi installer. PXELINUX is part of the SYSLINUX package, which can be found at http://www.kernel.org/pub/linux/utils/boot/syslinux/, although many Linux distributions include it. Many versions of PXELINUX also include gPXE. Some distributions, such as Red Hat Enterprise Linux version 5.3, include earlier versions of PXELINUX that do not include gPXE.

If you do not use gPXE, you might experience problems while booting the ESXi installer on a heavily loaded network TFTP is sometimes unreliable for transferring large amounts of data. If you use PXELINUX without gPXE, the `pxelinux.0` binary file, the configuration file, the kernel, and other files are transferred by TFTP. If you use gPXE, only the `gpxelinux.0` binary file and configuration file are transferred by TFTP. With gPXE, you can use a Web server to transfer the kernel and other files required to boot the ESXi installer.

Note VMware tests PXE booting with PXELINUX version 3.86. This is not a statement of limited support. For support of third-party agents that you use to set up your PXE booting infrastructure, contact the vendor.

Figure 6-1. Overview of PXE Boot Installation Process



Sample DHCP Configuration

To PXE boot the ESXi installer, the DHCP server must send the address of the TFTP server and a pointer to the `pxelinux.0` or `gpxelinux.0` directory.

The DHCP server is used by the target machine to obtain an IP address. The DHCP server must be able to determine whether the target machine is allowed to boot and the location of the PXELINUX binary (which usually resides on a TFTP server). When the target machine first boots, it broadcasts a packet across the network requesting this information to boot itself. The DHCP server responds.

CAUTION Do not set up a new DHCP server if your network already has one. If multiple DHCP servers respond to DHCP requests, machines can obtain incorrect or conflicting IP addresses, or can fail to receive the proper boot information. Talk to a network administrator before setting up a DHCP server. For support on configuring DHCP, contact your DHCP server vendor.

Many DHCP servers can PXE boot hosts. If you are using a version of DHCP for Microsoft Windows, see the DHCP server documentation to determine how to pass the `next-server` and `filename` arguments to the target machine.

gPXE Example

This example shows how to configure a ISC DHCP version 3.0 server to enable gPXE.

```
allow booting;
allow bootp;
# gPXE options
option space gpxe;
option gpxe-encap-opts code 175 = encapsulate gpxe;
option gpxe.bus-id code 177 = string
class "pxeclients" {
   match if substring(option vendor-class-identifier, 0, 9) = "PXEClient";
   next-server TFTP server address;
   if not exists gpxe.bus-id {
      filename "/gpxelinux.0";
   }
}
subnet Network address netmask Subnet Mask {
   range Starting IP Address Ending IP Address;
}
```

When a machine attempts to PXE boot, the DHCP server provides an IP address and the location of the `gpxelinux.0` binary file on the TFTP server. The IP address assigned is in the range defined in the subnet section of the configuration file.

PXELINUX (without gPXE) Example

This example shows how to configure a ISC DHCP version 3.0 server to enable PXELINUX.

```
#
# DHCP Server Configuration file.
#   see /usr/share/doc/dhcp*/dhcpd.conf.sample
#
ddns-update-style ad-hoc;
allow booting;
allow bootp;
class "pxeclients" {
   match if substring(option vendor-class-identifier, 0, 9) = "PXEClient";
   next-server xxx.xxx.xx.xx;
   filename = "pxelinux.0";
}
subnet 192.168.48.0 netmask 255.255.255.0 {
   range 192.168.48.100 192.168.48.250;
}
```

When a machine attempts to PXE boot, the DHCP server provides an IP address and the location of the `pxelinux.0` binary file on the TFTP server. The IP address assigned is in the range defined in the subnet section of the configuration file.

About PXE Configuration Files

The PXE configuration file defines the menu displayed to the target ESXi host as it boots up and contacts the TFTP server. You need a PXE configuration file to PXE boot the ESXi installer.

The TFTP server constantly listens for PXE clients on the network. When it detects that a PXE client is requesting PXE services, it sends the client a network package that contains a boot menu.

Required Files

In the PXE configuration file, you must include paths to the following files:

- `mboot.c32` is the boot loader.
- `boot.cfg` is the boot loader configuration file.

See "About the boot.cfg File," on page 165

File Name for the PXE Configuration File

For the file name of the PXE configuration file, select one of the following options:

- `01-`*`mac_address_of_target_ESXi_host`*. For example, `01-23-45-67-89-0a-bc`
- The target ESXi host IP address in hexadecimal notation.
- `default`

The initial boot file, `pxelinux.0` or `gpxelinux.0`, tries to load a PXE configuration file. It tries with the MAC address of the target ESXi host, prefixed with its ARP type code, which is 01 for Ethernet. If that attempt fails, it tries with the hexadecimal notation of target ESXi system IP address. Ultimately, it tries to load a file named `default`.

File Location for the PXE Configuration File

Save the file in `var/lib/tftpboot/pxelinux.cfg/` on the TFTP server.

For example, you might save the file on the TFTP server at `/tftpboot/pxelinux.cfg/01-00-21-5a-ce-40-f6`. The MAC address of the network adapter on the target ESXi host is 00-21-5a-ce-40-f6.

PXE Boot the ESXi Installer by Using PXELINUX and a PXE Configuration File

You can use a TFTP server to PXE boot the ESXi installer, using PXELINUX and a PXE configuration file.

See also "About Installation and Upgrade Scripts," on page 157 and "About the boot.cfg File," on page 165

Prerequisites

Verify that your environment has the following components:

- The ESXi installer ISO image downloaded from the VMware Web site.
- TFTP server that supports PXE booting with gPXE. See "About the TFTP Server, PXELINUX, and gPXE," on page 132.
- DHCP server configured for PXE booting. See "Sample DHCP Configuration," on page 133.
- PXELINUX
- Server with a hardware configuration that is supported with ESXi 5.1. See the Hardware Compatibility Guide at http://www.vmware.com/resources/compatibility/search.php.
- Network security policies to allow TFTP traffic (UDP port 69)
- (Optional) Installation script, the kickstart file. See "About Installation and Upgrade Scripts," on page 157.
- Network adapter with PXE support on the target ESXi host
- IPv4 networking. IPv6 is not supported for PXE booting.

Use a native VLAN in most cases. If you want to specify the VLAN ID to be used with PXE booting, check that your NIC supports VLAN ID specification.

Procedure

1 Create the `/tftpboot/pxelinux.cfg` directory on your TFTP server.

2 On the Linux machine, install PXELINUX.

PXELINUX is included in the SYSLINUX package. Extract the files, locate the `pxelinux.0` file and copy it to the `/tftpboot` directory on your TFTP server.

3 Configure the DHCP server to send the following information to each client host:

- The name or IP address of your TFTP server.
- The name of your initial boot file. This is `pxelinux.0`.

4 Copy the contents of the ESXi installer image to the `/var/lib/tftpboot` directory on the TFTP server.

5 (Optional) For a scripted installation, in the `boot.cfg` file, add the `kernelopt` option on the line following the kernel command, to specify the location of the installation script.

Use the following code as a model, where `XXX.XXX.XXX.XXX` is the IP address of the server where the installation script resides, and `esxi_ksFiles` is the directory containing the `ks.cfg` file.

```
kernelopt=ks=http://XXX.XXX.XXX.XXX/esxi_ksFiles/ks.cfg
```

6 Create a PXE configuration file.

This file defines how the host boots when no operating system is present. The PXE configuration file references the boot files. Use the following code as a model, where `XXXXXX` is the build number of the ESXi installer image.

```
DEFAULT menu.c32
MENU TITLE ESXi-5.x.x-XXXXXX-full Boot Menu
NOHALT 1
PROMPT 0
TIMEOUT 80
LABEL install
  KERNEL mboot.c32
   APPEND -c location of boot.cfg
MENU LABEL ESXi-5.x.x-XXXXXX-full ^Installer
LABEL hddboot
 LOCALBOOT 0x80
 MENU LABEL ^Boot from local disk
```

7 Name the file with the MAC address of the target host machine: `01-`*`mac_address_of_target_ESXi_host`*.

For example, `01-23-45-67-89-0a-bc`.

8 Save the PXE configuration file in `/tftpboot/pxelinux.cfg` on the TFTP server.

9 Boot the machine with the network adapter.

PXE Boot the ESXi Installer by Using PXELINUX and an isolinux.cfg PXE Configuration File

You can PXE boot the ESXi installer using PXELINUX, and use the isolinux.cfg file as the PXE configuration file.

See also "About Installation and Upgrade Scripts," on page 157 and "About the boot.cfg File," on page 165

Prerequisites

Verify that your environment has the following components:

- The ESXi installer ISO image downloaded from the VMware Web site.
- TFTP server that supports PXE booting with PXELINUX. See "About the TFTP Server, PXELINUX, and gPXE," on page 132.
- DHCP server configured for PXE booting. See "Sample DHCP Configuration," on page 133.

- PXELINUX
- Server with a hardware configuration that is supported with ESXi 5.1. See the *Hardware Compatibility Guide* at http://www.vmware.com/resources/compatibility/search.php.
- Network security policies to allow TFTP traffic (UDP port 69)
- (Optional) Installation script, the kickstart file. See "About Installation and Upgrade Scripts," on page 157.
- Network adapter with PXE support on the target ESXi host
- IPv4 networking. IPv6 is not supported for PXE booting.

Use a native VLAN in most cases. If you want to specify the VLAN ID to be used with PXE booting, check that your NIC supports VLAN ID specification.

Procedure

1 Create the `/tftpboot/pxelinux.cfg` directory on your TFTP server.

2 On the Linux machine, install PXELINUX.

PXELINUX is included in the SYSLINUX package. Extract the files, locate the file `pxelinux.0` and copy it to the `/tftpboot` directory on your TFTP server.

3 Configure the DHCP server.

The DHCP server sends the following information to your client hosts:

- The name or IP address of your TFTP server.
- The name of your initial boot file. This is `pxelinux.0`.

4 Copy the contents of the ESXi installer image to the `/var/lib/tftpboot` directory on the TFTP server.

5 (Optional) For a scripted installation, in the `boot.cfg` file, add the `kernelopt` option on the next line after the `kernel` command, to specify the location fo the installation script.

In the following example, *XXX.XXX.XXX.XXX* is the IP address of the server where the installation script resides.

`kernelopt=ks=http://XXX.XXX.XXX.XXX/esxi_ksFiles/ks.cfg`

6 Copy the `isolinux.cfg` file from the ESXi installer ISO image to the `/tftpboot/pxelinux.cfg` directory.

The `isolinux.cfg` file contains the following code, where `XXXXXX` is the build number of the ESXi installer image:

```
DEFAULT menu.c32
MENU TITLE ESXi-5.x.x-XXXXXX-full Boot Menu
NOHALT 1
PROMPT 0
TIMEOUT 80
LABEL install
  KERNEL mboot.c32
   APPEND -c location of boot.cfg
MENU LABEL ESXi-5.x.x-XXXXXX-full ^Installer
LABEL hddboot
 LOCALBOOT 0x80
 MENU LABEL ^Boot from local disk
```

7 Rename the `isolinux.cfg` file with the MAC address of the target host machine: `01-`*`mac_address_of_target_ESXi_host`*. For example, `01-23-45-67-89-0a-bc`

8 Boot the machine with the network adapter.

PXE Boot the ESXi Installer Using gPXE

You can PXE boot the ESXi installer using gPXE.

See also "About Installation and Upgrade Scripts," on page 157 and "About the boot.cfg File," on page 165

Prerequisites

Verify that your environment has the following components:

- The ESXi installer ISO image downloaded from the VMware Web site
- HTTP Web server that is accessible by your target ESXi hosts
- DHCP server configured for PXE booting: `/etc/dhcpd.conf` is configured for client hosts with a TFTP server and the initial boot file set to `gpxelinux.0/undionly.kpxe`. See "Sample DHCP Configuration," on page 133.
- Server with a hardware configuration that is supported with ESXi 5.1. See the Hardware Compatibility Guide at http://www.vmware.com/resources/compatibility/search.php.
- gPXELINUX
- (Optional) ESXi installation script. See "About Installation and Upgrade Scripts," on page 157.

Use a native VLAN in most cases. If you want to specify the VLAN ID to be used with PXE booting, check that your NIC supports VLAN ID specification.

Procedure

1 Copy the contents of the ESXi installer ISO image to the `/var/www/html` directory on the HTTP server.

2 Modify the `boot.cfg` file with the information for the HTTP server.

Use the following code as a model, where *XXX.XXX.XXX.XXX* is the HTTP server IP address. The `kernelopt` line is optional. Include that option to specify the location of the installation script for a scripted installation.

```
title=Loading ESX installer
kernel=http://XXX.XXX.XXX.XXX/tboot.b00
kernelopt=ks=http://XXX.XXX.XXX.XXX/esxi_ksFiles/ks.cfg
modules=http://XXX.XXX.XXX.XXX/b.b00 --- http://XXX.XXX.XXX.XXX/useropts.gz ---
http://XXX.XXX.XXX.XXX/k.b00 --- http://XXX.XXX.XXX.XXX/a.b00 ---
http://XXX.XXX.XXX.XXX/s.v00 --- http://XXX.XXX.XXX.XXX/weaselin.v00 ---
http://XXX.XXX.XXX.XXX/tools.t00 --- http://XXX.XXX.XXX.XXX/imgdb.tgz ---
http://XXX.XXX.XXX.XXX/imgpayld.tgz
```

3 gPXE boot the host and press Ctrl+B to access the GPT menu.

4 Enter the following commands to boot with the ESXi installer, where *XXX.XXX.XXX.XXX* is the HTTP server IP address.

```
dhcp net0 ( if dchp is not set)
kernel –n mboot.c32 http://XXX.XXX.XXX.XXX/mboot.c32
imgargs mboot.c32 –c http://XXX.XXX.XXX.XXX/boot.cfg
boot mboot.c32
```

Installing and Booting ESXi with Software FCoE

You can install and boot ESXi from an FCoE LUN using VMware software FCoE adapters and network adapters with FCoE offload capabilities. Your host does not require a dedicated FCoE HBA.

See the *vSphere Storage* documentation for information about installing and booting ESXi with software FCoE.

Using Remote Management Applications

Remote management applications allow you to install ESXi on servers that are in remote locations.

Remote management applications supported for installation include HP Integrated Lights-Out (iLO), Dell Remote Access Card (DRAC), IBM management module (MM), and Remote Supervisor Adapter II (RSA II). For a list of currently supported server models and remote management firmware versions, see "Supported Remote Management Server Models and Minimum Firmware Versions," on page 27. For support on remote management applications, contact the vendor.

You can use remote management applications to do both interactive and scripted installations of ESXi remotely.

If you use remote management applications to install ESXi, the virtual CD might encounter corruption problems with systems or networks operating at peak capacity. If a remote installation from an ISO image fails, complete the installation from the physical CD media.

Performing the Upgrade or Migration

Several tools are available to upgrade and migrate hosts. You can use different upgrade tools based depending on the type of host you are upgrading (ESX or ESXi) and whether the hosts are managed by vCenter Server.

You can migrate or upgrade to ESXi 5.x from version 4.x ESX or ESXi or version 5.0.x with the tools and methods described in "ESXi 5.1 Upgrade Options," on page 124.

To upgrade version 3.5 ESX or ESXi to ESXi 5.x, you must first upgrade version 3.5 ESX or ESXi to version 4.x ESX or ESXi. See the VMware vSphere 4.x documentation Web page for information about upgrading from version 3.5 ESX or ESXi 3.5 to version 4.x ESX or ESXi.

Caution If you upgrade hosts managed by vCenter Server, you must upgrade to vCenter Server before you upgrade ESX or ESXi. If you do not upgrade in the correct order, you can lose data and lose access to your servers.

Using vSphere Update Manager to Perform Orchestrated Host Upgrades

Orchestrated upgrades allow you to upgrade the objects in your vSphere inventory in a two-step process: host upgrades, followed by virtual machine upgrades. You can configure the process at the cluster level to automate more of the process, or you can configure it at the individual host or virtual machine level for granular control.

For example, you can define a host upgrade baseline to upgrade an ESXi 4.x host to ESXi 5.x, or you can define a virtual machine upgrade baseline to upgrade the VMware Tools and the virtual machine hardware to the latest version. Use wizard-based workflows to first schedule host upgrades for an entire cluster and then schedule a virtual machine upgrade for all the virtual machines.

You cannot use Update Manager to upgrade a host to ESXi 5.x if the host was previously upgraded from ESX 3.x to ESX 4.x. Such hosts do not have sufficient free space in the /boot partition to support the Update Manager upgrade process. This problem also affects some 4.x ESX hosts, even if they were not previously upgraded from ESX 3.x. Hosts must have more than 350MB of free space in the /boot partition to support the Update Manager upgrade process. If the host that you are upgrading does not have more than 350MB of free space in the /boot partition, use a scripted or interactive upgrade instead.

Important After you upgrade or migrate your host to ESXi 5.x, you cannot roll back to your version 4.x ESX or ESXi software. Back up your host before you perform an upgrade or migration, so that, if the upgrade or migration fails, you can restore your 4.x host.

The wizard workflows prevent erroneous upgrade sequences. For example, the wizard prevents you from upgrading virtual machine hardware before you upgrade hosts in a cluster.

You can use Distributed Resource Scheduler (DRS) to prevent virtual machine downtime during the upgrade process.

Update Manager monitors hosts and virtual machines for compliance against your defined upgrade baselines. Noncompliance appears in detailed reports and in the dashboard view. Update Manager supports mass remediation.

The following vSphere components are upgraded by Update Manager.

- ESX and ESXi kernel (vmkernel)
- Virtual machine hardware
- VMware Tools
- Virtual appliances

For components that are not listed here, you can perform the upgrade by using another upgrade method, or, for third-party components, by using the appropriate third-party tools.

The following topics describe how to use Update Manager to conduct an orchestrated upgrade of your ESXi hosts.

- "Configuring Host and Cluster Settings," on page 140
- "Perform an Orchestrated Upgrade of Hosts Using vSphere Update Manager," on page 141

To use Update Manager to conduct an orchestrated upgrade of virtual machines on your hosts, see "Perform an Orchestrated Upgrade of Virtual Machines with vSphere Update Manager," on page 191. For complete documentation of all Update Manager operations, see the *vSphere Update Manager Installation and Administration Guide*.

Configuring Host and Cluster Settings

When you update vSphere objects in a cluster with DRS, VMware High Availability (HA), and VMware Fault Tolerance (FT) enabled, you can choose to temporarily disable VMware Distributed Power Management (DPM), HA admission control, and FT for the entire cluster. When the update completes, Update Manager restores these features.

Updates might require that the host enters maintenance mode during remediation. Virtual machines cannot run when a host is in maintenance mode. To ensure availability, vCenter Server can migrate virtual machines to other ESX/ESXi hosts within a cluster before the host is put into maintenance mode. vCenter Server migrates the virtual machines if the cluster is configured for vMotion, and if DRS is enabled.

If a host has no running virtual machines, VMware DPM might put the host in standby mode and interrupt an Update Manager operation. To make sure that scanning and staging complete successfully, Update Manager disables VMware DPM during these operations. To ensure successful remediation, you should allow Update Manager to disable VMware DPM and HA admission control before the remediation operation. After the operation completes, Update Manager restores VMware DPM and HA admission control. Update Manager disables HA admission control before staging and remediation but not before scanning.

If VMware DPM has already put hosts in standby mode, Update Manager powers on the hosts before scanning, staging, and remediation. After the scanning, staging, or remediation is complete, Update Manager turns on VMware DPM and HA admission control and lets VMware DPM put hosts into standby mode, if needed. Update Manager does not remediate powered off hosts.

If hosts are put into standby mode and VMware DPM is manually disabled for a reason, Update Manager does not remediate or power on the hosts.

Within a cluster, you should select to temporarily disable HA admission control to allow vMotion to proceed, in order to prevent downtime of the machines on the hosts you remediate. After the remediation of the entire cluster, Update Manager restores HA admission control settings.

If FT is turned on for any of the virtual machines on hosts within a cluster, you should select to temporarily turn off FT before performing any Update Manager operations on the cluster. If FT is turned on for any of the virtual machines on a host, Update Manager does not remediate that host. You should remediate all hosts in a cluster with the same updates, so that FT can be re-enabled after the remediation, because a primary virtual machine and a secondary virtual machine cannot reside on hosts of different ESX/ESXi version and patch level.

Perform an Orchestrated Upgrade of Hosts Using vSphere Update Manager

You can use Update Manager to perform orchestrated upgrades of the ESX/ESXi hosts in your vSphere inventory by using a single upgrade baseline, or by using a baseline group.

This workflow describes the overall process to perform an orchestrated upgrade of the hosts in your vSphere inventory. Update Manager 5.x supports host upgrades to ESXi 5.x for hosts that are running ESX/ESXi 4.x.

You can perform orchestrated upgrades of hosts at the folder, cluster, or datacenter level.

NOTE The last two steps in this procedure are alternatives. Choose one or the other.

Prerequisites

- Make sure your system meets the requirements for vCenter Server 5.x, ESXi 5.x, and Update Manager 5.x. See "Update Manager Hardware Requirements," on page 27
- Install or upgrade vCenter Server to version 5.x. See Chapter 4, "Upgrading to vCenter Server 5.1," on page 29.
- Install or upgrade vSphere Update Manager to version 5.x. See Chapter 5, "Upgrading Update Manager," on page 113.

Procedure

1 Configure Host Maintenance Mode Settings on page 142

ESX/ESXi host updates might require that the host enters maintenance mode before they can be applied. Update Manager puts the ESX/ESXi hosts in maintenance mode before applying these updates. You can configure how Update Manager responds if the host fails to enter maintenance mode.

2 Configure Cluster Settings on page 143

For ESX/ESXi hosts in a cluster, the remediation process can run either in a sequence or in parallel. Certain features might cause remediation failure. If you have VMware DPM, HA admission control, or Fault Tolerance enabled, you should temporarily disable these features to make sure that the remediation is successful.

3 Enable Remediation of PXE Booted ESXi 5.x Hosts on page 144

You can configure Update Manager to let other software initiate remediation of PXE booted ESXi 5.x hosts. The remediation installs patches and software modules on the hosts, but typically the host updates are lost after a reboot.

4 Import Host Upgrade Images and Create Host Upgrade Baselines on page 144

You can create upgrade baselines for ESX/ESXi hosts with ESXi 5.1 images that you import to the Update Manager repository.

5 Create a Host Baseline Group on page 145

You can combine one host upgrade baseline with multiple patch or extension baselines, or combine multiple patch and extension baselines in a baseline group.

6 Attach Baselines and Baseline Groups to Objects on page 146

To view compliance information and remediate objects in the inventory against specific baselines and baseline groups, you must first attach existing baselines and baseline groups to these objects.

7 Manually Initiate a Scan of ESX/ESXi Hosts on page 147

Before remediation, you should scan the vSphere objects against the attached baselines and baseline groups. To run a scan of hosts in the vSphere inventory immediately, initiate a scan manually.

8 View Compliance Information for vSphere Objects on page 147

You can review compliance information for the virtual machines, virtual appliances, and hosts against baselines and baseline groups that you attach.

9 Remediate Hosts Against an Upgrade Baseline on page 148

You can remediate ESX/ESXi hosts against a single attached upgrade baseline at a time. You can upgrade or migrate all hosts in your vSphere inventory by using a single upgrade baseline containing an ESXi 5.1 image.

10 Remediate Hosts Against Baseline Groups on page 150

You can remediate hosts against attached groups of upgrade, patch, and extension baselines. Baseline groups might contain multiple patch and extension baselines, or an upgrade baseline combined with multiple patch and extension baselines.

Configure Host Maintenance Mode Settings

ESX/ESXi host updates might require that the host enters maintenance mode before they can be applied. Update Manager puts the ESX/ESXi hosts in maintenance mode before applying these updates. You can configure how Update Manager responds if the host fails to enter maintenance mode.

For hosts in a container different from a cluster or for individual hosts, migration of the virtual machines with vMotion cannot be performed. If vCenter Server cannot migrate the virtual machines to another host, you can configure how Update Manager responds.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered, and on the Home page, click **Update Manager** under Solutions and Applications. If your vCenter Server system is part of a connected group in vCenter Linked Mode, you must specify the Update Manager instance to use, by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **Configuration** tab, under Settings, click **ESX Host/Cluster Settings**.

2 Under Maintenance Mode Settings, select an option from the **VM Power state** drop-down menu to determine the change of the power state of the virtual machines and appliances that are running on the host to be remediated.

Option	Description
Power Off virtual machines	Powers off all virtual machines and virtual appliances before remediation.
Suspend virtual machines	Suspends all running virtual machines and virtual appliances before remediation.
Do Not Change VM Power State	Leaves virtual machines and virtual appliances in their current power state. This is the default setting.

3 (Optional) Select **Retry entering maintenance mode in case of failure**, specify the retry delay, and the number of retries.

If a host fails to enter maintenance mode before remediation, Update Manager waits for the retry delay period and retries putting the host into maintenance mode as many times as you indicate in **Number of retries** field.

4 (Optional) Select **Temporarily disable any removable media devices that might prevent a host from entering maintenance mode**.

Update Manager does not remediate hosts on which virtual machines have connected CD/DVD or floppy drives. All removable media drives that are connected to the virtual machines on a host might prevent the host from entering maintenance mode and interrupt remediation.

After remediation, Update Manager reconnects the removable media devices if they are still available.

5 Click **Apply**.

These settings become the default failure response settings. You can specify different settings when you configure individual remediation tasks.

Configure Cluster Settings

For ESX/ESXi hosts in a cluster, the remediation process can run either in a sequence or in parallel. Certain features might cause remediation failure. If you have VMware DPM, HA admission control, or Fault Tolerance enabled, you should temporarily disable these features to make sure that the remediation is successful.

NOTE Remediating hosts in parallel can improve performance significantly by reducing the time required for cluster remediation. Update Manager remediates hosts in parallel without disrupting the cluster resource constraints set by DRS.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered, and on the Home page, click **Update Manager** under Solutions and Applications. If your vCenter Server system is part of a connected group in vCenter Linked Mode, you must specify the Update Manager instance to use, by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **Configuration** tab, under Settings, click **ESX Host/Cluster Settings**.

2 Select the check boxes for features that you want to disable or enable.

Option	Description
Distributed Power Management (DPM)	VMware DPM monitors the resource use of the running virtual machines in the cluster. If sufficient excess capacity exists, VMware DPM recommends moving virtual machines to other hosts in the cluster and placing the original host into standby mode to conserve power. If the capacity is insufficient, VMware DPM might recommend returning standby hosts to a powered-on state. If you do not choose to disable DPM, Update Manager skips the cluster on which VMware DPM is enabled. If you choose to temporarily disable VMware DPM, Update Manager disables DPM on the cluster, remediates the hosts in the cluster, and re-enables VMware DPM after remediation is complete.
High Availability (HA) admission control	Admission control is a policy used by VMware HA to ensure failover capacity within a cluster. If HA admission control is enabled during remediation, the virtual machines within a cluster might not migrate with vMotion. If you do not choose to disable HA admission control, Update Manager skips the cluster on which HA admission control is enabled. If you choose to temporarily disable HA admission control, Update Manager disables HA admission control, remediates the cluster, and re-enables HA admission control after remediation is complete.
Fault Tolerance (FT)	FT provides continuous availability for virtual machines by automatically creating and maintaining a secondary virtual machine that is identical to the primary virtual machine. If you do not choose to turn off FT for the virtual machines on a host, Update Manager does not remediate that host.

Option	Description
Enable parallel remediation for hosts in cluster	Update Manager can remediate hosts in clusters in a parallel manner. Update Manager continuously evaluates the maximum number of hosts it can remediate in parallel without disrupting DRS settings. If you do not select the option, Update Manager remediates the hosts in a cluster sequentially.
Migrate powered off and suspended virtual machines to other hosts in the cluster, if a host must enter maintenance mode	Update Manager migrates the suspended and powered off virtual machines from hosts that must enter maintenance mode to other hosts in the cluster. You can select to power off or suspend virtual machines before remediation in the Maintenance Mode Settings pane.

3 Click **Apply**.

These settings become the default failure response settings. You can specify different settings when you configure individual remediation tasks.

Enable Remediation of PXE Booted ESXi 5.x Hosts

You can configure Update Manager to let other software initiate remediation of PXE booted ESXi 5.x hosts. The remediation installs patches and software modules on the hosts, but typically the host updates are lost after a reboot.

The global setting in the Update Manager **Configuration** tab enables solutions such as ESX Agent Manager or Cisco Nexus 1000V to initiate remediation of PXE booted ESXi 5.x hosts. In contrast, the **Enable patch remediation of powered on PXE booted ESXi hosts** setting in the Remediate wizard enables Update Manager to patch PXE booted hosts.

To retain updates on stateless hosts after a reboot, use a PXE boot image that contains the updates. You can update the PXE boot image before applying the updates with Update Manager, so that the updates are not lost because of a reboot. Update Manager itself does not reboot the hosts because it does not install updates requiring a reboot on PXE booted ESXi 5.x hosts.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered, and on the Home page, click **Update Manager** under Solutions and Applications. If your vCenter Server system is part of a connected group in vCenter Linked Mode, you must specify the Update Manager instance to use, by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **Configuration** tab, under Settings, click **ESX Host/Cluster Settings**.

2 To enable installation of software for solutions on PXE booted ESXi 5.x hosts, select **Allow installation of additional software on PXE booted ESXi 5.x hosts.**

3 Click **Apply**.

Import Host Upgrade Images and Create Host Upgrade Baselines

You can create upgrade baselines for ESX/ESXi hosts with ESXi 5.1 images that you import to the Update Manager repository.

You can use ESXi `.iso` images to upgrade ESXi 4.x and ESXi 5.0 hosts to ESXi 5.1 or migrate ESX 4.x hosts to ESXi 5.1.

To upgrade or migrate hosts, use the ESXi installer image distributed by VMware with the name format `VMware-VMvisor-Installer-5.1.0-`*`build_number`*`.x86_64.iso` or a custom image created by using Image Builder.

Prerequisites

Ensure that you have the **Upload File** privilege. For more information about managing users, groups, roles, and permissions, see *vCenter Server and Host Management*.

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered, and on the Home page, click **Update Manager** under Solutions and Applications. If your vCenter Server system is part of a connected group in vCenter Linked Mode, you must specify the Update Manager instance to use, by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **ESXi Images** tab click **Import ESXi Image** on the upper-right side.

2 On the Select ESXi Image page of the Import ESXi Image wizard, browse to and select the ESXi image that you want to upload.

3 Click **Next**.

The upload process starts.

CAUTION Do not close the import wizard. Closing the import wizard stops the upload process.

4 (Optional) In the Security Warning window, select an option to handle the certificate warning.

A trusted certificate authority does not sign the certificates that are generated for vCenter Server and ESX/ESXi hosts during installation. Because of this, each time an SSL connection is made to one of these systems, the client displays a warning.

Option	Action
Ignore	Click **Ignore** to continue using the current SSL certificate and start the upload process.
Cancel	Click **Cancel** to close the window and stop the upload process.
Install this certificate and do not display any security warnings	Select this check box and click **Ignore** to install the certificate and stop receiving security warnings.

5 After the file is uploaded, click **Next**.

6 (Optional) Create a host upgrade baseline.

a Leave the **Create a baseline using the ESXi image** selected.

b Specify a name, and optionally, a description for the host upgrade baseline.

7 Click **Finish**.

The ESXi image that you uploaded appears in the Imported ESXi Images pane. You can see more information about the software packages that are included in the ESXi image in the Software Packages pane.

If you also created a host upgrade baseline, the new baseline is displayed in the Baselines pane of the **Baselines and Groups** tab.

What to do next

To upgrade or migrate the hosts in your environment, you must create a host upgrade baseline if you have not already done so.

Create a Host Baseline Group

You can combine one host upgrade baseline with multiple patch or extension baselines, or combine multiple patch and extension baselines in a baseline group.

NOTE You can click **Finish** in the New Baseline Group wizard at any time to save your baseline group and add baselines to it at a later stage.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered, and on the Home page, click **Update Manager** under Solutions and Applications. If your vCenter Server system is part of a connected group in vCenter Linked Mode, you must specify the Update Manager instance to use, by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **Baselines and Groups** tab, click **Create** above the Baseline Groups pane.

2 Enter a unique name for the baseline group.

3 Under Baseline Group Type, select **Host Baseline Group** and click **Next**.

4 Select a host upgrade baseline to include it in the baseline group.

5 (Optional) Create a new host upgrade baseline by clicking **Create a new Host Upgrade Baseline** at the bottom of the Upgrades page and complete the New Baseline wizard.

6 Click **Next**.

7 Select the patch baselines that you want to include in the baseline group.

8 (Optional) Create a new patch baseline by clicking **Create a new Host Patch Baseline** at the bottom of the Patches page and complete the New Baseline wizard.

9 Click **Next**.

10 Select the extension baselines to include in the baseline group.

11 (Optional) Create a new extension baseline by clicking **Create a new Extension Baseline** at the bottom of the Patches page and complete the New Baseline wizard.

12 On the Ready to Complete page, click **Finish**.

The host baseline group is displayed in the Baseline Groups pane.

Attach Baselines and Baseline Groups to Objects

To view compliance information and remediate objects in the inventory against specific baselines and baseline groups, you must first attach existing baselines and baseline groups to these objects.

You can attach baselines and baseline groups to objects from the Update Manager Client Compliance view.

Although you can attach baselines and baseline groups to individual objects, a more efficient method is to attach them to container objects, such as folders, vApps, clusters, and datacenters. Individual vSphere objects inherit baselines attached to the parent container object. Removing an object from a container removes the inherited baselines from the object.

If your vCenter Server system is part of a connected group in vCenter Linked Mode, you can attach baselines and baseline groups to objects managed by the vCenter Server system with which Update Manager is registered. Baselines and baseline groups you attach are specific for the Update Manager instance that is registered with the vCenter Server system.

Prerequisites

Ensure that you have the **Attach Baseline** privilege.

Procedure

1 Connect the vSphere Client to a vCenter Server system with which Update Manager is registered and select **Home > Inventory** in the navigation bar.

2 Select the type of object that you want to attach the baseline to.

For example, **Hosts and Clusters** or **VMs and Templates**.

3 Select the object in the inventory, and click the **Update Manager** tab.

   If your vCenter Server system is part of a connected group in vCenter Linked Mode, the **Update Manager** tab is available only for the vCenter Server system with which an Update Manager instance is registered.

4 Click **Attach** in the upper-right corner.

5 In the Attach Baseline or Group window, select one or more baselines or baseline groups to attach to the object.

   If you select one or more baseline groups, all baselines in the groups are selected. You cannot deselect individual baselines in a group.

6 (Optional) Click the **Create Baseline Group** or **Create Baseline** links to create a baseline group or a baseline and complete the remaining steps in the respective wizard.

7 Click **Attach**.

The baselines and baseline groups that you selected to attach are displayed in the Attached Baseline Groups and Attached Baselines panes of the **Update Manager** tab.

Manually Initiate a Scan of ESX/ESXi Hosts

Before remediation, you should scan the vSphere objects against the attached baselines and baseline groups. To run a scan of hosts in the vSphere inventory immediately, initiate a scan manually.

Procedure

1 Connect the vSphere Client to a vCenter Server system with which Update Manager is registered and select **Home > Inventory > Hosts and Clusters** in the navigation bar.

2 Right-click a host, datacenter, or any container object and select **Scan for Updates**.

3 Select the types of updates to scan for.

   You can scan for either **Patches and Extensions** or **Upgrades**.

4 Click **Scan**.

The selected inventory object and all child objects are scanned against all patches, extensions, and upgrades in the attached baselines. The larger the virtual infrastructure and the higher up in the object hierarchy that you initiate the scan, the longer the scan takes.

View Compliance Information for vSphere Objects

You can review compliance information for the virtual machines, virtual appliances, and hosts against baselines and baseline groups that you attach.

When you select a container object, you view the overall compliance status of the attached baselines, as well as all the individual compliance statuses. If you select an individual baseline attached to the container object, you see the compliance status of the baseline.

If you select an individual virtual machine, appliance, or host, you see the overall compliance status of the selected object against all attached baselines and the number of updates. If you further select an individual baseline attached to this object, you see the number of updates grouped by the compliance status for that baseline.

Procedure

1 Connect the vSphere Client to a vCenter Server system with which Update Manager is registered and select **Home > Inventory** in the navigation bar.

2 Select the type of object for which you want to view compliance information.

For example, **Hosts and Clusters** or **VMs and Templates**.

3 Select an object from the inventory.

4 Click the **Update Manager** tab to view the scan results and compliance states.

Remediate Hosts Against an Upgrade Baseline

You can remediate ESX/ESXi hosts against a single attached upgrade baseline at a time. You can upgrade or migrate all hosts in your vSphere inventory by using a single upgrade baseline containing an ESXi 5.1 image.

NOTE Alternatively, you can upgrade hosts by using a baseline group. See "Remediate Hosts Against Baseline Groups," on page 150.

Update Manager 5.1 supports upgrade from ESXi 4.x and ESXi 5.0 to ESXi 5.1 and migration from ESX 4.x to ESXi 5.1. You cannot use Update Manager to upgrade a host to ESXi 5.1 if the host was upgraded from ESX 3.x to ESX 4.x. Such hosts do not have sufficient free space in the `/boot` partition to support the Update Manager upgrade process. Use a scripted or interactive upgrade instead.

To upgrade or migrate hosts, use the ESXi installer image distributed by VMware with the name format `VMware-VMvisor-Installer-5.1.0-`*`build_number`*`.x86_64.iso` or a custom image created by using Image Builder.

NOTE In case of an unsuccessful upgrade or migration from ESX/ESXi 4.x or ESXi 5.0 to ESXi 5.1, you cannot roll back to your previous ESX/ESXi 4.x or ESXi 5.0 instance.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered. If your vCenter Server system is a part of a connected group in vCenter Linked Mode, specify the Update Manager instance by selecting the name of the corresponding vCenter Server system in the navigation bar.

To remediate a host against an upgrade baseline, attach the baseline to the host.

Review any scan messages in the Upgrade Details window for potential problems with hardware, third-party software, and configuration issues that might prevent a successful upgrade or migration to ESXi 5.0.

Procedure

1 On the **Home** page of the vSphere Client, select **Hosts and Clusters** and click the **Update Manager** tab.

2 Right-click the inventory object you want to remediate and select **Remediate**.

If you select a container object, all hosts under the selected object are remediated.

3 On the Remediation Selection page of the Remediate wizard, select the upgrade baseline to apply.

4 (Optional) Select the hosts that you want to remediate and click **Next**.

If you have chosen to remediate a single host and not a container object, the host is selected by default.

5 On the End User License Agreement page, accept the terms and click **Next**.

6 (Optional) On the ESXi 5.1 Upgrade page, select the option to remove any installed third-party software modules that are incompatible with the upgrade and to continue with the remediation.

In case any additional third-party modules installed on the hosts are incompatible with the upgrade, the upgrade remediation does not succeed. To proceed and upgrade to ESXi 5.1 your ESX/ESXi hosts that contain third-party modules by using an ESXi image without the corresponding VIBs, you must choose to remove the third-party software on the hosts.

NOTE ESXi 5.0 hosts and ESXi 5.1 hosts are binary compatible. Any third-party software modules on ESXi 5.0 host will remain intact after upgrade to ESXi 5.1, regardless of whether you chose to remove third-party modules.

7 Click **Next**.

8 On the Schedule page, specify a unique name and an optional description for the task.

9 Select **Immediately** to begin the process immediately after you complete the wizard, or specify a time for the remediation process to begin, and click **Next**.

10 On the Host Remediation Options page, from the **Power state** drop-down menu, you can select the change in the power state of the virtual machines and virtual appliances that are running on the hosts to be remediated.

Option	Description
Power Off virtual machines	Power off all virtual machines and virtual appliances before remediation.
Suspend virtual machines	Suspend all running virtual machines and virtual appliances before remediation.
Do Not Change VM Power State	Leave virtual machines and virtual appliances in their current power state. A host cannot enter maintenance mode until virtual machines on the host are powered off, suspended, or migrated with vMotion to other hosts in a DRS cluster.

Some updates require that a host enters maintenance mode before remediation. Virtual machines and appliances cannot run when a host is in maintenance mode.

To reduce the host remediation downtime at the expense of virtual machine availability, you can choose to shut down or suspend virtual machines and virtual appliances before remediation. In a DRS cluster, if you do not power off the virtual machines, the remediation takes longer but the virtual machines are available during the entire remediation process, because they are migrated with vMotion to other hosts.

11 (Optional) Select **Retry entering maintenance mode in case of failure**, specify the number of retries, and specify the time to wait between retries.

Update Manager waits for the retry delay period and retries putting the host into maintenance mode as many times as you indicate in **Number of retries** field.

12 (Optional) Select **Disable any removable media devices connected to the virtual machine on the host**.

Update Manager does not remediate hosts on which virtual machines have connected CD, DVD, or floppy drives. In cluster environments, connected media devices might prevent vMotion if the destination host does not have an identical device or mounted ISO image, which in turn prevents the source host from entering maintenance mode.

After remediation, Update Manager reconnects the removable media devices if they are still available.

13 Click **Next**.

14 Edit the cluster remediation options.

The Cluster Remediation Options page is available only when you remediate hosts in a cluster.

Option	Details
Disable Distributed Power Management (DPM) if it is enabled for any of the selected clusters.	Update Manager does not remediate clusters with active DPM. DPM monitors the resource use of the running virtual machines in the cluster. If sufficient excess capacity exists, DPM recommends moving virtual machines to other hosts in the cluster and placing the original host into standby mode to conserve power. Putting hosts into standby mode might interrupt remediation.
Disable High Availability admission control if it is enabled for any of the selected clusters.	Update Manager does not remediate clusters with active HA admission control. Admission control is a policy used by VMware HA to ensure failover capacity within a cluster. If HA admission control is enabled during remediation, the virtual machines within a cluster might not migrate with vMotion.
Disable Fault Tolerance (FT) if it is enabled for the VMs on the selected hosts.	If FT is turned on for any of the virtual machines on a host, Update Manager does not remediate that host. For FT to be enabled, the hosts on which the Primary and Secondary virtual machines run must be of the same version and must have the same patches installed. If you apply different patches to these hosts, FT cannot be re-enabled.
Enable parallel remediation for the hosts in the selected clusters.	Remediate hosts in clusters in a parallel manner. If the setting is not selected, Update Manager remediates the hosts in a cluster sequentially. By default, Update Manager continuously evaluates the maximum number of hosts it can remediate concurrently without disrupting DRS settings. You can limit the number of concurrently remediated hosts to a specific number. NOTE Update Manager remediates concurrently only the hosts on which virtual machines are powered off or suspended. You can choose to power off or suspend virtual machines from the **Power State** menu in the Maintenance Mode Settings pane on the Host Remediation Options page.
Migrate powered off and suspended virtual machines to other hosts in the cluster, if a host must enter maintenance mode.	Update Manager migrates the suspended and powered off virtual machines from hosts that must enter maintenance mode to other hosts in the cluster. You can choose to power off or suspend virtual machines before remediation in the Maintenance Mode Settings pane.

15 (Optional) Generate a cluster remediation options report by clicking **Generate Report** on the Cluster Remediation Options page and click **Next**.

16 On the Ready to Complete page, click **Finish**.

NOTE In the Recent Tasks pane, the remediation task is displayed and will remain at about 22 percent for most of the process. The process is still running and will take approximately 15 minutes to complete.

Remediate Hosts Against Baseline Groups

You can remediate hosts against attached groups of upgrade, patch, and extension baselines. Baseline groups might contain multiple patch and extension baselines, or an upgrade baseline combined with multiple patch and extension baselines.

You can perform an orchestrated upgrade by using a host baseline group. The upgrade baseline in the baseline group runs first, followed by patch and extension baselines.

NOTE Alternatively, you can upgrade hosts by using a single upgrade baseline. See "Remediate Hosts Against an Upgrade Baseline," on page 148.

Prerequisites

Ensure that at least one baseline group is attached to the host.

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered. If your vCenter Server system is a part of a connected group in vCenter Linked Mode, specify the Update Manager instance by selecting the name of the corresponding vCenter Server system in the navigation bar.

Review any scan messages in the Upgrade Details window for potential problems with hardware, third-party software, and configuration issues that might prevent a successful upgrade or migration to ESXi 5.0.

Procedure

1 On the **Home** page of the vSphere Client, select **Hosts and Clusters** and click the **Update Manager** tab.

2 Right-click the inventory object you want to remediate and select **Remediate**.

If you select a container object, all hosts under the selected object are remediated.

3 On the Remediation Selection page of the Remediate wizard, select the baseline group and baselines to apply.

4 (Optional) Select the hosts that you want to remediate and click **Next**.

If you have chosen to remediate a single host and not a container object, the host is selected by default.

5 On the End User License Agreement page, accept the terms and click **Next**.

6 (Optional) On the ESXi 5.1 Upgrade page, select the option to remove any installed third-party software modules that are incompatible with the upgrade and to continue with the remediation.

In case any additional third-party modules installed on the hosts are incompatible with the upgrade, the upgrade remediation does not succeed. To proceed and upgrade to ESXi 5.1 your ESX/ESXi hosts that contain third-party modules by using an ESXi image without the corresponding VIBs, you must choose to remove the third-party software on the hosts.

NOTE ESXi 5.0 hosts and ESXi 5.1 hosts are binary compatible. Any third-party software modules on ESXi 5.0 host will remain intact after upgrade to ESXi 5.1, regardless of whether you chose to remove third-party modules.

---

7 Click **Next**.

8 (Optional) On the Patches and Extensions page, deselect specific patches or extensions to exclude them from the remediation process, and click **Next**.

9 (Optional) On the Dynamic Patches and Extensions to Exclude page, review the list of patches or extensions to be excluded and click **Next**.

10 On the Schedule page, specify a unique name and an optional description for the task.

11 Select **Immediately** to begin the process immediately after you complete the wizard, or specify a time for the remediation process to begin, and click **Next**.

12 On the Host Remediation Options page, from the **Power state** drop-down menu, you can select the change in the power state of the virtual machines and virtual appliances that are running on the hosts to be remediated.

Option	Description
Power Off virtual machines	Power off all virtual machines and virtual appliances before remediation.
Suspend virtual machines	Suspend all running virtual machines and virtual appliances before remediation.
Do Not Change VM Power State	Leave virtual machines and virtual appliances in their current power state. A host cannot enter maintenance mode until virtual machines on the host are powered off, suspended, or migrated with vMotion to other hosts in a DRS cluster.

Some updates require that a host enters maintenance mode before remediation. Virtual machines and appliances cannot run when a host is in maintenance mode.

To reduce the host remediation downtime at the expense of virtual machine availability, you can choose to shut down or suspend virtual machines and virtual appliances before remediation. In a DRS cluster, if you do not power off the virtual machines, the remediation takes longer but the virtual machines are available during the entire remediation process, because they are migrated with vMotion to other hosts.

13 (Optional) Select **Retry entering maintenance mode in case of failure**, specify the number of retries, and specify the time to wait between retries.

Update Manager waits for the retry delay period and retries putting the host into maintenance mode as many times as you indicate in **Number of retries** field.

14 (Optional) Select **Disable any removable media devices connected to the virtual machine on the host**.

Update Manager does not remediate hosts on which virtual machines have connected CD, DVD, or floppy drives. In cluster environments, connected media devices might prevent vMotion if the destination host does not have an identical device or mounted ISO image, which in turn prevents the source host from entering maintenance mode.

After remediation, Update Manager reconnects the removable media devices if they are still available.

15 (Optional) Select the check box under ESXi 5.x Patch Settings to enable Update Manager to patch powered on PXE booted ESXi hosts.

This option appears only when you remediate hosts against patch or extension baselines.

16 Click **Next**.

17 Edit the cluster remediation options.

The Cluster Remediation Options page is available only when you remediate hosts in a cluster.

Option	Details
Disable Distributed Power Management (DPM) if it is enabled for any of the selected clusters.	Update Manager does not remediate clusters with active DPM. DPM monitors the resource use of the running virtual machines in the cluster. If sufficient excess capacity exists, DPM recommends moving virtual machines to other hosts in the cluster and placing the original host into standby mode to conserve power. Putting hosts into standby mode might interrupt remediation.
Disable High Availability admission control if it is enabled for any of the selected clusters.	Update Manager does not remediate clusters with active HA admission control. Admission control is a policy used by VMware HA to ensure failover capacity within a cluster. If HA admission control is enabled during remediation, the virtual machines within a cluster might not migrate with vMotion.

Option	Details
Disable Fault Tolerance (FT) if it is enabled for the VMs on the selected hosts.	If FT is turned on for any of the virtual machines on a host, Update Manager does not remediate that host. For FT to be enabled, the hosts on which the Primary and Secondary virtual machines run must be of the same version and must have the same patches installed. If you apply different patches to these hosts, FT cannot be re-enabled.
Enable parallel remediation for the hosts in the selected clusters.	Remediate hosts in clusters in a parallel manner. If the setting is not selected, Update Manager remediates the hosts in a cluster sequentially. By default, Update Manager continuously evaluates the maximum number of hosts it can remediate concurrently without disrupting DRS settings. You can limit the number of concurrently remediated hosts to a specific number. NOTE Update Manager remediates concurrently only the hosts on which virtual machines are powered off or suspended. You can choose to power off or suspend virtual machines from the **Power State** menu in the Maintenance Mode Settings pane on the Host Remediation Options page.
Migrate powered off and suspended virtual machines to other hosts in the cluster, if a host must enter maintenance mode.	Update Manager migrates the suspended and powered off virtual machines from hosts that must enter maintenance mode to other hosts in the cluster. You can choose to power off or suspend virtual machines before remediation in the Maintenance Mode Settings pane.

18 (Optional) Generate a cluster remediation options report by clicking **Generate Report** on the Cluster Remediation Options page and click **Next**.

19 On the Ready to Complete page, click **Finish**.

NOTE In the Recent Tasks pane, the remediation task is displayed and will remain at about 22 percent for most of the process. The process is still running and will take approximately 15 minutes to complete.

Upgrade or Migrate Hosts Interactively

You can boot the ESXi installer from a CD, DVD, or USB flash drive to upgrade ESX/ESXi 4.x and ESXi 5.0.x hosts to ESXi 5.1.

IMPORTANT If you are performing a fresh ESXi installation, see the *vSphere Installation and Setup* documentation. The instructions in this *vSphere Upgrade* documentation are for an upgrade or migration of ESXi or ESX.

Before upgrading, consider disconnecting your network storage. This action decreases the time it takes the installer to search for available disk drives. 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.

IMPORTANT After you upgrade or migrate your host to ESXi 5.x, you cannot roll back to your version 4.x ESX or ESXi software. Back up your host before you perform an upgrade or migration, so that, if the upgrade or migration fails, you can restore your 4.x host.

Prerequisites

- You must have the ESXi installer ISO in one of the following locations.
  - On CD or DVD. If you do not have the installation CD/DVD, you can create one. See "Download and Burn the ESXi Installer ISO Image to a CD or DVD," on page 128

- On a USB flash drive. See "Format a USB Flash Drive to Boot the ESXi Installation or Upgrade," on page 128

NOTE You can also PXE boot the ESXi installer to launch an interactive installation or a scripted installation. See "PXE Booting the ESXi Installer," on page 132.

- Verify that the server hardware clock is set to UTC. This setting is in the system BIOS.
- ESXi Embedded must not be on the host. ESXi Installable and ESXi Embedded cannot exist on the same host.

Procedure

1 Insert the ESXi installer CD/DVD into the CD/DVD-ROM drive, or attach the Installer USB flash drive and restart the machine.

2 Set the BIOS to boot from the CD-ROM device or the USB flash drive.

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

3 In the Select a Disk panel, 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. On systems where drives are continuously being added and removed, they might be out of order.

4 If the installer finds an existing ESX or ESXi installation and VMFS datastore you can choose from the following options:

- **Upgrade ESXi, preserve VMFS datastore**
- **Install ESXi, preserve VMFS datastore**
- **Install ESXi, overwrite VMFS datastore**

If an existing VMFS datastore cannot be preserved, you can choose only to install ESXi and overwrite the existing VMFS datastore, or to cancel the installation. If you choose to overwrite the existing VMFS datastore, back up the datastore first.

If you are migrating a 4.x host that contains custom VIBs that are not included in the ESXi installer ISO, the option **Upgrade ESXi, preserve VMFS datastore** is replaced with **Force Migrate ESXi, preserve VMFS datastore**.

CAUTION Using the Force Migrate option might cause the upgraded host to not boot properly, to exhibit system instability, or to lose functionality. If you are upgrading a 5.0.x host, supported custom VIBs that are not included in the ESXi installer ISO are migrated. You do not need to to select the Force Migrate option. See "Upgrading Hosts That Have Third-Party Custom VIBs," on page 125.

5 Press F11 to confirm and start the upgrade.

6 When the upgrade is complete, remove the installation CD/DVD or USB flash drive.

7 Press Enter to reboot the host.

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

If an existing VMFS datastore cannot be preserved, you can choose only to install ESXi and overwrite the existing VMFS datastore, or to cancel the installation. If you choose to overwrite the existing VMFS datastore, back up the datastore first.

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

Installing, Upgrading, or Migrating Hosts Using a Script

You can quickly deploy ESXi hosts using scripted, unattended installations or upgrades. Scripted installations, upgrades, or migrations provide an efficient way to deploy multiple hosts.

The installation or upgrade script contains the installation settings for ESXi. You can apply the script to all hosts that you want to have a similar configuration.

For a scripted installation, upgrade, or migration, you must use the supported commands to create a script. and edit the script to change settings that are unique for each host.

The installation or upgrade script can reside in one of the following locations:

- FTP
- HTTP/HTTPS
- NFS
- USB flash drive
- CDROM

Enter Boot Options to Start an Installation or Upgrade Script

You can start an installation or upgrade script by typing boot command-line options at the ESXi installer boot command line.

At boot time you might need to specify options to access the kickstart file. You can enter boot options by pressing Shift+O in the boot loader. For a PXE boot installation, you can pass options through the `kernelopts` line of the `boot.cfg` file. See "About the boot.cfg File," on page 165 and "PXE Booting the ESXi Installer," on page 132.

A `ks=...` option must be given, to specify the location of the installation script. Otherwise, a scripted installation or upgrade will not start. If `ks=...` is omitted, the text installer will proceed.

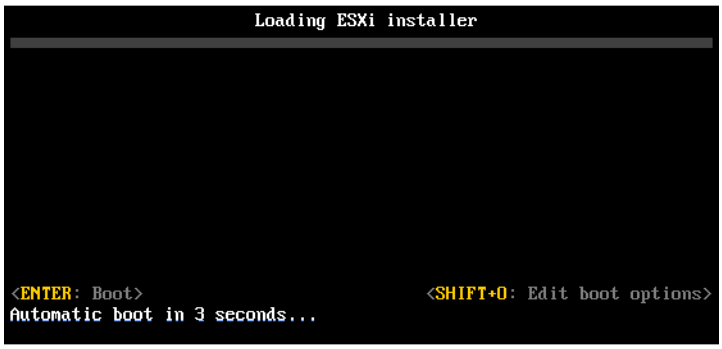
Supported boot options are listed in "Boot Options," on page 156.

IMPORTANT After you upgrade or migrate your host to ESXi 5.x, you cannot roll back to your version 4.x ESX or ESXi software. Back up your host before you perform an upgrade or migration, so that, if the upgrade or migration fails, you can restore your 4.x host.

Procedure

1 Start the host.

2 When the ESXi installer window appears, press Shift+O to edit boot options.



3 At the `runweasel` command prompt, type
`ks=`*`location of installation script plus boot command line options`*

Example: Boot Option

You type the following boot options:

```
ks=http://00.00.00.00/kickstart/ks-osdc-pdp101.cfg nameserver=00.00.0.0 ip=00.00.00.000
netmask=255.255.255.0 gateway=00.00.00.000
```

Boot Options

When you perform a scripted installation, you might need to specify options at boot time to access the kickstart file.

Supported Boot Options

Table 6-5. Boot Options for ESXi Installation

Boot Option	Description
`BOOTIF=`*`hwtype-MAC address`*	Similar to the `netdevice` option, except in the PXELINUX format as described in the IPAPPEND option under SYSLINUX at the syslinux.zytor.com site.
`gateway=`*`ip address`*	Sets this network gateway as the default gateway to be used for downloading the installation script and installation media.
`ip=`*`ip address`*	Sets up a static IP address to be used for downloading the installation script and the installation media. Note: the PXELINUX format for this option is also supported. See the IPAPPEND option under SYSLINUX at the syslinux.zytor.com site.
`ks=cdrom:/`*`path`*	Performs a scripted installation with the script at *path*, which resides on the CD in the CD-ROM drive. Each CDROM is mounted and checked until the file that matches the path is found.
`ks=file://`*`path`*	Performs a scripted installation with the script at *path*.
`ks=`*`protocol`*`://`*`serverpath`*	Performs a scripted installation with a script located on the network at the given URL. *protocol* can be `http`, `https`, `ftp`, or `nfs`. An example using nfs protocol is `ks=nfs://`*`host`*`:`*`porturl-path`*. The format of an NFS URL is specified in RFC 2224.
`ks=usb`	Performs a scripted installation, accessing the script from an attached USB drive. Searches for a file named `ks.cfg`. The file must be located in the root directory of the drive. If multiple USB flash drives are attached, they are searched until the `ks.cfg` file is found. Only FAT16 and FAT32 file systems are supported.
`ks=usb:/`*`path`*	Performs a scripted installation with the script file at the specified path, which resides on USB.
`ksdevice=`*`device`*	Tries to use a network adapter *device* when looking for an installation script and installation media. Specify as a MAC address, for example, 00:50:56:C0:00:01. This location can also be a vmnicNN name. If not specified and files need to be retrieved over the network, the installer defaults to the first discovered network adapter that is plugged in.
`nameserver=`*`ip address`*	Specifies a domain name server to be used for downloading the installation script and installation media.

Table 6-5. Boot Options for ESXi Installation (Continued)

Boot Option	Description
`netdevice=`*`device`*	Tries to use a network adapter *device* when looking for an installation script and installation media. Specify as a MAC address, for example, 00:50:56:C0:00:01. This location can also be a vmnicNN name. If not specified and files need to be retrieved over the network, the installer defaults to the first discovered network adapter that is plugged in.
`netmask=`*`subnet mask`*	Specifies subnet mask for the network interface that downloads the installation script and the installation media.
`vlanid=`*`vlanid`*	Configure the network card to be on the specified VLAN.

About Installation and Upgrade Scripts

The installation/upgrade script is a text file, for example `ks.cfg`, that contains supported commands.

The command section of the script contains the ESXi installation options. This section is required and must appear first in the script.

Locations Supported for Installation or Upgrade Scripts

In scripted installations and upgrades, the ESXi installer can access the installation or upgrade script, also called the kickstart file, from several locations.

The following locations are supported for the installation or upgrade script:

- CD/DVD. See "Create an Installer ISO Image with a Custom Installation or Upgrade Script," on page 131.
- USB Flash drive. See "Create a USB Flash Drive to Store the ESXi Installation Script or Upgrade Script," on page 130.
- A network location accessible through the following protocols: NFS, HTTP, HTTPS, FTP

Path to the Installation or Upgrade Script

You can specify the path to an installation or upgrade script.

`ks=http://`*`XXX.XXX.XXX.XXX`*`/kickstart/KS.CFG` is the path to the ESXi installation script, where *`XXX.XXX.XXX.XXX`* is the IP address of the machine where the script resides. See "About Installation and Upgrade Scripts," on page 157.

To start an installation script from an interactive installation, you enter the `ks=` option manually. See "Enter Boot Options to Start an Installation or Upgrade Script," on page 155.

Installation and Upgrade Script Commands

To modify the default installation or upgrade script or to create your own script, use supported commands. Use supported commands in the installation script, which you specify with a boot command when you boot the installer.

To determine which disk to install or upgrade ESXi on, the installation script requires one of the following commands: `install`, `upgrade`, or `installorupgrade`. The `install` command creates the default partitions, including a VMFS datastore that occupies all available space after the other partitions are created. The `install` command replaces the `autopart` command that was used for scripted ESXi 4.1 installations.

accepteula or vmaccepteula (required)

Accepts the ESXi license agreement. This command functions as it did in ESXi 4.1.

clearpart (optional)

Compared to kickstart, the behavior of the ESXi `clearpart` command is different. Carefully edit the `clearpart` command in your existing scripts.

Clears any existing partitions on the disk. Requires `install` command to be specified.

`--drives=` Remove partitions on the specified drives.

`--alldrives` Ignores the `--drives=` requirement and allows clearing of partitions on every drive.

`--ignoredrives=` Removes partitions on all drives except those specified. Required unless the `--drives=` or `--alldrives` flag is specified.

`--overwritevmfs` Permits overwriting of VMFS partitions on the specified drives. By default, overwriting VMFS partitions is not allowed.

`--firstdisk=`
`disk-type1`
`[`*`disk-type2`*`,...]`

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1 Locally attached storage (`local`)

2 Network storage (`remote`)

3 USB disks (`usb`)

You can change the order of the disks by using a comma separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including `esx` for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is `--firstdisk=ST3120814A,mptsas,local`.

dryrun (optional)

Parses and checks the installation script. Does not perform the installation.

install

Specifies that this is a fresh installation. Replaces the deprecated `autopart` command used for ESXi 4.1 scripted installations. Either the `install`, `upgrade`, or `installorupgrade` command is required to determine which disk to install or upgrade ESXi on.

`--disk= or --drive=` Specifies the disk to partition. In the command `--disk=`*`diskname`*, the *diskname* can be in any of the forms shown in the following examples:

- Path: `--disk=`*`/vmfs/devices/disks/mpx.vmhba1:C0:T0:L0`*
- MPX name: `--disk=`*`mpx.vmhba1:C0:T0:L0`*
- VML name: `--disk=`*`vml.000000034211234`*
- vmkLUN UID: `--disk=`*`vmkLUN_UID`*

For accepted disk name formats, see "Disk Device Names," on page 165.

`--firstdisk=`
***`disk-type1`*`,`**
`[`*`disk-type2`*`,...]`

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1 Locally attached storage (`local`)

2 Network storage (`remote`)

3 USB disks (`usb`)

You can change the order of the disks by using a comma separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including `esx` for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is `--firstdisk=ST3120814A,mptsas,local`.

`--overwritevmfs` Required to overwrite an existing VMFS datastore on the disk before installation.

`--preservevmfs` Preserves an existing VMFS datastore on the disk during installation.

`--novmfsondisk` Prevents a VMFS partition from being created on this disk. Must be used with `--overwritevmfs` if a VMFS partition already exists on the disk.

installorupgrade

Either the `install`, `upgrade`, or `installorupgrade` command is required to determine which disk to install or upgrade ESXi on.

`--disk= or --drive=` Specifies the disk to partition. In the command `--disk=`*`diskname`*, the *diskname* can be in any of the forms shown in the following examples:

- Path: `--disk=`*`/vmfs/devices/disks/mpx.vmhba1:C0:T0:L0`*
- MPX name: `--disk=`*`mpx.vmhba1:C0:T0:L0`*
- VML name: `--disk=`*`vml.000000034211234`*
- vmkLUN UID: `--disk=`*`vmkLUN_UID`*

For accepted disk name formats, see "Disk Device Names," on page 165.

`--firstdisk=`*`disk-type1`*`,`***`[`***`disk-type2`***`,...]`**

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1 Locally attached storage (`local`)

2 Network storage (`remote`)

3 USB disks (`usb`)

You can change the order of the disks by using a comma separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including `esx` for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is `--firstdisk=ST3120814A,mptsas,local`.

--overwritevmfs

Install ESXi if a VMFS partition exists on the disk, but no ESX or ESXi installation exists. Unless this option is present, the installer will fail if a VMFS partition exists on the disk, but no ESX or ESXi installation exists.

--forcemigrate

If a version 4.x host contains customizations, such as third-party VIBS or drivers, that are not included in the installer .ISO, the installer exits with an error describing the problem. The `forcemigrate` option overrides the error and forces the upgrade.

If you are upgrading a 5.0.x host, supported custom VIBs on the host that are not included in the ESXi installer ISO are migrated. If the host or the installer .ISO contains a VIB that creates a conflict and prevents the upgrade, an error message identifies the offending VIB. You can remove the VIB and retry the upgrade, or use ESXI Image Builder to create a custom installer .ISO that resolves the conflict. The `forcemigrate` option is not available.

See "Upgrading Hosts That Have Third-Party Custom VIBs," on page 125

.

CAUTION Using the `forcemigrate` option might cause the upgraded host to not boot properly, to exhibit system instability, or to lose functionality.

keyboard (optional)

Sets the keyboard type for the system.

keyboardType

Specifies the keyboard map for the selected keyboard type. *keyboardType* must be one of the following types.

- Belgian
- Brazilian
- Croatian
- Czechoslovakian
- Danish
- Default
- Estonian
- Finnish
- French
- German
- Greek
- Icelandic
- Italian
- Japanese
- Latin American
- Norwegian
- Polish
- Portuguese

- Russian
- Slovenian
- Spanish
- Swedish
- Swiss French
- Swiss German
- Turkish
- US Dvorak
- Ukranian
- United Kingdom

serialnum or vmserialnum (optional)

Deprecated in ESXi 5.0.x. Supported in ESXi 5.1. Configures licensing. If not included, ESXi installs in evaluation mode.

`--esx=<license-key>`	Specifies the vSphere license key to use. The format is 5 five-character groups (XXXXX-XXXXX-XXXXX-XXXXX-XXXXX).

network (optional)

Specify a network address for the system.

`--bootproto=[dhcp|static]`	Specify whether to obtain the network settings from DHCP or set them manually.
`--device=`	Specifies either the MAC address of the network card or the device name, in the form `vmnicNN`, as in `vmnic0`. This options refers to the uplink device for the virtual switch.
`--ip=`	Sets an IP address for the machine to be installed, in the form `xxx.xxx.xxx.xxx`. Required with the `--bootproto=static` option and ignored otherwise.
`--gateway=`	Designates the default gateway as an IP address, in the form `xxx.xxx.xxx.xxx`. Used with the `--bootproto=static` option.
`--nameserver=`	Designates the primary name server as an IP address. Used with the `--bootproto=static` option. Omit this option if you do not intend to use DNS. The `--nameserver` option can accept two IP addresses. For example: `--nameserver="10.126.87.104[,10.126.87.120]"`
`--netmask=`	Specifies the subnet mask for the installed system, in the form `255.xxx.xxx.xxx`. Used with the `--bootproto=static` option.
`--hostname=`	Specifies the host name for the installed system.
`--vlanid=` ***`vlanid`***	Specifies which VLAN the system is on. Used with either the `--bootproto=dhcp` or `--bootproto=static` option. Set to an integer from 1 to 4096.
`--addvmportgroup=(0|1)`	Specifies whether to add the VM Network port group, which is used by virtual machines. The default value is 1.

paranoid (optional)

Causes warning messages to interrupt the installation. If you omit this command, warning messages are logged.

part or partition (optional)

Creates an additional VMFS datastore on the system. Only one datastore per disk can be created. Cannot be used on the same disk as the `install` command. Only one partition can be specified per disk and it can only be a VMFS partition

datastore name	Specifies where the partition is to be mounted
--ondisk= or --ondrive=	Specifies the disk or drive where the partition is created.
--firstdisk= ***disk-type1,*** **[*disk-type2*,...]**	Partitions the first eligible disk found. By default, the eligible disks are set to the following order: 1 Locally attached storage (`local`) 2 Network storage (`remote`) 3 USB disks (`usb`) You can change the order of the disks by using a comma separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including `esx` for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is `--firstdisk=ST3120814A,mptsas,local`.

reboot (optional)

Reboots the machine after the scripted installation is complete.

<--noeject>	The CD is not ejected after the installation.

rootpw (required)

Sets the root password for the system.

--iscrypted	Specifies that the password is encrypted.
password	Specifies the password value.

upgrade

Either the `install`, `upgrade`, or `installorupgrade` command is required to determine which disk to install or upgrade ESXi on.

--disk= or --drive=	Specifies the disk to partition. In the command `--disk=`*`diskname`*, the *diskname* can be in any of the forms shown in the following examples: ■ Path: `--disk=`*`/vmfs/devices/disks/mpx.vmhba1:C0:T0:L0`* ■ MPX name: `--disk=`*`mpx.vmhba1:C0:T0:L0`* ■ VML name: `--disk=`*`vml.000000034211234`*

- vmkLUN UID:`--disk=`*`vmkLUN_UID`*

For accepted disk name formats, see "Disk Device Names," on page 165.

`--firstdisk=`
`disk-type1,`
`[`*`disk-type2`*`,...]`

Partitions the first eligible disk found. By default, the eligible disks are set to the following order:

1 Locally attached storage (`local`)

2 Network storage (`remote`)

3 USB disks (`usb`)

You can change the order of the disks by using a comma separated list appended to the argument. If you provide a filter list, the default settings are overridden. You can combine filters to specify a particular disk, including `esx` for the first disk with ESX installed on it, model and vendor information, or the name of the vmkernel device driver. For example, to prefer a disk with the model name ST3120814A and any disk that uses the mptsas driver rather than a normal local disk, the argument is `--firstdisk=ST3120814A,mptsas,local`.

`--deletecosvmdk`

If the system is being upgraded from ESX, remove the directory that contains the old Service Console VMDK file, `cos.vmdk`, to reclaim unused space in the VMFS datastore.

`--forcemigrate`

If a version 4.x host contains customizations, such as third-party VIBS or drivers, that are not included in the installer .ISO, the installer exits with an error describing the problem. The `forcemigrate` option overrides the error and forces the upgrade. If you are upgrading a 5.0.x host, supported custom VIBs that are not included in the ESXi installer ISO are migrated. You do not need to to use the `forcemigrate` option.

See "Upgrading Hosts That Have Third-Party Custom VIBs," on page 125

CAUTION Using the `forcemigrate` option might cause the upgraded host to not boot properly, to exhibit system instability, or to lose functionality.

%include or include (optional)

Specifies another installation script to parse. This command is treated similarly to a multiline command, but takes only one argument.

`filename`

For example: `%include part.cfg`

%pre (optional)

Specifies a script to run before the kickstart configuration is evaluated. For example, you can use it to generate files for the kickstart file to include.

`--interpreter`
`=[python|busybox]`

Specifies an interpreter to use. The default is busybox.

%post (optional)

Runs the specified script after package installation is complete. If you specify multiple `%post` sections, they run in the order that they appear in the installation script.

`--interpreter`

Specifies an interpreter to use. The default is busybox.

=[python|busybox]	
--timeout=secs	Specifies a timeout for running the script. If the script is not finished when the timeout expires, the script is forcefully terminated.
--ignorefailure =[true|false]	If true, the installation is considered a success even if the `%post` script terminated with an error.

%firstboot

Creates an `init` script that runs only during the first boot. The script has no effect on subsequent boots. If multiple `%firstboot` sections are specified, they run in the order that they appear in the kickstart file.

NOTE You cannot check the semantics of `%firstboot` scripts until the system is booting for the first time. A `%firstboot` script might contain potentially catastrophic errors that are not exposed until after the installation is complete.

--interpreter =[python|busybox]	Specifies an interpreter to use. The default is busybox.

NOTE You cannot check the semantics of the `%firstboot` script until the system boots for the first time. If the script contains errors, they are not exposed until after the installation is complete.

Differences Between ESXi 4.x and ESXi 5.x Scripted Installation and Upgrade Commands

Before you perform a scripted ESXi installation or upgrade, if you are familiar with ESXi version 4.x scripted installation, note the differences between ESXi 4.x and ESXi 5.x scripted installation and upgrade commands.

In ESXi 5.x, because the installation image is loaded directly into the host RAM when the host boots, you do not need to include the location of the installation media in the installation script.

ESXi 5.x supports scripted upgrades in addition to scripted installation.

Command differences are noted in the following summary.

accepteula or vmaccepteula	Only in ESXi
autopart	Deprecated and replaced with `install`, `upgrade`, or `installorupgrade`.
auth or authconfig	Not supported in ESXi 5.x.
bootloader	Not supported in ESXi 5.x.
esxlocation	Deprecated and unused in ESXi.
firewall	Not supported in ESXi 5.x.
firewallport	Not supported in ESXi 5.x.
install, installorupgrade, upgrade	These commands replace the deprecated autopart command. Use one of these command to specify the disk to partition, and the `part` command to create the vmfs datastore. `installorupgrade` and `upgrade` are newly supported in ESXi 5.x.
serialnum	Deprecated in ESXi 5.0.x. Supported in ESXi 5.1.
vmserialnum	Deprecated in ESXi 5.0.x. Supported in ESXi 5.1.
timezone	Not supported in ESXi 5.x.

virtualdisk	Not supported in ESXi 5.x.
zerombr	Not supported in ESXi 5.x.
%firstboot	`--level` option not supported in ESXi 5.x.
%packages	Not supported in ESXi 5.x.

Disk Device Names

The `install`, `upgrade`, and `installorupgrade` installation script commands require the use of disk device names.

Table 6-6. Disk Device Names

Format	Examples	Description
VML	vml.00025261	The device name as reported by the vmkernel
MPX	mpx.vmhba0:C0:T0:L0	The device name

NOTE When you use a scripted upgrade to upgrade from ESX 4.x to ESXi 5.x, the MPX and VML disk names change, which might cause the upgrade to fail. To avoid this problem, use Network Address Authority Identifiers (NAA IDs) for the disk device instead of MPX and VML disk names.

About the boot.cfg File

The boot loader configuration file `boot.cfg` specifies the kernel, the kernel options, and the boot modules that the `mboot.c32` boot loader uses in an ESXi installation.

The `boot.cfg` file is provided in the ESXi installer. You can modify the `kernelopt` line of the `boot.cfg` file to specify the location of an installation script or to pass other boot options.

The `boot.cfg` file has the following syntax:

```
# boot.cfg -- mboot configuration file
#
# Any line preceded with '#' is a comment.

title=STRING
kernel=FILEPATH
kernelopt=STRING
modules=FILEPATH1 --- FILEPATH2... --- FILEPATHn

# Any other line must remain unchanged.
```

The commands in `boot.cfg` configure the boot loader.

Table 6-7. Commands in `boot.cfg` .

Command	Description
`title=`*`STRING`*	Sets the boot loader title to *STRING*.
`kernel=`*`FILEPATH`*	Sets the kernel path to *FILEPATH*.
`kernelopt=`*`STRING`*	Appends *STRING* to the kernel boot options.
`modules=`*`FILEPATH1 --- FILEPATH2... --- FILEPATHn`*	Lists the modules to be loaded, separated by three hyphens (---).

See "Create an Installer ISO Image with a Custom Installation or Upgrade Script," on page 131, "PXE Boot the ESXi Installer by Using PXELINUX and a PXE Configuration File," on page 135, "PXE Boot the ESXi Installer by Using PXELINUX and an isolinux.cfg PXE Configuration File," on page 136, and "PXE Booting the ESXi Installer," on page 132.

Install, Upgrade, or Migrate ESXi from a CD or DVD Using a Script

You can install, upgrade, or migrate ESXi from a CD/DVD drive using a script that specifies the installation or upgrade options.

You can start the installation or upgrade script by entering a boot option when you start the host. You can also create an installer ISO image that includes the installation script. With an installer ISO image, you can perform a scripted, unattended installation when you boot the resulting installer ISO image. See "Create an Installer ISO Image with a Custom Installation or Upgrade Script," on page 131.

IMPORTANT After you upgrade or migrate your host from ESX/ESXi 4.x to ESXi 5.x, you cannot roll back to your version 4.x ESX or ESXi software. Back up your host before you perform an upgrade or migration, so that, if the upgrade or migration fails, you can restore your 4.x host.

Prerequisites

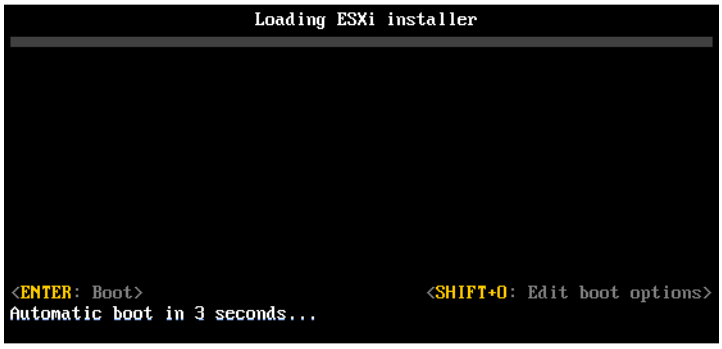
Before you run the scripted installation, upgrade, or migration, verify that the following prerequisites are met:

- The system on which you are installing, upgrading, or migrating meets the hardware requirements. See "ESXi Hardware Requirements," on page 13.
- You have the ESXi installer ISO on an installation CD/DVD. See "Download and Burn the ESXi Installer ISO Image to a CD or DVD," on page 128.
- The default installation or upgrade script (`ks.cfg`) or a custom installation or upgrade script is accessible to the system. See "About Installation and Upgrade Scripts," on page 157.
- You have selected a boot command to run the scripted installation, upgrade or migration. See "Enter Boot Options to Start an Installation or Upgrade Script," on page 155. For a complete list of boot commands, see "Boot Options," on page 156.

Procedure

1 Boot the ESXi installer from the CD or DVD using the local CD/DVD-ROM drive.

2 When the ESXi installer window appears, press Shift+O to edit boot options.



3 Type a boot option that calls the default installation or upgrade script or an installation or upgrade script file that you created.

The boot option has the form `ks=`.

4 Press Enter.

The installation, upgrade, or migration runs, using the options that you specified.

Install, Upgrade, or Migrate ESXi from a USB Flash Drive Using a Script

You can install, upgrade, or migrate ESXi from a USB flash drive using a script that specifies the installation or upgrade options.

IMPORTANT After you upgrade or migrate your host from ESX/ESXi 4.x to ESXi 5.x, you cannot roll back to your version 4.x ESX or ESXi software. Back up your host before you perform an upgrade or migration, so that, if the upgrade or migration fails, you can restore your 4.x host.

Supported boot options are listed in "Boot Options," on page 156.

Prerequisites

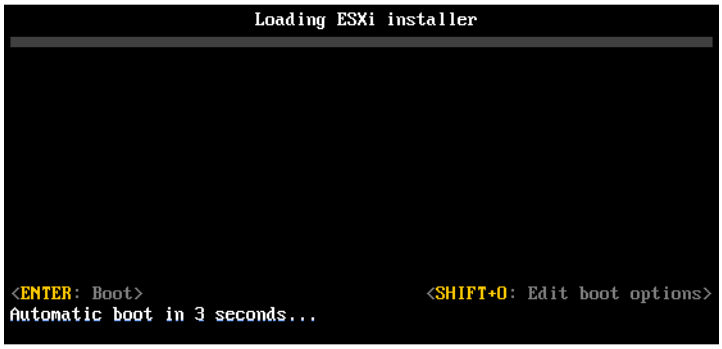
Before running the scripted installation, upgrade, or migration, verify that the following prerequisites are met:

- The system that you are installing, upgrading, or migrating to ESXi meets the hardware requirements for the installation or upgrade. See "ESXi Hardware Requirements," on page 13.
- You have the ESXi installer ISO on a bootable USB flash drive. See "Format a USB Flash Drive to Boot the ESXi Installation or Upgrade," on page 128.
- The default installation or upgrade script (`ks.cfg`) or a custom installation or upgrade script is accessible to the system. See "About Installation and Upgrade Scripts," on page 157.
- You have selected a boot option to run the scripted installation, upgrade, or migration. See "Enter Boot Options to Start an Installation or Upgrade Script," on page 155.

Procedure

1 Boot the ESXi installer from the USB flash drive.

2 When the ESXi installer window appears, press Shift+O to edit boot options.



3 Type a boot option that calls the default installation or upgrade script or an installation or upgrade script file that you created.

The boot option has the form `ks=`.

4 Press Enter.

The installation, upgrade, or migration runs, using the options that you specified.

Performing a Scripted Installation or Upgrade of ESXi by PXE Booting the Installer

ESXi 5.x provides many options for PXE booting the installer and using an installation or upgrade script.

- For information about setting up a PXE infrastructure, see "PXE Booting the ESXi Installer," on page 132.
- For information about creating and locating an installation script, see "About Installation and Upgrade Scripts," on page 157.
- For specific procedures to PXE boot the ESXi installer and use an installation script, see one of the following topics:
  - "PXE Boot the ESXi Installer by Using PXELINUX and an isolinux.cfg PXE Configuration File," on page 136
  - "PXE Boot the ESXi Installer by Using PXELINUX and a PXE Configuration File," on page 135
  - "PXE Boot the ESXi Installer Using gPXE," on page 138
- For information about using Auto Deploy to perform a scripted upgrade by PXE booting, see "Using vSphere Auto Deploy to Reprovision Hosts," on page 168.

Using vSphere Auto Deploy to Reprovision Hosts

If a host was deployed using vSphere Auto Deploy, you can use Auto Deploy to reprovision the host with a new image profile that contains an ESXi upgrade. You can use vSphere ESXi Image Builder PowerCLI to create and manage image profiles.

These instructions assume that you are reprovisioning a host that has already been provisioned with Auto Deploy. Provisioning a host that has never been provisioned with Auto Deploy differs from the process described here to upgrade a host. For information about using vSphere Auto Deploy and ESXi Image Builder PowerCLI, see the information about using vSphere Auto Deploy and vSphere ESXi Image Builder CLI in the *vSphere Installation and Setup* documentation.

Reprovisioning Hosts

vSphere Auto Deploy supports multiple reprovisioning options. You can perform a simple reboot or reprovision with a different image profile or a different host profile.

A first boot using Auto Deploy requires that you set up your environment and add rules to the rule set. See the topic "Preparing for vSphere Auto Deploy" in the *vSphere installation and Setup* documentation.

The following reprovisioning operations are available.

- Simple reboot.
- Reboot of hosts for which the user answered questions during the boot operation.
- Reprovision with a different image profile.
- Reprovision with a different host profile.

Reprovision Hosts with Simple Reboot Operations

A simple reboot of a host that is provisioned with Auto Deploy requires only that all prerequisites are still met. The process uses the previously assigned image profile, host profile, and vCenter Server location.

Setup includes DHCP server setup, writing rules, and making an image profile available to the Auto Deploy infrastructure.

Prerequisites

Make sure the setup you performed during the first boot operation is in place.

Procedure

1 Check that the image profile and host profile for the host are still available, and that the host has the identifying information (asset tag, IP address) it had during previous boot operations.

2 Place the host in maintenance mode.

Host Type	Action
Host is part of a DRS cluster	VMware DRS migrates virtual machines to appropriate hosts when you place the host in maintenance mode.
Host is not part of a DRS cluster	You must migrate all virtual machines to different hosts and place each host in maintenance mode.

3 Reboot the host.

The host shuts down. When the host reboots, it uses the image profile that the Auto Deploy server provides. The Auto Deploy server also applies the host profile stored on the vCenter Server system.

Reprovision a Host with a New Image Profile

You can reprovision the host with a new image profile, host profile, or vCenter Server location by changing the rule for the host and performing a test and repair compliance operation.

Several options for reprovisioning hosts exist.

- If the VIBs that you want to use support live update, you can use an `esxcli software vib` command. In that case, you must also update the rule set to use an image profile that includes the new VIBs.
- During testing, you can apply an image profile to an individual host with the `Apply-EsxImageProfile` cmdlet and reboot the host so the change takes effect. The `Apply-EsxImageProfile` cmdlet updates the association between the host and the image profile but does not install VIBs on the host.
- In all other cases, use this procedure.

Prerequisites

- Create the image profile you want boot the host with. Use the Image Builder PowerCLI. See "Using vSphere ESXi Image Builder CLI" in the *vSphere Installation and Setup* documentation.
- Make sure that the setup that you performed during the first boot operation is in place.

Procedure

1 At the PowerShell prompt, run the `Connect-VIServer` PowerCLI cmdlet to connect to the vCenter Server system that Auto Deploy is registered with.

```
Connect-VIServer myVCServer
```

The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2 Determine the location of a public software depot that contains the image profile that you want to use, or define a custom image profile with the Image Builder PowerCLI.

3 Run `Add-EsxSoftwareDepot` to add the software depot that contains the image profile to the PowerCLI session.

Depot Type	Cmdlet
Remote depot	Run **`Add-EsxSoftwareDepot`** ***`depot_url`***.
ZIP file	a Download the ZIP file to a local file path or create a mount point local to the PowerCLI machine. b Run **`Add-EsxSoftwareDepot C:\`*`file_path`*`\`*`my_offline_depot`*`.zip`**.

4 Run `Get-EsxImageProfile` to see a list of image profiles, and decide which profile you want to use.

5 Run `Copy-DeployRule` and specify the `ReplaceItem` parameter to change the rule that assigns an image profile to hosts.

The following cmdlet replaces the current image profile that the rule assigns to the host with the *my_new_imageprofile* profile. After the cmdlet completes, `myrule` assigns the new image profile to hosts. The old version of `myrule` is renamed and hidden.

`Copy-DeployRule myrule -ReplaceItem` ***`my_new_imageprofile`***

6 Test and repair rule compliance for each host that you want to deploy the image to.

See "Test and Repair Rule Compliance," on page 172.

When you reboot hosts after compliance repair, Auto Deploy provisions the hosts with the new image profile.

Applying a Host Profile to Prompt for User Input in the vSphere Client

If a host required user input during a previous boot, the answers are saved with the vCenter Server in an answer file. If you want to prompt the user for new information, you reapply the host profile.

Prerequisites

Attach a host profile that prompts for user input to the host.

Procedure

1 Migrate all virtual machines to different hosts, and place the host into maintenance mode.

Host Type	Action
Host is part of a DRS cluster	VMware DRS migrates virtual machines to appropriate hosts when you place the host in maintenance mode.
Host is not part of a DRS cluster	You must migrate all virtual machines to different hosts and place each host in maintenance mode.

2 In the vSphere Client, choose **Host Profiles > Apply Profile**.and

3 Select the host profile that requires user input when prompted.

4 When prompted, provide the user input.

You can now direct the host to exit maintenance mode.

The user input information is saved in an answer file. The next time you boot, the answer file information is applied to the host. One answer file per host is available.

Assign a Host Profile to Hosts

Auto Deploy can assign a host profile to one or more hosts. The host profile might include information about storage configuration, network configuration, or other characteristics of the host. If you add a host to a cluster, that cluster's host profile is used.

The following procedure explains how to write a rule that assigns a host profile to hosts. To assign the host profiles to hosts already provisioned with Auto Deploy, you must also perform a test and repair cycle. See "Test and Repair Rule Compliance," on page 172.

In many cases, you assign a host to a cluster instead of specifying a host profile explicitly. The host uses the host profile of the cluster.

Prerequisites

- Install vSphere PowerCLI and all prerequisite software.
- Export the host profile that you want to use.
- If you encounter problems running PowerCLI cmdlets, consider changing the execution policy. See the information about using Auto Deploy Cmdlets in the *vSphere Installation and Setup* documentation.

Procedure

1 Run the `Connect-VIServer` PowerCLI cmdlet to connect to the vCenter Server system that Auto Deploy is registered with.

```
Connect-VIServer 192.XXX.X.XX
```

The cmdlet might return a server certificate warning. In a production environment, make sure no server certificate warnings result. In a development environment, you can ignore the warning.

2 Using the vSphere Client or the vSphere Web Client, set up a host with the settings you want to use and create a host profile from that host.

3 Find the name of the host profile by running `Get-VMhostProfile` PowerCLI cmdlet, passing in the ESXi host from which you create a host profile.

4 At the PowerCLI prompt, define a rule in which hosts with certain attributes, for example a range of IP addresses, are assigned to the host profile.

```
New-DeployRule -Name "testrule2" -Item my_host_profile -Pattern "vendor=Acme,Zven",
"ipv4=192.XXX.1.10-192.XXX.1.20"
```

The specified item is assigned to all hosts with the specified attributes. This example specifies a rule named testrule2. The rule assigns the specified host profile my_host_profile to all hosts with an IP address inside the specified range and with a manufacturer of Acme or Zven.

5 Add the rule to the rule set.

```
Add-DeployRule testrule2
```

By default, the working rule set becomes the active rule set, and any changes to the rule set become active when you add a rule. If you use the `NoActivate` parameter, the working rule set does not become the active rule set.

What to do next

- Upgrade existing hosts to use the new host profile by performing compliance test and repair operations on those hosts. See "Test and Repair Rule Compliance," on page 172.
- Turn on unprovisioned hosts to provision them with the host profile.

Test and Repair Rule Compliance

When you add a rule to the Auto Deploy rule set or make changes to one or more rules, hosts are not updated automatically. Auto Deploy applies the new rules only when you test their rule compliance and perform remediation.

This task assumes that your infrastructure includes one or more ESXi hosts provisioned with Auto Deploy, and that the host on which you installed vSphere PowerCLI can access those ESXi hosts.

Prerequisites

- Install vSphere PowerCLI and all prerequisite software.
- If you encounter problems running PowerCLI cmdlets, consider changing the execution policy. See the information about using Auto Deploy Cmdlets in the *vSphere Installation and Setup* documentation.

Procedure

1 Use PowerCLI to check which Auto Deploy rules are currently available.

```
Get-DeployRule
```

The system returns the rules and the associated items and patterns.

2 Make a change to one of the available rules, for example, you might change the image profile and the name of the rule.

```
Copy-DeployRule -DeployRule testrule -ReplaceItem MyNewProfile
```

You cannot edit a rule already added to a rule set. Instead, you copy the rule and replace the item or pattern you want to change. By default, PowerCLI uses the old name for the copy and hides the old rule.

3 Verify that the host that you want to test rule set compliance for is accessible.

```
Get-VMHost -Name MyEsxi42
```

4 Run the cmdlet that tests rule set compliance for the host, and bind the return value to a variable for later use.

```
$tr = Test-DeployRuleSetCompliance MyEsxi42
```

5 Examine the differences between what is in the rule set and what the host is currently using.

```
$tr.itemlist
```

The system returns a table of current and expected items.

```
CurrentItem                          ExpectedItem
-----------                          ------------
My Profile 25                        MyProfileUpdate
```

6 Remediate the host to use the revised rule set the next time you boot the host.

```
Repair-DeployRuleSetCompliance $tr
```

What to do next

If the rule you changed specified the inventory location, the change takes effect when you repair compliance. For all other changes, boot your host to have Auto Deploy apply the new rule and to achieve compliance between the rule set and the host.

Upgrading Hosts by Using esxcli Commands

Using the vSphere CLI, you can upgrade, update, or patch ESXi 5.x hosts.

You cannot use `esxcli` commands to upgrade version 4.x ESX or ESXi hosts to ESXi 5.x. To upgrade version 4.x ESX or ESXi hosts to ESXi 5.x, use vSphere Update Manager, or perform an interactive or scripted upgrade.

To use esxcli vCLI commands, you must install vSphere CLI (vCLI). For more information about installing and using the vSphere CLI, see the following documents:

- *Getting Started with vSphere Command-Line Interfaces*
- *vSphere Command-Line Interface Concepts and Examples*
- *vSphere Command-Line Interface Reference* is a reference to `vicfg–` and related vCLI commands.

NOTE If you press Ctrl+C while an `esxcli` command is running, the command-line interface exits to a new prompt without displaying a message. However, the command continues to run to completion.

For ESXi hosts deployed with vSphere Auto Deploy, the tools VIB must be part of the base booting image used for the initial Auto Deploy installation. The tools VIB cannot be added separately later.

VIBs, Image Profiles, and Software Depots

Upgrading ESXi with esxcli commands requires an understanding of VIBs, image profiles, and software depots.

The following technical terms are used throughout the vSphere documentation set in discussions of installation and upgrade tasks.

VIB — A VIB is an ESXi software package. VMware and its partners package solutions, drivers, CIM providers, and applications that extend the ESXi platform as VIBs. VIBs are available in software depots. You can use VIBs to create and customize ISO images or to upgrade ESXi hosts by installing VIBs asynchronously onto the hosts.

Image Profile — An image profile defines an ESXi image and consists of VIBs. An image profile always includes a base VIB, and might include more VIBs. You examine and define an image profile using the Image Builder PowerCLI.

Software Depot — A software depot is a collection of VIBs and image profiles. The software depot is a hierarchy of files and folders and can be available through an HTTP URL (online depot) or a ZIP file (offline depot). VMware and VMware partners make depots available. Companies with large VMware installations might create internal depots to provision ESXi hosts with vSphere Auto Deploy, or to export an ISO for ESXi installation.

Understanding Acceptance Levels for VIBS and Hosts

Each VIB is released with an acceptance level that cannot be changed. The host acceptance level determines which VIBs can be installed to a host.

The acceptance level applies to individual VIBs installed by using the `esxcli software vib install` and `esxcli software vib update` commands, to VIBs installed using vSphere Update Manager, and to VIBs in image profiles.

The acceptance level of all VIBs on a host must be at least as high as the host acceptance level. For example, if the host acceptance level is VMwareAccepted, you can install VIBs with acceptance levels of VMwareCertified and VMwareAccepted, but you cannot install VIBs with acceptance levels of PartnerSupported or CommunitySupported. To install a VIB with a less restrictive acceptance level than that of the host, you can change the acceptance level of the host by using the vSphere Client or by running `esxcli software acceptance` commands.

Setting host acceptance levels is a best practice that allows you to specify which VIBs can be installed on a host and used with an image profile, and the level of support you can expect for a VIB. For example, you would probably set a more restrictive acceptance level for hosts in a production environment than for hosts in a testing environment.

VMware supports the following acceptance levels.

VMwareCertified The VMwareCertified acceptance level has the most stringent requirements. VIBs with this level go through thorough testing fully equivalent to VMware in-house Quality Assurance testing for the same technology. Today, only IOVP drivers are published at this level. VMware takes support calls for VIBs with this acceptance level.

VMwareAccepted VIBs with this acceptance level go through verification testing, but the tests do not fully test every function of the software. The partner runs the tests and VMware verifies the result. Today, CIM providers and PSA plugins are among the VIBs published at this level. VMware directs support calls for VIBs with this acceptance level to the partner's support organization.

PartnerSupported VIBs with the PartnerSupported acceptance level are published by a partner that VMware trusts. The partner performs all testing. VMware does not verify the results. This level is used for a new or nonmainstream technology that partners want to enable for VMware systems. Today, driver VIB technologies such as Infiniband, ATAoE, and SSD are at this level with nonstandard hardware drivers. VMware directs support calls for VIBs with this acceptance level to the partner's support organization.

CommunitySupported The Community Supported acceptance level is for VIBs created by individuals or companies outside of VMware partner programs. VIBs at this level have not gone through any VMware-approved testing program and are not supported by VMware Technical Support or by a VMware partner.

Table 6-8. VIB Acceptance Levels Required to Install on Hosts

Host Acceptance Level	VMwareCertified VIB	VMwareAccepted VIB	PartnerSupported VIB	CommunitySupported VIB
VMwareCertified	x			
VMwareAccepted	x	x		
PartnerSupported	x	x	x	
CommunitySupported	x	x	x	x

Match a Host Acceptance Level with an Update Acceptance Level

You can change the host acceptance level to match the acceptance level for a VIB or image profile that you want to install. The acceptance level of all VIBs on a host must be at least as high as the host acceptance level.

Use this procedure to determine the acceptance levels of the host and the VIB or image profile to install, and to change the acceptance level of the host, if necessary for the update.

When you specify a target server by using **--server=server_name** in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting , run `esxcli` commands in the ESXi Shell.

Procedure

1 Retrieve the acceptance level for the VIB or image profile.

Option	Description
List information for all VIBs	**esxcli --server=*server_name* software sources vib list --depot=*depot_URL***
List information for a specified VIB	**esxcli --server=*server_name* software sources vib list --viburl=*vib_URL***
List information for all image profiles	**esxcli --server=*server_name* software sources profile list --depot=*depot_URL***
List information for a specified image profile	**esxcli --server=*server_name* software sources profile get --depot=*depot_URL* --profile=*profile_name***

2 Retrieve the host acceptance level.

```
esxcli --server=server_name software acceptance get
```

3 (Optional) If the acceptance level of the VIB is more restrictive than the acceptance level of the host, change the acceptance level of the host.

```
esxcli --server=server_name software acceptance set --level=acceptance_level
```

The *acceptance_level* can be `VMwareCertified`, `VMwareAccepted`, `PartnerSupported`, or `CommunitySupported`. The values for *acceptance_level* are case-sensitive.

NOTE You can use the `--force` option for the `esxcli software vib` or `esxcli software profile` command to add a VIB or image profile with a lower acceptance level than the host. A warning will appear. Because your setup is no longer consistent, the warning is repeated when you install VIBs, remove VIBs, and perform certain other operations on the host.

Determine Whether an Update Requires the Host to Be in Maintenance Mode or to Be Rebooted

VIBs that you can install with live install do not require the host to be rebooted, but might require the host to be placed in maintenance mode. Other VIBs and profiles might require the host to be rebooted after the installation or update.

When you specify a target server by using **--server=server_name** in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting , run `esxcli` commands in the ESXi Shell.

Procedure

1 Check whether the VIB or image profile that you want to install requires the host to be placed in maintenance mode or to be rebooted after the installation or update.

Run one of the following commands.

Option	Description
Check the VIB	`esxcli --server=server_name software sources vib get -v absolute_path_to_vib`
Check the VIBs in a depot	`esxcli --server=server_name software sources vib get --depot=depot_name`
Check the image profile in a depot	`esxcli --server=server_name software sources profile get --depot=depot_name`

2 Review the return values.

The return values, which are read from the VIB metadata, indicate whether the host must be in maintenance mode before installing the VIB or image profile, and whether installing the VIB or profile requires the host to be rebooted.

NOTE vSphere Update Manager relies on the `esxupdate`/`esxcli` scan result to determine whether maintenance mode is required or not. When you install a VIB on a live system, if the value for `Live-Install-Allowed` is set to false, the installation result will instruct Update Manager to reboot the host. When you remove a VIB from a live system, if the value for `Live-Remove-Allowed` is set to false, the removal result will instruct Update Manager to reboot the host. In either case, during the reboot, Update Manager will automatically put the host into maintenance mode.

What to do next

If necessary, place the host in maintenance mode. See "Place a Host in Maintenance Mode," on page 176. If a reboot is required, and if the host belongs to a VMware HA cluster, remove the host from the cluster or disable HA on the cluster before the installation or update.

Place a Host in Maintenance Mode

Some installation and update operations that use live install require the host to be in maintenance mode.

To determine whether an upgrade operation requires the host to be in maintenance mode, see "Determine Whether an Update Requires the Host to Be in Maintenance Mode or to Be Rebooted," on page 175

When you specify a target server by using **`--server=server_name`** in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting, run `esxcli` commands in the ESXi Shell.

Procedure

1 Check to determine whether the host is in maintenance mode.

```
vicfg-hostops --server=server_name --operation info
```

2 Run one of the following commands for each virtual machine to power off all virtual machines running on the ESXi host.

Option	Command
To have the system try to shut down the guest operating system	`vmware-cmd --server=server_name path_to_vm stop soft`
To force the power off operation	`vmware-cmd --server=server_name path_to_vm stop hard`

Alternatively, to avoid powering off virtual machines, you can migrate them to another host. See the topic *Migrating Virtual Machines* in the *vCenter Server and Host Management* documentation.

3 Place the host in maintenance mode.

```
vicfg-hostops --server=server_name --operation enter
```

4 Verify that the host is in maintenance mode.

```
vicfg-hostops --server=server_name --operation info
```

Update a Host with Individual VIBs

You can update a host with VIBs stored in a software depot that is accessible through a URL or in an offline ZIP depot.

IMPORTANT If you are updating ESXi from a zip bundle in a VMware-supplied depot, either online from the VMware Web site or downloaded locally, VMware supports only the update method specified for VMware-supplied depots in the topic "Update a Host with Image Profiles," on page 178.

When you specify a target server by using `--server=server_name` in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

- Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting, run `esxcli` commands in the ESXi Shell.
- Determine whether the update requires the host to be in maintenance mode or to be rebooted. If necessary, place the host in maintenance mode.

  See "Determine Whether an Update Requires the Host to Be in Maintenance Mode or to Be Rebooted," on page 175. See "Place a Host in Maintenance Mode," on page 176.
- If the update requires a reboot, and if the host belongs to a VMware HA cluster, remove the host from the cluster or disable HA on the cluster.

Procedure

1 Determine which VIBs are installed on the host.

```
esxcli --server=server_name software vib list
```

2 Find out which VIBs are available in the depot.

Option	Description
from a depot accessible by URL	`esxcli --server=server_name software sources vib list --depot=http://web_server/depot_name`
from a local depot ZIP file	`esxcli --server=server_name software sources vib list --depot=absolute_path_to_depot_zip_file`

You can specify a proxy server by using the `--proxy` argument.

3 Update the existing VIBs to include the VIBs in the depot or install new VIBs.

Option	Description
Update VIBs from a depot accessible by URL	`esxcli --server=server_name software vib update --depot=http://web_server/depot_name`
Update VIBs from a local depot ZIP file	`esxcli --server=server_name software vib update --depot=absolute_path_to_depot_ZIP_file`
Install all VIBs from a ZIP file on a specified offline depot (includes both VMware VIBs and partner-supplied VIBs)	`esxcli --server=server_name software vib install --depot path_to_VMware_vib_ZIP_file\VMware_vib_ZIP_file --depot path_to_partner_vib_ZIP_file\partner_vib_ZIP_file`

Options for the `update` and `install` commands allow you to perform a dry run, to specify a specific VIB, to bypass acceptance level verification, and so on. Do not bypass verification on production systems. See the *esxcli Reference* at http://www.vmware.com/support/developer/vcli/.

4 Verify that the VIBs are installed on your ESXi host.

```
esxcli --server=server_name software vib list
```

Update a Host with Image Profiles

You can update a host with image profiles stored in a software depot that is accessible through a URL or in an offline ZIP depot.

IMPORTANT If you are updating ESXi from a zip bundle in a VMware-supplied depot, either online from the VMware Web site or downloaded locally, VMware supports only the update command `esxcli software profile update --depot=depot_location --profile=profile_name`.

When you specify a target server by using `--server=server_name` in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

NOTE Options to the `update` and `install` commands allow you to perform a dry run, to specify a specific VIB, to bypass acceptance level verification, and so on. Do not bypass verification on production systems. See the *vSphere Command-Line Interface Reference*.

Prerequisites

- Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting, run `esxcli` commands in the ESXi Shell.
- Determine whether the update requires the host to be in maintenance mode or to be rebooted. If necessary, place the host in maintenance mode.

  See "Determine Whether an Update Requires the Host to Be in Maintenance Mode or to Be Rebooted," on page 175. See "Place a Host in Maintenance Mode," on page 176.

- If the update requires a reboot, and if the host belongs to a VMware HA cluster, remove the host from the cluster or disable HA on the cluster.

Procedure

1 Determine which VIBs are installed on the host.

```
esxcli --server=server_name software vib list
```

2 Determine which image profiles are available in the depot.

```
esxcli --server=server_name software sources profile list --depot=http://webserver/depot_name
```

You can specify a proxy server by using the **--proxy** argument.

3 Update the existing image profile to include the VIBs or install new VIBs.

IMPORTANT The `software profile update` command updates existing VIBS with the corresponding VIBs from the specified profile, but does not affect other VIBs installed on the target server. The `software profile install` command installs the VIBs present in the depot image profile, and removes any other VIBS installed on the target server.

Option	Description
Update the image profile from a VMware-supplied zip bundle, in a depot, accessible online from the VMware Web site or downloaded to a local depot.	**esxcli software profile update --depot=*depot_location* --profile=*profile_name*** **IMPORTANT** This is the only update method that VMware supports for zip bundles supplied by VMware. VMware-supplied zip bundle names take the form: **VMware-ESXi-5.1.0-*build_number*-depot.zip** The profile name for VMware-supplied ziip bundles takes one of the following forms. ■ **ESXi-5.1.0-*build_number*-standard** ■ **ESXi-5.1.0-*build_number*-notools** (does not include VMware Tools)
Update the image profile from a depot accessible by URL	**esxcli --server=*server_name* software profile update --depot=http://*webserver/depot_name* --profile=*profile_name***
Update the image profile from ZIP file stored locally on the target server	**esxcli --server=*server_name* software profile update --depot=file:///<path_to_profile_ZIP_file>/<profile_ZIP_file> --profile=*profile_name***
Update the image profile from a ZIP file on the target server, copied into a datastore	**esxcli --server=*server_name* software profile update --depot="[*datastore_name*]*profile_ZIP_file*" --profile=*profile_name***
Update the image profile from a ZIP file copied locally and applied on the target server	**esxcli --server=*server_name* software profile update --depot=/*root_dir/path_to_profile_ZIP_file/profile_ZIP_file* --profile=*profile_name***
Install all new VIBs in a specified profile accessible by URL	**esxcli --server=*server_name* software profile install --depot=http://*webserver/depot_name* --profile=*profile_name***
Install all new VIBs in a specified profile from a ZIP file stored locally on the target	**esxcli --server=*server_name* software profile install --depot=file:///<path_to_profile_ZIP_file>/<profile_ZIP_file> --profile=*profile_name***

Option	Description
Install all new VIBs from a ZIP file on the target server, copied into a datastore	`esxcli --server=server_name software profile install --depot="[datastore_name]profile_ZIP_file" --profile=profile_name`
Install all new VIBs from a ZIP file copied locally and applied on the target server	`esxcli --server=server_name software profile install --depot=/root_dir/path_to_profile_ZIP_file/profile_ZIP_file --profile=profile_name`

NOTE Options to the `update` and `install` commands allow you to perform a dry run, to specify a specific VIB, to bypass acceptance level verification, and so on. Do not bypass verification on production systems. See the *vSphere Command-Line Interface Reference*.

4 Verify that the VIBs are installed on your ESXi host.

```
esxcli --server=server_name software vib list
```

Update ESXi Hosts by Using Zip Files

You can update hosts with VIBs or image profiles by downloading a ZIP file of a depot.

VMware partners prepare third-party VIBs to provide management agents or asynchronously released drivers.

IMPORTANT If you are updating ESXi from a zip bundle in a VMware-supplied depot, either online from the VMware Web site or downloaded locally, VMware supports only the update method specified for VMware-supplied depots in the topic "Update a Host with Image Profiles," on page 178.

When you specify a target server by using **`--server=server_name`** in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

- Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting, run `esxcli` commands in the ESXi Shell.
- Download the ZIP file of a depot bundle from a third-party VMware partner.
- Determine whether the update requires the host to be in maintenance mode or to be rebooted. If necessary, place the host in maintenance mode.

  See "Determine Whether an Update Requires the Host to Be in Maintenance Mode or to Be Rebooted," on page 175. See "Place a Host in Maintenance Mode," on page 176.
- If the update requires a reboot, and if the host belongs to a VMware HA cluster, remove the host from the cluster or disable HA on the cluster.

Procedure

- Install the ZIP file.

  ```
  esxcli --server=server_name software vib update --depot=/path_to_vib_ZIP/ZIP_file_name.zip
  ```

Remove VIBs from a Host

You can uninstall third-party VIBs or VMware VIBs from your ESXi host.

VMware partners prepare third-party VIBs to provide management agents or asynchronously released drivers.

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting , run `esxcli` commands in the ESXi Shell.

Prerequisites

- If the removal requires a reboot, and if the host belongs to a VMware HA cluster, disable HA for the host.
- Determine whether the update requires the host to be in maintenance mode or to be rebooted. If necessary, place the host in maintenance mode.

  See "Determine Whether an Update Requires the Host to Be in Maintenance Mode or to Be Rebooted," on page 175. See "Place a Host in Maintenance Mode," on page 176.
- Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting, run `esxcli` commands in the ESXi Shell.

Procedure

1 Run one of the following commands for each virtual machine to power off all virtual machines running on the ESXi host.

Option	Command
To have the system try to shut down the guest operating system	`vmware-cmd --server=server_name path_to_vm stop soft`
To force the power off operation	`vmware-cmd --server=server_name path_to_vm stop hard`

   Alternatively, to avoid powering off virtual machines, you can migrate them to another host. See the topic *Migrating Virtual Machines* in the *vCenter Server and Host Management* documentation.

2 Place the host in maintenance mode.

```
vicfg-hostops --server=server_name --operation enter
```

3 If necessary, shut down or migrate virtual machines.

4 Determine which VIBs are installed on the host.

```
esxcli --server=server_name software vib list
```

5 Remove the VIB.

```
esxcli --server=server_name software vib remove --vibname=name
```

   Specify one or more VIBs to remove in one of the following forms:

   - *name*
   - *name*:*version*
   - *vendor*:*name*
   - *vendor*:*name*:*version*

   For example, the command to remove a VIB specified by vendor, name and version would take this form:

```
esxcli --server myEsxiHost software vib remove --vibname=PatchVendor:patch42:version3
```

   NOTE The `remove` command supports several more options. See the *vSphere Command-Line Interface Reference*.

Adding Third-Party Extensions to Hosts with esxcli

If a third-party extension is released as a VIB package, and you use the `esxcli software vib` command to add the VIB package to your system, the VIB system updates the firewall ruleset and refreshes the host daemon after you reboot your system.

Otherwise, you can use a firewall configuration file to specify port rules for host services that you want to enable for the extension. The *vSphere Security* documentation discusses how to add, apply, and refresh a firewall rule set and lists the `esxcli network firewall` commands.

The ESXi 5.x `ruleset.xml` format for ESXi 5.x is the same as in version 4.x for ESX and ESXi, but has two more tags, `enabled` and `required`. The ESXi 5.x firewall still supports the older format.

Perform a Dry Run of an esxcli Installation or Upgrade

You can use the `--dry-run` option to preview the results of an installation or upgrade operation. A dry run of the installation or update procedure does not make any changes, but reports the VIB-level operations that will be performed if you run the command without the `--dry-run` option.

When you specify a target server by using **`--server=server_name`** in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting , run `esxcli` commands in the ESXi Shell.

Procedure

1 Enter the installation or upgrade command, adding the **--dry-run** option.

- **`esxcli --server=`*`server_name`*` software vib install --dry-run`**
- **`esxcli --server=`*`server_name`*` software vib update --dry-run`**
- **`esxcli --server=`*`server_name`*` software profile install --dry-run`**
- **`esxcli --server=`*`server_name`*` software profile update --dry-run`**

2 Review the output that is returned.

The output shows which VIBs will be installed or removed and whether the installation or update requires a reboot.

Display the Installed VIBs and Profiles That Will Be Active After the Next Host Reboot

You can use the `--rebooting-image` option to list the VIBs and profiles that are installed on the host and will be active after the next host reboot.

When you specify a target server by using **`--server=server_name`** in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting , run `esxcli` commands in the ESXi Shell.

Procedure

1 Enter one of the following commands.

Option	Description
For VIBs	`esxcli --server=server_name software vib list --rebooting-image`
For Profiles	`esxcli --server=server_name software profile get --rebooting-image`

2 Review the output that is returned.

The output displays information for the ESXi image that will become active after the next reboot. If the pending-reboot image has not been created, the output returns nothing.

Display the Image Profile and Acceptance Level of the Host

You can use the `software profile get` command to display the currently installed image profile and acceptance level for the specified host.

This command also shows details of the installed image profile history, including profile modifications.

When you specify a target server by using **`--server=server_name`** in the procedure, the specified server prompts you for a user name and password. Other connection options, such as a configuration file or session file, are supported. For a list of connection options, see *Getting Started with vSphere Command-Line Interfaces*, or run `esxcli --help` at the vCLI command prompt.

Prerequisites

Install vCLI or deploy the vSphere Management Assistant (vMA) virtual machine. See *Getting Started with vSphere Command-Line Interfaces*. For troubleshooting , run `esxcli` commands in the ESXi Shell.

Procedure

1 Enter the following command.

```
esxcli --server=server_name software profile get
```

2 Review the output.

Errors and Warnings Returned by the Installation and Upgrade Precheck Script

The installation and upgrade precheck script runs tests to identify problems on the host machine that can cause an installation, upgrade, or migration to fail.

For interactive installations, upgrades, and migrations, the errors or warnings are displayed on the final panel of the installer, where you are asked to confirm or cancel the installation or upgrade. For scripted installations, upgrades, or migrations, the errors or warnings are written to the installation log.

vSphere Update Manager provides custom messages for these errors or warnings. To see the original errors and warnings returned by the precheck script during an Update Manager host upgrade scan, review the Update Manager log file `vmware-vum-server-log4cpp.log`.

Table 6-9. Error and Warning Codes That Are Returned by the Installation and Upgrade Precheck Script

Error or Warning	Description
64BIT_LONGMODESTATUS	The host processor must be 64-bit.
COS_NETWORKING	Warning. An IPv4 address was found on an enabled Service Console virtual NIC for which there is no corresponding address in the same subnet in the vmkernel. A separate warning will be output for each such occurrence.

Table 6-9. Error and Warning Codes That Are Returned by the Installation and Upgrade Precheck Script (Continued)

Error or Warning	Description
CPU_CORES	The host must have at least two cores.
DISTRIBUTED_VIRTUAL_SWITCH	If Cisco's Virtual Ethernet Module (VEM) software is found on the host, the test checks to make sure the upgrade also contains the VEM software, and that it supports the same version of the Virtual Supervisor Module (VSM) as the existing version on the host. If the software is missing or is compatible with a different version of the VSM, the test returns a warning, and the result indicates which version of the VEM software was expected on the upgrade ISO and which version, if any, were found. You can use ESXi Image Builder CLI to create a custom installation ISO that includes the appropriate version of the VEM software.
HARDWARE_VIRTUALIZATION	Warning. If the host processor doesn't have hardware virtualization or if hardware virtualization is not turned on in the host BIOS, host performance will suffer. Enable hardware virtualization in the host machine boot options. See your hardware vendor's documentation.
MD5_ROOT_PASSWORD	This test checks that the root password is encoded in MD5 format. If a password is not encoded in MD5 format, it might be significant only to eight characters. In this case, any characters after the first eight are no longer authenticated after the upgrade, which can create a security issue. To work around this problem, see VMware Knowledge Base article 1024500.
MEMORY_SIZE	The host requires the specified amount of memory to upgrade.
PACKAGE_COMPLIANCE	vSphere Update Manager only. This test checks the existing software on the host against the software contained on the upgrade ISO to determine whether the host has been successfully upgraded. If any of the packages are missing or are an older version than the package on the upgrade ISO, the test returns an error and indicates which software was found on the host, and which software was found on the upgrade ISO.
PARTITION_LAYOUT	Upgrading or migration is possible only if there is at most one VMFS partition on the disk that is being upgraded and the VMFS partition must start after sector 1843200
POWERPATH	This test checks for installation of EMC PowerPath software, consisting of a CIM module and a kernel module. If either of these components is found on the host, the test checks to make sure that matching components (CIM, vmkernel module) also exist in the upgrade. If they do not, the test returns a warning that indicates which PowerPath components were expected on the upgrade ISO and which, if any, were found.
PRECHECK_INITIALIZE	This test checks that the precheck script itself can be run.
SANE_ESX_CONF	The file `/etc/vmware/esx.conf` must exist on the host.
SPACE_AVAIL_ISO	vSphere Update Manager only. The host disk must have enough free space to store the contents of the installer CD or DVD.
SPACE_AVAIL_CONFIG	vSphere Update Manager only. The host disk must have enough free space to store the 4.x configuration between reboots.

Table 6-9. Error and Warning Codes That Are Returned by the Installation and Upgrade Precheck Script (Continued)

Error or Warning	Description
SUPPORTED_ESX_VERSION	Upgrading or migration to ESXi 5.x is possible only from version 4.x ESX hosts or version 4.x or 5.x ESXi hosts.
TBOOT_REQUIRED	This message applies only to vSphere Update Manager upgrades. The upgrade fails with this error when the host system is running in Trusted Boot mode (tboot), but the ESXi upgrade ISO does not contain any tboot VIBs. This test prevents an upgrade that can make the host less secure.
UNSUPPORTED_DEVICES	Warning. This test checks for unsupported devices. Some PCI devices are not supported in ESXi 5.x.
UPDATE_PENDING	This test checks the host for VIB installations that require a reboot. This test fails if one or more such VIBs is installed, but the host has not yet been rebooted. In these conditions, the precheck script is unable to reliably determine which packages are currently installed on the host, so it might not be safe to rely on the rest of the precheck tests to determine whether an upgrade is safe. If you encounter this error, restart the host and retry the upgrade.

After You Upgrade or Migrate Hosts

A host upgrade or migration is not complete until you have ensured that the host is reconnected to its managing vCenter Server and reconfigured if necessary, and that the host license is reapplied or upgraded.

After you upgrade or migrate a host, take the following actions:

- View the upgrade logs. You can use the vSphere Client to export the log files.
- If vCenter Server manages the host, you must reconnect the host to vCenter Server by right-clicking the host in the vCenter Server inventory and selecting **Connect**.
- When the upgrade is complete, ESXi is in evaluation mode. The evaluation mode period is 60 days. You must reapply your license or assign an upgraded license to your product within 60 days after the upgrade. Use the License Portal and the vSphere Client to configure licensing. See
- On the VMware Web site, log in to your account page to access the license portal. From the license portal, upgrade your ESXi license. Use the vSphere Client to assign the upgraded license key to the host.
- The host sdX devices might be renumbered after the upgrade. If necessary, update any scripts that reference sdX devices.
- After the upgrade, convert any ESX 3.x-style /adv/Disk/MaskLUNs LUN masks to the claim rule format. Run the `esxcli storage core claimrule convert` command in the vSphere Command-Line Interface (vCLI). This command converts the `/adv/Disk/MaskLUNs` advanced configuration entry in `/etc/vmware/esx.conf` to claim rules with MASK_PATH as the plug-in.

CAUTION This conversion will not work for all input MaskLUNs variations. See the *vSphere Command-Line Interface Reference*.

- Upgrade virtual machines on the host. See Chapter 7, "Upgrading Virtual Machines," on page 187.

About ESXi Evaluation and Licensed Modes

After you purchase vSphere licenses, VMware provides a serial number that you use to license ESXi hosts. You can use evaluation mode to explore the entire set of features that are available for ESXi hosts, including features that are not included in the license that you have.

For example, in evaluation mode, you can use vMotion, HA, DRS, and other features, even if you have not licensed those features.

The installable version of ESXi is always installed in evaluation mode. ESXi Embedded is preinstalled on an internal USB device by your hardware vendor. It might be in evaluation mode or prelicensed.

The evaluation period is 60 days and begins when you turn on the ESXi host, even if you start in licensed mode rather than evaluation mode. Any time during the 60-day evaluation period, you can convert from licensed mode to evaluation mode. To take full advantage of the 60-day evaluation period, you should convert to evaluation mode as soon as possible after you first power on the host.

For information about managing licensing and setting an ESXi host to evaluation mode, see the *vCenter Server and Host Management* documentation.

Reapplying Licenses After Upgrading to ESXi 5.1

After you upgrade to ESXi 5.1, reapply your host license.

If you upgrade from ESX/ESXi 4.x, your ESXi 5.1 software returns to the 60-day evaluation mode period until you reapply your license. See "About ESXi Evaluation and Licensed Modes," on page 186. If you upgrade from ESXi 5.0 x, your existing license applies.

You can apply your license using the vSphere Client or the vSphere Web Client and vCenter Server. See the *vCenter Server and Host Management* documentation. If you use the scripted method to upgrade to ESXi 5.1, you can provide the license key in the kickstart (ks) file.

Upgrading Virtual Machines 7

After you perform an ESX/ESXi upgrade, you have the option of upgrading all the virtual machines that reside on the host to take advantage of new features.

See "Virtual Machine Compatibility," on page 189 to determine whether your virtual machines are compatible with the new version of ESXi. For a list of hardware features available to virtual machines with each ESXi compatibility setting, see the *vSphere Virtual Machine Administration* documentation.

The first step in upgrading virtual machines is to upgrade VMware Tools. If the virtual machines do not have VMware Tools installed, you can use the VMware Tools upgrade procedure to install VMware Tools. After you install or upgrade VMware Tools, upgrade the virtual machine hardware.

NOTE Do not use `vmware-vmupgrade.exe` to upgrade virtual machines.

VMware offers the following tools for upgrading virtual machines:

vSphere Client or vSphere Web Client	Requires you to perform the virtual machine upgrade one step at a time, but does not require vSphere Update Manager.
vSphere Update Manager	Automates the process of upgrading and patching virtual machines, thereby ensuring that the steps occur in the correct order. You can use Update Manager to directly upgrade virtual machine hardware, VMware Tools, and virtual appliances. You can also patch and update third-party software running on the virtual machines and virtual appliances. See "Perform an Orchestrated Upgrade of Virtual Machines with vSphere Update Manager," on page 191 and the *Installing and Administering VMware vSphere Update Manager* documentation.

This chapter includes the following topics:

About VMware Tools

VMware Tools improves the performance and management of the virtual machine.

VMware Tools is a suite of utilities that you install in the operating system of a virtual machine. VMware Tools enhances the performance of a virtual machine and makes possible many of the ease-of-use features in VMware products. For example, the following features are just some of the features that are available only if VMware Tools is installed:

- Significantly faster graphics performance and Windows Aero on operating systems that support Aero
- Copying and pasting text, graphics, and files between the virtual machine and the host or client desktop
- Improved mouse performance
- Synchronization of the clock in the virtual machine with the clock on the host or client desktop
- Scripting that helps automate guest operating system operations

Although the guest operating system can run without VMware Tools, many VMware features are not available until you install VMware Tools. For example, if you do not have VMware Tools installed in your virtual machine, you cannot use the shutdown or restart options from the toolbar. You can use only the power options.

The installers for VMware Tools are ISO image files. An ISO image file looks like a CD-ROM to your guest operating system. There is an ISO image file for each type of guest operating system, including Windows, Linux, Solaris, FreeBSD, and NetWare. When you select the command to install or upgrade VMware Tools, the virtual machine's first virtual CD-ROM disk drive temporarily connects to the VMware Tools ISO file for your guest operating system.

For information about VMware Tools in hosts that are provisioned with vSphere Auto Deploy, see VMware Knowledge Base article http://kb.vmware.com/kb/2004018.

For complete information about VMware Tools, see *Installing and Configuring VMware Tools*.

Upgrading VMware Tools

You can upgrade VMware Tools manually, or you can configure virtual machines to check for and install newer versions of VMware Tools.

The guest operating system checks the version of VMware Tools when you power on a virtual machine. The status bar of the virtual machine displays a message when a new version is available.

In Windows virtual machines, you can set VMware Tools to notify you when an upgrade is available. If this notification option is enabled, the VMware Tools icon in the Windows taskbar includes a yellow caution icon when a VMware Tools upgrade is available.

To install a VMware Tools upgrade, you can use the same procedure that you used for installing VMware Tools the first time. Upgrading VMware Tools means installing a new version.

For Windows and Linux guest operating systems, you can configure the virtual machine to automatically upgrade VMware Tools. Although the version check is performed when you power on the virtual machine, on Windows guest operating systems, the automatic upgrade occurs when you power off or restart the virtual machine. The status bar displays the message `Installing VMware Tools ...` when an upgrade is in progress.

IMPORTANT When you upgrade VMware Tools on Linux guest operating systems, new network modules are available but are not used until you either reboot the guest operating system or stop networking, unload and re-load the VMware networking kernel modules, and then restart networking. This behavior means that even if VMware Tools is set to automatically upgrade, you must reboot or re-load network modules to make new features available.

This strategy avoids network interruptions and allows you to work with VMware Tools over SSH.

You have options for upgrading many virtual machines at the same time.

- Log in to vCenter Server, select a host or cluster, and use the **Virtual Machines** tab to specify the virtual machines on which to perform a VMware Tools upgrade.
- Use Update Manager to perform an orchestrated upgrade of virtual machines at the folder or datacenter level.

Some new features in a particular release of a VMware product might depend on installing or upgrading to the new version of VMware Tools included in that release. Other compatibility options are also available.

Table 7-1. Virtual Machine Compatibility Options

Compatibility	Description
ESXi 5.1 and later	This virtual machine (hardware version 9) is compatible with ESXi 5.1 and later.
ESXi 5.0 and later	This virtual machine (hardware version 8) is compatible with ESXi 5.0 and 5.1.
ESX/ESXi 4.x and later	This virtual machine (hardware version 7) is compatible with ESX/ ESXi 4.x, ESXi 5.0, and ESXi 5.1.
ESX/ESXi 3.5 and later	This virtual machine (hardware version 4) is compatible with ESX/ESX 3.5. ESX/ESX 4.x, and ESXi 5.1. It is also compatible with VMware Server 1.0 and later. You cannot create a virtual machine with ESX/ESXi 3.5 compatibility on ESXi 5.0.
ESX Server 2.x and later	This virtual machine (hardware version 3) is compatible with ESX Server 2.x, ESX/ESXi 3.5, ESX/ESXi 4.x, and ESXi 5.0. You cannot create or edit virtual machines with ESX Server 2.x compatibility. You can only start or upgrade them.

Virtual Machine Compatibility

When you create a virtual machine or upgrade an existing virtual machine, you use the virtual machine compatibility setting to select the ESXi host versions that the virtual machine can run on.

The compatibility setting determines the virtual hardware available to the virtual machine, which corresponds to the physical hardware available on the host. Virtual hardware includes BIOS and EFI, available virtual PCI slots, maximum number of CPUs, maximum memory configuration, and other characteristics. New virtual hardware capabilities are typically released once a year with major or minor releases of vSphere.

Each virtual machine compatibility level supports at least five major or minor vSphere releases. For example, a virtual machine with ESXi 3.5 and later compatibility can run on ESXi 3.5, ESXi 4.0, ESXi 4.1, ESXi 5.0, and ESXi 5.1.

Table 7-2. Virtual Machine Compatibility Options

Compatibility	Description
ESXi 5.1 and later	This virtual machine (hardware version 9) is compatible with ESXi 5.1 and later.
ESXi 5.0 and later	This virtual machine (hardware version 8) is compatible with ESXi 5.0 and 5.1.
ESX/ESXi 4.x and later	This virtual machine (hardware version 7) is compatible with ESX/ ESXi 4.x, ESXi 5.0, and ESXi 5.1.
ESX/ESXi 3.5 and later	This virtual machine (hardware version 4) is compatible with ESX/ESXi 3.5. ESX/ESXi 4.x, and ESXi 5.1. It is also compatible with VMware Server 1.0 and later. ESXi 5.0 does not allow creation of virtual machines with this compatibility, but you can run such virtual machines if they were created on a host with different compatibility.
ESX Server 2.x and later	This virtual machine (hardware version 3) is compatible with ESX Server 2.x, ESX/ESXi 3.5, ESX/ESXi 4.x, and ESXi 5.0. You cannot create or edit virtual machines with ESX Server 2.x compatibility. You can only start or upgrade them.

The compatibility setting that appears in the **Compatible with** drop-down menu is the default for the virtual machine that you are creating. The following factors determine the default virtual machine compatibility:

- The ESXi host version on which the virtual machine is created.
- The inventory object that the default virtual machine compatibility is set on, including a host, cluster, or datacenter.

You can accept the default compatibility or select a different setting. It is not always necessary to select the latest ESXi host version. Selecting an earlier version can provide greater flexibility and is useful in the following situations:

- To standardize testing and deployment in your virtual environment.
- If you do not need the capabilities of the latest host version.
- To maintain compatibility with older hosts.

When you create a virtual machine, consider the environment that the virtual machine will run in and weigh the benefits of different compatibility strategies. Consider your options for these scenarios, which demonstrate the flexibility inherent with each virtual machine compatibility selection.

Objects in Environment	Compatibility	Results
Cluster with ESXi 5.0 and ESXi 4.x hosts	ESX 4.x and later	Preserves the ability of the virtual machine to run on other hosts in the cluster, such as ESXi 5.0. You might not have access to the latest virtual hardware features.
Cluster with ESXi 5.0 and ESXi 4.x hosts	ESXi 5.0 and later	Gives you access to virtual hardware features that are not available with ESXi 4.x. Can also run on ESXi 5.0 and later hosts. ■ You cannot migrate this virtual machine to an ESXi 4.x host. ■ This virtual machine does not have all the capabilities available to virtual machines that run on ESXi 5.1, for example, you cannot use 64 virtual processors.
ESXi 5.1 host	ESXi 5.1 and later	Provides access to the latest virtual features, but cannot share resources with earlier hosts.

If virtual machines do not have to stay compatible with older ESX/ESXi host versions, you can upgrade them.

- To maintain virtual machine compatibility with ESX/ESXi 3.5 hosts, upgrade the virtual machine on an ESX/ESXi 3.5 host, which results in a virtual machine upgrade to version 4.
- To maintain virtual machine compatibility with ESX/ESXi 4.x hosts, upgrade the virtual machine on an ESX/ESXi 4.x host, which results in a virtual machine upgrade to version 7.

For information about managing virtual machine compatibility, see the *vSphere Virtual Machine Administration* documentation.

Perform an Orchestrated Upgrade of Virtual Machines with vSphere Update Manager

An orchestrated upgrade of virtual machines allows you to upgrade VMware Tools and the virtual hardware for the virtual machines in your vSphere inventory at the same time. You can perform an orchestrated upgrade of virtual machines at the folder or datacenter level.

Update Manager makes the process of upgrading the virtual machines convenient by providing baseline groups. When you remediate a virtual machine against a baseline group containing the VMware Tools Upgrade to Match Host baseline and the VM Hardware Upgrade to Match Host baseline, Update Manager sequences the upgrade operations in the correct order. As a result, the guest operating system is in a consistent state at the end of the upgrade.

This workflow describes the overall process to perform an orchestrated upgrade of the virtual machines in your vSphere inventory.

Procedure

1 Create a Virtual Appliance Upgrade Baseline on page 191

You upgrade virtual appliances by using a virtual appliance upgrade baseline. You can either use the predefined virtual appliance upgrade baseline, or create custom virtual appliance upgrade baselines.

2 Create a Virtual Machine and Virtual Appliance Baseline Group on page 192

You can combine upgrade baselines in a virtual machine and virtual appliance baseline group.

3 Attach Baselines and Baseline Groups to Objects on page 193

To view compliance information and remediate objects in the inventory against specific baselines and baseline groups, you must first attach existing baselines and baseline groups to these objects.

4 Manually Initiate a Scan of Virtual Machines and Virtual Appliances on page 194

To scan virtual machines and virtual appliances in the vSphere inventory immediately, you can manually initiate a scan against attached baselines and baseline groups.

5 View Compliance Information for vSphere Objects on page 194

You can review compliance information for the virtual machines, virtual appliances, and hosts against baselines and baseline groups that you attach.

6 Remediate Virtual Machines and Virtual Appliances on page 195

You can manually remediate virtual machines and virtual appliances immediately, or can schedule a remediation at a time that is convenient for you.

Create a Virtual Appliance Upgrade Baseline

You upgrade virtual appliances by using a virtual appliance upgrade baseline. You can either use the predefined virtual appliance upgrade baseline, or create custom virtual appliance upgrade baselines.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered, and on the Home page, click **Update Manager** under Solutions and Applications. If your vCenter Server system is part of a connected group in vCenter Linked Mode, you must specify the Update Manager instance to use, by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **Baselines and Groups** tab, click **Create** above the Baselines pane.

The New Baseline wizard opens.

2 Type a name, and optionally, a description of the baseline.

3 Under Baseline Type, select **VA Upgrade**, and click **Next**.

4 On the Upgrade Options page, select **Vendor** and **Appliance** options from the respective drop-down menus.

The options listed in these menus depend on the virtual appliance upgrades that are downloaded in the Update Manager repository. If no upgrades are downloaded in the repository, the available options are **All Vendors** and **All Products**, respectively.

5 Select an option from the **Upgrade To** drop-down menu.

Option	Description
Latest	Upgrades the virtual appliance to the latest version.
A specific version number	Upgrades the virtual appliance to a specific version. This option is available when you select a specific vendor and appliance name.
Do Not Upgrade	Does not upgrade the virtual appliance.

6 Click **Add Rule**.

7 (Optional) Add multiple rules.

a Click **Add Multiple Rules**.

b Select one or all vendors.

c Select one or all appliances.

d Select one **Upgrade To** option to apply to the selected appliances, and click **OK**.

If you create multiple rules to apply to the same virtual appliance, only the first applicable rule in the list is applied.

8 (Optional) Resolve any conflicts within the rules you apply.

a In the Upgrade Rule Conflict window, select whether to keep the existing rules, to use the newly created rules, or to manually resolve the conflict.

b Click **OK**.

9 Click **Next**.

10 On the Ready to Complete page, click **Finish**.

The new baseline is displayed in the Baselines pane of the **Baselines and Groups** tab.

Create a Virtual Machine and Virtual Appliance Baseline Group

You can combine upgrade baselines in a virtual machine and virtual appliance baseline group.

NOTE You can click **Finish** in the New Baseline Group wizard at any time to save your baseline group, and add baselines to it at a later stage.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered, and on the Home page, click **Update Manager** under Solutions and Applications. If your vCenter Server system is part of a connected group in vCenter Linked Mode, you must specify the Update Manager instance to use, by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **Baselines and Groups** tab, click **Create** above the Baseline Groups pane.

2 In the New Baseline Group wizard, under Baseline Group Type, select **Virtual Machines and Virtual Appliances Baseline Group**.

3 Enter a name for the baseline group and click **Next**.

4 For each type of upgrade (virtual appliance, virtual hardware, and VMware Tools), select one of the available upgrade baselines to include in the baseline group.

NOTE If you decide to remediate only virtual appliances, the upgrades for virtual machines are ignored, and the reverse. If a folder contains both virtual machines and virtual appliances, the appropriate upgrades are applied to each type of object.

5 (Optional) Create a new Virtual Appliance upgrade baseline by clicking **Create a new Virtual Appliance Upgrade Baseline** at the bottom of the Upgrades page, and complete the New Baseline wizard.

After you complete the New Baseline wizard, you return to the New Baseline Group wizard.

6 Click **Next**.

7 On the Ready to Complete page, click **Finish**.

The new baseline group is displayed in the Baseline Groups pane.

Attach Baselines and Baseline Groups to Objects

To view compliance information and remediate objects in the inventory against specific baselines and baseline groups, you must first attach existing baselines and baseline groups to these objects.

You can attach baselines and baseline groups to objects from the Update Manager Client Compliance view.

Although you can attach baselines and baseline groups to individual objects, a more efficient method is to attach them to container objects, such as folders, vApps, clusters, and datacenters. Individual vSphere objects inherit baselines attached to the parent container object. Removing an object from a container removes the inherited baselines from the object.

If your vCenter Server system is part of a connected group in vCenter Linked Mode, you can attach baselines and baseline groups to objects managed by the vCenter Server system with which Update Manager is registered. Baselines and baseline groups you attach are specific for the Update Manager instance that is registered with the vCenter Server system.

Prerequisites

Ensure that you have the **Attach Baseline** privilege.

Procedure

1 Connect the vSphere Client to a vCenter Server system with which Update Manager is registered and select **Home > Inventory** in the navigation bar.

2 Select the type of object that you want to attach the baseline to.

For example, **Hosts and Clusters** or **VMs and Templates**.

3 Select the object in the inventory, and click the **Update Manager** tab.

If your vCenter Server system is part of a connected group in vCenter Linked Mode, the **Update Manager** tab is available only for the vCenter Server system with which an Update Manager instance is registered.

4 Click **Attach** in the upper-right corner.

5 In the Attach Baseline or Group window, select one or more baselines or baseline groups to attach to the object.

   If you select one or more baseline groups, all baselines in the groups are selected. You cannot deselect individual baselines in a group.

6 (Optional) Click the **Create Baseline Group** or **Create Baseline** links to create a baseline group or a baseline and complete the remaining steps in the respective wizard.

7 Click **Attach**.

The baselines and baseline groups that you selected to attach are displayed in the Attached Baseline Groups and Attached Baselines panes of the **Update Manager** tab.

Manually Initiate a Scan of Virtual Machines and Virtual Appliances

To scan virtual machines and virtual appliances in the vSphere inventory immediately, you can manually initiate a scan against attached baselines and baseline groups.

Prerequisites

After you import a VMware Studio created virtual appliance in the vSphere Client, power it on so that it is discovered as a virtual appliance.

Procedure

1 Connect the vSphere Client to a vCenter Server system with which Update Manager is registered and select **Home > Inventory > VMs and Templates** in the navigation bar.

2 Right-click a virtual machine, virtual appliance, a folder of virtual machines and appliances, or a datacenter, and select **Scan for Updates**.

3 Select the types of updates to scan for.

   The options are **Virtual Appliance upgrades**, **VM Hardware upgrades**, and **VMware Tools upgrades**.

4 Click **Scan**.

The virtual machines and appliances that you select are scanned against the attached baselines, depending on the options that you select. All child objects are also scanned. The larger the virtual infrastructure and the higher up in the object hierarchy that you initiate the scan, the longer the scan takes and the more accurate the compliance view is.

View Compliance Information for vSphere Objects

You can review compliance information for the virtual machines, virtual appliances, and hosts against baselines and baseline groups that you attach.

When you select a container object, you view the overall compliance status of the attached baselines, as well as all the individual compliance statuses. If you select an individual baseline attached to the container object, you see the compliance status of the baseline.

If you select an individual virtual machine, appliance, or host, you see the overall compliance status of the selected object against all attached baselines and the number of updates. If you further select an individual baseline attached to this object, you see the number of updates grouped by the compliance status for that baseline.

Procedure

1 Connect the vSphere Client to a vCenter Server system with which Update Manager is registered and select **Home > Inventory** in the navigation bar.

2 Select the type of object for which you want to view compliance information.

For example, **Hosts and Clusters** or **VMs and Templates**.

3 Select an object from the inventory.

4 Click the **Update Manager** tab to view the scan results and compliance states.

Remediate Virtual Machines and Virtual Appliances

You can manually remediate virtual machines and virtual appliances immediately, or can schedule a remediation at a time that is convenient for you.

You can perform an orchestrated upgrade by using a virtual machine baseline group. The VMware Tools upgrade baseline runs first, followed by the virtual machine hardware upgrade baseline.

Prerequisites

Connect the vSphere Client to a vCenter Server system with which Update Manager is registered. If your vCenter Server system is a part of a connected group in vCenter Linked Mode, specify the Update Manager instance by selecting the name of the corresponding vCenter Server system in the navigation bar.

Procedure

1 On the **Home** page of the vSphere Client , select **VMs and Templates** and click the **Update Manager** tab.

2 Right-click a container object from the inventory and select **Remediate**.

All virtual machines and appliances in the container are also remediated.

3 On the Remediation Selection page of the Remediate wizard, select the baseline group and upgrade baselines to apply.

4 Select the virtual machines and appliances that you want to remediate and click **Next**.

5 On the Schedule page, specify a name and an optional description for the task.

6 Select **Immediately** to begin the remediation process immediately after you complete the wizard, or enter specific times for powered on, powered off, or suspended virtual machines.

7 (Optional) Choose whether to upgrade VMware Tools on power cycle.

This option is active only when you perform an upgrade against a single Upgrade VMware Tools to Match Host baseline. You can only enable VMware Tools upgrade on power cycle from the Remediate wizard, but you cannot disable it. You can disable the setting by clicking the **VMware Tools upgrade settings** button in the Update Manager Compliance view and deselecting the check box of a virtual machine in the Edit VMware Tools upgrade settings window.

8 (Optional) Specify the rollback options.

This option is not available if you selected to upgrade VMware Tools on power cycle.

a On the Rollback Options page of the Remediate wizard, select **Take a snapshot of the virtual machines before remediation to enable rollback**.

A snapshot of the virtual machine (or virtual appliance) is taken before remediation. If the virtual machine (or virtual appliance) needs to roll back, you can revert to this snapshot.

Update Manager does not take snapshots of fault tolerant virtual machines.

If you perform a VMware Tools upgrade and select to upgrade VMware Tools on power cycle, Update Manager takes no snapshots of the selected virtual machines before remediation.

b Specify when the snapshot should be deleted or select **Don't delete snapshots**.

c Enter a name and optionally a description for the snapshot.

d (Optional) Select the **Take a snapshot of the memory for the virtual machine** check box.

9 Click **Next**.

10 Review the Ready to Complete page, and click **Finish**.

Planning Downtime for Virtual Machines

Plan downtime for each virtual machine during the upgrade process. Typically, this downtime occurs during the virtual machine upgrade and the VMware Tools upgrade. Depending on your upgrade plan, some virtual machine downtime might be required during the ESX upgrade.

If an ESX/ESXi host is not managed by vCenter Server, you cannot use vMotion to move virtual machines. The virtual machines must have some downtime when the ESX/ESXi host reboots after upgrade.

You might not have to shut down more than a single virtual machine at any given time. You can stagger virtual machine downtimes to accommodate a schedule convenient to you and your customers.

For example:

- If your virtual machine users are located in diverse time zones, you can prepare by migrating virtual machines to specific hosts to serve a given time zone. This way you can arrange host upgrades so that virtual machine downtime occurs transparently outside business hours for that time zone.
- If your virtual machine users operate around the clock, you can delay downtime for their virtual machines to normally scheduled maintenance periods. You do not need to upgrade any stage within a certain time period. You can take as long as needed at any stage.

Downtime for Upgrading Virtual Machines

When you upgrade virtual machines, the required downtime depends on the guest operating system.

When you upgrade VMware Tools, expect the following downtime:

- No downtime is required for vCenter Server.
- No downtime is required for ESXi hosts.
- You must reboot Microsoft Windows virtual machines at the end of the upgrade procedure, or later, for the upgrade take effect.
- On Windows guest operating systems, you must reboot the virtual machine three times when you upgrade VMware Tools and the virtual hardware.
- For Linux, NetWare, and Solaris guest operating systems, no reboot is required at the end of the procedure.

During the virtual hardware upgrade, you must shut down the virtual machine for all guest operating systems.

Table 7-3 summarizes the downtime required by guest operating system and by upgrade operation.

Table 7-3. Virtual Machine Downtime by Guest Operating System

Guest Operating System	Upgrade VMware Tools	Upgrade Virtual Hardware
Linux	No downtime.	Downtime for shut down and power on of virtual machine.
NetWare	No downtime.	Downtime for shut down and power on of virtual machine.
Solaris	No downtime.	Downtime for shut down and power on of virtual machine.
Microsoft Windows	Downtime for reboot of guest operating system.	Downtime for shut down and power on of virtual machine.

Manually Install or Upgrade VMware Tools in a Windows Virtual Machine

All supported Windows guest operating systems support VMware Tools.

Install the latest version of VMware Tools to enhance the performance of the virtual machine's guest operating system and improve virtual machine management. When you power on a virtual machine, if a new version of VMware Tools is available, you see a notification in the status bar of the guest operating system.

For Windows 2000 and later, VMware Tools installs a virtual machine upgrade helper tool. This tool restores the network configuration if you upgrade from virtual hardware version 4 to version 7 or higher. In vSphere, virtual hardware version 4 corresponds to ESX/ESXi 3.5 compatibility. Virtual hardware version 7 corresponds to ESX/ESXi 4.x compatibility.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- To determine whether you have the latest version of VMware Tools, look on the **Summary** tab for the virtual machine.
- Log in as an administrator unless you are using an older Windows operating system. Any user can install VMware Tools in a Windows 95, Windows 98, or Windows Me guest operating system. For operating systems newer than these, you must log in as an administrator.
- If you plan to install the vShield Endpoint Thin Agent driver, see the system requirements listed in the *vShield Quick Start Guide*. The vShield component is not installed by default. You must perform a custom installation and include that component.

Procedure

1 Select the menu command to mount the VMware Tools virtual disc on the guest operating system.

VMware Product	Menu Command
vSphere Client	**Inventory > Virtual Machine > Guest > Install/Upgrade VMware Tools**
vSphere Web Client	Right-click the virtual machine and select **All vCenter Actions > Guest OS > Install/Upgrade VMware Tools**. a To locate a virtual machine, select a datacenter, folder, cluster, resource pool, host, or vApp. b Click the **Related Objects** tab and click **Virtual Machines**.

2 If you are performing an upgrade or reinstallation, in the Install/Upgrade VMware Tools dialog box, select **Interactive Tools Installation** or **Interactive Tools Upgrade** and click **OK**.

The process starts by mounting the VMware Tools virtual disc on the guest operating system.

3 If you are installing VMware Tools for the first time, click **OK** in the Install VMware Tools information screen.

If autorun is enabled for the CD-ROM drive in the guest operating system, the VMware Tools installation wizard appears.

4 If autorun is not enabled, to manually launch the wizard, click **Start > Run** and enter `D:\setup.exe`, where `D:` is your first virtual CD-ROM drive.

5 Follow the on-screen instructions.

To install nondefault components, such as the vShield Endpoint Thin Agent driver, select the **Custom** setup.

6 If the New Hardware wizard appears, go through the wizard and accept the defaults.

7 If you are installing a beta or RC version of VMware Tools and you see a warning that a package or driver is not signed, click **Install Anyway** to complete the installation.

8 When prompted, reboot the virtual machine.

The **VMware Tools** label on the **Summary** tab changes to **OK**.

What to do next

(Recommended) If you upgraded VMware Tools as part of a larger, system-wide upgrade, next determine whether to upgrade the virtual machines in your environment. To review and compare the hardware available for different compatibility levels, see the *vSphere Virtual Machine Administration* documentation.

Manually Install or Upgrade VMware Tools in a Linux Virtual Machine

For Linux virtual machines, you manually install or upgrade VMware Tools by using the command line.

Install the latest version of VMware Tools to enhance the performance of the virtual machine's guest operating system and improve virtual machine management. When you power on a virtual machine, if a new version of VMware Tools is available, you see a notification in the status bar of the guest operating system.

NOTE This procedure describes how to use the VMware Tools tar installer to install or upgrade VMware Tools. For virtual machines in a vSphere environment, you can alternatively use VMware Tools operating system specific packages (OSPs) to install and upgrade VMware Tools. With OSPs you can use the native update mechanisms of your operating system to download, install, and manage VMware Tools. For more information, see "Operating System Specific Packages for Linux Guest Operating Systems," on page 202.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- Because the VMware Tools installer is written in Perl, verify that Perl is installed in the guest operating system.
- To determine whether you have the latest version of VMware Tools, look on the **Summary** tab for the virtual machine.

Procedure

1 Select the menu command to mount the VMware Tools virtual disc on the guest operating system.

VMware Product	Menu Command
vSphere Client	**Inventory > Virtual Machine > Guest > Install/Upgrade VMware Tools**
vSphere Web Client	Right-click the virtual machine and select **All vCenter Actions > Guest OS > Install/Upgrade VMware Tools**. a To locate a virtual machine, select a datacenter, folder, cluster, resource pool, host, or vApp. b Click the **Related Objects** tab and click **Virtual Machines**.

2 If you are performing an upgrade or reinstallation, in the Install/Upgrade VMware Tools dialog box, select **Interactive Tools Installation** or **Interactive Tools Upgrade** and click **OK**.

The process starts by mounting the VMware Tools virtual disc on the guest operating system.

3 In the virtual machine, log in to the guest operating system as root and open a terminal window.

4 Run the `mount` command with no arguments to determine whether your Linux distribution automatically mounted the VMware Tools virtual CD-ROM image.

   If the CD-ROM device is mounted, the CD-ROM device and its mount point are listed as something like this:

   ```
   /dev/cdrom on /mnt/cdrom type iso9660 (ro,nosuid,nodev)
   ```

5 If the VMware Tools virtual CD-ROM image is not mounted, mount the CD-ROM drive.

   a If a mount point directory does not already exist, create it.

      ```
      mkdir /mnt/cdrom
      ```

      Some Linux distributions use different mount point names. For example, on some distributions the mount point is `/media/VMware Tools` rather than `/mnt/cdrom`. Modify the command to reflect the conventions that your distribution uses.

   b Mount the CD-ROM drive.

      ```
      mount /dev/cdrom /mnt/cdrom
      ```

      Some Linux distributions use different device names or organize the `/dev` directory differently. If your CD-ROM drive is not `/dev/cdrom` or if the mount point for a CD-ROM is not `/mnt/cdrom`, modify the command to reflect the conventions that your distribution uses.

6 Change to a working directory (for example, `/tmp`).

   ```
   cd /tmp
   ```

7 Delete any previous `vmware-tools-distrib` directory before you install VMware Tools.

   The location of this directory depends on where you placed it during the previous installation. Often this directory is placed in `/tmp/vmware-tools-distrib`.

8 List the contents of the mount point directory and note the filename of the VMware Tools tar installer.

   ```
   ls mount-point
   ```

9 Uncompress the installer.

   ```
   tar zxpf /mnt/cdrom/VMwareTools-x.x.x-yyyy.tar.gz
   ```

   The value *x.x.x* is the product version number, and *yyyy* is the build number of the product release.

   If you attempt to install a tar installation over an RPM installation, or the reverse, the installer detects the previous installation and must convert the installer database format before continuing.

10 If necessary, unmount the CD-ROM image.

   ```
   umount /dev/cdrom
   ```

   If your Linux distribution automatically mounted the CD-ROM, you do not need to unmount the image.

11 Run the installer and configure VMware Tools.

   ```
   cd vmware-tools-distrib
   ./vmware-install.pl
   ```

   Usually, the `vmware-config-tools.pl` configuration file runs after the installer file finishes running.

12 Respond to the prompts by pressing Enter to accept the default values, if appropriate for your configuration.

13 Follow the instructions at the end of the script.

   Depending on the features you use, these instructions can include restarting the X session, restarting networking, logging in again, and starting the VMware User process. You can alternatively reboot the guest operating system to accomplish all these tasks.

The **VMware Tools** label on the **Summary** tab changes to **OK**.

What to do next

(Recommended) If you upgraded VMware Tools as part of a larger, system-wide upgrade, next determine whether to upgrade the virtual machines in your environment. To review and compare the hardware available for different compatibility levels, see the *vSphere Virtual Machine Administration* documentation.

Manually Install or Upgrade VMware Tools in a Solaris Virtual Machine

For Solaris virtual machines, you manually install or upgrade VMware Tools by using the command line.

Install the latest version of VMware Tools to enhance the performance of the virtual machine's guest operating system and improve virtual machine management. When you power on a virtual machine, if a new version of VMware Tools is available, you see a notification in the status bar of the guest operating system.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- Because the VMware Tools installer is written in Perl, verify that Perl is installed in the guest operating system.
- To determine whether you have the latest version of VMware Tools, look on the **Summary** tab for the virtual machine.

Procedure

1 Select the menu command to mount the VMware Tools virtual disc on the guest operating system.

VMware Product	Menu Command
vSphere Client	**Inventory > Virtual Machine > Guest > Install/Upgrade VMware Tools**
vSphere Web Client	Right-click the virtual machine and select **All vCenter Actions > Guest OS > Install/Upgrade VMware Tools**. a To locate a virtual machine, select a datacenter, folder, cluster, resource pool, host, or vApp. b Click the **Related Objects** tab and click **Virtual Machines**.

2 If you are performing an upgrade or reinstallation, in the Install/Upgrade VMware Tools dialog box, select **Interactive Tools Installation** or **Interactive Tools Upgrade** and click **OK**.

The process starts by mounting the VMware Tools virtual disc on the guest operating system.

3 In the virtual machine, log in to the guest operating system as root and open a terminal window.

4 If the Solaris volume manager does not mount the CD-ROM under `/cdrom/vmwaretools`, restart the volume manager.

```
/etc/init.d/volmgt stop
/etc/init.d/volmgt start
```

5 Change to a working directory (for example, `/tmp`).

```
cd /tmp
```

6 Extract VMware Tools.

```
gunzip –c /cdrom/vmwaretools/vmware–solaris–tools.tar.gz | tar xf –
```

7 Run the installer and configure VMware Tools.

```
cd vmware-tools-distrib
./vmware-install.pl
```

Usually, the `vmware-config-tools.pl` configuration file runs after the installer file finishes running.

8 Respond to the prompts by pressing Enter to accept the default values, if appropriate for your configuration.

9 Follow the instructions at the end of the script.

Depending on the features you use, these instructions can include restarting the X session, restarting networking, logging in again, and starting the VMware User process. You can alternatively reboot the guest operating system to accomplish all these tasks.

The **VMware Tools** label on the **Summary** tab changes to **OK**.

What to do next

(Recommended) If you upgraded VMware Tools as part of a larger, system-wide upgrade, next determine whether to upgrade the virtual machines in your environment. To review and compare the hardware available for different compatibility levels, see the *vSphere Virtual Machine Administration* documentation.

Manually Install or Upgrade VMware Tools in a NetWare Virtual Machine

For NetWare virtual machines, you manually install or upgrade VMware Tools by using the command line.

Install the latest version of VMware Tools to enhance the performance of the virtual machine's guest operating system and improve virtual machine management. When you power on a virtual machine, if a new version of VMware Tools is available, you see a notification in the status bar of the guest operating system.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- Because the VMware Tools installer is written in Perl, verify that Perl is installed in the guest operating system.
- To determine whether you have the latest version of VMware Tools, look on the **Summary** tab for the virtual machine.

Procedure

1 Select the menu command to mount the VMware Tools virtual disc on the guest operating system.

VMware Product	Menu Command
vSphere Client	**Inventory > Virtual Machine > Guest > Install/Upgrade VMware Tools**
vSphere Web Client	Right-click the virtual machine and select **All vCenter Actions > Guest OS > Install/Upgrade VMware Tools**. a To locate a virtual machine, select a datacenter, folder, cluster, resource pool, host, or vApp. b Click the **Related Objects** tab and click **Virtual Machines**.

2 If you are performing an upgrade or reinstallation, in the Install/Upgrade VMware Tools dialog box, select **Interactive Tools Installation** or **Interactive Tools Upgrade** and click **OK**.

The process starts by mounting the VMware Tools virtual disc on the guest operating system.

3 Load the CD-ROM driver so that the virtual CD-ROM device mounts the ISO image as a volume.

Operating System	Command
NetWare 6.5	`LOAD CDDVD`
NetWare 6.0 or NetWare 5.1	`LOAD CD9660.NSS`
NetWare 4.2 (not available in vSphere)	`load cdrom`

When the installation finishes, the message `VMware Tools for NetWare are now running` appears in the Logger Screen for NetWare 6.5 and NetWare 6.0 guest operating systems and in the Console Screen for NetWare 4.2 and 5.1 operating systems.

4 If the VMware Tools virtual disc (`netware.iso`) is attached to the virtual machine, right-click the CD-ROM icon in the status bar of the console window and select **Disconnect** to disconnect it.

What to do next

(Recommended) If you upgraded VMware Tools as part of a larger, system-wide upgrade, next determine whether to upgrade the virtual machines in your environment. To review and compare the hardware available for different compatibility levels, see the *vSphere Virtual Machine Administration* documentation.

Operating System Specific Packages for Linux Guest Operating Systems

For vSphere deployments, VMware provides operating system specific packages (OSPs) as a packaging and distribution mechanism for VMware Tools. These VMware Tools OSPs are packaged using native package formats and standards such as `rpm` and `deb`.

Using OSPs provides the following benefits:

- You can use the native update mechanisms of the guest operating system to download, install, and manage VMware Tools.
- You can upgrade to the latest version of VMware Tools without having to upgrade to the latest version of vSphere.
- Because VMware Tools OSPs follow the best practices and standards of the specific Linux operating system, OSPs use standard mechanisms for determining dependencies among packages. These mechanisms allow you to audit the packages on virtual machines with or without graphics components.
- You can use standard operating system tools to examine OSPs during VMware Tools installation. This process allows you to easily determine which components to install and to verify the validity of the packaging.

IMPORTANT Use OSPs if you want to use native update mechanisms, rather than vCenter Server, to manage updates for VMware Tools. If you use an OSP, the VMware Tools status is **unmanaged** on the virtual machine **Summary** tab. The status **unmanaged** means that you cannot use vCenter Server to manage VMware Tools and you cannot use vSphere Update Manager to upgrade VMware Tools.

For more information, go to the VMware Operating System Specific Packages Web site, at http://www.vmware.com/download/packages.html.

Perform an Automatic Upgrade of VMware Tools

When you start an automatic upgrade of VMware Tools, you do not need to perform any operations in the guest operating system that is running on the virtual machine. The automatic upgrade uninstalls the previous version of VMware Tools, installs the latest version that is available for your ESXi host, and if necessary, reboots the virtual machine.

Automatic VMware Tools upgrade is not supported for virtual machines with Solaris or NetWare guest operating systems.

Prerequisites

The following requirements are for each virtual machine in the upgrade:

- Power on the virtual machine.
- Verify that the guest operating system is running.
- To determine whether you have the latest version of VMware Tools, look on the **Summary** tab for the virtual machine.

Procedure

1 Select **Automatic Tools Upgrade**.

2 (Optional) In the **Advanced Options** field, enter advanced options for the guest operating system.

Option	Description
Microsoft Windows Guest Operating Systems	Enter `/s /v "/qn" /l "`*`Microsoft_Windows_location`*`\`*`filename`*`.log"` to perform a silent upgrade of VMware Tools and create a log file in the specified location on the guest operating system.
Linux Guest Operating Systems	■ Enter `--default` to perform the default behavior. Perform a silent upgrade of VMware Tools. Install tools `bin`, `lib` and `doc` files in the default `/usr` directory. ■ Enter `--prefix=`*`binary_location`*`,`*`lib_location`*`,`*`doc_location`* to perform a silent upgrade of VMware Tools and install the binary, library, and document files in the specified locations.

3 Click **OK.**

The **VMware Tools** label on the **Summary** tab changes to **OK**.

IMPORTANT When you upgrade VMware Tools on Linux guest operating systems, new network modules are available but are not used until you either reboot the guest operating system or stop networking, unload and re-load the VMware networking kernel modules, and then restart networking. This behavior means that even if VMware Tools is set to automatically upgrade, you must reboot or re-load network modules to make new features available.

This strategy avoids network interruptions and allows you to work with VMware Tools over SSH.

What to do next

Upgrade the virtual machine hardware to version 8.

Upgrade VMware Tools on Multiple Virtual Machines

You can upgrade VMware Tools on multiple virtual machines by using the **Virtual Machines** tab.

Procedure

1 Start the vSphere Client and log in to the vCenter Server.

2 Select **Inventory > Hosts and Clusters**.

3 Select the host or cluster that contains the virtual machines to upgrade.

4 Click the **Virtual Machines** tab.

5 Select and power on the virtual machines to upgrade.

6 Right-click your selections, select **Guest > Install/Upgrade VMware Tools** and click **OK**.

7 For Linux guest operating systems, reboot the operating system by running the `reboot` command from a command-line prompt so that you can use the new network modules.

The **VMware Tools** label on the **Summary** tab changes to **OK**.

Upgrade VMware Tools by Using the vSphere Web Client

You can upgrade VMware Tools in one or more virtual machines by using the vSphere Web Client.

Procedure

1 Start the vSphere Web Client and log in to the vCenter Server.

2 Select the virtual machines.

   a Select a datacenter, folder, cluster, resource pool, or host.

   b Click the **Related Objects** tab, and click **Virtual Machines**.

3 Power on the virtual machines to upgrade.

4 Right-click your selections.

5 Select **All vCenter Actions > Guest OS > Install/Upgrade VMware Tools** and click **OK**.

6 Select **Interactive Upgrade** or **Automatic Upgrade** and click **Upgrade**.

7 If you chose the interactive upgrade for a virtual machine with a Linux guest operating system, reboot the operating system by running the `reboot` command from a command-line prompt so that you can use the new network modules.

VMware Tools are upgraded.

Configure a Virtual Machine to Upgrade VMware Tools Automatically

You can configure a virtual machine to check for and apply VMware Tools upgrades each time you power on the virtual machine.

Automatic VMware Tools upgrade is not supported for virtual machines with Solaris or NetWare guest operating systems.

Prerequisites

- Virtual machines must have a version of VMware Tools shipped with ESX 3.0.1 or later installed.

- Virtual machines must be hosted on an ESX 3.0.1 or later, and VirtualCenter must be version 2.0.1 or later.
- Virtual machines must be running a Linux or Microsoft Windows guest operating system that is supported by ESX 3.0.1 or later and VirtualCenter 2.0.1 or later.

Procedure

1 Start the vSphere Client or vSphere Web Client and log in to the vCenter Server.

2 Power off the virtual machine.

3 Right-click the virtual machine and select the menu command to edit the virtual machine settings.

VMware Product	Menu Command
vSphere Client	Edit Settings
vSphere Web Client	Configuration > Edit Settings

4 On the **Options** tab (vSphere Client) or the **VM Options** tab (vSphere Web Client), select **VMware Tools**.

5 In the **Advanced** pane, select the menu command to upgrade VMware Tools automatially.

VMware Product	Menu Command
vSphere Client	Check and upgrade Tools during power cycling
vSphere Web Client	Check and upgrade VMware Tools before each power on

6 Click **OK**.

The next time you power on the virtual machine, it checks the ESXi host for a newer version of VMware Tools. On Linux guests, if a newer version is available, it is installed and the guest operating system is restarted (if required). On Windows guests, if a newer version is available, it is installed the next time you shut down or restart the virtual machine.

The **VMware Tools** label on the **Summary** tab changes to **OK**.

What to do next

Upgrade the virtual machine hardware to version 8.

Uninstall VMware Tools

Occasionally, an upgrade of VMware Tools is incomplete. You can usually solve the problem by uninstalling VMware Tools and then reinstalling.

In a vSphere deployment, if you decide to use Linux operating system specific packages to manage VMware Tools, and if you already used vSphere to install VMware Tools, you must uninstall the existing VMware Tools. For more information about Linux OSPs for VMware Tools, see "Operating System Specific Packages for Linux Guest Operating Systems," on page 202.

Prerequisites

- Power on the virtual machine.
- Log in to the guest operating system.

Procedure

- Use the appropriate operating-system-specific procedure to uninstall VMware Tools.

Operating System	Action
Windows 7	Use the guest operating system's **Programs > Uninstall a program** item.
Windows Vista and Windows Server 2008	Use the guest operating system's **Programs and Features > Uninstall a program** item.
Windows XP and earlier	Use the guest operating system's **Add/Remove Programs** item.
Linux	On a Linux guest operating system that has VMware Tools installed by using an RPM installer, enter the following command in a terminal window: `rpm –e VMwareTools`
Linux, Solaris, FreeBSD, NetWare	Log in as root and enter the following command in a terminal window: `vmware-uninstall-tools.pl`
Mac OS X Server	Use the **Uninstall VMware Tools** application, found in `/Library/Application Support/VMware Tools`.

What to do next

Reinstall VMware Tools.

Upgrade the Virtual Hardware for Virtual Machines by Using the vSphere Client

The virtual hardware version determines the virtual hardware that is available to the virtual machine, which corresponds to the physical hardware available on the host machine. You can upgrade the virtual hardware to make a virtual machine compatible with a newer version of ESXi running on the host.

For information about virtual machine hardware versions and compatibility, see "Virtual Machine Compatibility," on page 189 and the information about virtual machine compatibility in the *vSphere Virtual Machine Administration* documentation.

Prerequisites

- Create a backup or snapshot of the virtual machines. See the *vSphere Virtual Machine Administration* documentation.
- Upgrade VMware Tools. On Microsoft Windows virtual machines, if you upgrade the virtual hardware before you upgrade VMware Tools, the virtual machine might lose its network settings.
- Verify that all `.vmdk` files are available to the ESX/ESXi host on a VMFS3, VMFS5, or NFS datastore.
- Verify that the virtual machines are stored on VMFS3, VMFS5, or NFS datastores.
- Verify that the virtual hardware on the virtual machines is not the latest supported version.

NOTE The menu option to upgrade the virtual hardware does not appear if the virtual machine is powered on or already has the latest supported virtual hardware version.

Procedure

1. Log in to the vCenter Server from the vSphere Client.
2. In the inventory, select the host or cluster containing the virtual machines.
3. On the **Virtual Machines** tab, select the virtual machines to upgrade.
4. Power off the selected virtual machines.
5. Right-click your selections, and select **Upgrade Virtual Hardware**.

6 Click **Yes** to confirm the upgrade.

The selected virtual machines are upgraded to the latest supported version, which appears as the VM Version in the **Summary** tab of the virtual machine.

What to do next

Power on the virtual machines.

Upgrade the Compatibility Level for Virtual Machines by Using the vSphere Web Client

The compatibility level determines the virtual hardware available to the virtual machine, which corresponds to the physical hardware available on the host machine. You can upgrade the compatibility level to make a virtual machine compatible with the latest version of ESXi running on the host.

This procedure upgrades one or more virtual machines to the latest supported virtual hardware version immediately. To schedule an upgrade for the next virtual machine reboot, and choose from all supported virtual hardware upgrade versions, see "Schedule an Upgrade of the Compatibility Level for Virtual Machines," on page 208.

For information about virtual machine hardware versions and compatibility, see "Virtual Machine Compatibility," on page 189 and the information about virtual machine compatibility in the *vSphere Virtual Machine Administration* documentation.

Prerequisites

- Create a backup or snapshot of the virtual machines. See the *vSphere Virtual Machine Administration* documentation.
- Upgrade VMware Tools. On Microsoft Windows virtual machines, if you upgrade the compatibility level before you upgrade VMware Tools, the virtual machine might lose its network settings.
- Verify that all `.vmdk` files are available to the ESX/ESXi host on a VMFS3, VMFS5, or NFS datastore.
- Verify that the virtual machines are stored on VMFS3, VMFS5 or NFS datastores.
- Verify that the virtual hardware on the virtual machines is not the latest supported version.
- Determine the ESXi versions that you want the virtual machines to be compatible with. See "Virtual Machine Compatibility," on page 189.

Procedure

1 Log in to the vCenter Server from the vSphere Web Client.

2 Select the virtual machines.

   a Select a datacenter, folder, cluster, resource pool, or host.

   b Click the **Related Objects** tab, and click **Virtual Machines**.

3 Power off the selected virtual machines.

4 Select **Actions > All vCenter Actions > Compatibility > Upgrade VM Compatibility**.

5 Click **Yes** to confirm the upgrade.

6 Select the ESXi versions for the virtual machines to be compatible with.

7 Click **OK**.

The selected virtual machines are upgraded to the corresponding hardware version for the Compatibility setting that you chose, and the new hardware version is updated in the Summary tab of the virtual machine.

What to do next

Power on the virtual machines.

Schedule an Upgrade of the Compatibility Level for Virtual Machines

The compatibility level determines the virtual hardware available to the virtual machine, which corresponds to the physical hardware available on the host machine. You can schedule an upgrade of the compatibility level to make a virtual machine compatible with newer versions of ESXi running on the host.

Use this procedure to schedule an upgrade of one or more virtual machines at the next reboot of the virtual machine, and choose from all supported compatibility level upgrades. To upgrade virtual machines immediately to the latest supported virtual compatibility level, see "Upgrade the Compatibility Level for Virtual Machines by Using the vSphere Web Client," on page 207.

For information about virtual machine hardware versions and compatibility, see "Virtual Machine Compatibility," on page 189. Also see the information about virtual machine compatibility in the *vSphere Virtual Machine Administration* documentation.

Prerequisites

- Create a backup or snapshot of the virtual machines. See the *vSphere Virtual Machine Administration* documentation.
- Upgrade VMware Tools. On Microsoft Windows virtual machines, if you upgrade the compatibility level before you upgrade VMware Tools, the virtual machine might lose its network settings.
- Verify that all `.vmdk` files are available to the ESX/ESXi host on a VMFS3, VMFS5, or NFS datastore.
- Verify that the virtual machines are stored on VMFS3, VMFS5 or NFS datastores.
- Verify that the virtual hardware on the virtual machines is not the latest supported version.
- Determine the ESXi versions that you want the virtual machines to be compatible with. See "Virtual Machine Compatibility," on page 189.

Procedure

1. Log in to the vCenter Server from the vSphere Web Client.
2. Select the virtual machines.
   a. Select a datacenter, folder, cluster, resource pool, or host.
   b. Click the **Related Objects** tab and click **Virtual Machines**.
3. Power off the selected virtual machines.
4. Select **Actions > All vCenter Actions > Compatibility > Schedule VM Compatibility Upgrade**.
5. Click **Yes** to confirm the upgrade.
6. Select the ESXi versions for the virtual machines to be compatible with.
7. (Optional) Select **Only upgrade after normal guest OS shutdown**.

   This prevents the scheduled upgrade from occurring unless the guest operating system of the virtual machine is shut down or rebooted normally.

Each of the selected virtual machines is upgraded to the hardware version that you chose at the next reboot of the virtual machine, and the Compatibility setting is updated in the Summary tab of the virtual machine.

8 Example Upgrade Scenarios

Upgrade scenarios for vSphere 4.1 include cases with and without clustered hosts, hosts that you upgrade on the same machine on which they are currently running (in-place upgrades), and hosts that you upgrade using different machines (migration upgrades).

This chapter includes the following topics:

Upgrading Environments with Host Clusters

This example scenario shows how you can use vSphere Update Manager to simplify the host and virtual machine upgrade process and minimize downtime in environments that include host clusters.

For this scenario, verify the following details about your vSphere environment.

- You must have vCenter Server 4.x or vCenter 5.0.x.
- You must have vSphere Update Manager.
- All your hosts must be ESX 4.x/ESXi 4.x or later.
- If your environment has vCenter Guided Consolidation, uninstall it before upgrading.

The following list of tasks provides a high-level overview of the upgrade process.

1 Run the vCenter Host Agent Pre-Upgrade Checker.

2 Upgrade vCenter Server 2.5 Update 6 or higher, vCenter Server 4.x, or vCenter 5.0 to vCenter Server 5.1.

   a Make sure your database is compatible with vCenter Server 5.1. See the VMware Product Interoperability Matrix at http://www.vmware.com/resources/compatibility/sim/interop_matrix.php.

   b Make sure that you have the required permissions to perform this procedure. See "Prerequisites for the vCenter Server Upgrade," on page 46.

   c Take a full backup of the vCenter Server database. See your database documentation.

d Back up the vCenter Server SSL certificates.

The downtime required for this upgrade is based on the amount of data in the database. During this time, you cannot perform provisioning operations, such as cloning or creating virtual machines.

After the upgrade, the hosts are automatically connected to vCenter Server 5.1 if you select that option during the upgrade process. vSphere High Availability (HA) and vSphere Distributed Resource Scheduler (DRS) clusters are automatically reconfigured. (Check to ensure that the automatic reconfiguration is successful. In some cases, you might need to reconfigure the clusters manually.)

vCenter Server 5.x is supported only on 64-bit systems. The upgrade method you use depends on what version of vCenter Server you are upgrading and on what system it is currently installed. For a detailed description of the upgrade procedure, see "Preparing for the Upgrade to vCenter Server," on page 29 and Chapter 4, "Upgrading to vCenter Server 5.1," on page 29.

3 Install the vSphere Client.

You can install the vSphere Client on the same machine with your previous version of the vSphere Client. You must have the previous version of the vSphere Client to connect to previous versions of vCenter Server and ESX/ESXi.

For a detailed description of the procedure, see "Upgrade the vSphere Client," on page 90.

4 Upgrade vSphere Update Manager to vSphere Update Manager 5.1.

5 Use Update Manager to upgrade ESX 4.x/ESXi 4.x or higher hosts to ESXi 5.1.

Update Manager puts the host into maintenance mode before upgrading the host. The downtime for the procedure depends on the network speed and the server boot time.

For a detailed description of the procedure, see the *Installing and Administering VMware vSphere Update Manager* documentation.

6 Use Update Manager to upgrade your virtual machines. Update Manager ensures that the VMware Tools upgrade and the virtual hardware upgrade happen in the correct order to prevent loss of your network connectivity. Update Manager also performs automatic backups of your virtual machines in case you need to roll back after the upgrade. You can upgrade hosts in clusters without powering off the virtual machines if Distributed Resource Scheduler is available for the cluster.

7 Upgrade your product licenses:

a Either your new license keys are sent to you in email, or you get them using the license portal.

b Apply the new license keys to your assets using vCenter Server.

8 Use the vSphere Client to upgrade to VMFS5.

See the information on upgrading datastores to VMFS5 in the *vSphere Storage* documentation.

Upgrading Environments Without Host Clusters

If you have standalone ESX 4.x/ESXi 4.x hosts, you can upgrade your hosts and the vSphere Client to upgrade your virtual machines. This scenario provides a high-level overview of the upgrade process when you do not have host clusters and you do not have vSphere Update Manager.

This scenario applies to your environment whether or not you have vCenter Server.

Verify the following details about your vSphere environment.

- All your hosts must be ESX 4.x/ESXi 4.x or higher.
- If your environment has vCenter Guided Consolidation, uninstall it before upgrading.

1 Run the vCenter Host Agent Pre-Upgrade Checker.

See "Run the vCenter Host Agent Pre-Upgrade Checker," on page 57.

2 If you have vCenter Server, upgrade to vCenter Server 5.1.

See Chapter 4, "Upgrading to vCenter Server 5.1," on page 29.

The downtime required for this upgrade is based on the amount of data in the database. During this time, you cannot perform provisioning operations, such as cloning or creating virtual machines.

After the upgrade, the hosts are automatically connected to vCenter Server 5.1 if you select that option during the upgrade process.

3 Install or upgrade the vSphere Client to version 5.1. See "Upgrade the vSphere Client," on page 90

You can install the vSphere Client on the same machine with your previous versions of the vSphere Client. You must have the previous versions of the vSphere Client to connect to previous versions of vCenter Server and ESX/ESXi.

4 For all hosts, perform an interactive upgrade using an ESXi ISO installer image stored on a CD, DVD, or USB flash drive to upgrade ESX 4.x/ESXi 4.x. See Chapter 6, "Upgrading and Migrating Your Hosts," on page 117 and "Upgrade or Migrate Hosts Interactively," on page 153.

This procedure involves putting the host into maintenance mode before you upgrade the host. The downtime for the procedure depends on the network speed and the server boot time.

In case of upgrade failure, the process does not support rollback to the previous release.

5 Upgrade your virtual machines. See Chapter 7, "Upgrading Virtual Machines," on page 187.

6 Get your license key either in email or by using the license portal.

7 Apply the new license keys to your assets using the vSphere Client.

8 Use the vSphere Client to upgrade your datastore to VMFS5.

See information about upgrading datastores to VMFS5 in the *vSphere Storage* documentation.

Moving Virtual Machines Using vMotion During an Upgrade

This scenario is a migration upgrade. The migration upgrade is a managed transition rather than a strict upgrade. By using vMotion to move virtual machines directly from one production host to another production host, you minimize downtime of the virtual machines.

The following example provides a high-level overview of the upgrade process in an environment with ESX 4.0/ESXi 4.0 or higher and vCenter Server 5.1, using vMotion to migrate your running virtual machines to ESXi 5.1. The hosts in your environment must be licensed for and able to use vMotion.

You can perform a migration upgrade without vMotion. The only difference is the amount of downtime for the virtual machines.

A migration upgrade calls for sufficient resources to run the production environment partly on older hosts and partly on upgraded hosts. Any required redundancies and safeguards must be available on both upgraded and non-upgraded infrastructure during the transition.

Prerequisites

- Verify that one or more machines meets ESXi 5.1 requirements.
- Verify that empty host storage is sufficient to hold a portion of your production virtual machines. Ideally, the storage is large enough to hold all of the migrated virtual machines. A larger capacity for virtual machines on this extra storage means fewer operations are required before all your virtual machines are migrated.
- If your environment has vCenter Guided Consolidation, uninstall it.
- Run the vCenter Host Agent Pre-Upgrade Checker. See "Run the vCenter Host Agent Pre-Upgrade Checker," on page 57.

- Upgrade vCenter Server 4.0 to vCenter Server 5.1. See Chapter 4, "Upgrading to vCenter Server 5.1," on page 29.

  The downtime required for this upgrade is based on the amount of data in the database. During this time, you cannot perform provisioning operations, such as cloning or creating virtual machines.

- Install the version 5.1 vSphere Client or vSphere Web Client. See "Upgrade the vSphere Client," on page 90.

- If your environment has vSphere Update Manager, upgrade it to the latest version. See Chapter 5, "Upgrading Update Manager," on page 113.

Procedure

1 Use vMotion to move the virtual machines from the ESX 4.0/ESXi 4.0 or higher host.

2 Upgrade the host to ESXi 5.1, or perform a fresh installation of ESXi 5.1.

3 Add the ESXi 5.1 host to vCenter Server.

4 Use vMotion to move the virtual machines that you removed from the ESX 4.0/ESXi 4.0 or higher host before the upgrade.

  For vMotion to work, the hosts must be managed by the same vCenter Server instance.

What to do next

For all hosts and virtual machines in the migration upgrade, take the following actions.

- Upgrade your virtual machines. See Chapter 7, "Upgrading Virtual Machines," on page 187.

- Upgrade your product licenses:

  a Get your new license keys by email, or by using the license portal.

  b Apply the new license keys to your assets using the vSphere Client (or vCenter Server if you have it).

- Use the vSphere Client to upgrade the host datastore to VMFS5.

  See the information about upgrading datastores to VMFS5 in the *vSphere Storage* documentation.

Moving Powered Off or Suspended Virtual Machines During an Upgrade with vCenter Server

In a cold migration upgrade, you power off or suspend the virtual machines that you move to a new host. When you use cold migration to move virtual machines, more downtime is required for the virtual machines.

This scenario assumes that the hosts do not have vMotion capabilities.

Upgrades using cold migrations are useful for situations that require a multistep upgrade, such as upgrades from versions lower than ESX 4.x.

Prerequisites

- Verify that one or more machines meets ESXi 5.1 requirements.

- Verify that empty host storage is sufficient to hold a portion of your production virtual machines. Ideally, the storage is large enough to hold all of the migrated virtual machines. A larger capacity for virtual machines on this extra storage means fewer operations are required before all your virtual machines are migrated.

- If your environment has vCenter Guided Consolidation, uninstall it before upgrading.

- Run the vCenter Host Agent Pre-Upgrade Checker. See "Run the vCenter Host Agent Pre-Upgrade Checker," on page 57.

- Upgrade vCenter Server 4.0 to vCenter Server 5.1. See Chapter 4, "Upgrading to vCenter Server 5.1," on page 29.
- Install the version 5.1 vSphere Client or vSphere Web Client. See "Upgrade the vSphere Client," on page 90.
- If your environment has vCenter Update Manager, upgrade it to the latest version.

Procedure

1 Add the ESXi 5.1 host to vCenter Server 5.1.

2 Add the ESX 4.x/ESXi 4.x hosts to vCenter Server 5.1.

3 Power off or suspend the virtual machines on the ESX 4.x/ESXi 4.x hosts.

4 Move the virtual machines to the ESXi 5.1 host.

What to do next

For all hosts and virtual machines in the migration upgrade, take the following actions.

- Upgrade your virtual machines. See Chapter 7, "Upgrading Virtual Machines," on page 187.
- Upgrade your product licenses:
  a Get your new license keys by email, or by using the license portal.
  b Apply the new license keys to your assets using the vSphere Client (or vCenter Server if you have it).

Migrating ESX 4.x or ESXi 4.x Hosts to ESXi 5.1 in a PXE-Booted Auto Deploy Installation

This high-level overview describes the process for migrating an ESX/ESXi 4.x host to an ESXi 5.1 installation that is deployed by using vSphere Auto Deploy.

This scenario assumes the following details about your vSphere environment.

- The hosts that you are migrating are managed by a vCenter Server running vCenter Server 4.x.
- All hosts managed by that vCenter Server are running ESX/ESXi 4.x.

The following tasks provide an overview of the migration process.

1 Create host profiles for the ESXi 4.x hosts to be migrated and attach the host profiles to the hosts.

  See the *vSphere Host Profiles* documentation.

2 Upgrade the 4.x vCenter Server to version 5.1.

  See Chapter 4, "Upgrading to vCenter Server 5.1," on page 29.

3 Prepare your Auto Deploy server and environment.

  This preparation includes setting up the DHCP and TFTP servers that are used to PXE-boot Auto Deploy host machines and installing VMware PowerCLI.

  See the information about preparing for vSphere Auto Deploy in the *vSphere Installation and Setup* documentation.

4 Apply an image profile for an ESXI 5.1 host that is deployed by using the Auto Deploy PowerCLI commands.

  See the information about Auto Deploy in the *vSphere Installation and Setup* documentation.

5 Use vSphere vMotion to evacuate all virtual machines from the hosts to be migrated, and place the hosts in maintenance mode.

   See the *vCenter Server and Host Management* documentation.

6 Reboot the hosts, enter the BIOS, and reconfigure the hosts to boot from the network.

   See the information about Auto Deploy in the *vSphere Installation and Setup*. For ESXi 4.x hosts with compatible host profiles, the host configuration will be restored.

7 When one host is booted, complete any host configuration that was not migrated and take a host profile from the host.

   See the *vSphere Host Profiles* documentation.

8 Clone the host profile and attach the profile to the other migrated hosts.

   See the *vSphere Host Profiles* documentation.

9 Update the answer file of each cloned profile to provide host-specific configuration details, such as the IP configuration.

   See the *vSphere Host Profiles* documentation.

Upgrading vSphere Components Separately in a VMware View Environment

If you upgrade vSphere components separately from VMware View components, you must back up some View data and reinstall some View software.

Instead of performing an integrated upgrade of VMware View and vSphere components, you can choose to first upgrade all View components and then upgrade vSphere components, or the reverse. You might also upgrade only vSphere components when a new version or update of vSphere is released.

When you upgrade vSphere components separately from View components, you must perform the following additional tasks:

1 Before you upgrade vCenter Server, back up the vCenter Server database and the View Composer database.

2 Before you upgrade vCenter Server, back up the View LDAP database from a View Connection Server instance by using the `vdmexport.exe` utility.

   For instructions, see the *VMware View Administration* document. If you have multiple instances of View Connection Server in a replicated group, you need to export the data from only one instance.

3 If you use View Composer, after you upgrade all ESX/ESXi hosts that are managed by a particular vCenter Server instance, restart the View Composer service on that host.

4 After you upgrade VMware Tools in virtual machines that are used as View desktops, reinstall View Agent.

   Reinstalling View Agent guarantees that the drivers in the virtual machine remain compatible with the other View components.

   Step-by-step instructions for running the View Agent installer appear in the *VMware View Administration* document.

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