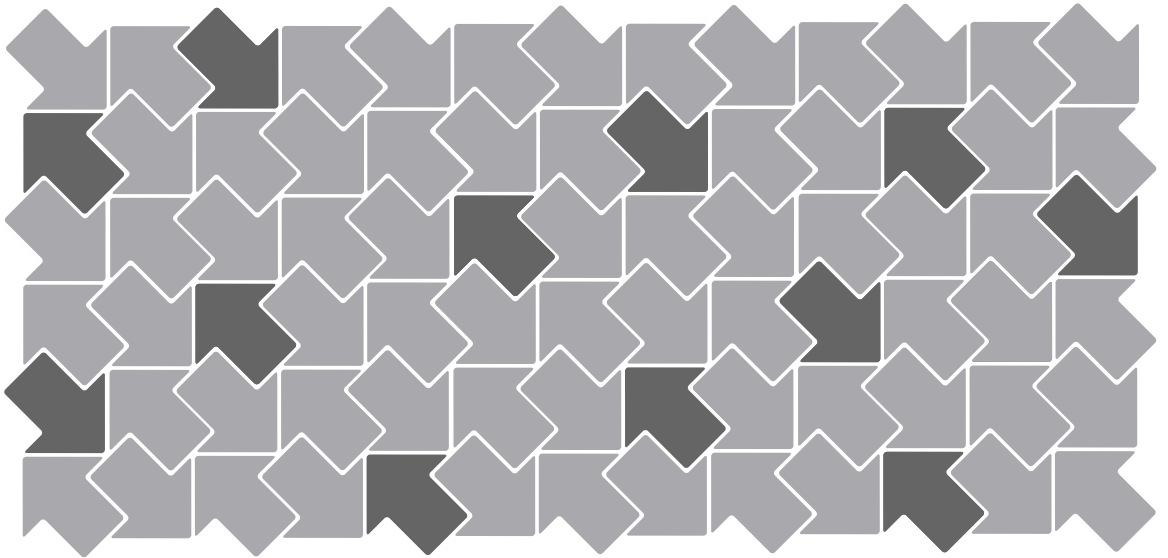


Installation and Upgrade Guide

ESX 3.0.1 and VirtualCenter 2.0.1



Installation and Upgrade Guide

Revision: 20060925

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<http://www.vmware.com/support/>

The VMware Web site also provides the latest product updates.

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Preface

This preface describes the contents of the *Installation and Upgrade Guide* and provides pointers to VMware® technical and educational resources.

This preface contains the following topics:

- [“About This Book”](#) on page 11
- [“Technical Support and Education Resources”](#) on page 14

About This Book

This manual, the *Installation and Upgrade Guide*, describes how to install new configurations and upgrade existing configurations of VMware VirtualCenter and ESX Server.

Quick Start

For the fastest path through this book, refer to the [Table P-1](#).

Table P-1. Installation Quick Start

Your Environment	Current Installation	Installation	Read This
ESX Server only	No previous installation	VMware ESX Server 3.0.1	<ul style="list-style-type: none">■ “Installing VMware ESX Server Software” on page 75■ “Installing the Virtual Infrastructure Client” on page 68
	VMware ESX Server 2.x	VMware ESX Server 3.0.1	<ul style="list-style-type: none">■ “Upgrading ESX Server” on page 147
VirtualCenter and ESX Server	No previous installation	VMware VirtualCenter 2.0.1 and VMware ESX Server 3.0.1	<ul style="list-style-type: none">■ “Installing VMware VirtualCenter” on page 57
	VMware VirtualCenter 1.x and VMware ESX Server 2.x	VMware VirtualCenter 2.0.1 and VMware ESX Server 3.0.1	<ul style="list-style-type: none">■ “Planning a VMware Infrastructure Upgrade” on page 107

Revision History

This manual is revised with each release of the product or when necessary. A revised version can contain minor or major changes. [Table P-2](#) provides you with the revision history of this manual.

Table P-2. Revision History

Revision	Description
20060615	ESX Server 3.0 and VirtualCenter 2.0 version of the VMware Infrastructure 3 <i>Installation and Upgrade Guide</i> . This is the first edition of this manual.
20060925	ESX Server 3.0.1 and VirtualCenter 2.0.1 version of the VMware Infrastructure 3 <i>Installation and Upgrade Guide</i> . This edition includes information on new upgrade features, as well as minor changes to installation and licensing information.

Intended Audience

This manual is intended for anyone who needs to install ESX Server 3 and VirtualCenter 2, or upgrade from earlier versions of these products to ESX Server 3 and VirtualCenter 2. The information in this manual is written for experienced Windows or Linux system administrators who are familiar with virtual machine technology and datacenter operations.

Document Feedback

If you have comments about this documentation, submit your feedback to:

docfeedback@vmware.com

VMware Infrastructure Documentation

The VMware Infrastructure documentation consists of the combined VirtualCenter and ESX Server documentation set.

You can access the most current versions of this manual and other books by going to:

<http://www.vmware.com/support/pubs>

Conventions

[Table P-3](#) illustrates the typographic conventions used in this manual.

Table P-3. Conventions Used in This Manual

Style	Elements
Blue (online only)	Cross-references and email addresses
Blue boldface (online only)	Links
Black boldface	User interface elements such as button names and menu items
Monospace	Commands, filenames, directories, and paths
Monospace bold	User input
<i>Italic</i>	Document titles, glossary terms, and occasional emphasis
< Name >	Variable and parameter names

Abbreviations Used in Graphics

The graphics in this manual use the abbreviations listed in [Table P-4](#).

Table P-4. Abbreviations

Abbreviation	Description
VC	VirtualCenter
VI	Virtual Infrastructure Client
server	VirtualCenter Server
database	VirtualCenter database
host n	VirtualCenter managed hosts
VM#	Virtual machines on a managed host

Table P-4. Abbreviations

Abbreviation	Description
user#	User with access permissions
dsk#	Storage disk for the managed host
datastore	Storage for the managed host
SAN	Storage area network type datastore shared between managed hosts
tplt	Template

Technical Support and Education Resources

The following sections describe the technical support resources available to you.

Self-Service Support

Use the VMware Technology Network (VMTN) for self-help tools and technical information:

- Product information – <http://www.vmware.com/products/>
- Technology information – <http://www.vmware.com/vcommunity/technology>
- Documentation – <http://www.vmware.com/support/pubs>
- VMTN Knowledge Base – <http://www.vmware.com/support/kb>
- Discussion forums – <http://www.vmware.com/community>
- User groups – <http://www.vmware.com/vcommunity/usergroups.html>

For more information about the VMware Technology Network, go to <http://www.vmtn.net>.

Online and Telephone Support

Use online support to submit technical support requests, view your product and contract information, and register your products. Go to <http://www.vmware.com/support>.

Customers with appropriate support contracts should use telephone support for the fastest response on priority 1 issues. Go to http://www.vmware.com/support/phone_support.html.

Support Offerings

Find out how VMware support offerings can help meet your business needs. Go to <http://www.vmware.com/support/services>.

VMware Education Services

VMware courses offer extensive hands-on labs, case study examples, and course materials designed to be used as on-the-job reference tools. For more information about VMware Education Services, go to <http://mylearn1.vmware.com/mgreg/index.cfm>.

Introduction to VMware Infrastructure

1

This book describes each separate installer for setting up VMware ESX Server and VirtualCenter components. This chapter describes the components individually, so you know which you need to install. The following sections introduce VMware ESX Server and VirtualCenter.

- [“VMware Infrastructure at a Glance”](#) on page 17
- [“What’s New for Installation”](#) on page 20

VMware Infrastructure at a Glance

[Figure 1-1](#) illustrates the six basic components of VMware Infrastructure.

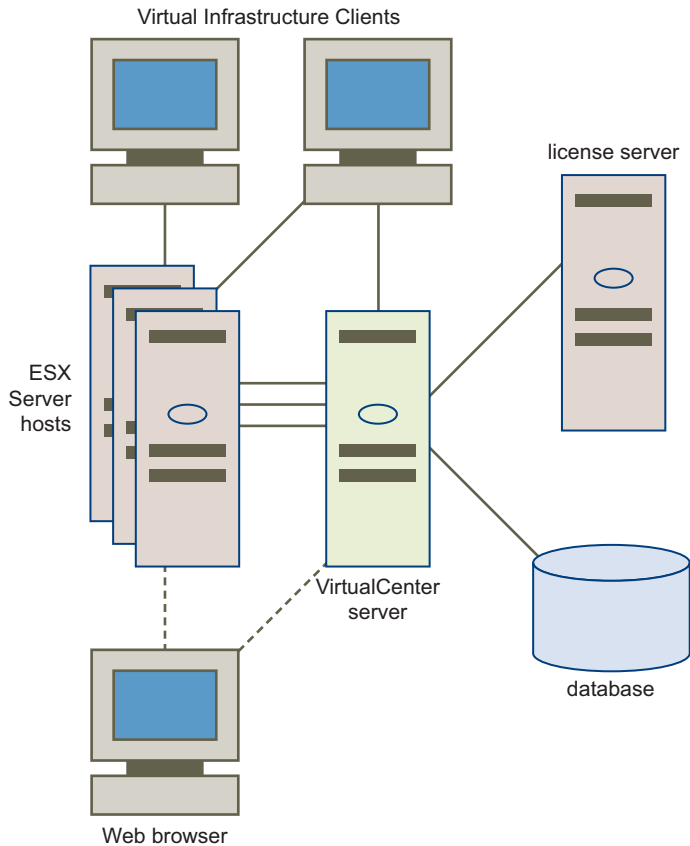


Figure 1-1. VMware Infrastructure Components

One VirtualCenter Server manages multiple ESX Server hosts.

Each shaded block represents a separate installer or procedure. The Virtual Infrastructure (VI) Client appears twice, because you can download it from a VirtualCenter Server or ESX Server host.

The major components of VMware Infrastructure are:

- **ESX Server host** – ESX Server provides a virtualization layer that abstracts the processor, memory, storage, and networking resources of the physical host into multiple virtual machines.

The ESX Server host installation includes documentation in the form of man pages available from the service console. See [“Installing VMware ESX Server Software”](#) on page 75.

- **VirtualCenter Server** – This server installs on a Windows machine to centrally manage your VMware ESX Server hosts. The VirtualCenter Server allows the use of advanced VMware Infrastructure features such as VMware DRS, VMware HA, and VMotion™.

A VMware SDK Web service is automatically installed with VirtualCenter Server. See [“Installing the VirtualCenter Server”](#) on page 63.

- **Virtual Infrastructure (VI) Client** – The VI Client installs on a Windows machine and is the primary method of interaction with virtual infrastructure. The VI Client acts as:

- A **console** to operate virtual machines.
- An **administration interface** into VirtualCenter Servers and ESX Server hosts.

The VI Client is downloadable from VirtualCenter Server and ESX Server hosts. The VI Client installation includes documentation for administrators and for console users. See [“Installing the Virtual Infrastructure Client”](#) on page 68.

- **Web browser** – A browser allows you to download the VI Client from the VirtualCenter Server or ESX Server hosts. When you have appropriate logon credentials, a browser also lets you perform limited management of your VirtualCenter Server and ESX Server hosts.
- **License server** – This server installs on a Windows system to authorize VirtualCenter Servers and ESX Server hosts appropriately for your licensing agreement. There is no direct interaction with the license server. Administrators make changes to software licenses using the VI Client.

License server installation includes no documentation. See [“Installing the License Server”](#) on page 54.

- **Database** – The VirtualCenter Server uses a database to organize all the configuration data for the virtual infrastructure environment. While VMware recommends a professional database for production environments, the bundled MSDE database allows you to set up a VirtualCenter Server for demonstration purposes. See [“Preparing the VirtualCenter Server Database”](#) on page 57.

What's New for Installation

This section describes procedures for installing and upgrading of previous versions of VirtualCenter and ESX Server software. This section is not a comprehensive listing of new features.

What's New About Installing VirtualCenter Version 2

New features introduced in VirtualCenter 2.0 include:

- New license server installation
- New Virtual Infrastructure client installation, downloadable from a new Web interface
- Updated SDK installation

Other new features do not impact any installation or upgrade processes.

What's New About Installing ESX Server Version 3

New features introduced in ESX Server 3.0.1 include:

- A new upgrade feature that allows migration upgrades without virtual machine downtime.

New features introduced in ESX Server 3.0 include:

- Onscreen Help no longer in the installer
- VMFS3, a new file system
- VM3, a new virtual machine format
- Updated VMware Tools
- New Virtual Infrastructure client installation, downloadable from a changed Web interface

Other new features do not impact any installation or upgrade processes.

Where to Go Next

- [“System Requirements”](#) on page 21
- [“Installing VMware VirtualCenter”](#) on page 57

System Requirements

This chapter describes the hardware and operating system requirements for hosts running VirtualCenter and ESX Server. Use the information in this chapter to ensure that your environment meets the requirements for installation. Topics covered here are:

- [“VirtualCenter Requirements”](#) on page 21
- [“ESX Server Requirements”](#) on page 24
- [“Supported Guest Operating Systems”](#) on page 29
- [“Virtual Machine Specifications”](#) on page 30

VirtualCenter Requirements

VirtualCenter manages ESX Server hosts using a server and three types of remote management clients. Hardware and software requirements for the server and client types appear in the following sections:

- [“VirtualCenter Server Requirements”](#) on page 21
- [“Virtual Infrastructure Client Requirements”](#) on page 23
- [“VirtualCenter VI Web Access Requirements”](#) on page 24
- [“License Server Requirements”](#) on page 24

VirtualCenter Server Requirements

The VirtualCenter Server is a physical machine or virtual machine configured with access to a supported database.

REVISED

See [Updates](#)
at the end
of this book.

Hardware Requirements

VirtualCenter Server hardware must meet the following requirements:

- **Processor** – 2.0GHz or higher Intel or AMD x86 processor. Processor requirements can be larger if your database is run on the same hardware.
- **Memory** – 2GB RAM minimum. RAM requirements can be larger if your database is run on the same hardware.
- **Disk storage** – 560MB minimum, 2GB recommended. You must have 245MB free on the destination drive for installation of the program, and you must have 315MB free on the drive containing your %temp% directory.

NOTE Storage requirements can be larger if your database runs on the same hardware as the VirtualCenter Server machine. The size of the database varies with the number of hosts and virtual machines you manage. Using default settings for a year with 25 hosts and 8 to 16 virtual machines each, the total database size can consume up to 2.2GB (SQL) or 1.0GB (Oracle).

MSDE disk requirements – The demonstration database requires up to 2GB free disk space to decompress the installation archive. However, approximately 1.5GB of these files are deleted after the installation is complete.

- **Networking** – 10/100 Ethernet adapter minimum (Gigabit recommended).
- **Scalability** – A VirtualCenter Server configured with the hardware minimums can support 20 concurrent clients, 50 ESX Server hosts, and over 1000 virtual machines. A dual-processor VirtualCenter Server with 3GB RAM can scale to 50 concurrent client connections, 100 ESX Server hosts, and over 2000 virtual machines.

VirtualCenter Server Software Requirements

The VirtualCenter Server is supported as a service on the 32-bit versions of these operating systems:

- Windows 2000 Server SP4 with Update Rollup 1 (Update Rollup 1 can be downloaded from <http://www.microsoft.com/windows2000/server/evaluation/news/bulletins/rollup.msp>)
- Windows XP Pro (at any SP level)
- Windows 2003 (all releases except 64-bit)

VirtualCenter 2.0 installation is not supported on 64-bit operating systems.

The VirtualCenter installer requires Internet Explorer 5.5 or higher in order to run.

VirtualCenter Database Requirements

VirtualCenter supports the following database formats:

- Microsoft SQL Server 2000 (SP 4 only)
- Oracle 9iR2, 10gR1 (versions 10.1.0.3 and higher only), and 10gR2
- Microsoft MSDE (not supported for production environments)

Each database requires some configuration adjustments in addition to the basic installation.

NOTE If you do not have database administrator (DBA) privileges in your organization, you need assistance from your DBA. See [“Preparing the VirtualCenter Server Database”](#) on page 57 for more information on the VirtualCenter database configuration.

End of Support Life for Microsoft Access Database Software

Support for Microsoft Access is discontinued with VMware VirtualCenter version 2. Configurations upgrading from VMware VirtualCenter version 1.x must use a different database. VirtualCenter 2.0 replaces Access with a bundled version of Microsoft MSDE, for use in demonstration installations.

Virtual Infrastructure Client Requirements

Virtual Infrastructure Client Hardware Requirements

The Virtual Infrastructure Client hardware must meet the following requirements:

- **Processor** – 266MHz or higher Intel or AMD x86 processor (500MHz recommended).
- **Memory** – 256MB RAM minimum, 512MB recommended.
- **Disk Storage** – 150MB free disk space required for basic installation. You must have 55MB free on the destination drive for installation of the program, and you must have 100MB free on the drive containing your %temp% directory.
- **Networking** – 10/100 Ethernet adapter (Gigabit recommended).

Virtual Infrastructure Client Software Requirements

The Virtual Infrastructure Client is designed for the 32-bit versions of these operating systems:

- Windows 2000 Pro SP4
- Windows 2000 Server SP4

- Windows XP Pro (at any SP level)
- Windows 2003 (all releases except 64-bit)

The Virtual Infrastructure Client requires the .NET framework 1.1 (included in installation if required).

VirtualCenter VI Web Access Requirements

The VI Web Access client is designed for these browsers:

- **Windows** – Internet Explorer 6.0 or higher, Netscape Navigator 7.0, Mozilla 1.X, Firefox 1.0.7 and higher.
- **Linux** – Netscape Navigator 7.0 or later, Mozilla 1.x, Firefox 1.0.7 and higher.

License Server Requirements

This section describes the license server requirements.

License Server Hardware Requirements

The license server hardware must meet the following requirements:

- **Processor** – 266MHz or higher Intel or AMD x86 processor.
- **Memory** – 256MB RAM minimum, 512MB recommended.
- **Disk Storage** – 25MB free disk space required for basic installation.
- **Networking** – 10/100 Ethernet adapter (Gigabit recommended).

VMware recommends that you install the license server on the same machine as your VirtualCenter Server to ensure connectivity.

License Server Software Requirements

The license server software is supported on the 32-bit versions of the following operating systems:

- Windows 2000 Server SP4
- Windows XP Pro (at any SP level)
- Windows 2003 (all releases except 64-bit)

ESX Server Requirements

This section discusses the minimum and maximum hardware configurations supported by ESX Server version 3. See the following sections:

- [“Minimum Server Hardware Requirements”](#) on page 25
- [“Enhanced Performance Recommendations”](#) on page 26
- [“Maximum Configuration for ESX Server”](#) on page 27
- [“Hardware and Software Compatibility”](#) on page 29

Minimum Server Hardware Requirements

You need the following hardware and system resources to install and use ESX Server.

- At least two processors:
 - 1500 MHz Intel Xeon and later, or AMD Opteron (32-bit mode) for ESX Server
 - 1500 MHz Intel Xeon and later, or AMD Opteron (32-bit mode) for Virtual SMP™
 - 1500 MHz Intel Viiv or AMD A64 x2 dual-core processors
- 1GB RAM minimum.
- One or more Ethernet controllers. Supported controllers include:
 - Broadcom NetXtreme 570x Gigabit controllers
 - Intel PRO/100 adapters

For best performance and security, use separate Ethernet controllers for the service console and the virtual machines.

NOTE The 3Com 3c990 driver does not support all revisions of the 3c990. For example, 3CR990B is incompatible.

- A SCSI adapter, Fibre Channel adapter, or internal RAID controller:
 - **Basic SCSI** controllers are Adaptec Ultra-160 and Ultra-320, LSI Logic Fusion-MPT, and most NCR/Symbios™ SCSI controllers.
 - **RAID adapters** supported are HP Smart Array, Dell PercRAID (Adaptec RAID and LSI MegaRAID), and IBM (Adaptec) ServeRAID controllers.
 - **Fibre Channel** adapters supported are Emulex and QLogic host bus adapters (HBAs).
- A SCSI disk, Fibre Channel LUN, or RAID LUN with unpartitioned space. In a minimum configuration, this disk or RAID is shared between the service console and the virtual machines.
- For iSCSI, a disk attached to an iSCSI controller, such as the QLogic qla4010.

ESX Server supports installing and booting from the following storage systems:

- **IDE/ATA disk drives** – Installing ESX Server on an IDE/ATA drive or IDE/ATA RAID is supported. However, you should ensure that your specific drive controller is included in the supported hardware.

Storage of virtual machines is currently not supported on IDE/ATA drives or RAIDs. Virtual machines must be stored on VMFS partitions configured on a SCSI drive, a SCSI RAID, or a SAN.

NOTE SATA drives are not supported for installing ESX Server or for storing virtual machines on VMFS partitions, even if they are masked by hardware as IDE or SCSI disks.

- **SCSI disk drives** – SCSI disk drives are supported for installing ESX Server. They can also store virtual machines on VMFS partitions.
- **Storage area networks (SANs)** – SANs are supported for installing ESX Server. They can also store virtual machines on VMFS partitions. For information about pre-installation and configuration tasks and known issues with installing and booting from SANs, see the *SAN Configuration Guide* at www.vmware.com/support/pubs/vi_pubs.html.

NOTE The minimum supported LUN capacity for VMFS3 is 1200MB.

Before deploying ESX Server on a SAN, check the latest version of the *ESX Server SAN Compatibility Guide* from the VMware Web site at www.vmware.com/support/pubs/vi_pubs.html.

Enhanced Performance Recommendations

The lists in previous sections suggest a basic ESX Server configuration. In practice, you can use multiple physical disks, which can be SCSI disks, Fibre Channel LUNs, or RAID LUNs.

Here are some recommendations for enhanced performance:

- **RAM** – Having sufficient RAM for all your virtual machines is important to achieving good performance. ESX Server hosts require more RAM than typical servers. An ESX Server host must be equipped with sufficient RAM to run concurrent virtual machines, plus run the service console.

For example, operating four virtual machines with Red Hat Enterprise Linux or Windows XP requires your ESX Server host be equipped with over a gigabyte of RAM for *baseline* performance:

- 1024MB for the virtual machines (256MB minimum per operating system as recommended by vendors × 4)
- 272MB for the ESX Server service console

Running these example virtual machines with a more reasonable 512MB RAM requires the ESX Server host to be equipped with at least 2.2GB RAM.

- 2048MB for the virtual machines (512MB × 4)
- 272MB for the ESX Server service console

These calculations do not take into account variable overhead memory for each virtual machine. For more information, see the *Resource Management Guide*.

NOTE The ESX Server host might require more RAM for the service console if you are running third-party management applications or backup agents.

- **Dedicated fast Ethernet adapters for virtual machines** – Dedicated Gigabit Ethernet cards for virtual machines, such as Intel PRO/1000 adapters, improve throughput to virtual machines with high network traffic.
- **Disk location** – For best performance, all data used by your virtual machines should be on physical disks allocated to virtual machines. These physical disks should be large enough to hold disk images to be used by all the virtual machines.
- **VMFS3 partitioning** – For best performance, use VI Client or VI Web Access to set up your VMFS3 partitions rather than the ESX Server installer. Using VI Client or VI Web Access ensures that the starting sectors of partitions are 64K-aligned, which improves storage performance.
- **Processors** – Faster processors improve ESX Server performance. For certain workloads, larger caches improve ESX Server performance.
- **Hardware compatibility** – To ensure the best possible I/O performance and workload management, VMware ESX Server provides its own drivers for supported devices. Be sure that the devices you plan to use in your server are supported. For additional detail on I/O device compatibility, download the *ESX Server I/O Compatibility Guide* from the VMware Web site at www.vmware.com/support/pubs/vi_pubs.html.

Maximum Configuration for ESX Server

This section describes the hardware maximums for an ESX Server host machine. (Do not confuse this with a list of virtual hardware supported by a virtual machine.)

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Storage

- 16 host bus adapters (HBAs) per ESX Server system, with 15 targets per HBA
- 128 logical unit numbers (LUNs) per storage array
- 255 LUNs per ESX Server system
- 32 paths to a LUN
- Maximum LUN ID: 255

NOTE Although ESX Server supports up to 256 Fibre Channel LUNs for operation, the installer supports a maximum of 128 Fibre Channel SAN LUNs. If you have more than 128 LUNs, connect them after the installation is complete.

Virtual Machine File System (VMFS)

- 128 VMFS volumes per ESX Server system
- Maximum physical extents per VMFS volume:
 - VMFS-3 volumes: 32 physical extents
 - VMFS-2 volumes: 32 physical extents (VMFS-2 volumes are read-only for ESX Server 3.0.)
- 2TB per physical extent
- Maximum size per VMFS volume:
 - VMFS-3 volumes: approximately 64TB, with a maximum of 2TB per physical extent
 - VMFS-2 volumes: approximately 64TB, with a maximum of 2TB per physical extent (VMFS-2 volumes are read-only for ESX Server 3.0.)

Hardware Processors

[Table 2-1](#) displays the number of physical processors supported per ESX Server host.

Table 2-1. Supported Processor Configurations

		Maximum Sockets	Maximum Cores	Maximum Threads
Single core	With hyperthreading	16	16	32
	Without hyperthreading	16	16	16
Dual core	With hyperthreading	8	16	32
	Without hyperthreading	16	32	32

Virtual Processors

- A total of 128 virtual processors in all virtual machines per ESX Server host

Memory

- 64GB of RAM per ESX Server system

Adapters

- Up to 64 adapters of all types, including storage and network adapters, per system
- Up to 20 Gigabit Ethernet or 10/100 Ethernet ports per system
- Up to 1024 ports per virtual switch

Hardware and Software Compatibility

For specific information on supported hardware and software, download the ESX Server Compatibility Guides from the VMware Web site at www.vmware.com/support/pubs/vi_pubs.html.

- **Systems compatibility** – Lists the standard operating systems and server platforms against which VMware tests.
- **I/O compatibility** – Lists devices that are accessed directly through device drivers in the ESX Server host.
- **Storage compatibility** – Lists in detail the combinations of HBAs and storage devices currently tested by VMware and its storage partners.
- **Backup software compatibility** – Describes the specific backup packages tested by VMware.

Supported Guest Operating Systems

The VMware *Systems Compatibility Guide* includes the constantly updated authoritative list of supported guest operating systems. This document is available for download at:

http://www.vmware.com/support/pubs/vi_pubs.html

ESX Server version 3 offers support for a number of 64-bit guest operating systems. Refer to the *Systems Compatibility Guide* for a complete list.

There are specific hardware requirements for 64-bit guest operating system support. For AMD Opteron-based systems, the processors must be Opteron Rev E and later. For Intel Xeon-based systems, the processors must include support for Intel's Virtualization Technology (VT). Note that many servers that include CPUs with VT support might ship with VT disabled by default, and VT must be enabled 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 allows you to enable VT support.

To determine whether your server has the necessary support, you can use a CPU Compatibility Tool included on the ESX Server product CD-ROM in `/images/cpuid.iso`.

Virtual Machine Specifications

Each ESX Server machine can host up to 128 virtual CPUs in virtual machines (and up to 200 registered virtual machines), with the following capabilities and specifications.

Virtual Storage

- Up to four host bus adapters per virtual machine
- Up to 15 targets per host bus adapter
- Up to 60 targets per virtual machine; 256 targets concurrently in all virtual machines per ESX Server host

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Virtual SCSI Devices

- Up to four virtual SCSI adapters per virtual machine, with up to 15 devices per adapter
- 9TB per virtual disk

Virtual Processor

- Intel Pentium II or later (dependent on system processor)
- One, two, or four processors per virtual machine

NOTE All multiprocessor virtual machines require purchased licensing for VMware Virtual SMP for ESX Server. If you plan to create a two-processor virtual machine, your ESX Server machine must have at least two physical processors. For a four-processor virtual machine, your ESX Server machine must have at least four physical processors.

Virtual Chip Set

- Intel 440BX-based motherboard with NS338 SIO chip

Virtual BIOS

- PhoenixBIOS 4.0 Release 6

Virtual Machine Memory

- Up to 16GB per virtual machine

NOTE Windows NT as a guest supports only 3.44GB RAM.

Virtual Adapters

- Up to six virtual PCI slots per virtual machine

Virtual Ethernet Cards

- Up to four virtual Ethernet adapters per virtual machine

NOTE Each virtual machine has a total of six virtual PCI slots, one of which is used by the graphics adapter. The total number of virtual adapters, SCSI plus Ethernet, cannot be greater than six.

Virtual Floppy Drives

- Up to two 1.44MB floppy drives per virtual machine

Virtual CD

- Up to four drives per virtual machine

Legacy Devices

Virtual machines can also make use of the following legacy devices. However, for performance reasons, use of these devices is not recommended.

Virtual Serial (COM) Ports

- Up to four serial ports per virtual machine

Virtual Parallel (LPT) Ports

- Up to three virtual LPT ports per virtual machine

Where to Go Next

- [“Installing VMware VirtualCenter”](#) on page 57

- [“Installing VMware ESX Server Software”](#) on page 75
- [“Planning a VMware Infrastructure Upgrade”](#) on page 107

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Licensing VirtualCenter and ESX Server

3

This chapter describes licensing options for VMware VirtualCenter and ESX Server. It describes the licensing models available with ESX Server and VirtualCenter, and provides procedures for redeeming license files and configuring license options.

This chapter contains the following sections:

- [“VirtualCenter and ESX Server Licensing Model”](#) on page 33
- [“License Key Functionality”](#) on page 37
- [“Obtaining License Files”](#) on page 40
- [“Setting Up License Server-Based Licensing”](#) on page 40
- [“Setting Up Host-Based Licensing”](#) on page 46
- [“ESX Server License Types”](#) on page 48
- [“License File”](#) on page 50
- [“Installing the License Server”](#) on page 54

VirtualCenter and ESX Server Licensing Model

Software licenses are required for most operations in VirtualCenter and ESX Server, such as powering on a virtual machine. However, you can install, launch, and configure VirtualCenter version 2 and ESX Server version 3 without a software license. See [“License Key Functionality”](#) on page 37 for a list of how specific features are licensed.

Customer Licensing Process

After you purchase VMware Infrastructure software, you visit the VMware support Web site to generate license files you can download. You then use the Virtual Infrastructure Client to import these license files into your configuration. Afterwards you can use all the features to which your purchase entitles you.

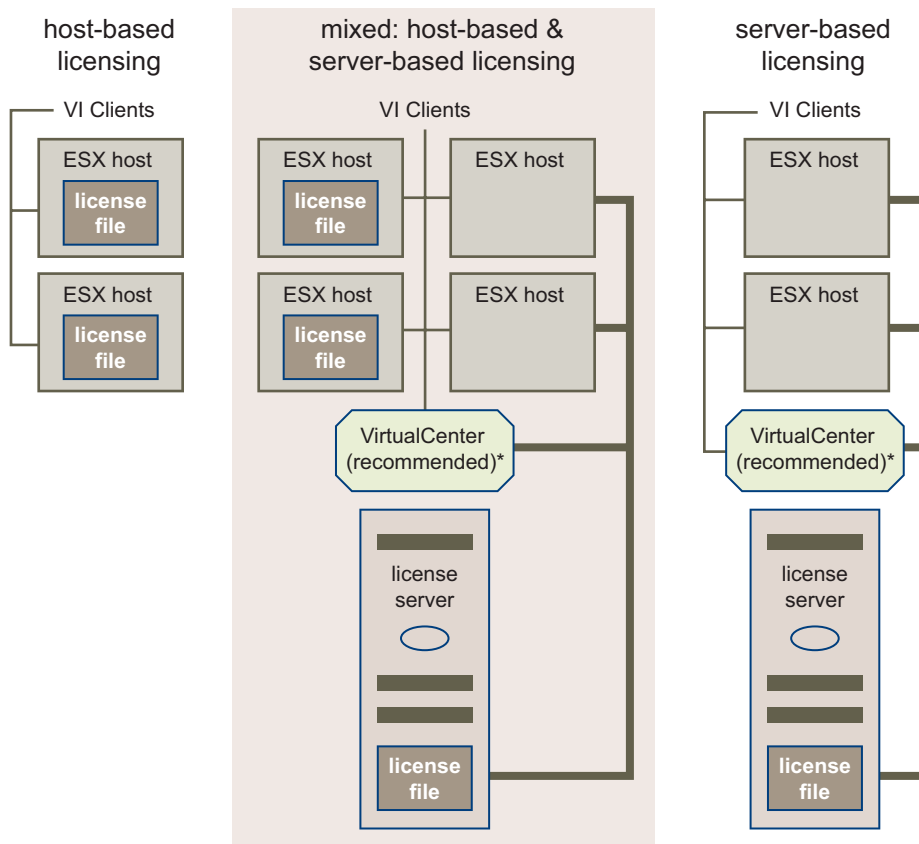
You have a choice regarding how you store and use your license files. VMware now uses the industry-standard FlexNet licensing, which offers you two modes: license server-based and host-based.

Host-Based and License Server-Based License Modes

VirtualCenter and ESX Server support two modes of licensing: license server-based and host-based. In host-based licensing mode, the license files are stored on individual ESX Server hosts. In license server-based licensing mode, licenses are stored on a license server, which makes these licenses available to one or more hosts. You can run a mixed environment employing both host-based and license server-based licensing.

VirtualCenter and features that require VirtualCenter, such as VMotion™, must be licensed in license server-based mode. ESX Server-specific features can be licensed in either license server-based or host-based mode.

[Figure 3-1](#) illustrates the three types of license environments.



* Some features, such as VMotion and VMware HA, require VirtualCenter.

Figure 3-1. License File Locations in Host-Based, Mixed, and License Server-Based Environments

License Server-Based Licensing

License server-based licensing simplifies license management in large, dynamic environments by allowing a VMware license server to administer licenses. With license server-based licensing, you maintain all your VirtualCenter Management Server and ESX Server licenses from one console.

Server-based licensing is based on industry-standard FlexNet mechanisms. With server-based licensing, a license server manages a license pool, which is a central repository holding your entire licensed entitlement. When a host requires a particular licensed functionality, the license for that entitlement is checked out from the license

pool. License keys are released back to the pool when they are no longer being used and are available again to any host.

The advantages of license server-based licensing include:

- You administer all licensing from a single location.
- New licenses are allocated and reallocated using any combination of ESX Server form factors. For example, you can use the same 32-processor license for sixteen 2-processor hosts, eight 4-processor hosts, four 8-processor hosts, two 16-processor hosts, or any combination totaling 32 processors.
- Ongoing license management is simplified by allowing licenses to be assigned and reassigned as needed. Assignment changes as the needs of an environment change, such as when hosts are added or removed, or premium features like VMotion, DRS, or HA are transferred among hosts.
- During periods of license server unavailability, VirtualCenter Servers and ESX Server hosts using license server-based licenses are unaffected for a 14-day grace period, relying on cached licensing configurations, even across reboots.

VMware recommends using the license server-based licensing mode for large, changing environments.

Host-Based Licensing

The host-based licensing mode is similar to the licensing mode of previous releases. With host-based licensing, your total entitlement for purchased features is divided on a per-machine basis, divided among separate license files residing on ESX Server hosts and the VirtualCenter Server.

With host-based licensing, when someone activates a licensed feature, the feature for that entitlement must reside in the license file on that host. With host-based licensing, you maintain separate license files on each ESX Server host. Distribution of unused licenses is not automatic, and there is no dependence on an external connection for licensing. Host-based license files are placed directly on individual ESX Server hosts and replace the serial numbers used by previous versions of ESX Server version 2.x.

The advantages of host-based licensing include:

- Host-based files require no license server to be installed for ESX Server host-only environments.
- In a VirtualCenter and license server environment, host-based licensing allows ESX Server host licenses to be modified during periods of license server unavailability. For example, with host-based licensing you can manually move virtual SMP license keys between hosts without a license server connection.

License Key Functionality

Specific entitlement to run VMware software is determined by license keys. You purchase such keys based on the numbers of processors and on the functionality you want in your entitlement.

Per-Processor and Per-Host Licensing

Most ESX Server licensing is on a per-processor basis for each host, meaning that an ESX Server host with two processors requires two license keys to activate a given feature, and a four-processor host requires four license keys to activate the feature. This per-processor licensing applies to basic features, as well as add-on functionality. Special considerations include:

- Dual-core processors count as one processor.
- You cannot partially license a multiprocessor machine.

For example, imagine that your virtual infrastructure includes four dual-processor machines, and you want to use migration with VMotion between two of these machines. You can buy a license for one instance of VirtualCenter Server, eight processor licenses for ESX Server, and four processor licenses for VMotion.

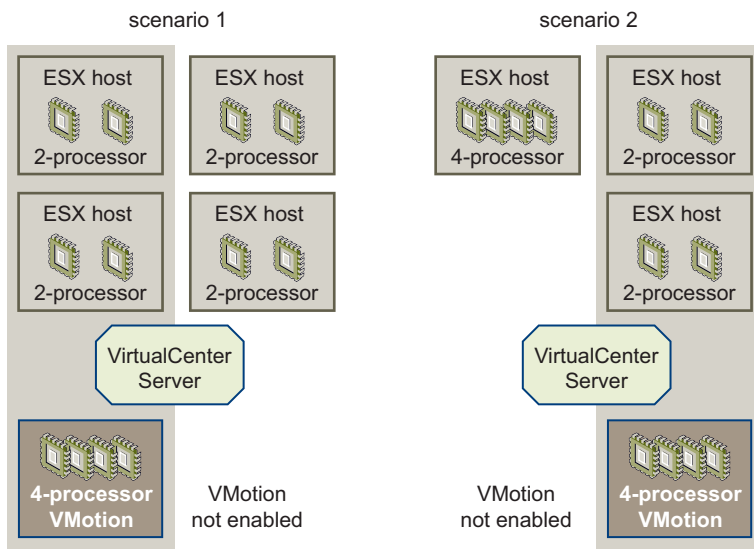


Figure 3-2. Two Example Licensing Scenarios Showing Different Uses for the Same Licenses

Scenario 1 displays four VMotion processor licenses enabling a cluster of two dual-processor machines. You can change the machines on which your VMotion licenses reside, allowing you to put any pair of your dual-processor machines into a VMotion cluster. However, you cannot perform VMotion with a machine from which you have removed a VMotion license keys.

Scenario 2 adds one 4-processor machine, requiring you to retire two dual-processor machines to enable the new hardware with the same licenses. Possible alternatives (not diagrammed) include the following:

- If you do not want to retire any machines, four more ESX Server processor license purchases are required.
- If you want to add the 4 processor machine to the VMotion cluster, you need four additional licenses for a total of eight processor licenses for VMotion.
- If you want to keep all four dual-processor hosts, add the 4-processor host, and license them all for VMotion, you need twelve total ESX Server processor licenses and twelve total VMotion processor licenses.

NOTE Refer to [Table 2-1, “Supported Processor Configurations,”](#) on page 28 for details on the maximum number of supported processors per host.

Many features can be enabled with ESX Server host licensing. VMware offers enhanced features by way of add-on licenses. A VirtualCenter Server is required for many of the enhanced features such as VMotion, VMware DRS, and VMware HA.

The next section describes differences between the features of ESX Server standard and VirtualCenter add-on licensing.

Per-Feature Licensing

There are two types of per-feature license keys:

- [ESX Server License Keys \(License Server-Based and Host-Based\)](#)
- [VirtualCenter License Keys \(License Server-Based Only\)](#)

ESX Server License Keys (License Server-Based and Host-Based)

ESX Server features are licensed to an individual host but are transferable. The host can acquire these licenses from a license server or from a file stored on the host:

- **ESX Server license type** – To power on a virtual machine, a host must have licensing on a per-processor basis. This means a dual-processor host requires two matching ESX Server licenses. A four-processor machine requires four matching

ESX Server licenses. For a description of ESX Server license types, see “[ESX Server License Types](#)” on page 48.

- **VMware Consolidated Backup (VCB)** – To leverage the new Consolidated Backup capabilities—and backup of all virtual machines running on an ESX Server host—a VCB license key must be available for each processor within that host. Refer to the *Virtual Machine Backup Guide* for a description of this feature.

These ESX Server features do not require a VirtualCenter Server or a license server.

VirtualCenter License Keys (License Server-Based Only)

A second kind of licensing entitlement covers these VirtualCenter-enhanced features.

- **VirtualCenter Management Server** – To manage your ESX Server hosts, the management server must have a VirtualCenter license key. Unlike ESX Server, VirtualCenter software is licensed “per-instance” instead of by processor count.
- **VirtualCenter Agent for ESX Server** – This agent is installed on a ESX Server host when it is added to your VirtualCenter Management Server. You must have one agent license key for each ESX Server processor to be added to your VirtualCenter Server.
- **VMotion** – To migrate a powered-on virtual machine between hosts, each ESX Server processor involved must have a VMotion license key. For example, if you use VMotion from a dual-processor ESX Server host to another dual-processor host, you must have four VMotion licenses. Refer to the *SAN Configuration Guide* for a description of this feature. Refer to *Basic System Administration* for a description of virtual machine configuration.
- **VMware HA** – To automatically restart virtual machines whose ESX Server host has failed, the VirtualCenter Server must have an HA license key for each ESX Server processor in the HA cluster. Refer to the *Resource Management Guide* for a description of this feature.
- **VMware DRS** – To provide automatic load balancing of virtual machines among hosts, the VirtualCenter Server must have a DRS license key for each ESX Server processor in the DRS cluster. Refer to the *Resource Management Guide* for a description of this feature.

NOTE As a prerequisite, DRS requires appropriate VMotion license keys for all hosts in the DRS cluster.

These enhanced VirtualCenter features require a VirtualCenter Management Server and a license server.

Obtaining License Files

When you purchase VMware Infrastructure, you receive an email from VMware containing instructions on how to redeem your licenses and obtain license files. Follow the instructions contained in the email to access the Web-based license activation portal and obtain license files.

For additional information on the license activation process, see the license activation portal online Help.

Setting Up License Server-Based Licensing

You can configure license server-based licensing at installation time. After installation, you can make changes to licensing through the Virtual Infrastructure Client. This section discusses:

- [“Installing the License File”](#) on page 40
- [“Location of the License Server”](#) on page 40
- [“Configuring License Server-Based Licensing”](#) on page 41
- [“License Server Availability”](#) on page 43

Installing the License File

When you receive email containing your license keys, save them in a text file. Use the name `vmware.lic` on a file system you can access from your Virtual Infrastructure (VI) Client.

NOTE	The file extension <code>.lic</code> is required.
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You can then import this file into your license server during installation:

- See [“Installing the VirtualCenter Server”](#) on page 63 for instructions regarding the recommended license server installation.
- See [“Installing the License Server”](#) on page 54 for instructions on the standalone license server.

Location of the License Server

VMware strongly recommends that you follow the default installation and place your license server on the same machine as your VirtualCenter Server. This has the advantage of simplicity of setup, as well as guaranteeing VirtualCenter-to-license

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server communications. Change this only if you have a good reason, such as an existing FlexNet license server. To access the license server documentation, choose:

Start > Programs > VMware > VMware License Server > VMware License Server User Guide.

Configuring License Server-Based Licensing

The first procedure in this section describes VirtualCenter license server-based licensing configuration. If your environment used the default VirtualCenter installation, or if you have no VirtualCenter Server, go directly to [“To configure license server-based licensing for an ESX Server host”](#) on page 42.

To configure license server-based licensing for VirtualCenter Server

- 1 From the VI Client, choose **Administration > Server Settings**.
- 2 Click **License Server** in the list on the left.
- 3 Select the **Use the Following License Server** radio button.
- 4 Enter the machine name and, optionally, a port in the field.

If you do not specify a port, the default port, 27000, is used.

For example, with the default license server port 27000 on a license server called license, your entry might look like this:

```
license.vmware.com:27000
```

- 5 (Optional) If you do not want VirtualCenter to override the host's current license setting, deselect the check box for **Change host license server settings to match VirtualCenter's setting when they are added to inventory**.

Selecting this check box causes VirtualCenter Server to override the host's current license setting and instead use the license server used by VirtualCenter.

- 6 Click **OK** to save your changes.

You do not have to change any other settings to enable license server-based licensing.

The total number of licenses consumed and available on the license server are summarized on the **Licenses** tab in the **Admin** view of the VI Client connected to the VirtualCenter Server. This tab was labeled "License Viewer" in earlier versions of VirtualCenter.

NOTE If you did not select the check box for the optional setting, follow the procedure in the next section to manually configure ESX Server hosts to use license server-based licensing.

To configure license server-based licensing for an ESX Server host

- 1 From the VI Client, select the host in the inventory.
- 2 Click the **Configuration** tab.
- 3 To set the license server:
 - a Click **Edit** to the right of **License Sources**.
The License Sources dialog box appears.
 - b Select the radio button for **Use License Server**.
This is the default configuration.
 - c Enter the license server machine name and, optionally, a port into the **Address** field. If you do not specify a port, the default port, 27000, is used.

For example, with the default license server port 27000 on a license server called `license-1`, your entry might look like this:

`license-1.vmware.com:27000`
 - d Click **OK** to close the dialog box and save your changes.
- 4 Set the ESX Server License Type:
 - a Click **Edit** to the right of **ESX Server License Type**.
The ESX Server License Type dialog box appears.
 - b Select either **Starter** or **Standard** license types, or select **Unlicensed** to release this host's licenses back to the license server.

For more information on license types, see [“ESX Server License Types”](#) on page 48.
 - c Click **OK** to close the dialog box and save your changes.
- 5 To configure add-on licenses:
 - a Click **Edit** to the right of **Add-Ons**.
The Add-Ons dialog box appears.
 - b Select the add-ons you want to license, and click **OK**.

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The total number of licenses consumed and available on the license server are summarized on the **Licenses** tab in the **Admin** view of the VI Client connected to the VirtualCenter Server. This tab was labeled "License Viewer" in earlier versions of VirtualCenter.

Changing the Default License Server Ports

By default, VirtualCenter and ESX Server software is configured to use TCP/IP ports 27000 and 27010 to communicate with the license server. If you did not use the default ports during license server installation, you must update the configuration on each ESX Server host.

If you change the default ports for the license server, log on to the ESX Server host service console and open the ports you want.

To open a specific port in the service console firewall

- 1 Log on to the service console as the root user.
- 2 Execute this command:

```
esxcfg-firewall --openport <portnumber>,tcp
```

License Server Availability

The server-based licensing mechanisms used by VMware software are designed to prevent the license server from being a single point of failure. If your license server stops being available, all VirtualCenter licensed features continue to operate indefinitely, relying on a cached version of the license state. For ESX Server licensed features, there is a 14-day grace period during which hosts continue operation, relying on a cached version of the license state, even across reboots. After the grace period expires, certain ESX Server operations, such as powering on virtual machines, become unavailable.

During the grace period, when the license server is unavailable, the following operations are unaffected:

- **Virtual machines** continue to run. Virtual Infrastructure Clients can configure and operate virtual machines.
- **VirtualCenter Server** continues to run. Host inventory does not change. You can connect to any ESX Server host in the VirtualCenter inventory for operation and maintenance.
- **ESX Server hosts** continue to run. Connections to the VirtualCenter Server remain. VI Clients can operate and maintain virtual machines from their host even if the VirtualCenter Server connection is also lost.

- **Licensed add-ons, such as VMotion and DRS**, continue for management server and host operations. Clusters for VMotion and DRS remain operational.

During the grace period, restricted operations include:

- Adding hosts to the VirtualCenter inventory. You cannot change host VirtualCenter agent licenses.
- Adding or removing hosts from a cluster. You cannot change host membership for the current VMotion, HA, or DRS configuration.
- Adding or removing license keys.

When the grace period has expired, cached license information is no longer stored. As a result, the following operations are affected:

- **Virtual machines** can no longer be powered on. Running virtual machines continue to run but cannot be rebooted.

When the license server becomes available again, hosts automatically reconnect to the license server. No rebooting or manual action is required to restore license availability. The grace period timer is automatically reset whenever the license server becomes available again.

[Table 3-1](#) displays licensed operations permitted while the license server is unavailable.

Table 3-1. Permitted Licensed Operations When the License Server Is Unavailable

Component	Attempted Action	During Grace Period	After Grace Period Expires
Virtual machine	Power on	Permitted	Not Permitted
	Create/delete	Permitted	Permitted
	Suspend/resume	Permitted	Permitted
	Configure virtual machine with VI Client	Permitted	Permitted
ESX Server host	Continue operations	Permitted	Permitted
	Power on/power off	Permitted	Permitted
	Configure ESX Server host with VI Client	Permitted	Permitted
	Modify license file for host-based licensing	Permitted	Permitted

Table 3-1. Permitted Licensed Operations When the License Server Is Unavailable (Continued)

Component	Attempted Action	During Grace Period	After Grace Period Expires
VirtualCenter Server	Remove an ESX Server host from inventory (see next entry)	Permitted	Permitted
	Add an ESX Server host to inventory	Not Permitted	Not Permitted
	Connect/reconnect to an ESX Server host in inventory	Permitted	Permitted
	Move a powered-off virtual machine between hosts in inventory (cold migration)	Permitted	Permitted
	Move an ESX Server host among folders in inventory	Permitted	Permitted
	Move an ESX Server host out of a VMotion-DRS-HA cluster (see next entry)	Permitted	Permitted
	Move an ESX Server host into a VMotion-DRS-HA cluster	Not Permitted	Not Permitted
	Configure VirtualCenter Server with VI Client	Permitted	Permitted
	Start VMotion between hosts in inventory	Permitted	Permitted
	Continue load balancing within a DRS cluster	Permitted	Permitted
	Restart virtual machines within the failed host's HA cluster	Permitted	Not Permitted
Any component	Add or remove license keys	Not Permitted	Not Permitted
	Upgrade	Not Permitted	Not Permitted



CAUTION Performing some permitted actions while the license server is unavailable can cause licenses to be removed until the license server becomes available again. For example, if you remove the network adapter associated with VMotion while the license server is unavailable, that VMotion license becomes unavailable until the license server is available again. Removing a host from the VirtualCenter inventory or removing a host from a cluster has a similar effect.

VirtualCenter Server uses a “heartbeat” mechanism to check whether the license server is reachable and to see if there have been any changes in the license file. The heartbeat interval is five minutes. Therefore, it might take VirtualCenter Server as long as five

minutes to detect if there are license changes or if the license server has become unavailable.

When the license server becomes unavailable, or if a change in the license file causes a checked-out license to be removed, VirtualCenter Server marks the affected licenses as “Unlicensed Use”, and the licensed features continue to operate as described above. When the license server becomes available again, or when licenses are re-added to the license file, VirtualCenter Server checks out the licenses again and reverts them to the Licensed state. If a license cannot be checked out, the license remains in the Unlicensed Use state.

To maximize license server availability in your environment, VMware recommends one of the following strategies:

- Install the license server on the same machine as the VirtualCenter Server. This is the default option provided by the VirtualCenter installer.
- Install the license server in a virtual machine, and place that virtual machine in an HA cluster.

Setting Up Host-Based Licensing

Host-based licensing requires a valid license file on each ESX Server host. This section discusses the following host-based licensing topics:

- [“Configuring an ESX Server Machine for Host-Based Licensing”](#) on page 46
- [“Host-Based and License Server-Based Machines in the Same Environment”](#) on page 47

Configuring an ESX Server Machine for Host-Based Licensing

When you receive email containing your license keys, save them in a text file. Use the name `vmware.lic` on a file system you can access from your Virtual Infrastructure (VI) Client.

NOTE The file extension `.lic` is required.

To use the VI Client to configure host-based licensing

- 1 From the VI Client, select the host in the inventory.
- 2 Click the **Configuration** tab.
- 3 Click **Edit** to the right of **License Sources**.

The License Sources dialog box appears.

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- 4 Select the radio button for **Use Host License File**.
- 5 Click **Browse** and locate the license file.

This file must be located on the client machine, not on the ESX Server host.

NOTE Files must have a `.lic` extension appear in the file browser.

- 6 Click **OK** to save your changes.

Host-Based and License Server-Based Machines in the Same Environment

Using host-based licenses for ESX Server features and license server-based licensing for VirtualCenter features in the same environment is permitted. However, doing so requires changes to the default VirtualCenter configuration settings. If you do not change the VirtualCenter settings, the settings can override host-based license files:

- When the VirtualCenter Server restarts
- When the host-based ESX Server machines are added to inventory again

Any host-based license file on the ESX Server machine remains unchanged but ignored



WARNING If you restore an ESX Server machine to host-based licensing without changing the VirtualCenter default configuration, you can experience unexpected behavior.

To change VirtualCenter settings to allow host-based ESX Server licensing

- 1 From the VI Client, choose **Administration > Server Settings**.
- 2 Click **License Server** in the list on the left.
- 3 Deselect the check box for **Change host license server settings to match VirtualCenter's setting when they are added to inventory**.
- 4 Click **OK** to save your changes.
- 5 **Remove** and **Add** any affected ESX Server machine in the inventory.

Now it is safe to reconfigure host-based licensing on any changed ESX Server machines. See [“Configuring an ESX Server Machine for Host-Based Licensing”](#) on page 46.

Configuring Licensing for a Mixed ESX Server 2.x and ESX Server 3.x Environment

You can use VirtualCenter Server 2.0 to manage a mixed environment of both ESX Server 2.x and ESX Server 3.x hosts. Licensing for the ESX Server 2.x hosts in the mixed environment should be configured as follows:

- Licensing for ESX Server 2.x and Virtual SMP remains linked to serial numbers associated with each host.
- Licensing for VirtualCenter-specific features such as the VirtualCenter Management Server, VirtualCenter Management Agents, and VMotion, must be licensed using new VI3 license files on a license server.

You can obtain both ESX Server 2.x serial numbers and VI3 license files for your environment from the Web-based license redemption portal.

ESX Server License Types

When you purchased your VMware Infrastructure software, you purchased one of three available editions, which are:

- **VMware Infrastructure Starter edition** – Provides virtualization for the small business and branch office environments. Its limited production-oriented features include:
 - NAS or local storage
 - Deployable on a server with up to four physical CPUs and up to 8GB physical memory
- **VMware Infrastructure Standard edition** – Provides an enterprise-class virtualized infrastructure suite for any workload. All standard functionality is enabled, and all optional add-on licenses (purchased separately) can be configured with this edition. Includes all production-oriented features, such as:
 - NAS, iSCSI, and SAN usage
 - Up to four-way Virtual SMP
- **VMware Infrastructure Enterprise edition** – Provides an enterprise-class virtualized infrastructure suite for the dynamic data center. It includes all the features of VMware Infrastructure Standard edition, and also includes all optional add-on licenses.

These three VMware Infrastructure editions correspond to two license types for ESX Server:

- **ESX Server Standard** – This license type includes full access to the full feature set of ESX Server version 3. All standard functionality is enabled and all optional add-on licenses can be configured with the standard license type. If you have purchased either VMware Infrastructure Standard edition or VMware Infrastructure Enterprise edition, select this license type when configuring your host.
- **ESX Server Starter** – This license type includes limited access to the feature set of ESX Server version 3. Certain standard functionality is disabled or available only with an optional add-on license, at additional cost. Some optional add-on licenses cannot be configured with the starter license type. If you have purchased VMware Infrastructure Starter edition, select this license type when configuring your host .

The following tables compare and describe the specific feature entitlement for each license type.

The exact capabilities of ESX Server software vary by license type. [Table 3-2](#) displays ESX Server features arranged by license type.

Table 3-2. License Type Features for ESX Server Machines

Feature	ESX Server Standard	ESX Server Starter
Maximum number of virtual machines	Unlimited	Unlimited
SAN support	Yes	Not available
iSCSI support	Yes	Not available
NAS support	Yes	Yes
Virtual SMP™ support	Yes	Not available
VMware Consolidated Backup (VCB)	Add-on ¹	Not available

1. This is an optional feature available at additional cost.

The add-ons available to VirtualCenter software also depend on the ESX Server edition license, as described in [Table 3-3](#).

Table 3-3. VirtualCenter Server Add-Ons by License Type

Feature	ESX Server Standard	ESX Server Starter
VirtualCenter Management Agent	Yes	Yes
VMotion	Add-on ¹	Add-on ¹

Table 3-3. VirtualCenter Server Add-Ons by License Type

Feature	ESX Server Standard	ESX Server Starter
VMware HA	Add-on ¹	Add-on ¹
VMware DRS	Add-on ¹	Add-on ¹

1. This is an optional feature available at additional cost.

License File

Both server-based and host-based operation require license files. This section contains the following topics:

- [“License File Contents”](#) on page 50
- [“License File Locations”](#) on page 51
- [“Editing the License File”](#) on page 52
- [“Sample License File”](#) on page 53

NOTE VMware recommends that you use the Virtual Infrastructure Client to install licenses. Editing the license file is required only when you increase your entitlement by purchasing new license keys.

License File Contents

License files are text files containing two types of information: license mode and license keys.

- **License mode** – The first data appearing in a license file is license mode information. Mode determines whether the license keys can be served on a license server or must be stored on a host. See [“Host-Based and License Server-Based License Modes”](#) on page 34. This mode section is an empty placeholder in host-based license files.

This section also specifies the TCP/IP ports used by the license server to communicate with ESX Server hosts. If you want to modify these default ports, you can do so by editing this section.

- **License key** – After the mode data, the file contains encrypted license keys, one for each feature to which you are entitled. See [“License Key Functionality”](#) on page 37 for a complete description.

License File Locations

A license file resides on every license server and every ESX Server machine:

- **Host-based license files** configured through the VI Client are placed at the following location. To add new licenses, edit the license file and re-upload the new file.

`/etc/vmware/vmware.lic`

NOTE In server-based mode, this file exists but contains no license keys.

- **Server-based license files** configured through the VI Client are placed at the following location on the machine running the VMware license server.

`C:\Program Files\VMware\VMware License Server\vmware.lic`

NOTE In VirtualCenter 2.0, the default location of the license file was `C:\Documents and Settings\All Users\Application Data\VMware\VMware License Server\vmware.lic`. This has been changed in VirtualCenter 2.0.1.

You can change the location of your license server-based license file using VMware License Server Tools.

To change the location of the license file

- 1 On the computer on which the license server application is installed, launch VMware License Server Tools by choosing **Start > Programs > VMware > VMware License Server > VMware License Server Tools**.
- 2 Click the **Config Services** tab.
- 3 Click **Browse** next to the Path to license file field, and choose a new license file.
- 4 Click the **Start/Stop/Reread** tab.
- 5 Click **Stop**.
- 6 Click **Start**.
- 7 Click **ReRead License File** to load the new license file.

NOTE During license server installation, the installer copies the contents of the license file you select to `C:\Program Files\VMware\VMware License Server\vmware.lic`. If you subsequently use VMware License Server Tools to change the license file, the license server uses the new location specified for the license file. VMware License Server Tools does not copy the new license file to `C:\Program Files\VMware\VMware License Server\vmware.lic`.

To add new licenses, edit the license file and restart the VMware license server.

Refer to [Figure 3-1, “License File Locations in Host-Based, Mixed, and License Server-Based Environments,”](#) on page 35 for a visual representation.

Editing the License File

To add new license keys, use a text editor to edit your license file .

License-File Editing Tips

When editing your license file, keep in mind the following tips:

- Back up your license file before you edit it.
- Do not directly edit the license file. Download a copy of the license file to another computer, make your changes, and re-upload the license file using the VI Client or VirtualCenter interface.
- Do not duplicate or delete the block of license mode information at the top of the file.
- When copying and pasting a license feature into the license file, be sure to select the entire block of feature information, which spans several lines. Incomplete feature entries are ignored.
- Do not edit the license file to change between server-based and host-based licensing. Use the VI Client to reconfigure licensing mode changes.
- Do not combine host-based and license server-based licensing information in a single file. The license file will not work. A single license file can contain either host-based or license server-based license information.

Activating an Edited License File

To activate an edited license file, you must do one of the following tasks:

- License server-based – Restart the license server Windows service.
- Host-based – Reload the license file with the VI Client, or reboot the ESX Server host.

To restart the license server Windows Service

The following sequence is for Windows 2000 Professional. The menus and commands for other versions of Windows can vary.

- 1 Choose **Start > Settings > Control Panel**.
- 2 Double-click **Administrative Tools**.

- 3 Double-click **Services**.
- 4 Scroll down until you can right-click **VMware License Server**.
- 5 Choose **Restart** from the pop-up menu.

To restart the ESX Server host

- 1 Log on to the service console or start an ssh session.
- 2 Type `reboot` and press Enter.

Sample License File

Example 3-1 shows a sample license file, with the license mode and license key sections labeled.

Example 3-1. Sample License File

SERVER this_host ANY 27000 VENDOR VMWARELM port=27010 USE_SERVER	License Mode Empty values for host-based
INCREMENT ESX_FULL_BACKUP VMWARELM 2005.05 22-dec-2010 32 \ VENDOR_STRING=licenseType=production;capacityType=cpuPackage \ ISSUED=21-Dec-2005 NOTICE=FulfillmentId=307 SIGN="0354 DA0C \ 8DEC 0E06 E589 225C 5C7C BF3D 2CE7 C286 278D 5F5B 72E3 A73A \ 130B 1EFC 6830 1D4C 8BD6 331B F962 1854 F345 56AE B3E1 ACA3 \ 3F05 0E69 3BC7 D8E2"	License Key #1 VMware Consolidated Backup
INCREMENT ESX_FULL_VSMP VMWARELM 2005.05 22-dec-2010 32 \ VENDOR_STRING=licenseType=production;capacityType=cpuPackage \ ISSUED=21-Dec-2005 NOTICE=FulfillmentId=306 SIGN="01A9 133B \ CE95 2C6F BC0B 655C C338 7DFB 99E0 37E4 50DF 5D34 A2C7 E261 \ 42A2 18C0 3044 D1FC 0B06 7057 EECD A197 892F 25FD 60B4 E8C1 \ C4DC 9030 FC52 F8AD"	License Key #2 Virtual SMP
INCREMENT VC_DAS VMWARELM 2005.05 22-dec-2010 32 \ VENDOR_STRING=licenseType=production;capacityType=cpuPackage \ ISSUED=21-Dec-2005 NOTICE=FulfillmentId=312 SIGN="0E67 7096 \ BA2F 4C22 9267 46BB EDD6 B294 189F F590 E787 FD59 50A9 FC59 \ 545C 1AC3 09A9 9DFA EBB1 754A EB8B 2D0E 335F CE15 93AA 1A28 \ 2E6C CC3F 6ACF 9D59"	License Key #3 VMware HA
INCREMENT VC_DRS VMWARELM 2005.05 22-dec-2010 32 \ VENDOR_STRING=licenseType=production;capacityType=cpuPackage \ ISSUED=21-Dec-2005 NOTICE=FulfillmentId=311 SIGN="0068 1798 \ 6390 E449 ABBC 7AFE 27AD 4576 D51E 491D 75FB C762 2EAC 8A23 \ F90D 17BE 6335 34F9 1382 A0FD A8D4 8EC3 07DB 3310 DD46 A196 \ 4C51 0914 79D3 538B"	License Key #4 VMware DRS

Installing the License Server

This section describes a standalone installation of the license server. Use this installer for ESX Server host environments that use no VirtualCenter Management Server.

NOTE VMware strongly recommends the default VirtualCenter Server installation in which the license server is automatically installed on the same machine.

To install the VMware license server software, you must have:

- Hardware that meets “[System Requirements](#)” on page 21
- A static IP address or machine name to be used by your license server

To install a VirtualCenter license server

- 1 As Administrator on the Windows system, double-click the VMware installation icon or choose **Start > Run** and enter the location of the executable—for example, `VMware-licenseserver.exe`—in the Run window.

A splash screen appears. The VirtualCenter license server installer prepares to install the components.

The Welcome page appears.

- 2 Verify you are installing the license server, and click **Next**.

The License Agreement page appears.

- 3 Read the license agreement, click the **Accept** button, and click **Next**.

The Customer Information page appears.

- 4 Enter your user name and company name. Click **Next**.

The Destination Folder page appears.

- 5 Select the folder in which you want to install the license server. Click **Next**.

The Licensing page appears.

- 6 Select the text file containing your license keys:
 - a Locate the email you received from VMware containing your license keys. Save this email as a text file on a drive you can reach from the installer.
 - b Type the location of the license file, or click **Browse** to locate this file.
 - c Click **Next** to continue.
- 7 Click **Install** to begin the installation.

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at the end
of this book.

A progress dialog box appears. Installation might take a few minutes.

- 8 Click **Finish** to complete the license server installation.

Installing VMware VirtualCenter

4

This chapter describes how to install VMware VirtualCenter components on your system. This chapter contains the following topics:

- [“Preparing the VirtualCenter Server Database”](#) on page 57
- [“Installing the VirtualCenter Server”](#) on page 63
- [“Installing the Virtual Infrastructure Client”](#) on page 68
- [“Configuring Communication Between VirtualCenter Components”](#) on page 69
- [“Uninstalling VirtualCenter Components”](#) on page 71

Preparing the VirtualCenter Server Database

VMware VirtualCenter Server requires a database to store and organize server data. VirtualCenter version 2 server supports Oracle, SQL Server, and Microsoft MSDE.

The VirtualCenter Management Server requires administration credentials (ID and password) to log on to an Oracle or SQL database. Contact your DBA for these credentials, or install the demonstration MSDE database for product testing.

NOTE MSDE is not supported for production environments. You must use an Oracle or SQL database to receive enterprise support.

The database topics are covered in the following sections:

- [“Configuring Your VirtualCenter Database”](#) on page 58
- [“Maintaining Your VirtualCenter Database”](#) on page 63

Configuring Your VirtualCenter Database

Database configuration is covered in the following sections:

- [“Configuring an Oracle Connection to Work Locally”](#) on page 58
- [“Configuring an Oracle Connection to Work Remotely”](#) on page 59
- [“Configuring a SQL Server ODBC Connection”](#) on page 59
- [“Configuring Microsoft SQL Server Desktop Engine \(MSDE\)”](#) on page 62

NOTE VMware does not support MSDE for production use. MSDE is meant to be used only for test and evaluations.

Configuring an Oracle Connection to Work Locally

To use an Oracle database as your VirtualCenter database and have VirtualCenter access the database locally, use the following procedure.

To prepare an Oracle database to work locally with VirtualCenter

- 1 From the Oracle database machine, install and prepare Oracle:
 - a Download Oracle 9i or Oracle 10g from the Oracle Web site, install it, and create a database (VirtualCenter).
 - b Download Oracle ODBC from the Oracle Web site.
 - c Install the Oracle ODBC corresponding driver through the Oracle Universal Installer (directions are provided with the driver).
 - d Increase the number of open cursors for the database. Add the entry `open_cursors = 300` to the `C:\Oracle\ADMIN\VPX\pfile\init.ora` file.
- 2 Connect Oracle locally:
 - a Create a new tablespace specifically for VirtualCenter using the following SQL statement:


```
CREATE TABLESPACE vpx DATAFILE 'C:\Oracle\ORADATA\VPX\vpv.dat' SIZE 500M;
```
 - b Create a user, such as `vpvAdmin`, for accessing this tablespace through ODBC:


```
CREATE USER vpxAdmin IDENTIFIED BY vpxadmin DEFAULT TABLESPACE vpx;
```
 - c Give that user `CONNECT` and `DBA` privileges:


```
GRANT CONNECT, DBA to vpxAdmin;
```

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at the end
of this book.

- d Create an ODBC connection to the database. The following are example settings:

```
Data Source Name: VMware VirtualCenter
TNS Service Name: VPX
User Id: vpxAdmin
```

Configuring an Oracle Connection to Work Remotely

To use an Oracle database as your VirtualCenter database and have VirtualCenter access the database remotely, use the following procedure.

To prepare an Oracle database to work remotely with VirtualCenter

- 1 Install the Oracle client on the VirtualCenter Server machine.
- 2 Connect to Oracle remotely:
 - a Download and install the ODBC driver.
 - b Edit the `tnsnames.ora` file located at `Ora9I` or `10g`, as appropriate.

```
C:\Oracle\Ora9I\NETWORK\ADMIN
```

In this example, xx is either `9I` or `10g`.

- c Use the Net8 Configuration Assistant to add the following entry:

```
VPX =
(DESCRIPTION =
(ADDRESS_LIST =
(ADDRESS=(PROTOCOL=TCP) (HOST=vpxd-Oracle) (PORT=1521))
)
(CONNECT_DATA =
(SERVICE_NAME = VPX)
)
)
HOST =
```

In this example, `HOST` is the managed host to which the client needs to connect.

Configuring a SQL Server ODBC Connection

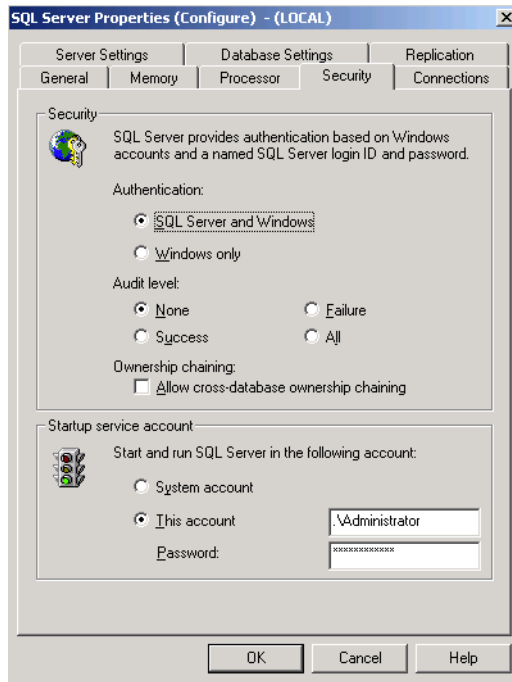
When you install VirtualCenter Server, you have the option to establish a connection with a SQL Server database. The following procedure describes how to configure a SQL Server ODBC connection.

Refer to your Microsoft SQL ODBC documentation for specific instructions regarding configuring the SQL Server ODBC connection.

NOTE Microsoft Windows NT authentication is not supported with remote SQL Server.

To prepare a SQL Server database to work with VirtualCenter

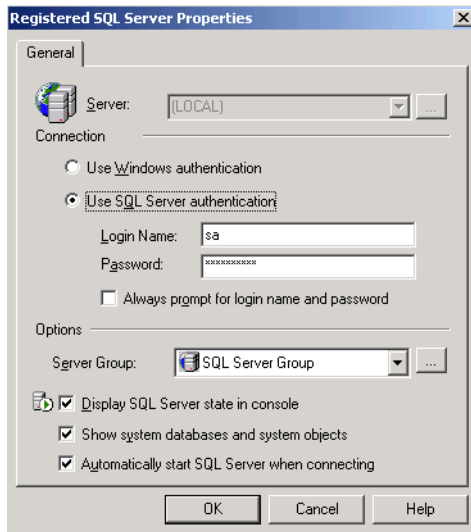
- 1 On your Microsoft SQL Server, perform the following:
 - a Create a SQL Server database using Enterprise Manager on the SQL Server.
 - b Create a SQL Server database user with database operator (DBO) rights.
 The default database for the DBO user is what you defined in [Step a](#).
- 2 On your VirtualCenter Server, open the Windows ODBC Data Source Administrator.
- 3 Select **Settings > Control Panel > Administrative Tools > Data Sources (ODBC)**.
- 4 Select the **System DSN** tab.
- 5 To modify an existing SQL Server ODBC connection:
 - a Select the appropriate ODBC connection from the **System Data Source** list. Click **Configure**.
 - b Proceed with [Step 7](#).
- 6 To create a new SQL Server ODBC connection:
 - a Click **Add**.
 - b Select **SQL Server**, and click **Finish**.
- 7 Type an ODBC DSN name in the **Name** field.
 For example, type VMware VirtualCenter.
- 8 (Optional) Type an ODBC DSN description in the **Description** field.
- 9 Select the server name from the **Server** drop-down menu.
 Type the SQL Server machine name in the text field if you cannot find it in the drop-down menu.
- 10 Click **Next**.
- 11 Select one of the authentication methods:
 - If you are using local SQL Server, select **Windows NT authentication**. Windows NT authentication, also known as “trusted authentication,” is supported only if the SQL Server is running on the same system as VirtualCenter Server.
 - If you are using remote SQL Server, select **SQL Server authentication**. Windows NT authentication is not supported on remote SQL servers.



To identify the authentication type

- a Open SQL Server Enterprise Manager.
- b Click the **Properties** tab to view properties.
- c Check the mode.

The mode indicates either Windows NT or SQL Server authentication type.



- 12 Type your SQL Server login name and password.
Ask your database administrator for this information.
- 13 Click **Next**.
- 14 Select the database created for VirtualCenter from the **Change the default database to** menu, and click **Next**.
- 15 Click **Finish**.
- 16 From the **ODBC Microsoft SQL Server Setup** menu, choose **Test Data Source**.
If the test data source is acceptable, click **OK**. If it is not acceptable, return and reconfigure any incorrect items.
- 17 To close the ODBC Data Source Administrator, click **Close**.

Configuring Microsoft SQL Server Desktop Engine (MSDE)

The MSDE database package is installed and configured when you select MSDE as your database during VirtualCenter installation or upgrade. This is shown in [“Installing the VirtualCenter Server”](#) on page 63. No additional configuration is required.

MSDE is compatible with Microsoft SQL Server, supports up to 25 concurrent users, and is limited to 2GB of data. Documentation is also available from Microsoft at the following Web site:

<http://www.microsoft.com/downloads/details.aspx?FamilyID=413744d1-a0bc-479f-bafa-e4b278eb9147&DisplayLang=en>

NOTE VMware does not support MSDE for production use. MSDE is meant to be used only for test and evaluations. MSDE replaces Microsoft Access as the low-end demonstration database.

Maintaining Your VirtualCenter Database

After your VirtualCenter database instance and VirtualCenter are installed and operational, perform standard database maintenance processes. These include:

- Monitoring the growth of the log file and compacting the database log file, as needed. Refer to the documentation for the database type you are using.
- Scheduling regular backups of the database.
- Backing up the database before any VirtualCenter upgrade.

Refer to your database documentation for more information on backing up your database.

Installing the VirtualCenter Server

This section describes how to install the VirtualCenter Server on your system when no previous VirtualCenter installation is present. To upgrade an existing VirtualCenter Server, see “[Upgrading VirtualCenter](#)” on page 133.

Components Installed

The VMware VirtualCenter version 2 default installation includes the following components:

- VMware VirtualCenter Server – A Windows service to manage ESX Server hosts.
- Microsoft .NET Framework – Software used by the VirtualCenter Server, Database Upgrade wizard, and the Virtual Infrastructure Client.
- VMware VI Web Access – A Web application to allow browser-based virtual machine management.
- VMware Web Service – A software development kit (SDK) for VMware products.
- VMware license server – A Windows service allowing all VMware products to be licensed from a central pool and managed from one console.

The last three components are optional if you select a custom setup type in [Step 7](#).

VirtualCenter Server Installation Procedure

Before installing VirtualCenter Server software, do the following:

- Ensure that your hardware meets [“System Requirements”](#) on page 21.
- Create a VirtualCenter database. See [“Preparing the VirtualCenter Server Database”](#) on page 57. If you have not previously configured a database, you cannot install VirtualCenter Server.
- Obtain and assign a static IP address and host name to the Windows server that will host VirtualCenter Server and the license server. This IP address must have a valid (internal) DNS registration that resolves properly from all managed ESX Server hosts. For best results, ensure that the Windows server name is exactly the same as the DNS host name.
- If an existing license server will be used, obtain the host name or IP address. Otherwise, install a license server during VirtualCenter Server installation.
- If you are installing a license server, you need a valid served license file. See [“Obtaining License Files”](#) on page 40.

To install a VirtualCenter Server

- 1 As Administrator on the Windows system, insert the installation CD. When the VMware VirtualCenter Install menu is displayed, click **VirtualCenter Management Server**.

If the VMware VirtualCenter Install menu is not displayed, double-click the autorun.exe icon, and click **VirtualCenter Management Server**.

A splash screen appears. The VirtualCenter Server installer prepares to install the components.

NOTE If a dialog box appears with **Modify**, **Repair**, or **Remove**, the installer has detected a previous VirtualCenter installation. You must follow the procedures described in [“Upgrading the VirtualCenter Server”](#) on page 136.

- 2 Install Microsoft .NET Framework version 1.1.

If you do not have Microsoft .NET Framework version 1.1 on your machine, a prompt appears to ask if you want to install it. Click **Yes**.

The VirtualCenter Server installer installs Microsoft .NET Framework version 1.1. If you have an older version, the VirtualCenter installer upgrades your version to version 1.1.

For more information on .NET Framework 1.1, see msdn.microsoft.com/netframework/technologyinfo/.

The Welcome page appears.

- 3 Verify that you are installing VirtualCenter Server, and click **Next**.

The license agreement appears.

- 4 Select **I accept the terms in the license agreement**, and click **Next**.

The Customer Information page appears.

- 5 Type your user name and company name, and click **Next**.

The Destination Folder page appears.

- 6 Accept the default folder, or click **Browse** to select the folder in which you want to install the VirtualCenter Server, and click **Next**.

The Setup Type page appears.

- 7 Select the type of setup:

- **Typical** – Select this option for a quick installation using the default settings.
- **Custom** – Select this option to configure all details of your installation.

The VMware VirtualCenter Database page appears.

- 8 Select the option corresponding with the database you previously configured in [“Preparing the VirtualCenter Server Database”](#) on page 57, and click **Next**.

The Database Information page appears.

NOTE If you have not previously configured a supported database, you must install a MSDE database or cancel the installation (and install or configure a supported database). If no supported database is available, the VirtualCenter installer cannot continue.

- 9 Enter your database connection information:

- a Type the data source name (DSN) associated with your database.

This must be a system DSN.

- b If your database is a local SQL Server database using Windows NT authentication, leave the user name and password fields blank. Otherwise, type the user name and password associated with the datasource name, and click **Next**.

If your connection fails, a warning appears: “The ‘<DSN_Name>’ DSN does not exist or is not a system DSN. VirtualCenter accepts only system DSNs. Use the ‘ODBC DSN Setup’ button to start the ODBC Data Source Administrator to define it.”

Click **OK** and re-enter your database connection information until you can continue. If you have trouble, see “[Preparing the VirtualCenter Server Database](#)” on page 57.

- 10 Decide how to configure a license server for VirtualCenter Server. If you want to install a license server on the VirtualCenter server machine, continue with [Step 11](#). If you want to use a license server installed elsewhere, continue with [Step 12](#).

NOTE This release does not support upgrading a Flexnet or VMware license server previously installed on this computer. If you have a previously installed license server, this dialog box does not appear. Continue with [Step 13](#).

VirtualCenter Server requires a license server. If you do not want to install a license server on this machine, select **Configure VirtualCenter to use an existing License Server**, even if you have not yet installed the license server elsewhere.

VMware recommends that you install and use a license server on the same machine as your VirtualCenter Server. This ensures the best possible license pool availability.

- 11 To **Install a License Server** on the VirtualCenter Server machine, ensure that you have a license file saved on this machine. Take the following steps:
 - a Select **Install a local VMware License Server**, and click **Next**.
The Licensing Info page is displayed.
 - b Type the location of your saved license file, or click **Browse** to locate this file.
 - c Click **Next** to continue.
 - d Skip to [Step 13](#).
- 12 If you do not want to install a license server on the same machine on which you are installing VirtualCenter, take the following steps:
 - a Select **Configure VMware VirtualCenter Server to use an existing License Server** and click **Next**.
The Licensing Info page is displayed.

- b To configure the network location of your VirtualCenter license server, type the port and host name of your VirtualCenter license server in one of the following formats:

port@hostname — for example, 27000@testserver.vmware.com

port@ip.address — for example, 27000@192.168.123.254

If you have not previously installed a license server, leave the default port entry in place. See [“Installing the License Server”](#) on page 54 for more information.

Click **Next**.

The VirtualCenter Web Service page appears.

- 13 To configure the VirtualCenter SDK Web service:

This dialog box configures the Web service for the VMware Software Development Kit (SDK). This Web service should not be confused with VirtualCenter Server Web server, which provides client downloads and administrative functionality. You will configure the VirtualCenter Server Web server in the next step.

- a Type a Web Service https port. The default is 443.
- b Type a Web Service http port. The default is 80.
- c Type a VirtualCenter diagnostic port. The default is 8083.
- d Type a VirtualCenter port (the port which VirtualCenter uses to communicate with the VI Client). The default is 902.
- e Type a VirtualCenter heartbeat port. The default is 902.
- f Select the check box if you want to maintain compatibility with the older SDK Web interface.
- g Click **Next**.

The VMware VirtualCenter Web Server page appears.

- 14 To configure the VirtualCenter Web server:

- a Verify the TCP/IP port on which you want the Web server to communicate.
- b Select the appropriate check box if you want the Web server to start each time Windows starts.
- c Select the appropriate check box if you want to start the Web server now.
- d Click **Next** when you have completed Web server configuration.

- 15 Click **Install** to begin the installation.

Installation might take a few minutes. Multiple progress bars appear during VMware VirtualCenter Server installation.

- 16 Click **Finish** to complete the VirtualCenter Server installation.

Installing the Virtual Infrastructure Client

This section describes how to install a Virtual Infrastructure (VI) Client on your system when there is no previous VirtualCenter installation.

For upgrading a previous VirtualCenter Client, see [“Upgrading VirtualCenter”](#) on page 133.

NOTE You can install the VI Client on any number of Windows machines. Your licensing agreement does not regulate the number of VI Clients installed.

To install a VI Client on a Windows host

- 1 As Administrator on the Windows system, run the VI Client installer from the CD or download it.

- **From a CD** – Click **Virtual Infrastructure Client** on the VMware VirtualCenter Install menu. Continue with [Step 2](#).
- **From a download** – follow these steps:
 - a Open a Web browser to the URL of a VirtualCenter version 2 Server or ESX Server 3.0 host.
 - b Click the link **Download the Virtual Infrastructure Client**.
 - c Save the file on your hard drive as `VMware-viclient.exe`.
 - d In Windows Explorer, double-click the `VMware-viclient.exe` file.

A splash screen appears. The VirtualCenter VI Client installer prepares to install the components.

- 2 Install Microsoft .NET Framework version 1.1.

If you do not have Microsoft .NET Framework 1.1 on your machine, a prompt appears to ask if you want to install it. Click **Yes**.

The VirtualCenter Client installer installs Microsoft .NET Framework 1.1 on your machine. If you have an older version, the VirtualCenter installer upgrades your version to version 1.1.

For more information on .NET Framework 1.1, see msdn.microsoft.com/netframework/technologyinfo/.

The Welcome page appears.

- 3 Verify you are installing the VI Client, and click **Next**.

The license agreement appears.

- 4 Select **I accept the terms in the license agreement**, and click **Next**.

The Customer Information page appears.

- 5 Type your user name and company name, and click **Next**.

The Destination Folder page appears.

- 6 Accept the default folder, or click **Browse** to select a folder in which to install the VI Client, and click **Next**.

The Ready to Install the Program page appears.

- 7 Click **Install** to begin the installation.

A progress dialog box appears. Installation might take a few minutes.

- 8 Click **Finish** to complete the VirtualCenter Client installation.

Configuring Communication Between VirtualCenter Components

The VirtualCenter Server must be able to send data to every VirtualCenter-managed host and receive data from each VI client. To enable any migration or provisioning activities between VirtualCenter-managed hosts, the source and target hosts must be able to receive data from each other.

During normal operations, VirtualCenter is listening for data from its managed hosts and clients on designated ports. Additionally, VirtualCenter assumes that its managed hosts are listening for data from VirtualCenter on designated ports. If there is a firewall between any of these elements, a hole must be created to allow data transfer to these designated ports.

The following sections describe how to facilitate this communication. For information on SDK communications, refer to the VMware SDK documentation. For a more thorough discussion of firewall configuration, refer to the *Server Configuration Guide*.

The following sections describe communication requirements and options:

- [“Connecting to Your VirtualCenter Server Through a Firewall”](#) on page 70

- [“Connecting to Your Managed Hosts Through a Firewall”](#) on page 70

Connecting to Your VirtualCenter Server Through a Firewall

The default ports that VirtualCenter Server uses to listen for connections from the VI Client are ports 80 and 902. VirtualCenter Server also uses port 443 to listen for data transfer from the VI Web Access Client and other SDK clients.

If you have a firewall between your VirtualCenter Server and its clients, you must configure a means for the VirtualCenter Server to receive data from them.

To enable the VirtualCenter Server to receive data from the VI Client, open ports 80 and 902 in the firewall to allow data transfer from the VI Client to the VirtualCenter Server. To enable VirtualCenter Server to receive data from the VI Web Access Client, open port 443 in the firewall. Consult your firewall system administrator for additional information on configuring ports in a firewall.

If you want the VirtualCenter Server to use a different port to receive VirtualCenter client data, refer to *Basic System Administration*.

If you want to tunnel the VirtualCenter client data through the firewall to the receiving port on the VirtualCenter Server, refer to *Basic System Administration*. This method is not recommended as it disables the VirtualCenter console function.

Connecting to Your Managed Hosts Through a Firewall

The default port that VirtualCenter uses to send data to the managed hosts is port 902.

If you have a firewall between your VirtualCenter Server and VirtualCenter-managed host, you must configure a means for the VirtualCenter Server to send data to the VirtualCenter-managed host.

If you have a firewall between two VirtualCenter-managed hosts and you want to perform any source or target activities, such as migration or cloning, you must configure a means for the managed hosts to receive data.

Managed hosts also send a regular heartbeat over UDP port 902 to VirtualCenter Server. This port must not be blocked by firewalls.

To enable a VirtualCenter-managed host to receive data on the default port

Open port 902 in the firewall to allow data transfer to the VirtualCenter-managed host from the VirtualCenter Server or another VirtualCenter-managed host. Consult your firewall system administrator for additional information on configuring the ports.

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See [Updates](#)
at the end
of this book.

Connecting Hosts with the License Server Through a Firewall

The default ports that the license server uses to communicate with ESX Server hosts are 2700 and 27010. If you are using server-based licensing with your ESX Server hosts, and have a firewall between your ESX Server hosts and your license server, open these ports.

These default ports can be changed by editing the license file. See [“Editing the License File”](#) on page 52. After changing the ports, open the new ports you have chosen in the firewall. Consult your firewall system administrator for additional information on configuring the ports. For information on configuring the ESX Server firewall, see the *Server Configuration Guide*.

Where to Go Next

- [“Installing VMware ESX Server Software”](#) on page 75

Uninstalling VirtualCenter Components

The VI Client and VirtualCenter Server are uninstalled separately, even if they are on the same machine. You must have Administrator privileges to uninstall the VirtualCenter component.



WARNING If you try to uninstall the VirtualCenter Server while it is running, you must confirm that you want to take action. Uninstalling in this way causes a disruption to any VirtualCenter clients connected to the service. This can cause data loss.

Uninstalling the VirtualCenter components does not uninstall the .NET framework. Do not uninstall the .NET framework if you have other applications on your system that depend upon it.

There are two methods of uninstalling a VirtualCenter component: using the Windows Add/Remove Tool, and using the VirtualCenter installer. You can also uninstall the VI Client using the VirtualCenter installer.

To uninstall VirtualCenter Server or the VI Client using the Add/Remove Programs Tool

- 1 As Administrator on the Windows system, choose **Start > Settings > Control Panel > Add/Remove Programs**.
- 2 To select a VirtualCenter component:
 - a Scroll through the list of installed programs.
 - b Select the VirtualCenter component to remove.
 - c Click **Remove**.
- 3 Click **Yes** to confirm that you want to remove the program.
- 4 Click **Finish**.

The VirtualCenter component is now removed.

To uninstall VirtualCenter Server using the installer

- 1 As Administrator on the Windows system, insert the installation CD. When the VMware VirtualCenter Install menu is displayed, click **VirtualCenter Management Server**.

If the VMware VirtualCenter Install menu is not displayed, double-click the autorun.exe icon, and click **VirtualCenter Management Server**.

A splash screen appears. The VirtualCenter Server installer prepares to modify, repair, or remove the components.

The Welcome page appears.

- 2 Click **Next**.

The Program Maintenance page appears.
- 3 Select **Remove**, and click **Next**.

The Remove the Program page appears.
- 4 Click **Remove** to uninstall VirtualCenter Server.

A progress bar is displayed. When the removal is complete, the Uninstall Completed page appears.
- 5 Click **Finish**.

VirtualCenter Server is now uninstalled.

To Uninstall the VI Client Using the Installer

- 1 As Administrator on the Windows system, double-click the VMware installation icon, or choose **Start > Run** and enter the location of the installer in the Run window.

The Welcome page appears.

- 2 Verify that you are using the VirtualCenter Installer, and click **Next**.

The Program Maintenance page appears.

- 3 Select **Remove**, and click **Next**.

- 4 Verify that you are ready to proceed with uninstallation, and click **Remove**.

VirtualCenter displays a progress screen as it proceeds with the uninstallation.

- 5 Click **Finish** to close the installation wizard.

The VirtualCenter client is now removed.

Installing VMware ESX Server Software

5

This chapter describes how to install and configure ESX Server. See the following topics:

- [“Preparing to Install”](#) on page 75
- [“Installing ESX Server”](#) on page 77
- [“Postinstallation Considerations”](#) on page 87
- [“Downloading the Virtual Infrastructure Client”](#) on page 90

Preparing to Install

This section describes the components that are installed during ESX Server installation, describes the two available installation methods. It also details how to select a boot drive for installation.

Installed Components

The VMware ESX Server version 3 installation includes the following components:

- VMware ESX Server – Software to manage and serve virtual machines.
- VMware VI Web Access – Software to allow Web browser access to the ESX Server host.

Installation Methods

Two installation modes are available for installing VMware ESX Server software:

- **Graphical mode** – This is a graphical, mouse-based installation program to install or upgrade ESX Server. This is the recommended installation method. See [“Installing ESX Server”](#) on page 77.
- **Text-mode** — This is a text-based interface to install or upgrade ESX Server. Choose this installation method if your video controller, keyboard, or mouse does not function properly using the graphical installer. See [“Installing ESX Server”](#) on page 77.

Using ILO, DRAC, and RSA II

If you use ILO(Integrated Lights-Out) or DRAC (Dell Remote Access Card) to install ESX Server, exercise care when using the virtual CD feature. You might encounter corruption problems if you use this installation method with systems under load. If you must use this method to install ESX Server, run the media test provided by the ESX Server Installer.

Remote installations from an ISO image using DRAC may fail. If this occurs, carry out the remote installation from the physical CD-ROM media.

Do not use the virtual CD feature with RSA (Remote Supervisor Adapter) II to install or upgrade ESX Server.

Installation on IDE or SATA Drives

The installer displays a warning if you attempt to install ESX Server software on an IDE drive or a SATA drive in ATA emulation mode. VMFS is not supported on IDE or SATA. An ESX Server host must have SCSI storage, NAS, or a SAN on which to store virtual machines.

See [“ESX Server Requirements”](#) on page 24 for complete hardware requirements. See [“Datastore Partitioning”](#) on page 181 for a description of partitioning requirements.

LUN Requirements

Although ESX Server supports up to 256 LUNs for operation, the installer supports a maximum of 128 LUNs. If you have more than 128 LUNs, connect them after the installation is complete. The minimum supported LUN capacity for VMFS3 is 1200MB.

An ESX Server host supports only the first 256 LUNs loaded at boot time, as noted in [“Maximum Configuration for ESX Server”](#) on page 27. Your boot volume must be encountered in the first 256 LUNs, or the ESX Server host can hang at startup. If you

have a controller loading 256 LUNs before the boot volume, you must reduce the number of LUNs on that controller to 256 or less.

If you have not yet installed ESX Server software, you can arrange PCI controller cards to determine the desired LUN order.

NOTE VMware recommends that you do not rearrange drive controllers among PCI slots after you have installed the ESX Server software.

If you want an ESX Server host to boot from a SAN, allocate an entire LUN to each ESX Server host. See [“Configuring the ESX Server Host to Boot from a SAN”](#) on page 87 for post-installation configuration. See [“Required Partitions”](#) on page 181 for a description of VMFS.

ESX Server software does not support booting from a shared LUN. If you install ESX Server software onto a shared LUN, you might overwrite the data on the shared LUN.

NOTE You must determine the status of your available LUNs. The installer cannot determine if a LUN is shared.

Before beginning the installation, zone and mask all SAN LUNs away from your server, except those for its use.

Installing ESX Server

Refer to [“Planning a VMware Infrastructure Upgrade”](#) on page 107 if you want to upgrade from a previous ESX Server version.

Prepare for this installation by reading [“Preparing to Install”](#) on page 75.

Navigation in the Installer

To navigate and perform actions in the ESX Server installer, press the Tab key, spacebar, directional arrows, or Enter key. You can:

- Move the highlight between selection fields with the Tab key.
- Make a selection within a field using the arrow keys or by typing a value.
- Press Tab until the highlight is in the **OK** box, and press either the spacebar or Enter key.

ESX Server Installation Procedure

This section describes how to install the ESX Server software on your server machine using either the graphical or text installer.

To install ESX Server

- 1 Verify the network cable is plugged into the Ethernet adapter that you are using for the service console.

The ESX Server installer needs a live network connection to properly detect certain network settings, such as the machine name under DHCP.

- 2 Power on the machine with the VMware ESX Server CD in the CD drive.

The ESX Server begins its boot process until the mode selection page appears.



If this page does not appear:

- a Reboot the machine.
 - b Press the key required to enter your machine's BIOS Setup page.
This key is often F1, F2, or F10.
 - c Set the CD drive as the first boot device.
 - d Reboot the machine.
- 3 Press Enter to start the graphical installer, or type **esx text** and press Enter to start the text installer.

A series of installation messages scroll past until the CD Media Test page appears.

- 4 Click **Test** to have the installer inspect the installation CD media for errors.
 - If you click **Skip**, continue now with [Step 5](#).

- If you click **Test**, a progress bar appears. The CD media is being tested for errors. When testing is complete, a Media Check Result dialog box appears. Click **OK**.

The Welcome page appears.

- 5 Click **Next** (graphical installer) or **OK** (text installer).

The Select Keyboard page appears.

- 6 Select your keyboard language from the list, and click **Next** (graphical installer) or **OK** (text installer).

The Mouse Configuration page appears.

- 7 Select your mouse.

NOTE Mouse configuration is not a critical setting. After ESX Server is installed, the setting is ignored. The X Window System is not supported from the service console.

Here are some helpful mouse identification hints:

- If the connector is round, your mouse is a PS/2 or a bus mouse.
- If the connector is trapezoidal with nine holes, it is a serial mouse.
- If the connector is a flat rectangle with a slot, it is a USB mouse.

Try to find an exact match – If you cannot find an exact match, choose a mouse type that is compatible with yours. Otherwise, choose the appropriate generic mouse type.

Three-button mouse emulation – During the installation, selecting this box enables you to use middle-mouse button functionality by clicking both mouse buttons at once.

When you have selected your mouse, click **Next** (graphical installer) or **OK** (text installer).

- 8 Select the type of installation.

The Select Installation Type dialog box appears only if the installer detects a previous ESX Server installation.

- **Install** – For a clean installation preserving no ESX Server configuration data, select **Install** and click **Next** (graphical installer) or **OK** (text installer).
- **Upgrade** – If you are upgrading, see [“Upgrading Using the Graphical Installer”](#) on page 155. Do not continue with this procedure.

9 Accept the VMware license agreement.

NOTE You cannot install this product unless you accept the license agreement.

- If you are using the graphical installer, read through the end user license agreement and select **I accept the terms of the license agreement**. Click **Next**.
- If you are using the text installer, read through the end user license agreement and select **Accept End User License**. Click **OK**.

If any drives or LUNs (SCSI or Fibre Channel) are uninitialized, a warning dialog box appears.

If you do not have data on the drive, click **OK** to allow partitioning to occur. You must initialize a drive to use it during installation.

10 Select a partitioning option.

- **Recommended** – This option configures default partitions for you, based on the capacity of the hard drive. If you select this method, continue with [“Recommended Partitioning”](#) on page 82.
- **Advanced** – You specify all partition settings. If you select this method, continue with [“Advanced Partitioning”](#) on page 83.

NOTE If you want the ESX Server host to boot from a SAN, review [“”](#) on page 77 for VMFS partitioning requirements.

11 Select how the ESX Server will boot:

- **From a drive (install on the MBR of the drive)** – Use this option for most installations.

This drive must match the first boot device set in the host BIOS. If these settings do not match, the host cannot boot into the ESX Server software. See also [Step 10](#) on [page 80](#).

NOTE To boot an ESX Server host from a SAN, choose a SAN-based LUN from the drop-down menu. If you are using the text installer, click **OK**.

- **From a partition** – Use this option for legacy hardware that stores BIOS information in the MBR.

If you are using the text installer, click **OK**.

12 Configure boot options:

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See [Updates](#)
at the end
of this book.

- **General kernel parameters** – To add default options to the boot command, enter them into the kernel parameters field. Any options you enter are passed to the ESX Server kernel every time it boots.
- **Force LBA32** – Use this option to exceed the 1024 cylinder limit for the /boot partition. If you have a system that supports the LBA32 extension for booting operating systems above the 1024 cylinder limit, and you want to place your /boot partition above cylinder 1024, you should select this option. This is usually needed only for legacy hardware.

- 13 Click **Next** (graphical installer) or **OK** (text installer) to continue the installation.
- 14 Configure the network settings.
 - a Select the network interface for use by the ESX Server console. If you are using the text installer, click **OK** to proceed.

NOTE Virtual machine network traffic shares this network adapter until you configure a virtual switch for another network adapter. You can configure other network adapters at a later time from the Virtual Infrastructure Client.

- b Configure the ESX Server host network IP address. If you are using the text installer, click **OK** to proceed.

VMware recommends that you use a static IP address to simplify client access. If you do not have the required network configuration information, see your network administrator for assistance.
- c Enter the ESX Server host name. Type the complete machine name, including the domain where appropriate.

This option is available only if you have opted to use a static IP address.

NOTE Virtual Infrastructure Clients can use either the host name or the IP address to access the ESX Server host.

- d If your network requires a VLAN ID, enter a VLAN ID.
- e Select **Create a default network for virtual machines** to create a default port group for virtual machines. (This option is selected by default.)

NOTE If you select **Create a default network for virtual machines**, your virtual machines will share a network adapter with the service console, which is not the recommended configuration for optimum security. If you do not select this option, create a network connection for your virtual machines as described in the *Server Configuration Guide*.

- f Click **Next** (graphical installer) or **OK** (text installer).
- 15 Set your time zone. See [“Setting Your Time Zone”](#) on page 86.
- 16 Enter a root password.

Type the same password into both fields and click **Next** (graphical installer) or **OK** (text installer).

The root password must contain at least six characters. A warning appears if the passwords do not match.
- 17 Confirm your installation configuration, and click **Next** (graphical installer) or **OK** (text installer).



WARNING This is your last opportunity to cancel and return to your previous configuration. When you click **Next** or **OK**, the installer begins partitioning and formatting the file system.

Progress bars appear to show the status of the installation, and a dialog box informs you when the installation completes.

- 18 Click **Finish** to exit.

Recommended Partitioning

This section describes how to partition your hard drive using recommended partitioning settings.

To partition your hard drive using the recommended partitioning

- 1 Select a volume on which to install the ESX Server software.
- 2 If you want to preserve existing VMFS partitions with existing virtual machines, select **Keep virtual machines and the VMFS**.

This usually applies only if you are installing on top of a previous version of ESX Server.
- 3 Select **Recommended partitioning**, and click **Next** (graphical installer) or **OK** (text installer).

A warning dialog box appears.

- 4 Click **Yes** to continue with your partitioning selection.
- 5 (Optional) Change the automatic partitioning settings:
 - **New** – Select a disk and click this button to create a new partition.
 - **Edit** – Select a partition and click this button to change an existing partition.
 - **Delete** – Select a partition and click this button to remove an existing partition.
 - **Reset** – Click this button to restore the default partitioning scheme.
- 6 When you are finished with automatic partitioning, click **Next** (graphical installer) or **OK** (text installer), and continue with [Step 11](#) on [page 80](#).

Advanced Partitioning

With manual partitioning, the installer lists the drives with existing partitions and the amount of available space. You must create all partitions, determining a specific mount point, file system, and capacity.

Each ESX Server host requires five specific partitions. If the host has network storage, only the first three required partitions must be configured on local storage. See “[Datastore Partitioning](#)” on page 181 for detailed descriptions of required and optional partitions.

To partition local storage

- 1 Select a volume on which to install the ESX Server software.
- 2 If you want to preserve existing VMFS partitions with existing virtual machines, select **Keep virtual machines and the VMFS**.

This usually applies only if you are installing on top of a previous version of ESX Server.
- 3 Select **Advanced partitioning**, and click **Next** (graphical installer) or **OK** (text installer).

A warning dialog box appears.
- 4 Click **Yes** to continue with your partitioning selection.

- 5 To create a partition, click **New**. The Add Partition dialog box appears. Fill in the parameters for each of the partitions as described in the following steps, and click **OK**.
 - a To create a boot partition, use the following settings:
 - **Mount Point** – /boot
 - **File System** – ext3
 - **Size (MB)** – VMware recommends 100MB
 - **Additional Size Options** – Fixed size
 - b To create a swap partition, use the following settings:
 - **Mount Point** – Not applicable. This drop-down menu is disabled when you select *swap* for file system.
 - **File System** – swap
 - **Size (MB)** – VMware recommends 544MB. For a guide to sizing, see the description of the swap partition in [“Datastore Partitioning”](#) on page 181.
 - **Additional size options** – Fixed size
 - c To create a root partition, use the following settings:
 - **Mount Point** – /
 - **File System** – ext3
 - **Size (MB)** – VMware recommends at least 2560MB for the root partition, but you can fill the remaining capacity of the drive. For a guide to sizing, see the description of the root partition in [“Datastore Partitioning”](#) on page 181.
 - **Additional size options** – Fixed size



WARNING If you do not create a / partition, the installation fails at the last step, producing an anaconda dump. Create all necessary partitions before proceeding to the next step of the installation.

- d (Optional) To create a log partition (recommended), use the following settings:
 - **Mount Point** – /var/log
 - **File System** – ext3

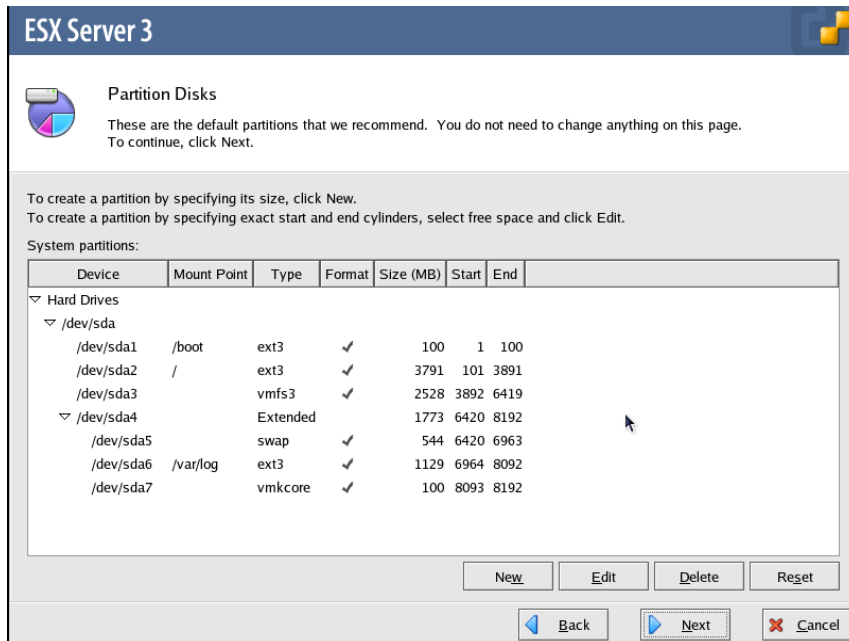
- **Size (MB)** – 500MB is the minimum size, but VMware recommends 2000MB for the log partition
- e (Optional) Create additional logical partitions.

For best performance, use VI Client or VI Web Access to set up your VMFS3 partitions rather than the ESX Server installer. Using VI Client or VI Web Access ensures that the starting sectors of partitions are 64K-aligned, which improves storage performance.

NOTE If your ESX Server host has no network storage and one local disk, you *must* create two more required partitions on the local disk (for a total of five required partitions):

- **vmkcore** – A vmkcore partition is required to store core dumps for troubleshooting. VMware does not support ESX Server host configurations without a vmkcore partition.
- **vmfs3** – A vmfs3 partition is required to store your virtual machines.

These vmfs and vmkcore partitions are required on a local disk only if the ESX Server host has no network storage.



- 6 When you are finished with manual partitioning, click **Next** (graphical installer) or **OK** (text installer) to continue with [Step 11](#) of the installation on [page 80](#).

Setting Your Time Zone

The graphical installer gives you the option to select your time zone using a map, a list of locations, or a list of time zones.

To set the time zone using the map

- 1 Click the **Map** tab to display the map.
- 2 Click the map on the city nearest to your location.
- 3 Select the check box for using UTC (Coordinated Universal Time) if appropriate. (This option is selected by default.)
- 4 Click **Next** to continue the installation with [Step 16](#) on [page 82](#).

1 To set the time zone using a location

- 2 Click the **Location** tab to display a list of cities.
- 3 Select a city in your time zone from the scrolling list.
- 4 Select the check box for using UTC, if appropriate.
- 5 Click **Next** to continue the installation with [Step 16](#) on [page 82](#).

To set the time zone based on UTC offset from GMT

- 1 Click the UTC Offset tab.
- 2 Select an offset from the list.
- 3 Select the check box to automatically compensate for daylight saving time (if appropriate).
- 4 Select the check box for using UTC, if appropriate.
- 5 Click **Next** to continue the installation with [Step 16](#) on [page 82](#).

To set the time zone using the text installer

- 1 Select the check box for using UTC, if appropriate.
- 2 Select a city in your time zone from the scrolling list.
- 3 Click **OK** to continue the installation with [Step 16](#) on [page 82](#).

Where to Go Next

- [“Configuring the ESX Server Host to Boot from a SAN”](#) on page 87
- [“Locating the Installation Logs”](#) on page 87
- [“Assigning New Hardware on the Server”](#) on page 87
- [“Installing Additional Drivers from the VMware Driver Disk”](#) on page 88
- [“Verifying Your Device Driver Mappings”](#) on page 88
- [“Creating a Rescue Floppy Disk”](#) on page 89
- [“Downloading the Virtual Infrastructure Client”](#) on page 90

Postinstallation Considerations

This section discusses the following topics:

- [“Configuring the ESX Server Host to Boot from a SAN”](#) on page 87
- [“Locating the Installation Logs”](#) on page 87
- [“Assigning New Hardware on the Server”](#) on page 87
- [“Installing Additional Drivers from the VMware Driver Disk”](#) on page 88
- [“Verifying Your Device Driver Mappings”](#) on page 88
- [“Creating a Rescue Floppy Disk”](#) on page 89

Configuring the ESX Server Host to Boot from a SAN

For instructions on configuring an ESX Server host to boot from a SAN, refer to the *SAN Configuration Guide*.

Locating the Installation Logs

After you install and reboot, log on to the service console to read the installation logs:

- `/root/install.log` is a complete log of the installation.
- `/root/anaconda-ks.cfg` is a kickstart file containing the selected installation.

Assigning New Hardware on the Server

After you install the new hardware on your system, use VirtualCenter to assign the hardware to the virtual machines. Refer to *Basic System Administration* for more information.

Simply booting or rebooting the machine does not make the service console aware of the newly installed hardware.

To make the service console aware of newly installed hardware, log on to the service console as root, and do one of the following:

- Run the command `kudzu` at a command prompt.
- Manually edit the `/etc/modules.conf` file.

To run kudzu

- 1 Log on as root on the service console.
- 2 At a command prompt, type `kudzu`.
- 3 The `kudzu` utility detects any new hardware and adds appropriate entries to `/etc/modules.conf`.

To edit modules.conf

If you edit the `/etc/modules.conf` file by hand, add an alias line for the new device. For example, if you are adding a new SCSI adapter that uses a driver named `adapXXXX`, add this line:

```
alias scsi_hostadapter adapXXXX
```

Installing Additional Drivers from the VMware Driver Disk

VMware provides a driver disk for a device that is not handled by drivers in this release of ESX Server. Use driver disks to upgrade the drivers on an existing system or install new drivers onto an existing system.

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See [Updates](#) at the end of this book.

Verifying Your Device Driver Mappings

During the upgrade, the ESX Server installer renames the `/etc/vmware/vmware-device.map.local` file to `/etc/vmware/vmware-device.map.local.orig`.

After the upgrade, compare the `vmware-device.map.local.orig` file with the newly created `vmware-device.map.local` file and make any necessary changes. The locations of some drivers have changed in ESX Server version 3. With the addition of new drivers in ESX Server version 3, further customization of `vmware-device.map.local` might not be necessary.

Creating a Rescue Floppy Disk

Use `dd`, `rawwritewin`, or `rawrite` to create a floppy image called `bootnet.img`. This file is located on the ESX Server CD in the `/images` directory.

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See [Updates](#) at the end of this book.

Installing Language Packs on the ESX Server Host

If you want German or Japanese language support when using VI Web Access or the VI Client with your ESX Server host, you must install language packs.

To install language packs

- 1 Locate the language pack zip file in the `langpack` directory on the ESX Server installation CD, or download the language pack zip file from www.vmware.com. The file has the name `VMware-esxlangpack-2.0.1-<build#>.zip`.
- 2 Extract the zip file into a temporary directory.
- 3 Copy the files from the `ESX-LangPack/hostd/` directory into the `hostd` installation directory on your ESX Server host (usually `/usr/lib/vmware/hostd/`).
- 4 Copy the files from the `ESX-LangPack/webAccess/` directory into the VI Web Access installation directory on your ESX Server host (usually `/usr/lib/vmware/webAccess/tomcat/apache-tomcat-5.5.17/webapps/`).
- 5 Edit the `/etc/vmware/hostd/config.xml` file to enable the correct default language:

- For German, add the following lines to the `config.xml` file:

```
<locale>
  <DefaultLocale>de_DE</DefaultLocale>
</locale>
```

- For Japanese, add the following lines to the `config.xml` file:

```
<locale>
  <DefaultLocale>ja_JP</DefaultLocale>
</locale>
```

- 6 Type the following commands to restart VI Web Access and host agent services:

```
service mgmt-vmware restart
service vmware-webAccess restart
```

To fully localize your VMware Infrastructure installation, change the default language for VirtualCenter Server and install the .NET language pack on your VI Client computer as described below.

To enable German or Japanese with VirtualCenter

- 1 Modify C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\vpzd.cfg to specify the default locale as follows:
 - For German, add the following lines to the config.xml file:


```
<locale>
      <DefaultLocale>de_DE</DefaultLocale>
</locale>
```
 - For Japanese, add the following lines to the config.xml file:


```
<locale>
      <DefaultLocale>ja_JP</DefaultLocale>
</locale>
```
- 2 Restart VirtualCenter Server.
- 3 Install the .NET language pack from the /redist directory on the VirtualCenter installation CD on the computer on which you run the VI Client.

Downloading the Virtual Infrastructure Client

The VMware Virtual Infrastructure Client is a Windows program that you can use to configure the ESX Server host and to operate its virtual machines. You can download a Virtual Infrastructure Client from any ESX Server version 3 host.

You must obtain the URL of an ESX Server host. This is the IP address or machine name that was entered during [Step 14](#) of the installation, described on [page 81](#).

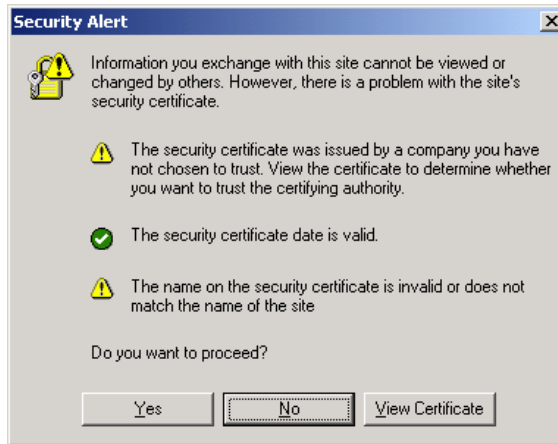
To download the client

- 1 From a Windows machine, open a Web browser.
- 2 Enter the URL for the ESX Server host.

For example, enter `http://testserver.vmware.com/`

The Web Access login page appears.
- 3 Download the client.
 - a Click the link under **Other Applications** on the right side of the page.

A security warning dialog box appears.



b Click **Yes**.

4 Install the client.

Follow the procedure in [“Installing the Virtual Infrastructure Client”](#) on page 68.

Where to Go Next

- [“Preparing the VirtualCenter Server Database”](#) on page 57
- [“Installing the VirtualCenter Server”](#) on page 63
- [“Installing the Virtual Infrastructure Client”](#) on page 68
- [“Licensing VirtualCenter and ESX Server”](#) on page 33

Remote and Scripted Installations

6

The following sections describe how to install ESX Server using remote and scripted installations:

- [“Scripting Your Installations”](#) on page 93
- [“Setting Up the Script”](#) on page 95

Scripting Your Installations

After you install ESX Server on a system, you can quickly deploy or provision more ESX Server systems that share the same or similar configurations. You can set up a script to aid in the installation. The ESX Server scripted installation method is based on Red Hat’s kickstart installation method. The script is a kickstart configuration file, which consists of the choices you want to make during the installation of the ESX Server software.

If you want all of your servers to have the same configuration as the original ESX Server system, make the same choices for the script that you made when you installed ESX Server on the original system.

The installation can run unattended as in the original installation, but if the installer encounters an unspecified setting for the system, a prompt appears and you must respond to it.

After you set up the script, you can use it to install ESX Server files in either of the following ways:

- From the ESX Server CD in the local CD-ROM drive of the new system.
- Across the network, using installation files that are hosted on a remote server.

Enabling Scripted Installation

Once you have installed ESX Server 3.0.1 on a system, you must enable the scripted installation feature before you can use Web Access to create an installation script.

To enable scripted installation

- 1 Log in to the ESX Server 3.0.1 service console as root.
- 2 Open the file
`/usr/lib/vmware/webAccess/tomcat/apache-tomcat-5.5.17/webapps/ui/WEB-INF/struts-config.xml` in a text editor such as vi.
- 3 Locate the scripted section.
- 4 Comment out the line reading:

```
<action path="/scriptedInstall"
        type="org.apache.struts.actions.ForwardAction"
        parameter="/WEB-INF/jsp/scriptedInstall/disabled.jsp" />
```

- 5 Uncomment the following lines:

```
<!--
    <action path="/scriptedInstall"
            type="com.vmware.webcenter.scripted.ProcessAction">
        <forward name="scriptedInstall.form1"
            path="/WEB-INF/jsp/scriptedInstall/form1.jsp" />
        <forward name="scriptedInstall.form2"
            path="/WEB-INF/jsp/scriptedInstall/form2.jsp" />
        <forward name="scriptedInstall.form3"
            path="/WEB-INF/jsp/scriptedInstall/form3.jsp" />
        <forward name="scriptedInstall.form4"
            path="/WEB-INF/jsp/scriptedInstall/form4.jsp" />
        <forward name="scriptedInstall.form5"
            path="/WEB-INF/jsp/scriptedInstall/form5.jsp" />
        <forward name="scriptedInstall.form6"
            path="/WEB-INF/jsp/scriptedInstall/form6.jsp" />
        <forward name="scriptedInstall.form7"
            path="/WEB-INF/jsp/scriptedInstall/form7.jsp" />
    </action>
-->
```

- 6 Save and close the file.
- 7 Type **service vmware-webAccess restart**.

Setting Up the Script

After you install ESX Server on one system and enable scripted installations on that system, you can set up a script necessary for performing a scripted installation of ESX Server on other systems.

When setting up the script, you must choose the networking method (static IP or DHCP) for the server on which you will install ESX Server. You can specify unique network identification information, including the static IP address and host name of each system, or you can use DHCP initially to quickly set up a number of ESX Server systems. In addition, you can edit the kickstart configuration file (see [“Editing the Kickstart Configuration File”](#) on page 101) to comment out the network command, which causes the installer to prompt you for network information during the installation.

If you use DHCP initially to create one installation script that is used to deploy new ESX Server systems, you must then configure each system separately and assign a unique host name and IP address. This requirement is in addition to configuring the server with the Management Interface wizard.

You can also create multiple scripts, each containing unique network identification information you specify when you set up the script.

You must copy the script generated at the end of the setup process to a floppy disk or to a network-accessible server.

In addition, you need access to the ESX Server installation files. The files can be on the ESX Server CD-ROM, or stored on a separate server and accessed across the network.

To create your script, you can either use the VI Web Access graphical interface to specify your script options, or you can manually create and edit a kickstart configuration file.

Creating a Script Using VI Web Access

The VI Web Access interface allows you to create a kickstart configuration file using a graphical interface.

To set up the script

- 1 Launch a supported Web browser and enter the URL of your ESX Server installation to open VI Web Access.

The Welcome page appears.

- 2 Click **Log in to the Scripted Installer**.

The Scripted Install page appears.

Scripted Install
Configure your VMware ESX Server to create and provide automated installation services

Kickstart Options

Installation Type: Initial Installation

Installation Method: CD-ROM

Remote Server URL:

Network Method: DHCP

Create a default network for VMs: Yes

VLAN: 0

Time Zone: America/Los_Angeles

Reboot After Installation: Yes

Root Password

Password:

Again:

Next

3 Enter the information that the script needs to configure another ESX Server system:

- a In the **Installation Type** list, select **Initial Installation** if you are going to perform a new installation; select **Upgrade** if you are going to upgrade an existing ESX Server system.
- b In the **Installation Method** list, select from the following options:
 - Select **Remote** to perform a remote network install option from a HTTP or FTP server that contains the ESX Server installation files. In the **Remote Server URL** field, type the port number along with the name of the server that contains the ESX Server installation files, like this:

```
http://<hostname>:<port number>/
ftp://<hostname>:<port number>/
```

where <hostname> is the name assigned to the HTTP or FTP server.

- Select **CD-ROM** to install from the CD on the local CD-ROM drive on the new system.
- Select **NFS** to perform a network install using the Network File System (NFS) application. In the **Remote Server URL** entry field, type the host machine name along with the mount point, like this:

```
<hostmachine>:<mountpoint>
```

- c In the **Network Method** list, select **DHCP** if the ESX Server system will have a dynamic IP address; select **Static IP** if the ESX Server system will have a static IP address.

NOTE VMware recommends that each ESX Server system have its own static IP address. However, you can use DHCP to deploy new ESX Server systems from the same floppy image, and then configure each system separately and assign a unique host name and IP address. Or you can create multiple floppy images containing the network identification information you specify here.

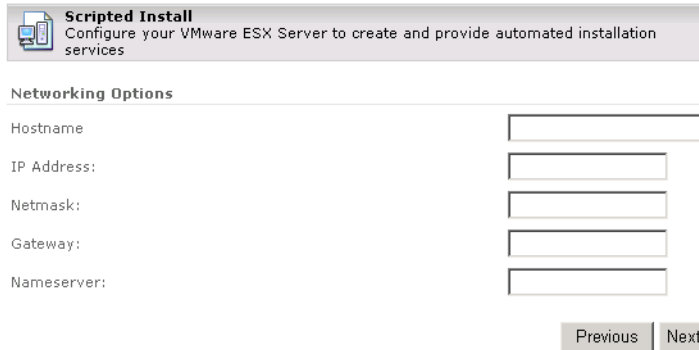
- d If your network requires a VLAN ID, type one in the VLAN ID field.
 - e Select **Create a default network for VMs** to create a default network for virtual machines.

Selecting this option creates a portgroup for the service console and a portgroup for the virtual machines. If you do not select this option, only the service console portgroup is created, and you must create the portgroup for the virtual machines manually.
 - f In the **Time Zone** list, select the time zone for the server you are about to install.

The list defaults to setting of the original ESX Server machine.
 - g In the **Reboot After Installation** list, select **Yes** to have the system reboot after the installation is complete.

Before the reboot, Kickstart displays a message and asks the user to press a key before rebooting the server.
 - h Under **Root Password**, specify the root password. Type the root password in the **Password** field. Type this password a second time in the **Again** field.
- 4 Read through the end user license agreement and select the **I have read and accept the terms in the license agreement** check box.
 - 5 If the ESX Server system will have a static IP address, the Networking Options page appears.

If the ESX Server system will use DHCP, skip to [Step 4](#).



Scripted Install
Configure your VMware ESX Server to create and provide automated installation services

Networking Options

Hostname

IP Address:

Netmask:

Gateway:

Nameserver:

- 6 Enter the host name in the **Hostname** field, the IP address in the **IP Address** field, the netmask in the **Netmask** field, the network gateway in the **Gateway** field, and the domain name server in the **Nameserver** field.

NOTE Be sure to include the full domain name if you are running with domains.

- 7 Click **Next** to continue.

The Partition Configuration page appears.

Scripted Install
Configure your VMware ESX Server to create and provide automated installation services

Partition Configuration

If you do not know how to partition your system, please refer to Scripted Install documentation and read through the instructions before setting partitions.

WARNING:

All devices selected below will have all data erased before new partitions are created. This could result in **UNINTENDED DATA LOSS**. Please be sure no important data will be destroyed on the selected disks.

Drive	Mount Point	Size	Type	Grow
SCSI Disk 1 (sda)	/boot	102	ext3	<input type="checkbox"/>
SCSI Disk 1 (sda)	/	4997	ext3	<input type="checkbox"/>
SCSI Disk 1 (sda)		1500	swap	<input type="checkbox"/>
SCSI Disk 1 (sda)	vmfs	10000	vmfs3	<input checked="" type="checkbox"/>
SCSI Disk 1 (sda)		94	vmkcore	<input type="checkbox"/>
SCSI Disk 1 (sda)	/var/log	1992	ext3	<input type="checkbox"/>
SCSI Disk 1 (sda)			ext3	<input type="checkbox"/>
SCSI Disk 1 (sda)			ext3	<input type="checkbox"/>
SCSI Disk 1 (sda)			ext3	<input type="checkbox"/>
SCSI Disk 1 (sda)			ext3	<input type="checkbox"/>
SCSI Disk 1 (sda)			ext3	<input type="checkbox"/>

Licensing Information

Licensing Mode: Server Based

Previous Next

- 8 Under **Partition Configuration**, specify the following for each partition in the service console:

- In the **Drive** list, select from the list of disks.

NOTE If you are installing the service console on IDE hard drives, select **/dev/hda**.

- In the **Mount Point** field, specify the mount point.

At a minimum, you should specify the boot (**/boot**) and root (**/**) mount points.

- In the **Size** field, specify the size of the partition in megabytes (MB). Specify an integer value here, such as 500. Do not append the number with MB.

Refer to [Appendix B, “Datastore Partitioning,”](#) on page 181 for information on recommended partition sizes.

- In the **Type** list, select the type of file system. Choose from **vmfs**, **vmcore**, **ext3**, and **swap**. Select **swap** if the partition is a swap partition. You must create a swap partition.
 - Select the **Grow** check box if you want the partition to grow until it fills the available space on the disk (if any), or up to the maximum size setting.
- VMware recommends you do not make your boot and swap partitions growable.
- 9 From the **Licensing Mode** list, specify one of the following:
 - **Post Install** – Choose this option to configure licensing manually after installation.
 - **Server Based** – Choose this option to retrieve licenses automatically from a license server.
 - **File Based** – Choose this option to upload a license file.
 - 10 When you are satisfied with your choices, click **Next** to continue.
 - 11 If you selected Server Based licensing, enter the license server-based licensing information.



Server Based Licensing Information

License Server

Port:

ESX Server License Type

☒ Starter

☐ Standard

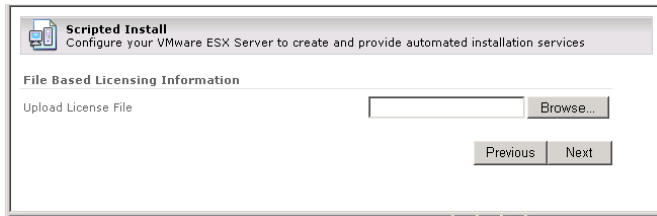
Previous

Next

- **License Server** – Enter the license server to use.
- **Port** – Enter the port to which to connect.

■ **ESX Server License Type – Select Starter or Standard.**

- 12 If you selected File Based licensing, specify or browse for the license to upload.



- 13 Click **Next** to continue to the next configuration screen.
- 14 Click **Download Kickstart File** to create a kickstart configuration file.

Running a Scripted Installation from the Kickstart File

After you have created a kickstart file, use one of the following procedures to run your scripted installation, depending on whether you selected to install from an ESX Server installation CD-ROM or from installation files hosted on a remote server.

To run a scripted installation using a CD

- 1 Copy your kickstart file to a floppy disk.
- 2 Insert the floppy disk into the floppy drive of the machine on which you want to install ESX Server. Insert the ESX Server Installation CD into the CD-ROM drive.
- 3 Boot up the machine.
The mode selection page appears.
- 4 Type **esx ks=floppy method=cdrom** and press Enter to start the scripted installation.

To run a scripted installation using a PXE server

- 1 Upload your kickstart file to an NFS or HTTP server.
- 2 Specify the installation method in the PXE server boot options, where <ks url> is the URL to access the kickstart file, and <method url> is the URL to access the uploaded installation files.

Editing the Kickstart Configuration File

The kickstart configuration file is a text file containing the options specified for the ESX Server installation. You can edit your kickstart configuration file to modify the options

you specified using the VI Web Access interface, or to specify additional options not available in that interface.

The kickstart configuration file can contain up to five sections:

- “[Command Section](#)” on page 102
- “[%packages Section](#)” on page 104
- “[%pre Section](#)” on page 104
- “[%post Section](#)” on page 104
- “[%vmlicense_text Section](#)” on page 104

Command Section

The command section contains the options specified for the ESX Server installation. This section is required and must appear first in the kickstart file.

Most of the commands that can be included in this section are standard Red Hat kickstart commands. More information on these commands can be found in Chapter 9 of the *Red Hat Enterprise Linux 3: System Administration Guide*, available at www.redhat.com/docs/manuals/enterprise/RHEL-3-Manual/pdf/rhel-sag-en.pdf. Some commands are VMware-specific. They are documented in [Table 6-1](#) and [Table 6-2](#).

[Table 6-1](#) describes the commands required for a successful ESX Server installation.

Table 6-1. Kickstart Commands Required for ESX Server Installation

Command	Description
auth or authconfig	Standard Red Hat kickstart commands.
bootloader	Standard Red Hat kickstart command.
clearpart	Standard Red Hat kickstart command. Not required if the upgrade command is used. You must use the --drives option to specify which drives to clear partitions from. For example, clearpart --drives=sda removes partitions on the first SCSI drive on the system.
install or upgrade	Standard Red Hat kickstart commands.
keyboard	Standard Red Hat kickstart command.
lang	Standard Red Hat kickstart command.
langsupport	Standard Red Hat kickstart command.
mouse	Standard Red Hat kickstart command.

Table 6-1. Kickstart Commands Required for ESX Server Installation (Continued)

Command	Description
network	<p>Standard Red Hat kickstart command, with two optional VMware-specific options:</p> <ul style="list-style-type: none"> ■ --addvmportgroup=<1 or 0> Set to 1 to create a portgroup for virtual machines, or to 0 if you do not want to create a portgroup. Defaults to 1. ■ --vlanid=<vlanid> Set to an integer between 0 and 4095 to specify a VLAN to use for networking.
part	<p>Standard Red Hat kickstart command. Not required if the upgrade command is used. You must use the --ondisk option to specify the disk on which partitions will be created. For example, part --ondisk=sda creates partitions on the first SCSI drive on the system.</p>
rootpw	Standard Red Hat kickstart command.
skipx	Standard Red Hat kickstart command.
timezone	Standard Red Hat kickstart command.
vmaccepteula	Accepts the ESX Server license agreement.

The Red Hat **firewall** command is no longer supported. To configure your firewall during a scripted installation, call the **esxcfg-firewall** command in the **%post** script section of the kickstart file. For more information on **esxcfg-firewall**, refer to the *Server Configuration Guide*.

[Table 6-2](#) lists optional VMware-specific commands.

Table 6-2. Optional VMware-Specific Kickstart Commands

Command	Description
vmlicense	<p>Specifies license information. If you specify server-based licensing, the command takes the form:</p> <pre>vmlicense --mode=server --server=<server> [--features=<features>] [--edition=<edition>]</pre> <p>where <server> is the host name or IP address of the license server in the format port@hostnam. <features> is an optional, comma-separated list of features to request from the licensing server, and <edition> is the ESX Server edition.</p> <p>If you specify host-based licensing, the command takes the form:</p> <pre>vmlicense --mode=file [--features=<features>] [--edition=<edition>]</pre> <p>The contents of the license file must be included in the %vmlicense_text section of the kickstart file.</p>

Consult the *Red Hat Enterprise Linux 3: System Administration Guide* for more information on non-VMware-specific optional commands.

%packages Section

This section specifies packages for installation. The %packages section is required for successful installation and must follow the commands section. The section consists of the following two lines:

```
%packages
@ base
```

%pre Section

The %pre section allows you to specify a script to run prior to installation. This section is optional and must come after the commands section. Refer to the *Red Hat Enterprise Linux 3: System Administration Guide* for more information on preinstallation scripting.

%post Section

The %post section allows you to specify a script to run after installation. This section is optional and must come after the commands section. Refer to the *Red Hat Enterprise Linux 3: System Administration Guide* for more information on postinstallation scripting.

%vmlicense_text Section

This section contains the license file for the ESX Server installation. Omit this section if you have not specified host-based licensing. This section must come after the commands section.

Sample Kickstart File

The following is a sample kickstart file for an ESX Server installation using a license server:

```
# Installation Method
cdrom
# root Password
rootpw --iscrypted $1$MpÉRëĒiİ$n9sgFQJweS1PeSBpqRRu..
# Authconfig
authconfig --enableshadow --enablemd5
# BootLoader ( The user has to use grub by default )
bootloader --location=mbr
# Timezone
timezone America/Los_Angeles
# X windowing System
skipx
# Install or Upgrade
install
# Text Mode
text
# Network install type
network --device eth0 --bootproto dhcp
# Language
lang en_US
# Language Support
langsupport --default en_US
# Keyboard
keyboard us
# Mouse
mouse generic3ps/2 --device psaux
# Reboot after install ?
reboot
# Clear Partitions
clearpart --all --initlabel --drives=sda
# Partitioning
part /boot --fstype ext3 --size=100 --ondisk=sda
part / --fstype ext3 --size=1500 --ondisk=sda
part None --fstype vmkcore --size=100 --ondisk=sda
part None --fstype vmfs3 --size=900 --grow --maxsize=2500 --ondisk=sda
part swap --size=256 --grow --maxsize=512 --ondisk=sda
#VMware Specific Commands
vmaccepteula
vmlicense --mode=server --server=27000@license.vmware.com
--edition=esxFull --features= backup
%packages
@ base
%post
```


Planning a VMware Infrastructure Upgrade

7

This chapter discusses planning and preparations for upgrading virtual infrastructure from an ESX Server 2.x/VirtualCenter 1.x environment to an ESX Server 3.0.1/VirtualCenter 2.0.1 environment. Upgrading is a multi-stage process in which procedures must be performed in a particular order. The upgrade path depends on your ESX Server host and datastore configurations. The information in this chapter can help you plan a smooth upgrade with a minimum of system downtime.

This chapter begins with a list of precautions you should take before upgrading to guard against data loss. Next, it describes the changes to VMware architecture that take place during the upgrade process and discusses the four stages of upgrading. Finally, it presents general strategies for upgrading, followed by four example upgrade scenarios.



WARNING VMware strongly recommends you read this chapter before attempting to upgrade. If you do not follow appropriate safeguards, you might lose data and lose access to your servers. Without careful planning, you might incur more downtime than is necessary.

This chapter contains the following sections:

- [“Ensuring a Safe and Smooth Upgrade”](#) on page 108
- [“Understanding Changes to VMware Architecture”](#) on page 111
- [“Strategies for In-Place or Migration Upgrades”](#) on page 113
- [“Understanding the Stages of Upgrading”](#) on page 115
- [“Upgrade Examples”](#) on page 123

Ensuring a Safe and Smooth Upgrade

Even if you want to start upgrading immediately, read these topics to help prevent data loss or surprises:

- [“Supported Upgrades in This Release”](#) on page 108
- [“Upgrade Order Is Important”](#) on page 108
- [“Upgrade Is Not Reversible”](#) on page 109
- [“Backup and Restore Strategies”](#) on page 109
- [“Pre-Upgrade Script”](#) on page 110
- [“Downtime for Virtual Machines”](#) on page 110

Supported Upgrades in This Release

The following upgrades are supported in this ESX Server 3.0.1 and VirtualCenter 2.0.1 release.

- **VirtualCenter upgrades** are supported from most released versions of VirtualCenter to this VirtualCenter 2.0.1 release. See [“Before You Upgrade VMware VirtualCenter”](#) on page 133 for a compatibility list.
- **ESX Server upgrades** are supported from most ESX Server version 2.x versions to this ESX Server 3.0.1 release. See [“Before You Upgrade ESX Server”](#) on page 147 for a compatibility list.

A subset of ESX Server versions support the migration upgrade using the new feature in ESX Server 3.0.1 that enables VMotion with simultaneous relocation to a new datastore. Consult the release notes for details on which releases support the feature.

- **Unsupported upgrades** can fail with lost data, lost network connections, and unusable configurations. Do not upgrade an unsupported configuration that contains important data or is a production machine.

Upgrade Order Is Important

You must upgrade VirtualCenter Server, ESX Server hosts, and datastores in a specific order, as described in [“Understanding the Stages of Upgrading”](#) on page 115. If you do not complete each upgrade stage before moving on, you can lose data and server access.

Order is also important within each upgrade stage. Even when an exact sequence is optional, VMware makes recommendations. For example, to minimize downtime,

follow VMware recommendations for completing and repeating certain steps in a stage.

Upgrade Is Not Reversible

The upgrade process has only one direction. Once you upgrade part of your virtual infrastructure, that upgraded part cannot be reverted for use with older VMware software.

With appropriate backups and planning, you can restore your original ESX Server 2.x and VirtualCenter 1.x configuration.

Backup and Restore Strategies

VMware strongly recommends that you back up your VMware infrastructure components before upgrading. This section briefly describes backup and restore strategies for each component.

VirtualCenter Backup

Before upgrading, make a full backup of the VirtualCenter database. Refer to your database documentation for more information on how to back up.

Back up any virtual machine templates that reside on the VirtualCenter Server repository.

To restore the previous configuration of VirtualCenter

- 1 Completely uninstall VirtualCenter 2.0.
See [“Uninstalling VirtualCenter Components”](#) on page 71.
- 2 Restore the VirtualCenter 1.x database from the backup.
- 3 Reinstall your original VirtualCenter 1.x version, selecting the restored database during the installation process.

ESX Server Backup

Before upgrading an ESX Server host, back up the service console and the local VMFS2 file system, including the following:

- The `/etc/passwd` and `/etc/groups` files
- Custom scripts
- `.vmx` files
- Local images: templates, exported virtual machines, and `.iso` files

To restore your original ESX Server host configuration

- 1 Reinstall the original version of ESX Server on the host.
- 2 Restore the backed-up service console and local VMFS files.

Refer to “Using VMware ESX Server System and VMware Virtual Infrastructure for Backup, Restoration, and Disaster Recovery” at http://www.vmware.com/pdf/esx_backup_wp.pdf for more information on backing up your ESX Server system.

Virtual Machine Backup

Before beginning an upgrade, back up virtual machines by one of the following methods:

- **Back up virtual machine files** – Back up your virtual machine files, including the .vmdk or .dsk and .vmx files. The .vmdk or .dsk files are located on your VMFS2 partitions. The .vmx files are stored with the service console.
- **Backup agent** – Using a backup agent, back up each virtual machine at the operating system level. This method requires you to recreate the .vmx and .vmdk files for the virtual machine before you restore from the backup.
- **Cloning** – Clone the virtual machine to another datastore. (Note that this changes the UUID and so does not produce a virtual machine that is identical to the original in every respect.)

Pre-Upgrade Script

ESX Server version 3.0.1 includes a pre-upgrade script, which verifies that your system can be upgraded and alerts you to any problems that need to be addressed before upgrading. Before upgrading any ESX Server host, run the pre-upgrade script as described in “[Running the Pre-Upgrade Script](#)” on page 154 and address any problems flagged by the script.

Downtime for Virtual Machines

You must plan some downtime for each individual virtual machine at some time during the upgrade process. Typically, this downtime occurs during Stage 3 (virtual machine upgrade) and Stage 4 (VMware Tools upgrade). Depending on your upgrade strategy, some virtual machines downtime may be required during Stage 2 (ESX Server and VMFS upgrade). See “[Understanding the Stages of Upgrading](#)” on page 115 for more information on downtime requirements for each stage.

Depending on your upgrade strategy, you might not have to shut down more than a single virtual machine at any given time. You can stagger or offset individual 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 might find it convenient to prepare by migrating virtual machines to specific hosts in order to serve a given time zone. This way you can arrange host upgrades so 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. There is no requirement that any upgrade stage be completed within a certain time period. You can take as long as you like at any given stage.

Two specific strategies for upgrade are discussed in [“Strategies for In-Place or Migration Upgrades”](#) on page 113.

Understanding Changes to VMware Architecture

This section describes VMware architecture changes as they relate to the upgrade process. If you do not want to read about architectural details, proceed to [“Understanding the Stages of Upgrading”](#) on page 115.

To help you understand why upgrade order is important, these sections describe differences in architecture from previous versions:

- [“Virtual Machine File System Format: VMFS2 to VMFS3”](#) on page 111
- [“Upgrading VM2 Virtual Machine Format to VM3”](#) on page 112

Virtual Machine File System Format: VMFS2 to VMFS3

You might be aware of file system formats such as FAT, NTFS, HPFS, UFS, and EXT3. VMware created a file system optimized for virtual machines called *VMFS*.

Two types of VMFS file systems are:

- **VMFS2** — This file system is created with ESX Server version 2.x.
- **VMFS3** — This file system is created with ESX Server version 3. VMFS3 enhancements include multidirectory support, and support for storing all components of a virtual machine (both *.vmx* and *.vmdk* files) on the VMFS3 datastore. A virtual machine must reside on a VMFS3 file system before an ESX Server version 3 host can power it on.

Table 7-1. Host Access to VMFS File Systems

	VMFS2 Datastore	VMFS3 Datastore
ESX Server version 2 host	Read/write (runs VMs)	No access
ESX Server version 3 host	Read only (copies VMs)	Read/write (runs VMs)

Converting a file system to VMFS3 takes approximately 15 minutes and requires downtime for all virtual machines remaining on the volume.

By moving all virtual machine files, including .vmx configuration files, to central, shared storage such as NAS or VMFS3 on Fibre Channel SAN and iSCSI SAN, an ESX Server host receives benefits for larger storage environments enabled by SAN, NAS, and iSCSI. Now all information about a virtual machine is centrally stored, and it is easier to manage, backup, restore, migrate, and copy virtual machines than it was in ESX Server 2.x. Having all virtual machine data stored centrally on the VMFS3 datastore is also essential to newer VMware Infrastructure functionality, such as VMware HA.

NOTE VMFS3 file systems are restricted to a block size of no greater than 8MB. You cannot directly upgrade a VMFS2 file system with a block size of greater than 8MB to VMFS3. To upgrade a VMFS2 file system with a block size greater than 8MB, use a migration upgrade strategy as described in [“Migration Upgrade”](#) on page 114.

Converting the file system on a volume is Procedure 2B from [“Understanding the Stages of Upgrading”](#) on page 115. Refer to [“Upgrading Datastores”](#) on page 164 for the details of this procedure.



WARNING You cannot revert from VMFS3 to VMFS2. Once upgraded, the VMFS3 volume is usable only with ESX Server version 3 hosts.

Upgrading VM2 Virtual Machine Format to VM3

VMware software stores virtual machines in multiple files. These files encompass virtual disk files, virtual hardware information presented to the guest operating system, and virtual machine configuration attributes.

The two types of virtual machine formats are:

- **VM2 Virtual Machine** – The VM2 format is used by virtual machines created with ESX Server version 2.
- **VM3 Virtual Machine** – The VM3 format is is used by virtual machines created with ESX Server version 3. VM3 enhancements include improved snapshot support, and support for new hardware.

ESX Server version 3 can power on VM2-format virtual machines in “Legacy Mode” if they are located on VMFS3 datastores. However, performance and features are limited without an upgrade to VM3.

Part of the VM2 to VM3 process moves the virtual machine .vmx configuration file from an ESX Server host file system to a directory on the VMFS3 datastore, placing all files for that virtual machine in one directory.

Upgrading the virtual machine format is Stage 3, from “[Understanding the Stages of Upgrading](#)” on page 115. Refer to “[Upgrading Virtual Machines](#)” on page 167 for the details of this procedure.



WARNING You cannot revert from VM3 to VM2. Once upgraded, a VM3-format virtual machine is usable only with ESX Server version 3.

Strategies for In-Place or Migration Upgrades

This section focuses on the upgrade process for VMFS volumes and virtual machines. There are two upgrade strategies:

- “[In-Place Upgrade](#)” on page 113
- “[Migration Upgrade](#)” on page 114

Examples for these strategies appear in “[Upgrade Examples](#)” on page 123.

In-Place Upgrade

The in-place upgrade is what most people imagine when considering a software upgrade. You have a computer running a given software package, and you install a more modern version of the same software. Two in-place examples are described in detail later in this chapter:

- “[Upgrading a Host with Virtual Machines on a Local Disk](#)” on page 124
- “[Upgrading Hosts Sharing a SAN with In-Place VMFS Upgrade](#)” on page 128

With an in-place upgrade strategy, you upgrade VirtualCenter Server, ESX Server, the VMFS file system, and the virtual machines on the hosts and datastores on which they currently reside.

For ESX Server hosts using only local disks, an in-place upgrade means replacing the existing ESX Server 2.x with ESX Server 3.0, the existing VMFS2 with VMFS3, and upgrading the VM2-format virtual machines to VM3.

For multiple ESX Server hosts sharing SAN LUNs, an in-place upgrade is more complex. You will upgrade one or more of your ESX Server 2.x hosts to ESX Server 3.0.

Then, at an appropriate time, you will upgrade one SAN LUN from VMFS2 to VMFS3. Downtime for all virtual machines on that LUN will begin at that time.

Pros of an In-Place Upgrade

You can upgrade properlyprepared datastores and virtual machines with one click. This strategy also requires fewer additional resources than a migration upgrade.

Cons of an In-Place Upgrade

The disadvantage of an in-place upgrade is that all virtual machines on a particular datastore must be powered off simultaneously for the VMFS2 to VMFS3 file system upgrade.

Migration Upgrade

The migration upgrade is more of a managed transition than a strict upgrade. The migration upgrade reduces virtual machine downtime to the bare minimum by moving virtual machines directly from a production host running ESX Server version 2 to a production host running ESX Server version 3. If you are upgrading from a supported ESX Server 2.x version to ESX Server 3.0.1, you can migrate powered-on virtual machines from an ESX Server 2.x host to an ESX Server 3.0.1 host while simultaneously relocating the virtual machine files from a VMFS2 to a VMFS3 datastore. This allows you to completely avoid virtual machine downtime associated with the host and datastore upgrade.

A migration upgrade requires that you have extra machines and storage capacity that are not yet part of your production environment:

- One or more machines meeting ESX Server 3.0 [“Minimum Server Hardware Requirements”](#) on page 25.
- Empty host storage sufficient to hold a portion of your production virtual machines. This storage capacity should be as large as possible. A larger capacity for virtual machines on this extra storage means fewer operations are required before all your virtual machines are migrated.

In order to migrate powered-virtual machines while simultaneously relocating them from a VMFS2 to a VMFS3 datastore, you must meet the following requirements:

- This feature is only supported for upgrades from particular ESX Server 2.x versions. Consult the release notes to determine if the version of ESX Server 2.x from which you will upgrade is supported.
- The virtual machines to be migrated must have persistent-mode disks.

A migration example is described later in this chapter. See [“Upgrading Hosts on a SAN Using VMotion with Datastore Relocation”](#) on page 126.

Pros of a Migration Upgrade

The advantage of a migration upgrade is that you can minimize downtime for mission-critical virtual machines by keeping them operational until you have upgraded ESX Server hosts ready to receive them. With the migration upgrade, it is not necessary to have all virtual machines on a particular datastore powered off simultaneously. Instead virtual machines can be migrated to the new environment while powered on.

Cons of a Migration Upgrade

The disadvantage of this upgrade strategy is that it needs additional resources. A migration upgrade calls for sufficient resources to run the production environment partly on ESX Server version 2 hosts and partly on ESX Server version 3 hosts. Any required redundancies and safeguards must be available on both upgraded and non-upgraded infrastructure during the transition.

Where to Go Next

- To learn the technical details behind the upgrade, and to give you a better understanding of how to prevent problems, read the rest of this chapter.
- When you are ready to start upgrading your installation, see [“Before You Upgrade VMware VirtualCenter”](#) on page 133 to begin the procedure.

Understanding the Stages of Upgrading

There are four sequential stages to upgrade your virtual infrastructure to VMware VirtualCenter version 2 and ESX Server version 3:

- [“Stage 1—Upgrading VMware VirtualCenter”](#) on page 116
- Stage 2 — Upgrading ESX Server Hosts and Datastores
 - [“Procedure 2A—Upgrading a VMware ESX Server Host”](#) on page 120
 - [“Procedure 2B—Upgrading a Datastore from VMFS2 to VMFS3”](#) on page 120
- [“Stage 3—Upgrading Your Virtual Machines”](#) on page 121
- [“Stage 4—Upgrading VMware Tools Within the Guest Operating System”](#) on page 123

Requirements for Staging

You can take as long as you want to accomplish each of the upgrade stages. However:

- You must complete each stage before you move to the next stage.
- After you start an upgrade stage, you cannot revert to the previous stage. Each of these stages is an irreversible process.
- Some major stages have minor steps within them. Follow the directions within each stage regarding the required sequence of minor steps.



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

Stage 1—Upgrading VMware VirtualCenter

This stage upgrades VirtualCenter Server and its database.

Expected Downtime in Stage 1

- **VirtualCenter Server** – Expect downtime for the following elements:

NOTE Refer to [“Release Upgrade Support”](#) on page 133 to ensure that this release supports an upgrade from your software version.

- **In-place upgrade** – VMware estimates that the upgrade requires VirtualCenter Server to be out of production for ten minutes. You must remove the version 1 software and install the version 2 software. No reboot is required. The downtime can be scheduled entirely at your convenience.
- **Migration upgrade** – You can avoid Stage 1 downtime if you have an extra supported machine. (See [“VirtualCenter Server Requirements”](#) on page 21.) Install the VirtualCenter version 2 server on the extra machine before you take the VirtualCenter version 1 server out of service.



WARNING VMware does not support management of one ESX Server host by multiple VirtualCenter Server machines. While there are safeguards, you might inadvertently find a host to be managed by VirtualCenter version 1 and version 2 servers at the same time. If so, shut down the version 1 server immediately or remove the host from the version 1 server to prevent corruption of virtual machines or the VirtualCenter database.

- **VMware license server** – No downtime is required.
- **ESX Server hosts** – No downtime is required.

- **Virtual machines** – No downtime is required.

Stage 1 Prerequisites

The following items are prerequisites for completing stage 1 of installation:

- A VirtualCenter release 1.x server.
- VMware VirtualCenter version 2 installation media.
- License keys for all purchased functionality.
These keys can include VirtualCenter Server, ESX Server, Virtual SMP, VMotion, DRS, and HA.
- Login credentials, the database name, and the database server name used by the VirtualCenter database. The database server name is typically the ODBC System DSN connection name for the VirtualCenter database.

Stage 1 Upgrade Tasks

- 1 Upgrade the VirtualCenter Server to version 2. Refer to [“Upgrading the VirtualCenter Server”](#) on page 136. These instructions describe the in-place upgrading of VirtualCenter Server.
- 2 Upgrade the VirtualCenter database. Refer to [“Upgrading the VirtualCenter Database”](#) on page 140.
- 3 Install the VI Client for users of the VirtualCenter client. Refer to [“Upgrading VirtualCenter Clients to Virtual Infrastructure Clients”](#) on page 144.
- 4 (Optional) Install a license server. Refer to [“Upgrading Virtual Infrastructure to Use the License Server”](#) on page 144. (As an alternative, you can use an existing license server, if one is available.)

Repercussions of Stage 1

- **Access database** – Access is no longer supported. MSDE is the supported demonstration database.
- **Legacy clients** – VMware Management Interface users and remote console clients cannot connect to a VirtualCenter version 2 server. However, any browser can connect to the VirtualCenter version 2 server URL and download a Windows Virtual Infrastructure Client. The Management Interface and remote console clients can still connect directly to ESX Server 2.x hosts, even if those hosts are now managed by VirtualCenter Server 2.0.

Stage 2—Upgrading Your ESX Server Hosts and Datastores

To ensure that you have enough free space for the upgrade and to check for other potential upgrade problems, run the pre-upgrade script. See [“Running the Pre-Upgrade Script”](#) on page 154.

Upgrade Strategy for ESX Server Host with Local Disks

If you are upgrading ESX Server hosts with only local disks and no shared SAN, your upgrade procedures are straightforward. Insert the product CD into the CD-ROM drive of your ESX Server host, and upgrade the ESX Server host as described in [“Performing the ESX Server Host Upgrade”](#) on page 153. This will upgrade the following components:

- ESX Server (in-place)
- VMFS filesystem (in-place)

The following components are not upgraded:

- Your virtual machines
- VMware Tools inside each machine

See [“Upgrading a Host with Virtual Machines on a Local Disk”](#) on page 124 for a more detailed walkthrough.

Upgrade Strategy for ESX Server Host with SAN

The rest of this section describes upgrading hosts with SAN-based shared VMFS datastores. The challenge here is in upgrading something that is shared: the VMFS disk. If you have multiple servers depending on, for example, a single VMFS disk, how do you accomplish the upgrade of that disk?

One approach is to upgrade all the servers first, and then upgrade the disk. Although this approach is possible, it incurs a large amount of downtime. All virtual machines in your environment must be brought down for the duration of the process, due to a key limitation that ESX Server 3.0 hosts cannot run virtual machines residing on legacy VMFS2 storage.

There are, fortunately, two other strategies that can minimize and mitigate the downtime for your virtual machines. These two approaches require additional thought and planning.

Depending on your situation, you might consider one of the two following strategies in upgrading a shared SAN environment:

- A migration upgrade to a separate VMFS3 datastore, as illustrated in the example [“Upgrading Hosts on a SAN Using VMotion with Datastore Relocation”](#) on page 126.
- An in-place upgrade of each VMFS2 datastore, as illustrated in the example [“Upgrading Hosts Sharing a SAN with In-Place VMFS Upgrade”](#) on page 128.

A migration upgrade to a separate VMFS3 datastore involves migrating virtual machines from your legacy environment to your new environment.

- **Pros** – Avoids downtime for virtual machines at this step.
- **Cons** – Migrating each virtual machine is time-consuming. Additional disk resources are needed. Each virtual machine’s virtual disk is copied from a VMFS2 volume to a VMFS3 volume.

NOTE This migration scenarios described in this chapter make use of a new feature in ESX Server 3.0.1. This feature is supported only for upgrades from specific ESX Server 2.x versions. Refer to the release notes for details of supported ESX Server 2.x versions. If you need to upgrade from an unsupported ESX Server 2.x version directly to ESX Server 3.0.1, you can use the alternative migration scenarios described in [Appendix C, “Additional Migration Upgrade Scenarios,”](#) on page 187.

An in-place upgrade essentially involves upgrading a subset of your ESX Server hosts and then upgrading their associated VMFS2 volumes in-place. This process can be repeated multiple times over subsets of ESX Server hosts and disks.

- **Pros** – An in-place upgrade is faster than a migration upgrade. No additional disk or server resources are needed.
- **Cons** – A group of virtual machines must experience downtime simultaneously while the VMFS2 volume on which they reside is upgraded.

Whatever strategy you take, you need to employ two basic procedures. The remainder of this section discusses these basic procedures:

- 1 [“Procedure 2A—Upgrading a VMware ESX Server Host”](#) on page 120
- 2 [“Procedure 2B—Upgrading a Datastore from VMFS2 to VMFS3”](#) on page 120

Expected Downtime in Stage 2

- **ESX Server Hosts – Expect downtime from the following elements:**
 - Procedure 2A – Whether you choose a migration or an in-place upgrade, each host must be rebooted for the upgrade, and then rebooted after the upgrade is installed. VMware estimates the upgrade requires each host to be out of

production for approximately 40 minutes. Virtual machines can be migrated with VMotion to prevent downtime.

- **Procedure 2B** – For an in-place upgrade, each datastore file system partition must be unavailable to all ESX Server hosts except the one performing the upgrade for the duration of the upgrade. For a migration upgrade, the VMFS2 datastore is emptied of virtual machines before it is upgraded, so the upgrade does not affect any ESX Server hosts.
- **Virtual Machine** – For an in-place upgrade, downtime occurs when you upgrade the host and continues until you have upgraded the VMFS2 datastore to VMFS3. For a migration upgrade, virtual machine downtime need not occur during the host or datastore upgrade.

See also [“Procedure 2A—Upgrading a VMware ESX Server Host”](#) on page 120 and [“Procedure 2B—Upgrading a Datastore from VMFS2 to VMFS3”](#) on page 120.

Procedure 2A—Upgrading a VMware ESX Server Host

Procedure 2A has the following repercussions:

- **VM2 virtual machines** – VM2-format virtual machines remain on VMFS2 datastores. An ESX Server 3.0 host cannot power on a VM2-format virtual machines on a VMFS2 datastore. If you attempt to power on a VM2-format virtual machine before moving it to a VMFS3 datastore, you receive an error.
- **VMFS2 datastores** – VMFS2 datastore must be upgraded or they are read-only on ESX Server 3.0 hosts at the end of stage 2. The required VMFS2 to VMFS3 upgrade is accomplished in the next stage.
- **Legacy clients** – VMware Management Interface users and remote console clients cannot connect to an ESX Server version 3 host. However, any browser can connect to the ESX Server version 3 host URL and download a Windows Virtual Infrastructure Client.

Procedure 2B—Upgrading a Datastore from VMFS2 to VMFS3

The upgrade from VMFS2 to VMFS3 is a nondestructive upgrade to the file system. Virtual machines stored on VMFS2 volumes are not erased. All virtual machines with disks on the VMFS2 volume must be powered off.

Procedure 2B has the following repercussions:

- **ESX Server version 2 host** – Is no longer supported at the end of procedure 2B. An ESX Server version 2 host cannot access VMFS3 datastores.

- **ESX Server version 3 host** – Reads VMFS2 datastores for upgrade only. An ESX Server version 3 host cannot power on a virtual machine from VMFS2 datastores.
- **VM2-Format virtual machines** – Can be powered on in legacy mode if they are relocated to VMFS3 datastores.

Non-upgraded (VM2 format) virtual machines remain in the appropriate ESX Server inventory. Manual VM3 upgrades occur in stage 4.

- **VMFS2 datastores** – Are no longer supported for running virtual machines. VMFS2 datastores are upgraded or removed from service. All virtual machines on VMFS2 partitions remain registered with the appropriate ESX Server 3.0 host. However, any attempt to power on a VM2-format virtual machine fails with an error message `IncompatibleVersion`.
- **VMFS3 datastores** – Contain all usable virtual machines at the end of procedure 2B. All virtual machines are on VMFS3 partitions registered with the appropriate ESX Server version 3 host.



WARNING Do not move to stage 3 until all virtual machines are relocated onto VMFS3 datastores.

Stage 3—Upgrading Your Virtual Machines

Stage 3 is a manual upgrade for remaining VM2-format virtual machines. The VM3-format upgrade offers improved snapshots and other enhanced functionality.



WARNING The stage 3 upgrade is irreversible. Upgraded virtual machines can never again be powered on by an ESX Server version 2 host, even if relocated to a VMFS2 datastore. Make certain you have previously backed up any virtual machine if you hope to use it again on an ESX Server version 2 host.

Expected Downtime in Stage 3

- **VirtualCenter Server** – No downtime is required.
- **ESX Server hosts** – No downtime is required.
- **VMware license server** – No downtime is required.
- **Virtual machines** – VMware estimates the upgrade requires each virtual machine to be out of production for 30 minutes. The downtime can be concurrent for multiple virtual machines.

Stage 3 Prerequisites

The following items are prerequisites for completing stage 3 of installation:

- All `.vmdk` files must be available to the ESX Server host on a VMFS3 datastore.
- A virtual machine can be upgraded if:
 - It is stored on VMFS3 or NAS datastores.
 - No suspend files exist.
 - At least one virtual disk exists.

Repercussions of Stage 3

- **VM2-format virtual machines** – Have been upgraded at the end of this stage.
- **VM3-format virtual machines** – This is the format of all virtual machines.

Stage 3 Upgrade Tasks

- 1 Select a virtual machine in the Inventory.
- 2 Choose **Inventory > Virtual Machine > Upgrade Virtual Hardware**.

See [“Upgrading Datastores”](#) on page 164 for the details of this procedure.

Alternatively, you can run a script to upgrade multiple virtual machines from VM2 to VM3 and upgrade their VMware Tools versions. See [“Upgrading Hardware and VMware Tools in Multiple Virtual Machines”](#) on page 169.

Upgrading to VM3 virtual hardware format results in these actions:

- The `.vmx` configuration file is updated to VM3 format.
- The `.vmdk` virtual disk file is updated to VMDK3 format. This allows operation of features such as multiple snapshots.
- The `.vmx` and `.vmdk` files are located in one directory on the VMFS3 volume. This allows a virtual machine to be used by any ESX Server host sharing the datastore. (If the virtual machine was relocated to this VMFS3 datastore during a migration upgrade, these files will already be located on the VMFS3 volume prior to the virtual hardware upgrade.)



WARNING Do not move to stage 4 until all virtual machines are upgraded to VM3 format.

Stage 4—Upgrading VMware Tools Within the Guest Operating System

VMware Tools includes drivers that are optimized for the emulated and virtualized hardware in a VMware virtual machine. Updating VMware Tools provides the best performance and stability available for a guest operating system.

Expected Downtime in Stage 4

- **VirtualCenter Server** – No downtime is required.
- **ESX Server hosts** – No downtime is required.
- **VMware license server** – No downtime is required.
- **Virtual machines** – Must be rebooted once as part of the VMware Tools upgrade.

Stage 4 Prerequisites

The following items are prerequisites for completing stage 4 of installation:

- A supported guest operating system must be installed on the virtual machine.
- You must have a license installed that allows you to power on virtual machines.

Stage 4 Upgrade Procedure

- 1 Launch the virtual machine.
- 2 Install VMware Tools from your VirtualCenter 2.0 client. For the procedure, refer to [“Upgrading to VMware Tools 3”](#) on page 168.

Alternatively, you can run a script to upgrade multiple virtual machines from VM2 to VM3 and upgrade their VMware Tools versions. See [“Upgrading Hardware and VMware Tools in Multiple Virtual Machines”](#) on page 169.

Repercussions of Stage 4

- **VMware Tools 2** – All virtual machines have been upgraded from VMware Tools 2 to VMware Tools 3 at the end of this stage.
- **VMware Tools 3** – Is used by all virtual machines.

The next section describes several upgrade scenarios.

Upgrade Examples

This section describes details of four specific upgrade scenarios as listed in [Table 7-2](#). These scenarios illustrate some possible upgrade paths for typical virtual infrastructure

environments but do not provide an exhaustive description of all possible upgrade paths.

Table 7-2. Upgrade Examples

Scenario	Method	Pros	Cons
“Upgrading a Host with Virtual Machines on a Local Disk” on page 124	In-place upgrade for VirtualCenter Server, ESX Server, and VMFS.	■ Upgrade without new disk or new server.	■ All virtual machines on disk have downtime.
“Upgrading Hosts on a SAN Using VMotion with Datastore Relocation” on page 126	In-place upgrade of VirtualCenter Server and ESX Server. Migration upgrade for VMFS.	■ Avoids virtual machine downtime.	■ Needs duplication of storage. ■ Copying of virtual machines to VMFS3 datastores can be slow. ■ Network overhead is high.
“Upgrading Hosts Sharing a SAN with In-Place VMFS Upgrade” on page 128	In-place upgrade for VirtualCenter Server, ESX Server, and VMFS.	■ Upgrade without new disks or servers.	■ All virtual machines on disk have downtime.

Time estimates are based on assumptions below:

- ESX Server upgrade: 40 minutes per host.
- VMFS upgrade: 15 to 20 minutes.
- VM upgrade: one minute per virtual machine.

Upgrading a Host with Virtual Machines on a Local Disk

In this in-place upgrade scenario, you upgrade one ESX Server host, an internal VMFS datastore, and all virtual machines in one session. The ESX Server host is not operational during the upgrade.

Table 7-3. Summary of Upgrade for Single Host with Virtual Machines on a Local Disk

ESX Server Hosts	Internal SCSI Drives or RAID	Networked Storage or SAN Volumes	Manual Upgrade Time
1	1	0	2 hours

This upgrade scenario is applicable to environments like that depicted in [Figure 7-1](#), where each ESX Server hosts has its own virtual machines stored on local VMFS2 storage.

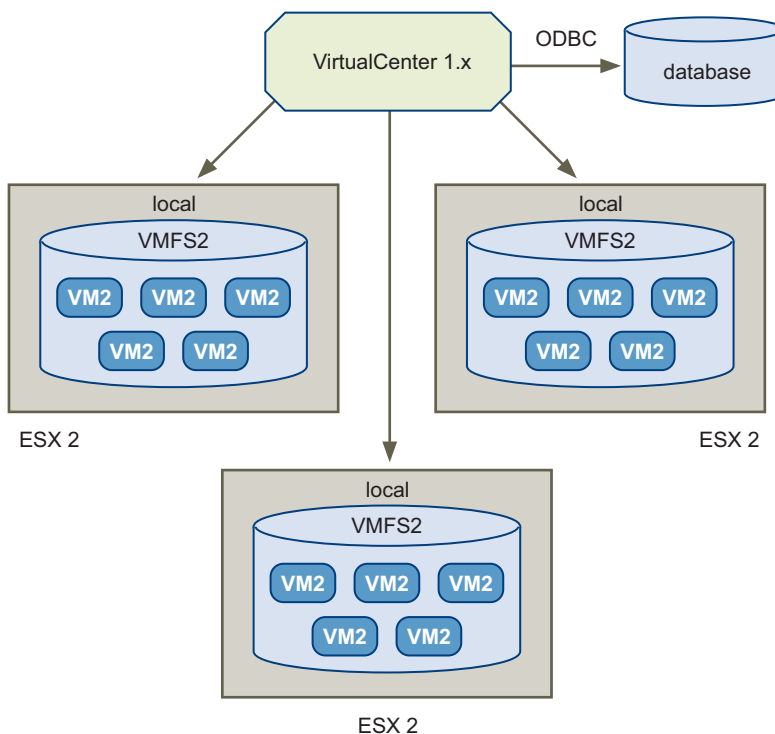


Figure 7-1. Typical Environment for “[Upgrading a Host with Virtual Machines on a Local Disk](#)” on page 124

To upgrade a host with virtual machines on a local disk

- 1 Upgrade VirtualCenter version 1.x to version 2.
See “[Performing the VirtualCenter Upgrade](#)” on page 135.
- 2 Power off all virtual machines.
- 3 Upgrade ESX Server version 2.x to version 3. Reconnect the ESX Server host to the Virtual Center Server.
See “[Performing the ESX Server Host Upgrade](#)” on page 153.
- 4 Upgrade VMFS2 to VMFS3, in-place.
See “[Upgrading Datastores](#)” on page 164.

- 5 Upgrade virtual machines from VM2 format to VM3.
See [“Upgrading Virtual Machines”](#) on page 167. This step also relocates all virtual machine files to the VMFS3 datastore.
- 6 Upgrade VMware Tools 2 to VMware Tools 3.
See [“Upgrading to VMware Tools 3”](#) on page 168.

In this scenario, all virtual machines on the disk experience downtime.

Upgrading Hosts on a SAN Using VMotion with Datastore Relocation

In this scenario, you upgrade multiple ESX Server hosts sharing VMFS2 volumes on a SAN datastore. A typical environment for this upgrade is illustrated in [Figure 7-2](#).

NOTE You cannot use this type of migration upgrade for virtual machines residing on a shared mode VMFS2 datastore. Refer to *Setup for Microsoft Cluster Service* for more information on upgrading with shared VMFS2 volumes.

Table 7-4. Summary of Upgrade for Multiple Hosts Sharing a SAN Using Network Copy

ESX Server Hosts	Internal SCSI Drives or RAID	Networked Storage or SAN Volumes	Manual Upgrade Time
Two or more	0	One or more	Four hours or more, depending on number of hosts

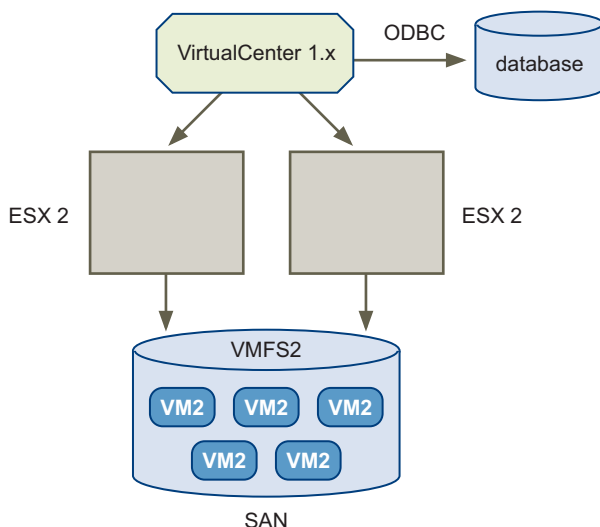


Figure 7-2. Typical Environment for “[Upgrading Hosts on a SAN Using VMotion with Datastore Relocation](#)” on page 126

To upgrade hosts on a SAN using VMotion with datastore relocation

- 1 Upgrade VirtualCenter release 1.x to version 2.
See “[Performing the VirtualCenter Upgrade](#)” on page 135.
- 2 Evacuate all virtual machines from an ESX Server version 2.x host using VMotion.
- 3 Upgrade this empty host to ESX Server version 3.
See “[Performing the ESX Server Host Upgrade](#)” on page 153.
- 4 Use this host to create a new VMFS3 volume on the SAN.
This volume must be equal or greater in storage capacity to the VMFS2 volume to be upgraded.
- 5 Migrate the virtual machine to the ESX Server host and the new VMFS3 datastore without virtual machine downtime.

NOTE If the migration fails during the copying of the virtual machine disk files from the VMFS2 to the VMFS3 datastore, you must power off the virtual machine and relocate the virtual machine to the VMFS3 datastore.

- 6 Using the ESX Server version 3 host, upgrade the virtual machine from VM2 format to VM3.

See [“Upgrading Virtual Hardware to VM3 Format”](#) on page 167.

- 7 Upgrade VMware Tools 2 to VMware Tools 3 from within the guest operating system.

See [“Upgrading to VMware Tools 3”](#) on page 168.

- 8 Migrate your remaining virtual machines in the same manner.

Upgrading Hosts Sharing a SAN with In-Place VMFS Upgrade

This scenario describes an upgrade for multiple ESX Server hosts sharing a SAN datastore. A typical environment for this upgrade is illustrated in [Figure 7-3](#).

Table 7-5. Summary of Upgrade of Multiple Hosts on a SAN with VMFS Datastore In-place

ESX Server Hosts	Internal SCSI Drives or RAID	Networked Storage or SAN Volumes	Manual Upgrade Time
Two or more	0	More volumes than hosts	Four hours or more, depending on number of hosts

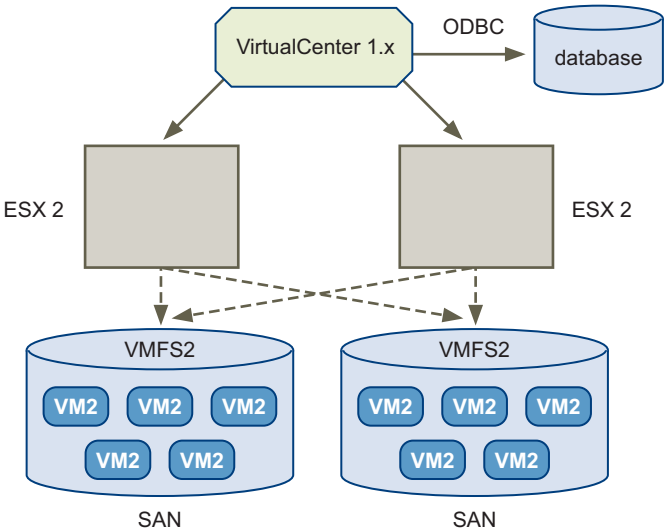


Figure 7-3. Typical Environment for [“Upgrading Hosts Sharing a SAN with In-Place VMFS Upgrade”](#) on page 128

Before performing this type of upgrade, it might be useful to perform a host-virtual machine-LUN (HVL) alignment, that is, to migrate virtual machines so that all virtual machines on a given LUN are associated with only one ESX Server host. When hosts, virtual machines, and LUNs are aligned in this way, you can upgrade hosts and VMFS2 datastores in pairs without having to consider effects on other hosts and datastores.

Often, an HVL alignment can be achieved using VMotion to realign the virtual machines with hosts. If this is not possible, then cold migration is necessary. The extra virtual machine downtime incurred by cold migration might outweigh the benefits of performing the HVL alignment.

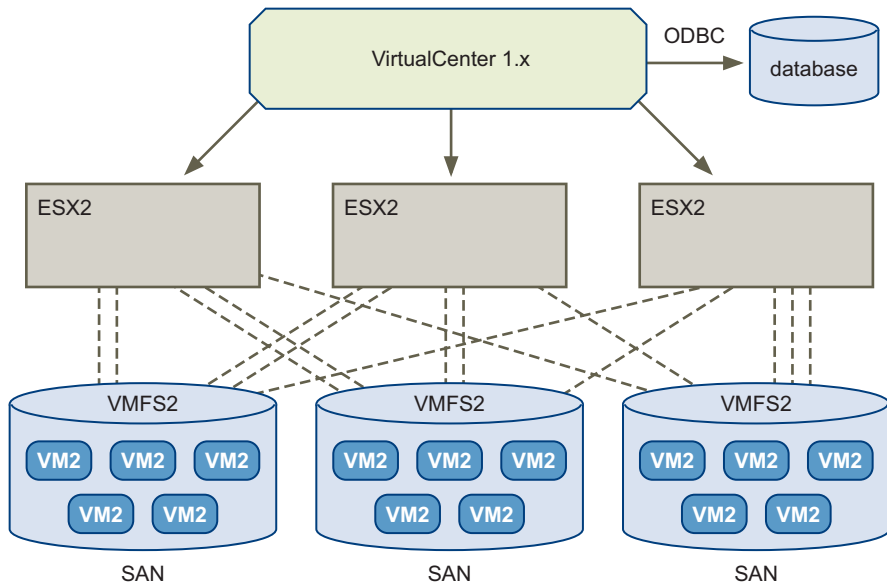


Figure 7-4. Typical Environment Before HVL Alignment

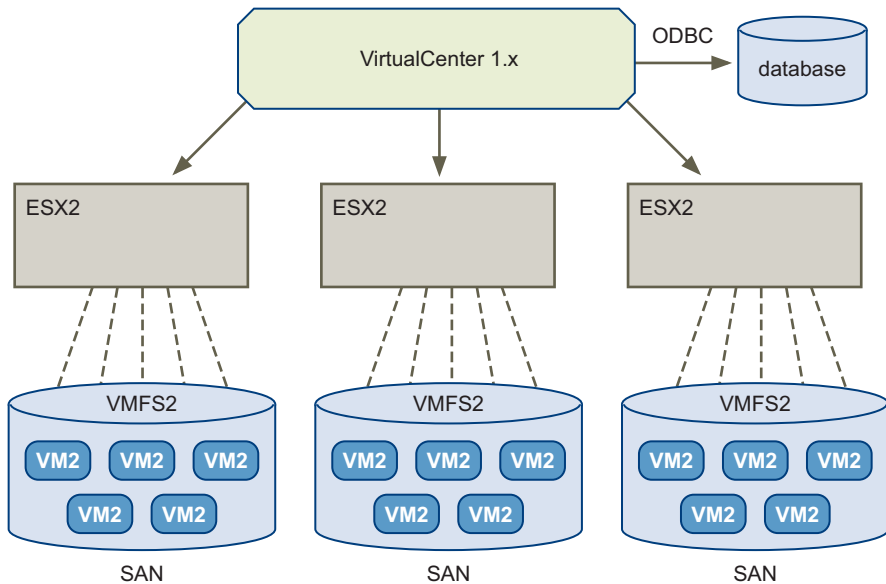


Figure 7-5. Typical Environment After HVL Alignment

To upgrade hosts sharing a SAN with in-place VMFS upgrade

- 1 Upgrade VirtualCenter version 1.x to version 2.
See [“Performing the VirtualCenter Upgrade”](#) on page 135.
- 2 Choose a host and datastore pair to upgrade. Power off all virtual machines on the host.
- 3 Upgrade the host to ESX Server version 3.
See [“Performing the ESX Server Host Upgrade”](#) on page 153.
- 4 Upgrade the file system in-place from VMFS2 to VMFS3.
See [“Upgrading Datastores”](#) on page 164.
- 5 Upgrade the virtual machine from VM2 format to VM3.
See [“Upgrading Virtual Hardware to VM3 Format”](#) on page 167. This step also relocates all virtual machine files to the VMFS3 datastore.
- 6 Upgrade VMware Tools 2 to VMware Tools 3.
See [“Upgrading to VMware Tools 3”](#) on page 168.

Where to Go Next

- [“Upgrading VirtualCenter”](#) on page 133

Upgrading VirtualCenter

The following sections list procedures and issues for upgrading VMware VirtualCenter:

- [“Before You Upgrade VMware VirtualCenter”](#) on page 133
- [“Performing the VirtualCenter Upgrade”](#) on page 135



WARNING You must upgrade VMware VirtualCenter before you upgrade VMware ESX Server. However, some upgrade procedures in this chapter must occur *after* you install VMware ESX Server. If you do not upgrade in the stages described in this manual, you can lose data and lose access to your servers. See [“Understanding the Stages of Upgrading”](#) on page 115.

Before You Upgrade VMware VirtualCenter

This section describes important considerations to be aware of and preparations to make before you begin a VirtualCenter upgrade:

- [“Release Upgrade Support”](#) on page 133
- [“Before You Upgrade Your VirtualCenter Server”](#) on page 134

Release Upgrade Support

Upgrades from previous VirtualCenter releases are supported as follows:

- **VirtualCenter upgrades** are supported from VirtualCenter 1.0–1.4 to VirtualCenter 2.0 release.
- **Unsupported upgrades** include all VirtualCenter beta releases. Upgrading from these releases can fail with lost data and unusable configurations.

[Table 8-1](#) lists versions of VirtualCenter which are supported for upgrade.

Table 8-1. VirtualCenter Upgrade Support

VMware VirtualCenter Version	Upgrade Support to VirtualCenter version 2
VirtualCenter beta release (any)	No upgrade support
VirtualCenter release 1.0	Upgrade to VirtualCenter version 1.2 first ¹
VirtualCenter release 1.1	Upgrade to VirtualCenter version 1.2 first ¹
VirtualCenter release 1.2	Yes
VirtualCenter release 1.3	Yes
VirtualCenter release 1.3.1	Yes
VirtualCenter release 1.4	Yes

1. **The database is not preserved unless you first upgrade to at least VirtualCenter version 1.2.**

Before You Upgrade Your VirtualCenter Server

Before you upgrade your VirtualCenter Server, consider the following points:

- [“VirtualCenter Version 2 Server Uses TCP/IP Ports 80 and 443”](#) on page 134
- [“VirtualCenter Version 2 Server Cannot Run on a GSX Server Host”](#) on page 134
- [“VirtualCenter Database Must Be Upgraded”](#) on page 135
- [“MDAC 2.6 or Higher Must Be Installed on Windows 2000 Server SP4”](#) on page 135

VirtualCenter Version 2 Server Uses TCP/IP Ports 80 and 443

Previous releases allow you to run VirtualCenter Server on the same machine as a Web server using TCP/IP port 80 (http) or port 443. This configuration is no longer allowed because it causes a port conflict. VirtualCenter Server uses TCP/IP ports 80 and 443 for the virtual infrastructure Web client.

VirtualCenter Version 2 Server Cannot Run on a GSX Server Host

VirtualCenter version 2 server cannot exist on a GSX Server host. These VMware applications use the same TCP/IP ports (notably 80 and 902).

You can remove GSX Server software after you perform the VirtualCenter Server upgrade. However, with both products operating on the same machine, errors can include the following:

- No Web access to the VirtualCenter version 2 server.
- Connections using a Virtual Infrastructure Client produce the message 530 Please Login with USER and PASS.
- Dropped or unsuccessful connections occur when using the GSX Server client.

VirtualCenter Database Must Be Upgraded

As part of upgrading your VirtualCenter Server, you must upgrade the VirtualCenter database. You cannot use the same database for VirtualCenter Server release 1.x and version 2.

Read [“Upgrading the VirtualCenter Database”](#) on page 140 carefully before you begin the upgrade process.



WARNING When the VirtualCenter Database Upgrade wizard runs, it updates the database with extra fields, making the database unusable by a VirtualCenter 1.x server.

MDAC 2.6 or Higher Must Be Installed on Windows 2000 Server SP4

If you are upgrading VirtualCenter Server installed on a computer running Windows 2000 Server Service Pack 4, you must install Microsoft Data Access Components (MDAC) version 2.6 or higher in order for the database upgrade to proceed successfully. Download the latest version of MDAC from <http://msdn.microsoft.com/data/ref/mdac/downloads/>.

Performing the VirtualCenter Upgrade

This section describes stage 1 (out of four stages) in upgrading your VirtualCenter Server and ESX Server infrastructure. For a list of all stages, see [“Understanding the Stages of Upgrading”](#) on page 115.

The VirtualCenter upgrade includes the following steps:

- [“Upgrading the VirtualCenter Server”](#) on page 136
- [“Upgrading the VirtualCenter Database”](#) on page 140
- [“Upgrading VirtualCenter Clients to Virtual Infrastructure Clients”](#) on page 144
- [“Upgrading Virtual Infrastructure to Use the License Server”](#) on page 144

Upgrading the VirtualCenter Server

The VirtualCenter 2.0 installer detects any previous VirtualCenter release and uninstalls it. After the uninstall, the actual installation of VirtualCenter 2.0 begins.

This operation requires downtime for the VirtualCenter Server that you are upgrading. No virtual machines need to be powered off.

To upgrade VirtualCenter Server

- 1 Launch the VirtualCenter installer.

Insert the installer CD or download the VirtualCenter installer file from the VMware secure Web site to a local drive.

- 2 Run the installer.

- **From CD** – Click **VirtualCenter/webCenter** on the **Autorun** menu.

- **From a Download** – Double-click the vmware-vcserver.exe icon.

A splash screen appears. The VirtualCenter installer prepares to install the components. A progress dialog box appears.

NOTE You can click **Cancel** to abort the upgrade at any time.

The Welcome page appears.

- 3 Verify you are installing VirtualCenter Server. The installer recognizes your previous installation and warns you that it is going to remove it. Click **Next**.

The license agreement appears.

- 4 Read the license agreement, and click **Accept** to agree to the terms and conditions. Click **Next**.

The Customer information page appears.

- 5 Type your user name and company name. Click **Next**.

The Destination Folder page appears.

- 6 Select the destination folder in which you want to install the VirtualCenter Server. Click **Next**.

The Setup Type page appears.

- 7 Select the type of setup, and click **Next**.

- **Typical** – Select this option for a quick installation using the typical settings.

- **Custom** – Select this option to configure all the details of your upgrade.

For example, use the custom installation if you do not want to install VI Web Access.

The VMware VirtualCenter Database page appears.

- 8 Select the option corresponding with the database you previously configured in [“Preparing the VirtualCenter Server Database”](#) on page 57. Click **Next**.

NOTE If you have not previously configured a supported database, you must choose to install a MSDE database, or cancel the upgrade and install or configure a supported database. If no supported database is available, the VirtualCenter installer cannot continue.

The Database Information page appears.

- 9 Enter your database connection information (Oracle and SQL):

NOTE This step does not appear for MSDE database setup.

- a Enter the System data source name (DSN) associated with your database.
This must be a System DSN, and not a User DSN. If a User DSN is specified, the installation fails.
- b If this is a local SQL Server database using Windows NT authentication, leave the user name and password blank. Otherwise, type the user name and password.
- c Click **Next**.

NOTE If your connection fails, a warning appears: “The ‘<DSN_Name>’ DSN does not exist or is not a system DSN. VirtualCenter accepts only system DSNs. Use the ‘ODBC DSN Setup’ button to start the ODBC Data Source Administrator to define it.”

Click **OK** and re-enter your database connection information until you can continue. If you have trouble, see [“Preparing the VirtualCenter Server Database”](#) on page 57.

- 10 Configure a license server for the VirtualCenter Server.

NOTE VirtualCenter version 2 server requires a license server.

If you have a previously installed license server, this dialog box does not appear. Continue with [Step 11](#).

VMware recommends that your license server reside on the same machine as your VirtualCenter Server. This ensures the best possible license pool availability. If you want to install a license server on another machine, select **Configure VirtualCenter to use an existing License Server**, even if you have not yet installed the license server elsewhere.

The two options are to install a license server on this machine or configure VirtualCenter to use an existing license server on another machine:

■ **Install a License Server** on the VirtualCenter Server.

You need to have a license file saved on this machine.

- a Select **Install a local VMware License Server**, and click **Next**.
- b Browse for the license file, and click **Next**.

■ **Configure VirtualCenter to use an existing License Server.**

You need not have previously installed a license server.

- a Select **Configure VMware VirtualCenter Server**, and click **Next**
- b Configure the network location of your VirtualCenter license server.

Enter the port and host name of your VirtualCenter license server in one of the following formats:

port@hostname – For example, 27000@testserver.vmware.com

port@ip.address – For example, 27000@192.168.123.254

If you have not yet installed a license server, leave the default port entry in place. See [“Installing the License Server”](#) on page 54 for more information.

- c Click **Next**.

The VirtualCenter Web Service page appears.

NOTE This dialog box configures the Web service for the VMware Software Development Kit (SDK). This Web service should not be confused with VirtualCenter Server Web server, which provides client downloads and administrative functionality.

- 11 Configure the VirtualCenter SDK Web service:
 - a Enter a Web Service https port. The default is 443.
 - b Enter a Web Service http port. The default is 80.

- c Enter a VirtualCenter diagnostic port. The default is 8083.
- d Enter a VirtualCenter port (the port that VirtualCenter uses to communicate with the VI Client). The default is 902.
- a Enter a VirtualCenter heartbeat port. The default is 902.
- b Select the check box if you want to maintain compatibility with the older SDK Web interface.
- c Click **Next**.

The VMware VirtualCenter Web Server page appears.

- 12 Configure the VirtualCenter Web server:
 - a Verify the TCP/IP port on which you want the Web server to communicate.
 - b Select the appropriate check box if you want the Web server to start each time Windows starts.
 - c Select the appropriate check box if you want to start the Web server now.
 - d Click **Next** when you have completed configuring the Web server.
- 13 Click **Install** to begin the installation.

NOTE If you have a VirtualCenter version 1 client open on this machine, the installer asks you to close the client to continue the upgrade.

Installation can take a few minutes. Multiple progress bars appear during the VirtualCenter Server upgrade.



WARNING All VMware clients connected to this VirtualCenter Server are disconnected now. To access a virtual machine during [Step 13](#), a VMware client must connect directly to the appropriate ESX Server host.

- 14 A dialog box is displayed with the message, "Would you like to remove the VMware VirtualCenter database setting from this machine? Select 'NO' if you would like to preserve these settings for future install."
 - Click **No** to preserve the VirtualCenter database for upgrading by the Database Upgrade wizard.
 - Click **Yes** if you had a Microsoft Access database and no longer need it.



WARNING If you click **Yes** at this point, the DSN is deleted, and the Database Upgrade wizard cannot upgrade the VirtualCenter database. To recover the DSN, follow the instructions in [“Repairing the Database DSN”](#) on page 143.

The Installation Completed page appears.

- 15 Select **Launch the VMware VirtualCenter Server 2.0 database upgrade wizard** to upgrade your database after the installation is finished. Click **Finish** to complete the installation of VirtualCenter Server.

The Database Upgrade wizard launches.

- 16 Continue with [“Using the Database Upgrade Wizard”](#) on page 142.

Upgrading the VirtualCenter Database

This section describes how to upgrade your VirtualCenter database. Follow the steps in [“Using the Database Upgrade Wizard”](#) on page 142 to upgrade your database. Follow the steps in [“Repairing the Database DSN”](#) on page 143 to restore a database DSN that you have unintentionally deleted.

NOTE You must upgrade a VirtualCenter Server version 1 or version 1.1 configuration to version 1.2 or higher if you want to preserve your database.

Three issues arise when migrating an existing VirtualCenter database to one of the database formats supported by VirtualCenter version 2 server:

- If you select the **database upgrade** option, the appropriate scripts for a database upgrade are launched, and progress, status, and any error messages encountered appear in the VirtualCenter installer.
- If a database chosen for upgrade appears to be corrupted or somehow incompatible with the database upgrade process, a warning appears in the VirtualCenter Server installer. You are given the option to cancel the database upgrade process.
- **If you upgrade on a Windows 2000 Server SP4 machine**, Windows 2000 Server SP4 requires installation of Microsoft Data Access Components (MDAC) 2.6 or higher. Before you upgrade VirtualCenter on Windows 2000, you should upgrade to the latest version of MDAC.

NOTE This issue does not appear to affect other Windows versions, only Windows 2000.

Upgrading Oracle and SQL Databases

During the upgrade of VirtualCenter Server, a dialog box asks if you want to keep your database settings. The ability to keep your database depends on the VirtualCenter release from which you are upgrading:

- **VirtualCenter release 1.0 or 1.1** – VirtualCenter version 2 cannot upgrade your database. Click **No**. The installer creates an empty database, using your existing database configuration and login credentials.
- **VirtualCenter release 1.2 and 1.3** – VirtualCenter version 2 can upgrade your database, or you can create an empty database:
 - Click **OK** to upgrade the existing database for VirtualCenter version 2.
 - Click **No** to have the installer create an empty database, using your existing database configuration and login credentials.

End of Life for Access Database

VMware VirtualCenter version 2 does not support Microsoft Access. For demonstration installations, VirtualCenter 2.0 supports Microsoft MSDE. For help configuring MSDE, see [“Configuring Microsoft SQL Server Desktop Engine \(MSDE\)”](#) on page 62.

If you have data in an Access database that you want to use with your upgraded VirtualCenter version 2 installation, you can migrate to an MSDE or SQL Server database.

To migrate an Access database to MSDE or SQL Server

- 1 Install MSDE or SQL Server.
- 2 Create and configure a new database to store the VirtualCenter repository, as described in either [“Configuring a SQL Server ODBC Connection”](#) on page 59 or [“Configuring Microsoft SQL Server Desktop Engine \(MSDE\)”](#) on page 62.
- 3 Shut down the VirtualCenter Server.
- 4 Reinstall VirtualCenter version 1.2 or 1.3, selecting the database you created in [Step 2](#) as your database. Do not start the VirtualCenter service after reinstallation.
- 5 Use the Microsoft Access Upsizing wizard to migrate your old database to the new database:
 - a Open the database that you want to migrate in Microsoft Access.
 - b Choose **Tools > Database Utilities > Upsizing Wizard**.
 - c Select **Use existing database**, and click **Next**.

- d The Select Data Source dialog box appears. Click the **Machine Data Source** tab, and select the DSN you created as part of [Step 2](#). Click **OK**.
 - e Click >> to move all available tables to the Export to SQL Server column. Click **Next**.
 - f Do not select any table attributes to data options to include. Click **Next**.
 - g Select **No application changes**. Click **Next**.
 - h Click **Finish**.
- 6 The Upsizing Wizard Report appears. Review the report. If no errors are reported, migration is complete.

After your Microsoft Access database has been migrated to an MSDE or SQL Server database, it can be upgraded as part of the upgrade to VirtualCenter version 2.0.

NOTE The Microsoft Access Upsizing wizard is available in Microsoft Access 2000 and higher versions. For information on using the Upsizing wizard on earlier versions of Access and for other known issues, refer to the following Microsoft knowledge base articles: support.microsoft.com/default.aspx?kbid=241743 and support.microsoft.com/?kbid=237980.

Using the Database Upgrade Wizard

If you selected the check box for **Launch the VMware VirtualCenter Server 2.0 database upgrade wizard** on the Finish page of the VirtualCenter installation, the Database Upgrade wizard starts automatically.

To upgrade the VirtualCenter database

- 1 On the first page of the wizard, review the supported database types. If your database is not one of these supported types, click **Cancel**, convert the database to one of those types, and restart the wizard.

NOTE On the first three wizard pages, you can click **Cancel** at any time to cancel the upgrade process and close the wizard. Be aware, however, that if you do not upgrade your VirtualCenter 1.x database, you cannot use the VirtualCenter Management Server version 2.0 with that database.

- 2 After you have determined that your database is one of the supported database types, click **Next**.
- 3 On the Upgrade Information page of the wizard, select one or both of the following options if you want to include either of these types of data in your upgraded database:

- **Preserve events and tasks** – Ensures that all events and tasks associated with the ESX Server hosts, virtual machines, and VirtualCenter 1.x are preserved after the upgrade.
- **Preserve performance data** – Ensures that all performance data for the ESX Server hosts and virtual machines is preserved after the upgrade.

NOTE The tables for events/tasks and performance data can be large. For that reason, you might decide not to save them. Be aware, however, that if you do not preserve the tables, you cannot view historical performance statistics and events/tasks for the time when the database was maintained in VirtualCenter 1.x.

- 4 Click **Next** after you have selected the options you want to use.
- 5 On the Ready to Complete page of the wizard, review the summary information. If you need to change any of these particulars for the database, click **Back** or click the **Upgrade Information** link to return to the Upgrade Information panel and make the needed changes.
- 6 When the summary information is correct, click **Start** to begin the upgrade process.

The Upgrade Status page is displayed and shows you the progress of the upgrade as it occurs. When the upgrade has completed, the Upgrade Status page displays a message about the success or failure of the upgrade process.

NOTE After a successful database upgrade, the system tries to start the vpxd service. If the service times out because the database is large, you see an error message noting that the upgrade has failed. The upgrade has not failed, however. The installer has simply timed out waiting for the service to start.

- 7 Click **Finish** to close the Database Upgrade wizard.

Repairing the Database DSN

Follow this procedure to restore your database DSN and upgrade your database if you selected yes in [Step 14](#) of the procedure “[Upgrading the VirtualCenter Server](#)” on page 136.

To restore the database DSN

- 1 Create a DSN and configure it with the same options used for your original VirtualCenter 1.x DSN. See “[Configuring Your VirtualCenter Database](#)” on page 58.
- 2 Start the VC2.0 Server installer again.

- 3 Select the **Repair/Modify** option and provide database details in the Database Information page.
- 4 Complete the remaining pages of the VirtualCenter Upgrade wizard, and launch the Database Upgrade wizard. Follow the steps described in [“Using the Database Upgrade Wizard”](#) on page 142.

Upgrading VirtualCenter Clients to Virtual Infrastructure Clients

Virtual machine users and VirtualCenter administrators must use the Virtual Infrastructure Client (VI Client) to connect. Older clients do not work for VirtualCenter version 2 server or ESX Server version 3 hosts.

The VI Client is available for download from all VirtualCenter version 2 servers or ESX Server version 3 hosts. Connect to the URL of the appropriate machine with a Web browser.

Downtime for a Virtual Infrastructure Client Upgrade

This operation requires no downtime. No virtual machines or clients need to be powered off for this process.

To upgrade the Virtual Infrastructure Client

- 1 (Optional) Use **Add/Remove Programs** from the control panel to remove any previous VMware client.

NOTE Older VMware clients do not need to be removed. The Virtual Infrastructure Client can coexist with the VirtualCenter Client version 1.x, the GSX Server Client version 3.x, and the VMware remote console.

- 2 Install the Virtual Infrastructure Client as described in [“Installing the Virtual Infrastructure Client”](#) on page 68.

Troubleshooting the Virtual Infrastructure Client

The “One or more of the types in the assembly unable to load” message indicates that the client installation has failed. You must uninstall the VI Client using **Add/Remove Programs** from the Windows Control Panel, and reinstall it.

Upgrading Virtual Infrastructure to Use the License Server

VirtualCenter version 2 requires a license server. If you did not allow the VirtualCenter installer to install one, see [“Installing the License Server”](#) on page 54 to install a license server.

Downtime for a License Server Installation

This stage requires no downtime. No virtual machines, servers, hosts, or clients need to be powered off for this process.

Where to Go Next

- [“Installing the License Server”](#) on page 54
- [“Upgrading ESX Server”](#) on page 147

Upgrading ESX Server

This chapter lists the upgrade issues and procedure for upgrading ESX Server hosts.

- [“Before You Upgrade ESX Server”](#) on page 147
- [“Performing the ESX Server Host Upgrade”](#) on page 153
- [“Upgrading Datastores”](#) on page 164
- [Appendix 9, “Relocating Virtual Machines,”](#) on page 166



WARNING If you have an enterprise using VMware VirtualCenter, you must upgrade the VirtualCenter Server before you upgrade any ESX Server hosts. Otherwise, you might lose data and host access. See [“Understanding the Stages of Upgrading”](#) on page 115.

Before You Upgrade ESX Server

Read [“Planning a VMware Infrastructure Upgrade”](#) on page 107 before you begin an upgrade. If you do not follow the order given in this manual, you might lose data and lose access to your servers.

This section discusses important issues to consider before you upgrade an ESX Server host.

- [“Release Upgrade Support”](#) on page 148
- [“Follow Upgrade Steps in the Order Given”](#) on page 149
- [“Host Configuration Requires a Virtual Infrastructure Client”](#) on page 149
- [“Support for Scripted Installations”](#) on page 149

- [“Support for Legacy Hardware”](#) on page 149
- [“Components Installed by the Upgrade”](#) on page 150
- [“Upgrade Requirements”](#) on page 150
- [“Using ILO, DRAC, and RSA II”](#) on page 151
- [“Selecting the Boot Drive”](#) on page 151
- [“Host Drive and LUN Requirements”](#) on page 151
- [“Verifying Hardware Support”](#) on page 152
- [“Allocating PCI Devices”](#) on page 152
- [“Debug Mode Is Not Installed with an Upgrade from ESX Server 2.x”](#) on page 152
- [“Commit or Discard Changes to Virtual Disks in Undoable Mode”](#) on page 152
- [“Restoring NFS Mounts After Upgrade”](#) on page 153
- [“Reconfigure Virtual Machines with SCSI Passthroughs After Upgrade”](#) on page 153
- [“Upgrading Virtual Machines with RAW Disks”](#) on page 153

Release Upgrade Support

This release supports upgrades from most customer releases of VMware ESX Server software.



WARNING Upgrading from unsupported releases can fail with lost data and unusable configurations. Refer to the [Table 9-1](#) to verify your installation is supported by this release candidate upgrade.

[Table 9-1](#) gives details of upgrade support for ESX Server versions.

Table 9-1. Upgrade Support for ESX Server

ESX Server Version	Support
ESX Server beta release (any)	No upgrade support
ESX Server release 1.x	No upgrade support
ESX Server version 2	No upgrade support
ESX Server version 2.1	No upgrade support
ESX Server version 2.1.1	Yes
ESX Server version 2.1.2	Yes

Table 9-1. Upgrade Support for ESX Server

ESX Server Version	Support
ESX Server version 2.1.3	Yes
ESX Server version 2.2	Yes
ESX Server version 2.3	No upgrade support
ESX Server version 2.5	No upgrade support
ESX Server version 2.5.1	Yes
ESX Server version 2.5.2	Yes
ESX Server version 2.5.3	Yes
ESX Server version 3.0	Yes

Follow Upgrade Steps in the Order Given

It is critical that you upgrade components in a specific order. The complete upgrade process includes upgrades to the file system, virtual machine file structures, and VMware Tools. Performing any step out of order can result in lost data and server access.

This manual assumes you have a multiple-server production environment to upgrade from VMware ESX Server software 2.x to 3.0.1, one host at a time. However, even if you have only one ESX Server host, your upgrade steps should follow the same order.

Host Configuration Requires a Virtual Infrastructure Client

Host configuration now requires a Virtual Infrastructure Client. This is a change from previous versions which included a browser-based management interface, and advocated the use of the service console. The browser-based management interface, Web Access, allows you to manage virtual machines, but cannot perform host configuration tasks. Using the service console is not recommended.

Support for Scripted Installations

Refer to [Chapter 6, “Remote and Scripted Installations,”](#) on page 93 for information on remote and scripted installations.

Support for Legacy Hardware

Refer to [“Minimum Server Hardware Requirements”](#) on page 25 to determine if you have hardware that is not supported for ESX Server 3.0 software.

Components Installed by the Upgrade

Upgrading VMware ESX Server installs the following components:

- **The service console** – Installs, configures, and administers third-party add-ons for ESX Server. This is a modified version of Red Hat Enterprise Linux 3.0 with a single purpose: configuring the ESX Server host.
- **VMkernel** – Manages system hardware and the virtual machines running on the server. Users communicate with the VMkernel through the service console.
- **VMkernel modules** – Support high-performance device I/O and allow you to add functionality at runtime to the VMkernel (for example, network traffic filters).

Upgrade Requirements

To upgrade VMware ESX Server, you need:

- Installation media or installation archive containing VMware ESX Server 3.0.1.
- A computer running ESX Server 2.x that meets the system hardware requirements for ESX Server 3.0.1. See [“ESX Server Requirements”](#) on page 24.

To upgrade your VMFS2 volumes to VMFS3 as described in [“Upgrading Datastores”](#) on page 164, you must have at least 1200MB of free space on the VMFS2 volumes. Run the pre-upgrade script as described in [“Running the Pre-Upgrade Script”](#) on page 154. The script checks that your VMFS2 volumes meet the minimum space requirements.

If the VMFS2 volume does not have sufficient free space, the upgrade to VMFS3 fails. An error message is displayed. To proceed, free up space on the VMFS2 volume.

To free up space on a VMFS2 volume

- 1 Log on to the service console via SSH or a local console.
- 2 Unload the vmfs2 and vmfs3 modules by typing `vmkload_mod -u vmfs2` and `vmkload_mod -u vmfs3` at the command line.
- 3 Load the fsaux module in VMFS-2 unlink mode by typing `vmkload_mod fsaux fsauxFunction=fs2unlink`.
- 4 Move or remove files on the volume to make at least 1200MB available on it. Use the `rm` and `mv` commands.
- 5 Unload the fsaux module by typing `vmkload_mod -u fsaux`.
- 6 Reload the vmfs2 and vmfs3 modules by typing `vmkload_mod vmfs2` and `vmkload_mod vmfs3`.
- 7 Try the upgrade again.

Using ILO, DRAC, and RSA II

If you use ILO or DRAC to install ESX Server, exercise care if using the Virtual CD feature. You might encounter corruption problems if you use this installation method with systems under load. If you must use this method to install ESX Server, run the media test provided by the ESX Server Installer.

Remote installations from an ISO image using DRAC may fail. If this occurs, carry out the remote installation from the physical CD-ROM media.

Do not use the Virtual CD feature with RSA II to install or upgrade ESX Server.

Selecting the Boot Drive

The ESX Server service console operating system supports booting from the following storage systems:

- **SCSI disk drive or RAID** – SCSI disk drives and RAIDs are supported for installing ESX Server and for storing virtual machines.
- **SANs** – SANs are supported for installing ESX Server and for storing virtual machines. See [“LUN Requirements”](#) on page 76 for important considerations.
- **IDE or ATA disk drive or RAID** – IDE/ATA disk drives and RAIDs are supported for installing ESX Server.
- **iSCSI** – iSCSI disk drives are supported for installing ESX Server and for storing virtual machines.

SATA disk drives and RAIDs are not supported for installing ESX Server.

NOTE If you are upgrading an ESX Server system with an IDE drive that has the master boot record (MBR) on it, and a SCSI drive that has the ESX Server service console installed on it, you might experience boot problems after upgrading, such as booting into a grub boot loader menu. The ESX Server version 3.0 upgrade installer selects the disk containing the service console as the default boot device. To avoid problems, either select the IDE drive as the boot device during the upgrade or change the settings in the system BIOS after the upgrade to set the SCSI drive as the boot device.

REVISED
See [Updates](#)
at the end
of this book.

Host Drive and LUN Requirements

- You must have a SCSI drive, SCSI RAID, iSCSI drive, NFS, or SAN to store virtual machines if you install ESX Server on an IDE, or ATA drive. IDE, ATA, and SATA drives are not supported for VMFS3 partitions.
- Although ESX Server supports up to 255 Fibre Channel LUNs for operation, the installer supports a maximum of 128 SCSI, Fibre Channel SAN, and gatekeeper

LUNs. If you have more than 128 LUNs, connect them after the installation is complete.

Verifying Hardware Support

Before deploying ESX Server on a particular drive and disk controller, check the latest version of the *ESX Server Storage Compatibility Guide* to ensure your specific controller is supported.

Before deploying ESX Server on a SAN, please check the latest versions of the *ESX Server Storage Compatibility Guide* and the *SAN Configuration Guide* from the VMware Web site at www.vmware.com/support/pubs/vi_pubs.html.

Allocating PCI Devices

ESX Server 2.x had a PCI device allocation system whereby all SCSI storage devices controlled by the same driver must be allocated in one of the following ways:

- Allocated to the VMkernel for use by virtual machines
- Allocated to the service console
- Allocated to the VMkernel but shared with the service console

When you upgrade from ESX Server 2.x to 3.0, all PCI devices are allocated to the VMkernel and shared with the service console as necessary.

Debug Mode Is Not Installed with an Upgrade from ESX Server 2.x

The default boot partition from ESX Server version 2.x is not large enough for a version 3 upgrade to include a debug kernel. An upgraded ESX Server host boot menu includes only two options:

- VMware ESX Server
- Service Console only (troubleshooting mode)

Commit or Discard Changes to Virtual Disks in Undoable Mode

To avoid problems, VMware strongly recommends that virtual machine redo logs be committed and virtual disks changed to persistent mode before upgrading to ESX Server 3.0.

Restoring NFS Mounts After Upgrade

During the upgrade from ESX Server 2.x to ESX Server 3.0, the `/etc/fstab` file is replaced, causing NFS mounts to be lost. The old `/etc/fstab` file is copied to `/etc/fstab.save`. To restore NFS mounts, copy any missing entries from `/etc/fstab.save` to `/etc/fstab`.

Reconfigure Virtual Machines with SCSI Passthroughs After Upgrade

When you upgrade an ESX Server 2.5 system, SCSI devices that were previously attached in passthrough mode to virtual machines are renumbered. This renumbering results in virtual machines previously attached to them pointing at invalid devices. After you upgrade your system, edit the virtual machine settings, remove all such devices, and readd them. Refer to *Basic System Administration* for more information on configuring hardware devices.

Upgrading Virtual Machines with RAW Disks

Virtual machines with RAW disks do not work after upgrading to ESX Server 3.0. To upgrade a virtual machine with a RAW disk, do one of the following:

- If upgrading from ESX Server 2.5, convert the RAW disk to a raw device mapping before upgrading. Refer to the *ESX Server 2.5 Administration Guide* for more information.
- If upgrading from ESX Server 2.1, remove the RAW disk from the virtual machine before upgrading. When you have finished upgrading, add the RAW disk back as a raw device mapping.

Performing the ESX Server Host Upgrade

This section describes the procedures for upgrading an ESX Server host to version 3. This is Procedure 2A, as described in [“Understanding the Stages of Upgrading”](#) on page 115.

NOTE VMware strongly recommends that for each ESX Server version 2 host, you perform Procedure 2A and Procedure 2B together. Upgrade one host and its datastores, then another host and its datastores, and so on. This technique prevents a situation in which you have a long time with no access to any virtual machine.

Machine Downtime for a Host Upgrade

Procedure 2A requires downtime for the single ESX Server host that you are upgrading.

Virtual Machine Downtime for a Host Upgrade

Virtual machines do not require down time for Procedure 2A if you can migrate them to another ESX Server host using VMotion.

- **If you have a VMotion license**, use it to migrate all virtual machines to a different ESX Server host before you upgrade this ESX Server binary. Migrating prevents virtual machine downtime during Procedure 2A.
- **If you do not have VMotion**, all virtual machines have unavoidable downtime at this step. You can minimize the downtime for a production virtual machine by preparing an ESX Server host with a VMFS3 partition before you begin upgrading the production ESX Server hosts.

See [“Understanding the Stages of Upgrading”](#) on page 115 for procedures to minimize downtime.

Host Upgrade Methods

There are multiple methods available for upgrading the VMware ESX Server host:

- **Graphical installer from CD** – Use a graphical, mouse-based installation program to upgrade ESX Server. This is the recommended installation method. See [“Upgrading Using the Graphical Installer”](#) on page 155.
- **Text-mode installer from CD** – Use a text-based interface to upgrade ESX Server. Choose this upgrade method if your video controller, keyboard, or mouse does not function properly using the graphical installer. See [“Upgrading Using the Text-Based Installer”](#) on page 159.
- **Tarball installer from download** – Use the service console to upgrade ESX Server. See [“Upgrading from a Tarball”](#) on page 163.
- **Scripted upgrade from CD or PXE server** – Use a scripted installation method to upgrade ESX Server. See [“Scripting Your Installations”](#) on page 93.

Running the Pre-Upgrade Script

ESX Server version 3.0 includes a pre-upgrade script, which verifies that your system can be upgraded, and alerts you to any problems that need to be addressed before upgrading. If you have multiple network interfaces exposed to the service console, this script also gathers additional information needed for the upgrade. VMware requires that you run this script before upgrading ESX Server.

To run the pre-upgrade script

- 1 Insert the ESX Server version 3.0 installation CD into the CD drive.

- 2 Mount the CD:

```
mount /mnt/cdrom
```

- 3 Run the upgrade script:

```
perl /mnt/cdrom/scripts/preupgrade.pl
```

After you have run the script, take note of any warnings or error messages, and take appropriate action. If there are no problems with the system, the script informs you that it is safe to upgrade.

Upgrading Using the Graphical Installer

This section describes how to upgrade ESX Server software using the graphical installer. For a description of the alternative installer, see [“Upgrading Using the Text-Based Installer”](#) on page 159.

You can execute all actions in the ESX Server graphical installer by pressing the Tab key, spacebar, arrow keys, or Enter key.

To upgrade the server with the graphical installer

- 1 Run the pre-upgrade script, and address any problems flagged. See [“Running the Pre-Upgrade Script”](#) on page 154.

- 2 Verify that the network cable is plugged into the Ethernet adapter that you are using for the service console.

The ESX Server installer needs a live network connection to properly detect certain network settings, such as the machine name under DHCP.

- 3 Power on the machine with the VMware ESX Server CD in the CD drive.

ESX Server begins its boot process until the mode selection page appears.



If this page does not appear:

- a Reboot the machine.
 - b Press the key required to enter your machine's BIOS Setup page.
This key is often F1, F2, or F10.
 - c Set the CD as the first boot device.
 - d Reboot the machine.
- 4 Press **Enter**.

A series of installation messages scroll past until the Test Media page appears.

- 5 Select **Test** to have the installer inspect the installation CD media for errors.
 - If you select **Skip**, continue with [Step 6](#).
 - If you select **OK**, a progress bar appears. The CD media is being tested for errors. When testing is complete, a Media Check Result dialog box appears. Click **OK**.

Anaconda system installer messages appear.

- 6 Click **Next** at the Welcome page.

The Select Keyboard page appears.

- 7 Choose the language for your keyboard from the list, and click **Next**.

The Mouse Configuration page appears.

- 8 Select your mouse.

NOTE This is not a critical setting. After ESX Server is installed, the setting is ignored. The X Window System is not supported from the service console.

Here are some helpful mouse identification hints:

- If the connector is round, your mouse is a PS/2 or a Bus mouse.
- If the connector is trapezoidal with nine holes, it is a serial mouse.
- If the connector is a flat rectangle with a slot, it is a USB mouse.

Try to find an exact match – If you cannot find an exact match, choose a mouse type that is compatible with yours. Otherwise, choose the appropriate generic mouse type.

Three-button mouse emulation – During the installation, selecting this box enables you to use middle-mouse-button functionality by clicking both mouse buttons at once.

When you have selected your mouse, click **Next**.

If the installer detects a previous installation of ESX Server, the Select Installation Type page appears, allowing you to select a fresh installation or an upgrade installation.

- 9 Select the type of installation:
 - **Install** – If you are not upgrading, see [“Installing ESX Server”](#) on page 77.
 - **Upgrade** – This option upgrades an existing installation of ESX Server, preserving ESX Server configuration data and VMFS virtual machine partitions.

NOTE The installer detects the version if it finds a previous installation and indicates whether upgrading from that version is supported. See [“”](#) on page 148 for more information about upgrade support for a specific version.

Select **Upgrade**, and click **Next**.

The license agreement appears.

- 10 Read through the end user license agreement, select the **I accept the terms of the license agreement check box**, and click **Next**.

NOTE You cannot install this product unless you accept the license agreement.

If the installer does not detect that your drive has been partitioned, you see the following dialog box.



WARNING If you are upgrading, do not click **Yes**. If you expected to upgrade a previous ESX Server installation and you see this dialog box, click **No** and exit from the installation. The installer does not recognize your existing ESX Server installation, and the disk partitioning or file system needs repair before any upgrade can occur.

- 11 Select the location for the boot loader record.

- **Master Boot Record** – Use this option for most installations.

This drive must match the first boot device set in the host BIOS. If these settings do not match, the host cannot boot into ESX Server software. If these settings are not properly configured, the host boots into a grub boot loader menu instead of ESX Server software.

- **First sector of boot partition** – Use this option for legacy hardware that stores BIOS information in the MBR.

Do not select an optical drive as the location for the boot loader.

- 12 Select the boot options.

- **Force LBA32** – Select this option to exceed the 1024 cylinder limit for the `/boot` partition. This option does not apply to upgrades because no partitioning takes place.
- **General kernel parameters** – If you want to add default options to the boot command, enter them into the kernel parameters field. Any options you enter are passed to the ESX Server kernel every time it boots.

- 13 Review and confirm your entries in the About to install dialog box, and click **Next**.

REVISED
See [Updates](#)
at the end
of this book.

With an upgrade, you do not have to configure disk partitions, network, time zone, or root password. All these settings are preserved from your previous installation.



WARNING This is the last opportunity to cancel the upgrade and return to your previous configuration. When you click **Next**, the installer begins upgrading your existing installation.

A progress bar appears with a percentage indicator to show the status of the upgrade. A dialog box informs you when the installation completes.

14 Click **Finish** to exit and reboot.

NOTE If the system reboots and displays a boot loader prompt, such as LILO or LI, the BIOS boot setting is set to a different disk than the one you specified during [Step 11](#) of the upgrade. Change the BIOS settings so that the correct disk is selected for booting.

Where to Go Next

To continue with the Procedure 2B upgrade, see [“Upgrading Datastores”](#) on page 164.

Upgrading Using the Text-Based Installer

This section describes how to upgrade the ESX Server software using the text-based installer. For a description of the alternative installer, see [“Upgrading Using the Graphical Installer”](#) on page 155.

To navigate and perform actions in the ESX Server text installer, press the Tab key, spacebar, arrow keys, or Enter key:

- Move the highlight between selection fields using the Tab key.
- Make a selection within a field using the arrow keys or by typing a value.
- Press Tab until the highlight is in the **OK** box, and then press the spacebar or Enter.

To upgrade the server with the text-based installer

- 1 Download the ESX Server installer CD image and burn a CD for it.
- 2 Verify that the network cable is plugged into the Ethernet adapter that you are using for the service console.

The ESX Server installer needs a live network connection to properly detect certain network settings, such as the machine name under DHCP.

- 3 Power on the machine with the VMware ESX Server CD in the CD drive.

The ESX Server begins its boot process until the mode selection page appears.



If this page does not appear:

- a Reboot the machine.
 - b Press the key required to enter your machine's BIOS Setup page.
This key is often F1, F2, or F10.
 - c Set the CD as the first boot device.
 - d Reboot the machine.
- 4 Type **esx text**, and press **Enter**.

A series of installation messages scroll past until the Test Media page appears.

- 5 Click **Test** to have the installer inspect the installation CD media for errors.
 - If you click **Skip**, continue with [Step 6](#).
 - If you click **Test**, a progress bar appears. The CD media is being tested for errors. When testing is complete, a Media Check Result dialog box appears. Click **OK**.
- 6 Click **OK** at the Welcome page.
- 7 Select your keyboard language and click **OK**.
- 8 Select your mouse.

NOTE This is not a critical setting. After ESX Server is installed, the setting is ignored. The X Window System is not supported from the service console.

Here are some helpful mouse identification hints:

- If the connector your mouse plugs into is round, your mouse is a PS/2 or a Bus mouse.
- If the connector is trapezoidal with nine holes, it is a serial mouse.
- If the connector is flat with a slot, it is a USB mouse.

Try to find an exact match – If you cannot find an exact match, choose a mouse type which is compatible with yours. Otherwise, choose the appropriate generic mouse type.

Three-button mouse emulation – During the installation, selecting this box enables you to use middle-mouse-button functionality by clicking both mouse buttons at once.

When you have selected your mouse, click **OK**.

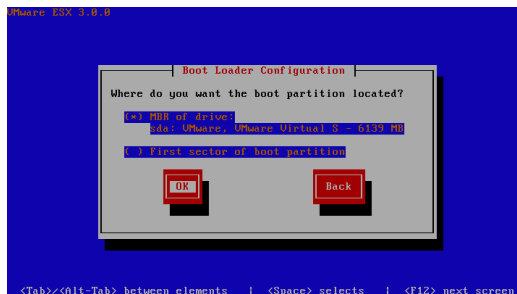
If the installer now detects a previous installation of ESX Server, a dialog box appears allowing you to select **Install** or **Upgrade**.

- 9 Select **Upgrade**, and click **OK**.

The license agreement appears.

- 10 Read through the end user license agreement, select the **I accept the terms of the license agreement** check box, and click **Next**.

NOTE You cannot upgrade this product unless you accept the license agreement.



- 11 Select the location for the boot loader record.
 - **MBR of drive** – Use this option for most installations.

This drive must match the first boot device set in the host BIOS. If these settings do not match, the host cannot boot into ESX Server software. If these settings are not properly configured, the host boots into a boot loader menu instead of ESX Server software.

- **First sector of boot partition** – Use this option for legacy hardware that stores BIOS information in the MBR.

Do not select an optical drive as the location for the boot loader.

12 Click **OK**.

13 Configure the boot loader options, and click **OK**:

- **Force LBA32** – Use this option to exceed the 1024 cylinder limit for the /boot partition. If you have a system that supports the LBA32 extension for booting operating systems above the 1024 cylinder limit and you want to place your /boot partition above cylinder 1024, select this option.
- **General kernel parameters** – If you want to add default options to the boot command, enter them into the kernel parameters field. Any options you enter are passed to the ESX Server kernel every time it boots.

The About to Install page appears.

14 Confirm your entries, and click **OK**.



WARNING This is the last opportunity to cancel the upgrade and return to your previous configuration. When you click **Next**, the installer begins upgrading your previous installation.

A progress bar appears with a percentage indicator to show the status of the installation. A dialog box appears when the installation completes.

15 Click **Finish** to exit and reboot.

NOTE If the system reboots and displays a boot loader prompt (such as LIL0 or LI), the BIOS boot setting is set to a different disk than the one you specified during [Step 11](#) of the upgrade. Change the BIOS settings so that the correct disk is selected for booting.

Where to Go Next

To continue with the Procedure 2B upgrade, see [“Upgrading Datastores”](#) on page 164.

Upgrading from a Tarball

You can upgrade from ESX Server 2.x to ESX Server 3.0.1 using an upgrade tarball packaged with an upgrade script.

Previous releases allowed you to upgrade using a tarball with one script and two reboots. Due to the added complexity of upgrading from ESX Server 2.x to 3.0.1, upgrading now requires two scripts and three reboots.

NOTE When upgrading using an upgrade tarball, you must take special care not to interrupt the upgrade process. If the upgrade script is interrupted in the middle of an upgrade, you might not be able to restart it due to a lack of free disk space.

In this case, either attempt to free up disk space and try again, or force the upgrade by passing the `--force` option to `upgrade.pl`.

To upgrade the ESX Server host using a tarball

- 1 Reboot the ESX Server host into Linux mode.
- 2 Run the script `upgrade.pl`.
- 3 Reboot the ESX Server host into Service Console only mode.
- 4 Run the script `upgrade2.pl`.
- 5 Reboot the ESX Server host to VMware ESX Server mode.

Both scripts have the same syntax, and accept the same arguments.

The form of these commands is:

```
./upgrade.pl
```

Available options include:

- `-h, --help`: Display a help message.
- `--accept-eula`: Accept the end user licensing agreement automatically.
- `--reboot=[yes | no]`: Do not prompt for reboot. If yes, reboot. If no, do not reboot. Defaults to yes if neither is specified.

Upgrading Using `esxupdate`

You can upgrade from ESX Server 3.0 to ESX Server 3.0.1 using the `esxupdate` utility provided with ESX Server 3.0.

To upgrade using esxupdate

- 1 Download the esxupdate tar archive bundle.

NOTE This tar archive bundle is not the same as the tarball used to upgrade from ESX Server 2.x to ESX Server 3.0.1. Ensure that you have downloaded the correct tarball before proceeding.

- 2 Extract the compressed tar archive and change to the newly created directory.
- 3 Type **esxupdate -n update**.
- 4 When the update command completes, reboot the ESX Server host.

Upgrading Datastores

This section describes the procedures for upgrading an ESX Server datastore from VMFS2 to VMFS3. This is Procedure 2B, described in [“Understanding the Stages of Upgrading”](#) on page 115.

This Procedure 2B requires downtime for all virtual machines on the datastore being upgraded. However, an ESX Server version 3 host with multiple datastores can operate virtual machines already stored on VMFS3 datastores while upgrading a VMFS2 datastore to VMFS3.

You can minimize downtime for virtual machines by migrating them to another datastore while this one is upgraded. See [“Migration Upgrade”](#) on page 114.

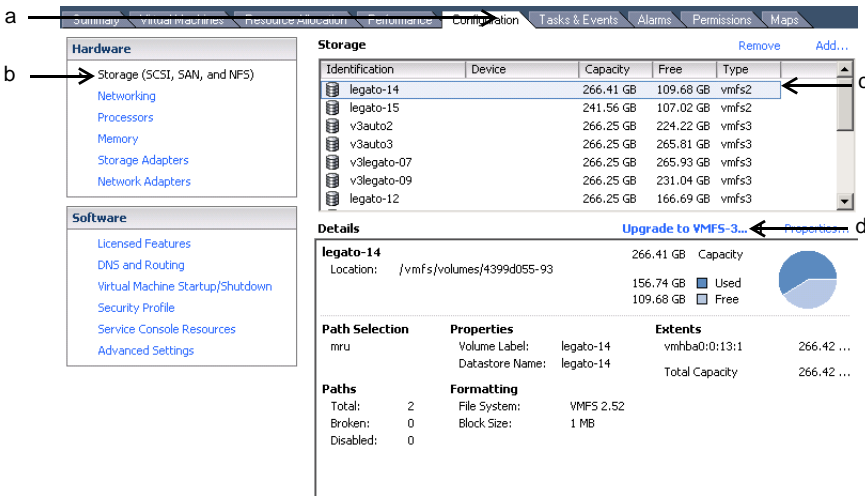
If you have a virtual machine with disks on multiple VMFS2 volumes, the first virtual disk and the .vmx file are relocated to a subdirectory when the VMFS2 volume on which they reside is upgraded to VMFS3. Other virtual disks located on other VMFS2 volumes are not relocated, even when those disks are upgraded to VMFS3.

You must upgrade all of the VMFS2 datastores on which a virtual machine’s disks reside before you power on that virtual machine.

NOTE VMFS3 file systems are restricted to a block size of no greater than 8MB. You cannot directly upgrade a VMFS2 file system with a block size of greater than 8MB to VMFS3 using the procedure described below. To upgrade from a VMFS2 file system with a block size greater than 8MB, use a migration upgrade strategy as described in [“Migration Upgrade”](#) on page 114.

To upgrade a datastore

- 1 Connect to the ESX Server host using the datastore you want to migrate to VMFS3.
- 2 If shared, the datastores must be disconnected from other hosts before you attempt the VMFS upgrade.
- 3 Put the ESX Server host into maintenance mode:
 - a Right-click the appropriate host in the inventory, and choose **Enter Maintenance Mode** from the drop-down menu.
 - b Click **Yes** to confirm the dialog box that appears.
- 4 Select the volume you want to upgrade:
 - a Select the **Configuration** tab.
 - b Select **Storage** from the **Hardware** list.
 - c Click the appropriate item in the Storage pane.
 - d Click **Upgrade to VMFS3**.



When the file system is converted, the file system is VMFS3.

NOTE If any file on the VMFS2 file system is locked, the upgrade fails with an error message identifying which ESX Server host is using the locked files.

- 5 Repeat this process until you have only VMFS3 datastores on this ESX Server host.

- 6 Exit maintenance mode:
 - a Select the **Summary** tab.
 - b Click **Exit Maintenance Mode** in the **Commands** area.

Relocating Virtual Machines

This operation moves the `.vmx` configuration file from the ESX Server host to the VMFS3 datastore. At the end of this operation, all virtual machine data and configuration files reside in one folder on the datastore.

To relocate virtual machines

- 1 Right-click the ESX Server host in the VI Client inventory, and choose **Relocate VM files** from the drop-down menu.

When the relocation is complete, a dialog box appears with the following message:
“The virtual machine files for host <hostname> have been relocated successfully.”

- 2 Click **OK** to dismiss the dialog box.

Where to Go Next

- [“Upgrading Virtual Machines”](#) on page 167

Upgrading Virtual Machines

This chapter lists upgrade issues and the procedure for upgrading virtual machines, and contains the following sections:

- [“Upgrading Virtual Hardware to VM3 Format”](#) on page 167
- [“Upgrading to VMware Tools 3”](#) on page 168
- [“Upgrading Virtual Machine Templates”](#) on page 172
- [“Using Workstation or GSX Server Virtual Disks with ESX Server 3.0”](#) on page 173



WARNING You must upgrade the ESX Server host and datastore on which a virtual machine resides before you upgrade a virtual machine. See [“Understanding the Stages of Upgrading”](#) on page 115.

Upgrading Virtual Hardware to VM3 Format

This section describes the procedures for upgrading a virtual machine. This is stage 3, described in [“Understanding the Stages of Upgrading”](#) on page 115.

To upgrade the virtual hardware and VMware Tools for multiple virtual machines at one time, refer to [“Upgrading Hardware and VMware Tools in Multiple Virtual Machines”](#) on page 169.

NOTE Performing a virtual hardware upgrade on nonpersistent, append, and undoable mode virtual machines converts the redo logs of the virtual machines to snapshots. You can find the corresponding snapshots under the snapshot manager after the upgrade. However, VMware strongly recommends committing the redo logs before performing the virtual hardware upgrade.

To upgrade virtual hardware

- 1 From the VI Client, right-click a virtual machine in the inventory, and choose **Upgrade Virtual Hardware** from the drop-down menu.

A confirmation dialog box appears with the message, “This operation will cause the virtual hardware your guest operating system runs on to change. It is an irreversible operation that will make your virtual machine incompatible with earlier versions of the VMware software products. It is strongly recommended that you make a backup copy of your disk(s) before proceeding. Are you sure you want to upgrade your configuration?”

- 2 Click **Yes**.

A progress bar appears in the Recent Tasks pane at the bottom of the client window.

Repeat this procedure for all virtual machines on this host.

Upgrading to VMware Tools 3

This section describes the procedures for upgrading virtual machine guest operating system drivers. This is stage 4, described in [“Understanding the Stages of Upgrading”](#) on page 115.

VMware strongly recommends that you upgrade all virtual machines with VMware Tools 3. A virtual machine powered on with VMware Tools 2 on an ESX Server version 3 host might not have full network connectivity and might display incorrect connectivity information.

VMware Tools Upgrade Procedure

Refer to *Basic System Administration* for a description of the installation of VMware Tools. The upgrade procedure is identical to the initial installation of VMware Tools.

NOTE VMware Tools 1 is not supported by ESX Server version 3. Although virtual machines can run VMware Tools 2 on an ESX Server version 3 host, all virtual machines running the original VMware Tools 1 must be upgraded to VMware Tools 3.

Unexpected Hardware Changes When Upgrading Virtual Adapter

Upgrading virtual hardware and installing VMware Tools 3 includes enhancements to the virtual network adapter. A Windows guest operating system might interpret these changes as indicating a different network adapter in the virtual machine and launch the New Hardware wizard accordingly.

NOTE While this behavior occurs mostly on Windows guest operating systems, it can occur on older releases of Linux guest operating systems.

Upgrading Hardware and VMware Tools in Multiple Virtual Machines

You can upgrade VMware Tools and virtual hardware for one or more virtual machines from earlier releases. Using an ESX Server version 3 host, VMware Tools and virtual hardware can be upgraded for multiple virtual machines simultaneously without needing to interact with each virtual machine from the console. The user performing the upgrade must have appropriate permissions.

Requirements

- Only virtual machines managed by VirtualCenter 2 can be upgraded.
- Mass upgrades are available only for Linux and Microsoft Windows 2000 and higher.
- Windows NT, Novell NetWare, and FreeBSD are not supported.
- The virtual disk must be on a VMFS-3 volume.
- Virtual machines must be powered off. (Linux virtual machines must be shut down, rather than powered off.)
- The mass upgrade command-line tool is installed as part of the VirtualCenter version 2 installation, on Microsoft Windows.

To upgrade VMware Tools and virtual hardware on multiple virtual machines

- 1 Open the Windows command prompt.

For example, on a Windows 2000 Professional machine, choose **Start > Programs > Accessories > Command Prompt**.

- 2 Change to the directory where the VirtualCenter Server is installed.
- 3 Type the command with your desired options.

Use the following command syntax:

```
vmware-vmupgrade.exe -u user [-p password] [-n vmname] [-h host]
                        [-m maxpowerons] [-o port] [-t maxpowerontime] [-s] [-q]
```

Table 10-1 describes the available options.

Table 10-1. Options for vmware-vmupgrade.exe

Option	Description
-u user	Specifies a user with sufficient privileges on the target virtual machine, including VirtualMachine.Config.*, VirtualMachine.Interact.*, and VirtualMachine.Provisioning.*
-p password	Specifies a password on the command line. If this is omitted, the tool immediately prompts for a password.
-n vmname	Specified the name of the virtual machine to upgrade. This name corresponds to the display name of a virtual machine. Specify multiple virtual machines using multiple -n parameters. The -n option is ignored if -h is specified. See “Specifying Host or Virtual Machine Names” on page 170 for more information on this parameter.
-h host	Attempts to upgrade all the virtual machines on a particular host. Fails if the specified host is not version ESX Server 3.0 or greater. See “Specifying Host or Virtual Machine Names” on page 170 for more information on this parameter.
-m maxpowerons	On a particular host, powers on only this number of virtual machines at a time.
-o port	Specifies the VirtualCenter Server port, if a port other than the default port 902 has been configured.
-t maxpowerontime	Allows a user to set the maximum amount of time for a virtual machine to be powered on in case the guest is unable to power off the machine itself. After the tools upgrade is scheduled on a virtual machine, the virtual machine is powered on and allowed to run through the tools installation process. In most cases, the guest powers down the machine automatically when the process completes.
-s	Skips the tools and does only the virtual hardware upgrade.
-q	Works quietly. Doesn’t produce status or completion messages on stdout.

Specifying Host or Virtual Machine Names

To specify a host or a virtual machine name for the `vmware-vmupgrade.exe` command, you must specify a path to the host or virtual machine. The path corresponds to the location of the host or virtual machine displayed in the VI Client inventory. To determine host paths, display the Hosts and Clusters view in the inventory panel. To determine virtual machine paths, display the Virtual Machines and Templates view in the inventory panel.

For the case illustrated in [Figure 10-1](#), the path for the host `testserver3.eng.vmware.com` is `/Datacenter1/Folder1/testserver3.eng.vmware.com`.



Figure 10-1. Example Hosts and Clusters Inventory View, Showing the Path for a Host

For the case illustrated in [Figure 10-2](#), the path for the virtual machine `vm1` is `/Datacenter1/MyVMs/vm1`.

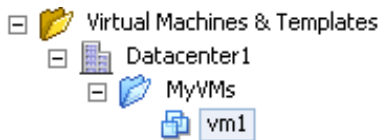


Figure 10-2. Example Virtual Machines and Templates Inventory View, Showing the Path for a Virtual Machine

Usage Examples

The following are some usage examples for the `vmware-vmupgrade` command:

- To upgrade a single virtual machine named `myvm`, in datacenter `DC`, in the root virtual machine folder:

```
vmware-vmupgrade -u user -n /DC/myvm
```

- To upgrade a single virtual machine named `vm1` in the folder `My VMs`, in datacenter `DC`, in the folder `dcFolder`:

```
vmware-vmupgrade -u user -n /dcFolder/DC/MyVMs/vm1
```

- To upgrade two virtual machines, `vm1` and `vm2`, both in datacenter `DC`, and to force all virtual machines to power off after 5 five minutes. One virtual machine is a Linux virtual machine that does not have Advanced Power Management configured, so that when the guest is shutdown, the virtual machine doesn't power off.

```
vmware-vmupgrade -u user -n /DC/vm1 -n /DC/vm2 -t 5
```

- To upgrade all (powered-off) virtual machines on host `myhost.vmware.com` in the root host folder of datacenter `DC`, while powering-on at most two virtual machines at a time on the host:

```
vmware-vmupgrade -u user -h /DC/myhost.vmware.com -m 2
```

- To upgrade powered-off virtual machines on host `host1.vmware.com` in cluster `myCluster` in the datacenter folder `/DC/folder1`:

```
vmware-vmupgrade -u user -h /DC/folder1/myCluster/host1.vmware.com
```

Upgrading Virtual Machine Templates

Virtual machine templates created with earlier versions of VirtualCenter and ESX Server must also be upgraded for use with VirtualCenter 2.0 and ESX Server 3.0.

With VirtualCenter 1.x and ESX Server 2.x, virtual machine templates could be stored locally on the VirtualCenter Server disk or on an ESX Server datastore. With VirtualCenter 2.0 and ESX Server 3.0, templates must be located on an ESX Server datastore. The Legacy Templates Upgrade wizard included in the VI Client can relocate your templates during the upgrade process.

To upgrade a virtual machine template

- 1 From the VI Client, log on to your VirtualCenter Server.
- 2 Choose **Administration > Upgrade Legacy Templates**.
The Legacy Template Upgrade wizard is launched.
- 3 Select the template to upgrade, and click **Next**.
- 4 If the template currently resides on the VirtualCenter Server disk, select an ESX Server host to relocate to, and click **Next**.
The Select Datastore page displays.
- 5 Select a disk on which to place the upgraded template, and click **Next**.
- 6 Select the destination folder on the host, and click **Next**.
- 7 Review your choices, and click **Finish**.

The template is upgraded and relocated to the location you have chosen.

NOTE When you upgrade templates residing on the VirtualCenter Server disk, the upgraded template is relocated to the disk you have chosen, but the original template remains on the VirtualCenter Server disk. VMware recommends deleting this original after you have verified that your template upgrade was successful.

Using Workstation or GSX Server Virtual Disks with ESX Server 3.0

Virtual machines created in VMware Workstation or VMware GSX Server are not supported in ESX Server 3.0. To use these virtual machines in ESX Server 3.0, use the `vmkfstools -i` command to import their virtual disks into your ESX Server system. Then, create a new virtual machine on your ESX Server host using the imported virtual disks. See Appendix B, “Using vmkfstools”, in the *Server Configuration Guide* for more information.

Upgrade Preparation Checklists



This appendix contains tables briefly detailing components that change in each of the four upgrade stages. The tables describe the tasks to be completed at each stage and list the VMware Infrastructure components that are supported at each stage of the upgrade. This appendix contains the following tables:

- [“Upgrading VirtualCenter Components”](#) on page 176
- [“Upgrading ESX Server Host”](#) on page 177
- [“Upgrading File Systems on a Datastore”](#) on page 178
- [“Upgrading Virtual Machines to VM3 Format”](#) on page 179
- [“Upgrading Guest Operating Systems with VMWare Tools 3”](#) on page 180

Table A-1 summarizes stage 1 of the upgrade process. See “[Stage 1—Upgrading VMware VirtualCenter](#)” on page 116.

Table A-1. Upgrading VirtualCenter Components

Product	Component	Stage 1 Description
VirtualCenter	Client 1.x	Task: Remove from service.
	Server 1.x	Task: Remove from service.
	Client 2.0	Task: Install in Stage 1.
	Server 2.0	Task: Install in Stage 1. Issues: Access database is not supported.
	WebCenter	Task: Install in Stage 1. Issues: Runs virtual machines with limited functionality.
	Oracle database	No change.
	SQL database	No change.
	Access database	Task: Remove from service.
	MSDE database	Task: Install in Stage 1 (optional).
License server	License server	Task: Install in Stage 1 (optional).
ESX Server	ESX Server 2.0 host	No change.
	VMFS2 volumes	No change.
	VM2 virtual machines	No change.
	VMDK2 virtual disk	No change.
	ESX Server MUI	No change.
	ESX Server host client	No change.
	VMware Tools 2.x	No change.
	ESX Server 3.0 host	Not supported in this environment.
	VMFS3 volumes	Not supported in this environment.
	VM3 virtual machines	Not supported in this environment.
	VMDK3 virtual disk	Not supported in this environment.
	VMware Tools 3.0	Not supported in this environment.

Table A-2 summarizes procedure 2A of the upgrade process. See “Procedure 2A—Upgrading a VMware ESX Server Host” on page 120.

Table A-2. Upgrading ESX Server Host

Product	Component	Procedure 2A Description
VirtualCenter	Client 1.x	Not supported in this environment.
	Server 1.x	Not supported in this environment.
	Client 2.0	No change.
	Server 2.0	No change.
	WebCenter	No change.
	Oracle database	No change.
	SQL database	No change.
	Access database	Not supported in this environment.
	MSDE database	No change.
License server	License Server	No change.
ESX Server	ESX Server 2.0 host	Task: Remove from service.
	VMFS2 volumes	Issues: Read only from ESX Server 3.0 hosts.
	VM2 virtual machines	Issues: Unavailable if stored on VMFS2. Supported on VMFS3 with limited operations, such as power-on, power-off, suspend, resume and relocate (migrate).
	VMDK2 virtual disk	
	ESX Server MUI	Task: Remove from service.
	ESX Server host client	Task: Remove from service.
	VMware Tools 2.x	No change.
	ESX Server host 3.0	Task: Install in this stage.
	VMFS3 volumes	Supported by ESX Server 3.0 hosts.
	VM3 virtual machines	Supported by ESX Server 3.0 hosts.
	VMDK3 virtual disk	Supported by ESX Server 3.0 hosts.
	VMware Tools 3.0	Supported by ESX Server 3.0 hosts.

Table A-3 summarizes procedure 2B of the upgrade process. See “Procedure 2B—Upgrading a Datastore from VMFS2 to VMFS3” on page 120.

Table A-3. Upgrading File Systems on a Datastore

Product	Component	Procedure 2B Description
VirtualCenter	Client 1.x	Not supported in this environment.
	Server 1.x	Not supported in this environment.
	Client 2.0	No change.
	Server 2.0	No change.
	WebCenter	No change.
	Oracle database	No change.
	SQL database	No change.
	Access database	Not supported in this environment.
	MSDE database	No change.
License server	License server	No change.
ESX Server	ESX Server 2.0 host	Not supported in this environment.
	VMFS2 volumes	Task: Upgrade all datastores to VMFS3 in this stage. Issues: Read-only allowed from ESX Server 3.0 hosts.
	VM2 virtual machines	Issues: Supported with limited operations, such as power-on, power-off, suspend, resume and relocate (migrate).
	VMDK2 virtual disk	Issues: Virtual disk files on VMFS2 remain in the VMDK2 format
	ESX Server MUI	Not supported in this environment.
	ESX Server host client	Not supported in this environment.
	VMware Tools 2.x	No change.
	ESX Server host 3.0	No change.
	VMFS3 volumes	No change.
	VM3 virtual machines	No change.
	VMDK3 virtual disk	No change.
	VMware Tools 3.0	No change.

Table A-4 summarizes stage 3 of the upgrade process. See “[Stage 3—Upgrading Your Virtual Machines](#)” on page 121.

Table A-4. Upgrading Virtual Machines to VM3 Format

Product	Component	Stage 3 Description
VirtualCenter	Client 1.x	Not supported in this environment.
	Server 1.x	Not supported in this environment.
	Client 2.0	No change.
	Server 2.0	No change.
	WebCenter	No change.
	Oracle database	No change.
	SQL database	No change.
	Access database	Not supported in this environment.
	MSDE database	No change.
License server	License server	No change.
ESX Server	ESX Server 2.0 host	Not supported in this environment.
	VMFS2 volumes	Not supported in this environment.
	VM2 virtual machines	Task: Upgrade to VM3 format in this stage.
	VMDK2 virtual disk	Not supported in this environment.
	ESX Server MUI	Not supported in this environment.
	ESX Server host client	Not supported in this environment.
	VMware Tools 2.x	No change.
	ESX Server host 3.0	No change.
	VMFS3 volumes	No change.
	VM3 virtual machines	No change.
	VMDK3 virtual disk	No change.
	VMware Tools 3.0	No change.

Table A-5 summarizes stage 4 of the upgrade process. See “[Stage 4—Upgrading VMware Tools Within the Guest Operating System](#)” on page 123.

Table A-5. Upgrading Guest Operating Systems with VMWare Tools 3

Product	Component	Stage 4 Description
VirtualCenter	Client 1.x	Not supported in this environment.
	Server 1.x	Not supported in this environment.
	Client 2.0	No change.
	Server 2.0	No change.
	WebCenter	No change.
	Oracle database	No change.
	SQL database	No change.
	Access database	Not supported in this environment.
	MSDE database	No change.
License server	License server	No change.
ESX Server	ESX Server 2.0 host	Not supported in this environment.
	VMFS2 volumes	Not supported in this environment.
	VM2 virtual machines	Not supported in this environment.
	VMDK2 virtual disk	Not supported in this environment.
	ESX Server MUI	Not supported in this environment.
	ESX Server host client	Not supported in this environment.
	VMware Tools 2.x	Task: Upgrade to VMware Tools 3.0 in this stage.
	ESX Server host 3.0	No change.
	VMFS3 volumes	No change.
	VM3 virtual machines	No change.
	VMDK3 virtual disk	No change.
	VMware Tools 3.0	No change.

Datastore Partitioning

This appendix describes the details for partitions on an ESX Server version 3 host datastore. Topics include:

- [“Required Partitions”](#) on page 181
- [“Optional Partitions”](#) on page 185

Required Partitions

An ESX Server local boot volume requires three specific partitions for operation. In addition, a local or remote VMFS partition is required to store your virtual machines, and a `vmkcore` partition is required to provide core dumps for technical support.

Table B-1. ESX Server Required Partitions

Recommended Storage by Host Disk Configuration					
Mount Point	Type	Internal Disk with External SAN, NAS, or iSCSI	SAN Only	Internal Disk Only	Partition Description
/boot	ext3	Size: 100MB Location: internal disk	Size: 100MB Location : LUN0	Size: 100MB	The boot partition stores information required to boot the ESX Server host system. For example, this is where the grub and LILO boot loaders reside.
Not applicable	swap	Size: 544MB Location: internal disk	Size: 544MB Location : LUN0	Size: 544MB	The swap partition allows ESX Server and third-party add-ons to use disk space when more memory is needed than the physical RAM allows. The minimum value allowed is 100MB. Note: The ESX Server swap partition is not to be confused with virtual machine swap space. See the <i>Resource Management Guide</i> for a discussion of configuring a partition for virtual machine swap space.
/	ext3	Size: 2560MB [‡] Location: internal disk	Size: 2560MB [‡] Location : LUN0	Size: 2560MB [‡]	The root partition contains the ESX Server operating system and services, accessible through the service console. This partition also contains any third-party add-on services or applications you install. Note: Running the installation script to copy the contents of the ESX Server installation CD requires about 460MB of space.

Table B-1. ESX Server Required Partitions (Continued)

Recommended Storage by Host Disk Configuration					
Mount Point	Type	Internal Disk with External SAN, NAS, or iSCSI	SAN Only	Internal Disk Only	Partition Description
Not applicable	VMFS3	Size: 1.1GB+	Size: 1.1GB + Locate VMFS on a different shared LUN. (not LUN0)	Size: 1.1GB+	<p>A VMFS partition is required. However, VMFS partitions do not need to be located on a local or boot drive.</p> <p>VMFS partitions can be located on:</p> <ul style="list-style-type: none">■ a local SCSI volume■ a networked SCSI volume■ a SAN <p>A VMFS partition is used to store virtual machine virtual disks. VMware recommends 4GB storage per virtual machine.</p> <p>Notes:</p> <ul style="list-style-type: none">■ No more than one VMFS volume can be created on each LUN.■ VMFS2 is supported in read-only mode to import legacy virtual machines.■ If you want the ESX Server host to boot from a SAN, make sure you have read " " on page 77 for VMFS partitioning requirements.

Table B-1. ESX Server Required Partitions (Continued)

Recommended Storage by Host Disk Configuration					
Mount Point	Type	Internal Disk with External SAN, NAS, or iSCSI		Internal Disk Only	Partition Description
		SAN Only			
Not applicable	vmkcore	Size: 100MB Location: any disk	Size: 100MB per ESX Server host sharing the SAN Location : Core LUN	Size: 100MB	A 100MB vmkcore partition is required for each ESX Server host. A vmkcore partition can be located on a local SCSI volume, a networked SCSI volume, or a SAN. It cannot be located on a software iSCSI volume. A vmkcore partition is used to store core dumps for debugging and technical support. Each ESX Server host must have a vmkcore partition of 100MB. If multiple ESX Server hosts share a SAN, configure a vmkcore partition with 100MB for each host.

Optional Partitions

The following partitions are optional.

Table B-2. ESX Server Optional Partitions

Mount Point	Type	Recommended Storage by Host Disk Configuration			Partition Description
		Internal Disk with External SAN/NAS /iSCSI	SAN Only	Internal Disk Only	
/home	ext3	Size: 512MB			A home partition is optional. [†] This partition is used for storage by individual users.
/tmp	ext3	Size: 1024MB	Size: 1024MB Location : LUN0	Size: 1024MB	A tmp partition is optional. [†] This partition is used for storage of temporary files.
/var/log	ext3	Size: 2000MB [‡] Location: internal disk	Size: 2000MB [‡] Location : LUN0	Size: 2000MB [‡]	A log partition is optional. [†] This partition is used for storage of log files.
Not applicable	vfat	any disk			A vfat partition is optional. The vfat partition is used to store a virtual machine using a RAW disk format.
Not applicable	LVM	NA			Obsolete with ESX Server 3.0. Remove from upgraded servers.
/vmimages	ext3	NA			Obsolete with ESX Server 3.0. Remove from upgraded servers.

[†] VMware recommends a separate partition to prevent unexpected disk space constraints from compromising ESX Server operations.

[‡] Increase this partition by 512MB if you use Kickstart, or if you plan to perform a remote or scripted installation from the ESX Server machine.

Additional Migration Upgrade Scenarios



This appendix describes additional migration upgrade scenarios that can be used when a migration upgrade using VMotion with simultaneous relocation from a VMFS2 to a VMFS3 datastore cannot be used. Refer to the ESX Server 3.0.1 release notes for details on which ESX Server versions are supported with this feature.

The upgrade scenarios described in this appendix are:

- [“Upgrading Hosts On a SAN Using Network Copy”](#) on page 187
- [“Upgrading Hosts Sharing a SAN with VMotion”](#) on page 189

Upgrading Hosts On a SAN Using Network Copy

In this scenario, you upgrade multiple ESX Server hosts sharing VMFS2 volumes on one SAN datastore. A typical environment for this type of upgrade is illustrated in [Figure C-1](#).

Table C-1. Summary of Upgrade for Multiple Hosts Sharing a SAN Using Network Copy

ESX Server Hosts	Internal SCSI Drives or RAID	Networked Storage or SAN Volumes	Manual Upgrade Time
Two or more	0	One or more	Four hours or more, depending on number of hosts

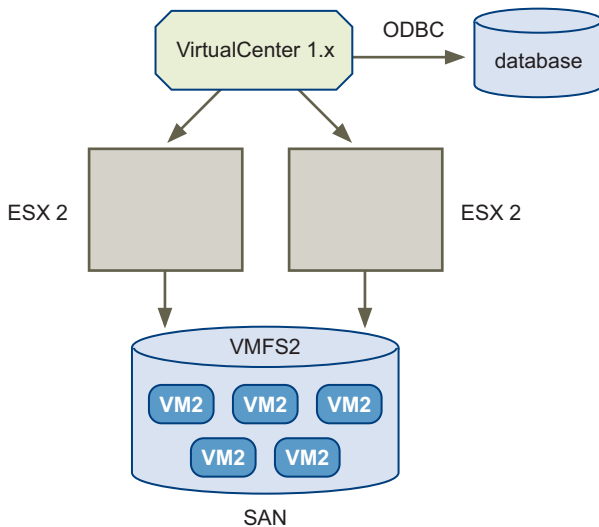


Figure C-1. Typical Environment for “[Upgrading Hosts On a SAN Using Network Copy](#)” on page 187

To upgrade hosts on a SAN using network copy

- 1 Upgrade VirtualCenter release 1.x to version 2.
See “[Performing the VirtualCenter Upgrade](#)” on page 135.
- 2 Evacuate all virtual machines from an ESX Server version 2.x host using VMotion.
- 3 Upgrade this empty host to ESX Server version 3.
See “[Performing the ESX Server Host Upgrade](#)” on page 153.
- 4 Use this host to create a new VMFS3 volume on the SAN.
This volume must be equal or greater in storage capacity to the VMFS2 volume to be upgraded.
- 5 Power off a virtual machine to migrate.
- 6 Using VirtualCenter Server, relocate the virtual machine to the VMFS3 volume.
Each virtual machine should be in its own subdirectory. See “[Relocating Virtual Machines](#)” on page 166.

In this step, the virtual machine files must be relocated manually rather than being relocated automatically as part of the virtual machine hardware upgrade in [Step 7](#).

The datastore on which these machines reside has not yet been upgraded to VMFS3.

- 7 Using the ESX Server version 3 host, upgrade the virtual machine from VM2 format to VM3.

See [“Upgrading Virtual Hardware to VM3 Format”](#) on page 167.

- 8 Upgrade VMware Tools 2 to VMware Tools 3 from within the guest operating system.

See [“Upgrading to VMware Tools 3”](#) on page 168.

- 9 Migrate your remaining virtual machines in the same manner.

Upgrading Hosts Sharing a SAN with VMotion

This scenario describes an upgrade for multiple ESX Server hosts sharing a SAN datastore. This upgrade covers any scenario where the number of ESX Server hosts is less than or equal to the number of shared VMFS volumes.

This scenario is similar to the scenario, [“Upgrading Hosts Sharing a SAN with In-Place VMFS Upgrade”](#) on page 128. It differs in that VMotion is used to evacuate virtual machines from the ESX Server host to be upgraded. This results in shorter virtual machine downtime, but requires VMotion capability and sufficient server capacity to hold the evacuate virtual machines.

Table C-2. Summary of Upgrade of Multiple Hosts on a SAN with VMotion

ESX Server Hosts	Internal SCSI Drives or RAID	Networked Storage or SAN Volumes	Manual Upgrade Time
Two or more	0	More volumes than hosts	Four hours or more, depending on number of hosts

To upgrade multiple hosts on a SAN with VMotion

- 1 Upgrade VirtualCenter version 1.x to version 2.
See [“Performing the VirtualCenter Upgrade”](#) on page 135.
- 2 Remove all virtual machines from one ESX Server version 2.x host using VMotion.
- 3 Upgrade this empty host to ESX Server version 3.
See [“Performing the ESX Server Host Upgrade”](#) on page 153.

- 4 Power off all virtual machines that reside on the VMFS2 volume.
- 5 Using VirtualCenter Server, migrate the virtual machines to the ESX Server version 3.0 host.
- 6 Upgrade the file system in-place from VMFS2 to VMFS3.
See [“Upgrading Datastores”](#) on page 164.
- 7 Upgrade the virtual machine from VM2 format to VM3.
See [“Upgrading Virtual Hardware to VM3 Format”](#) on page 167. This step also relocates all virtual machine files to the VMFS3 datastore.
- 8 Upgrade VMware Tools 2 to VMware Tools 3.
See [“Upgrading to VMware Tools 3”](#) on page 168.

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Updates for the Installation and Upgrade Guide

ESX Server 3.0.1 and VirtualCenter 2.0.1

Last Updated: August 1, 2007

This document provides you with updates to ESX Server 3.0.1 and VirtualCenter 2.0.1 version of the *Installation and Upgrade Guide*. Updated descriptions, procedures, and graphics are organized by page number so you can easily locate the areas of the guide that have changes. If the change spans multiple sequential pages, this document provides the starting page number only.

The following is a list of *Installation and Upgrade Guide* page updates in this document:

- [“Updates for the Hardware Requirements Discussion on Page 22”](#)
- [“Updates for the Storage Discussion on Page 28”](#)
- [“Updates for the Virtual SCSI Devices Discussion on Page 30”](#)
- [“Updates for the Configuring an Oracle Connection to Work Locally Procedure on Page 58”](#)
- [“Updates for the Connecting Hosts with the License Server Through a Firewall Discussion on Page 71”](#)
- [“Updates for the ESX Installation Procedure on Page 81”](#)
- [“Updates for the Verifying Your Device Driver Mappings Discussion on Page 88”](#)
- [“Updates for the Installing Language Packs on the ESX Server Host Discussion on Page 89”](#)

- [“Updates for the Host Drive and LUN Requirements Discussion on Page 151”](#)
- [“Updates for the Upgrading Using the Graphical Installer Procedure on Page 158”](#)

Updates for the Hardware Requirements Discussion on Page 22

The Scalability section on this page incorrectly indicates that a dual-processor VirtualCenter Server with 3GB RAM can support over 2000 virtual machines. In fact, the recommended maximum number of virtual machines on a VirtualCenter Server with this configuration is 1500.

Updates for the Storage Discussion on Page 28

This page indicates that the maximum number of LUNs per ESX Server system is 255. Instead, it should be 256. While the maximum LUN ID is 255, counting starts from 0.

In addition, Page 28 indicates that the maximum number of VMFS volumes per ESX Server system is 128. Instead, it should be 256.

Updates for the Virtual SCSI Devices Discussion on Page 30

This page indicates that the maximum size of a virtual disk could be 9TB per disk. This is incorrect. Since the the maximum file size allowed on VMFS3 is 2TB, the size of the virtual disk cannot be more than 2TB.

Updates for the Configuring an Oracle Connection to Work Locally Procedure on Page 58

Step 1(b) of the procedure on this page, instructs you to download Oracle ODBC from the Oracle web site. While this is necessary for Oracle9i, it is not applicable to Oracle10g. ODBC driver is included in the product media for Oracle 10g and a downloadable version is not available from the web site.

Updates for the Connecting Hosts with the License Server Through a Firewall Discussion on Page 71

The description of ports used by the license server on this page indicates that the license server uses port 2700 to communicate with ESX Server hosts. Instead, it should indicate that the license server uses port 27000.

Updates for the ESX Installation Procedure on Page 81

This page describes the Force LBA32 boot option. This option has been removed from the ESX Server installer for ESX Server 3.0.1.

Updates for the Verifying Your Device Driver Mappings Discussion on Page 88

The topic “Verifying Your Device Driver Mappings” on this page applies only to upgraded systems, not to fresh ESX Server installations.

Updates for the Installing Language Packs on the ESX Server Host Discussion on Page 89

The following sections have been revised and updated with the new information on installing language packs.

Installing Language Packs on the ESX Server Host

If you want German or Japanese language support when using VI Web Access or the VI Client with your ESX Server host, you must install language packs.

To install language packs

- 1 Locate the language pack zip file in the `langpack` directory on the ESX Server installation CD, or download the language pack zip file from www.vmware.com. The file has the name `VMware-esxlangpack-2.0.1-<build#>.zip`.
- 2 Extract the zip file into a temporary directory.
- 3 Copy the files from the `ESX-LangPack/hostd/` directory into the `hostd` installation directory on your ESX Server host (usually `/usr/lib/vmware/hostd/`).

For example,

```
cp -pr ESX-LangPack/hostd /usr/lib/vmware/hostd
```

- 4 Copy the files from the `ESX-LangPack/webAccess/` directory into the VI Web Access installation directory on your ESX Server host (usually `/usr/lib/vmware/webAccess/tomcat/apache-tomcat-5.5.17/`).

For example,

```
cp -pr ESX-LangPack/webAccess  
/usr/lib/vmware/webAccess/tomcat/apache-tomcat-5.5.17
```

- 5 Edit the `/etc/vmware/hostd/config.xml` file to enable the correct default language:

- For German, add the following lines to the bottom of the `config.xml` file before the `</config>` tag:

```
<locale>
  <DefaultLocale>de_DE</DefaultLocale>
</locale>
```

- For Japanese, add the following lines to the bottom of the `config.xml` file before the `</config>` tag:

```
<locale>
  <DefaultLocale>ja_JP</DefaultLocale>
</locale>
```

- 6 Type the following commands to restart VI Web Access and host agent services:

```
service mgmt-vmware restart
service vmware-webAccess restart
```

To fully localize your VMware Infrastructure installation, change the default language for VirtualCenter Server and install the .NET language pack on your VI Client computer as described below.

Installing Language Packs for VirtualCenter Applications

The VirtualCenter language pack contains localized resources for different applications in the VirtualCenter installer.

The VirtualCenter language pack is a zip file that includes three main directories, each corresponding to a separate application. You need to copy the files from the three directories to the installation directories for each application. The installation directories can be located on one host, or distributed between three separate hosts.

- From the `vpzd` directory to the VirtualCenter server installation location (typically `C:\Program Files\VMware\VMware VirtualCenter 2.0`).
- From the `viclient` directory to the VI client installation location (typically `C:\Program Files\VMware\VMware Virtual Infrastructure Client 2.0`).
- From the `webAccess` directory to the Web Access installation location (typically `C:\Program Files\VMware\VMware VirtualCenter 2.0\tomcat`).

If you later need to uninstall localized language support, you can delete the installed language pack files. The exception are the `vlcl` files copied to the `locale` directory and the `locale/en` sub-directory.

NOTE Uninstall the language packs before upgrading to any non-localized version of the VirtualCenter server.

To enable German or Japanese with VirtualCenter

- 1 Modify `C:\Documents and Settings\All Users\Application Data\VMware\VMware VirtualCenter\vpzd.cfg` to specify the default locale as follows:
 - For German, add the following lines to the bottom of the `vpzd.cfg` file before the `</config>` tag:

```
<locale>
  <DefaultLocale>de_DE</DefaultLocale>
</locale>
```
 - For Japanese, add the following lines to the bottom of the `vpzd.cfg` file before the `</config>` tag:

```
<locale>
  <DefaultLocale>ja_JP</DefaultLocale>
</locale>
```
- 2 Restart VirtualCenter Server.
- 3 Install the .NET language pack from the `/redist` directory on the VirtualCenter installation CD on the computer on which you run the VI Client.

After you copy VirtualCenter language pack files and enable language support, restart the VirtualCenter server.

NOTE The locale of the OS is used to determine the application locale when logging into the server from the VI client.

The locale in the Languages list of the browser will determine the application locale when logging into the server from the Web Access client.

Updates for the Host Drive and LUN Requirements Discussion on Page 151

This page incorrectly indicates that the maximum number of LUNs per ESX Server system is 255. Instead, it should be 256. While the maximum LUN ID is 255, counting starts from 0.

Updates for the Upgrading Using the Graphical Installer Procedure on Page 158

This page describes the Force LBA32 boot option. This option has been removed from the ESX Server installer for ESX Server 3.0.1.

Licensing VirtualCenter and ESX Server

3

This chapter describes licensing options for VMware VirtualCenter and ESX Server. It describes the licensing models available with ESX Server and VirtualCenter, and provides procedures for redeeming license files and configuring license options.

This chapter contains the following sections:

- [“VirtualCenter and ESX Server Licensing Model”](#) on page 33
- [“License Key Functionality”](#) on page 38
- [“Obtaining License Files”](#) on page 41
- [“Setting Up License Server-Based Licensing”](#) on page 42
- [“Setting Up Host-Based Licensing”](#) on page 50
- [“ESX Server License Types”](#) on page 53
- [“License File”](#) on page 55
- [“Installing a Standalone License Server”](#) on page 62
- [“Troubleshooting Licensing”](#) on page 63

VirtualCenter and ESX Server Licensing Model

Software licenses are required for most operations in VirtualCenter and ESX Server, such as powering on a virtual machine. However, you can install, launch, and configure VirtualCenter version 2 and ESX Server version 3 without a software license. See [“License Key Functionality”](#) on page 38 for a list of how specific features are licensed.

Customer Licensing Process

After you purchase VMware Infrastructure software, do the following to obtain and use your licenses:

- 1 Decide which licensing mode to employ.

VMware now uses the industry-standard FLEXnet licensing, which offers a choice of licensing modes: license server-based, host-based, or mixed. See [“Host-Based and License Server-Based License Modes”](#) on page 35 for more information.

- 2 Register your purchase.

If you purchased VMware Infrastructure 3 from a VMware partner, you must register your purchase to your VMware store account. See [“Obtaining License Files”](#) on page 41 for more information.

If you purchased VMware Infrastructure 3 directly from VMware, your purchase is already registered to your account. Proceed to [Step 3](#).

- 3 Obtain license files.

After your purchase has been registered (if necessary) and you have received one or more license activation codes, use the Web-based license activation portal to generate and download license files appropriate to the licensing mode you chose in [Step 1](#). See [“Obtaining License Files”](#) on page 41.

- 4 Install and configure software.

Install VirtualCenter and ESX Server. Configure your licensing according to the licensing mode you chose in [Step 1](#):

- To configure license server-based licensing, see [“Setting Up License Server-Based Licensing”](#) on page 42.
- To configure host-based licensing, see [“Setting Up Host-Based Licensing”](#) on page 50.
- To configure a mixed license environment, see [“Host-Based and License Server-Based Machines in the Same Environment”](#) on page 51.

Some terms you might encounter during the license redemption and configuration process are defined below:

- **License activation code** – A license activation code is a unique code that is associated with one or more VMware products purchased. You receive this code after your order is processed, unless you have purchased your products from a VMware partner, in which case you receive your license activation code after you have registered your partner activation code to your VMware account.

- **License redemption portal** – The license redemption portal is a self-service Web portal which you can use to redeem your license activation codes and download license files for VMware Infrastructure 3.
- **Partner activation code** – A partner activation code is a unique code identifying orders placed through VMware partners. If you have purchased VMware Infrastructure 3 from a VMware partner, you use this code to register your purchase to your VMware store account and obtain a license activation code.
- **Partner activation portal** – A partner activation portal is a self-service Web portal used to register a purchase made from a VMware partner to your VMware store account. You enter your partner activation code into the portal, and receive a license activation code.

If you require assistance with licensing, contact VMware for support as follows:

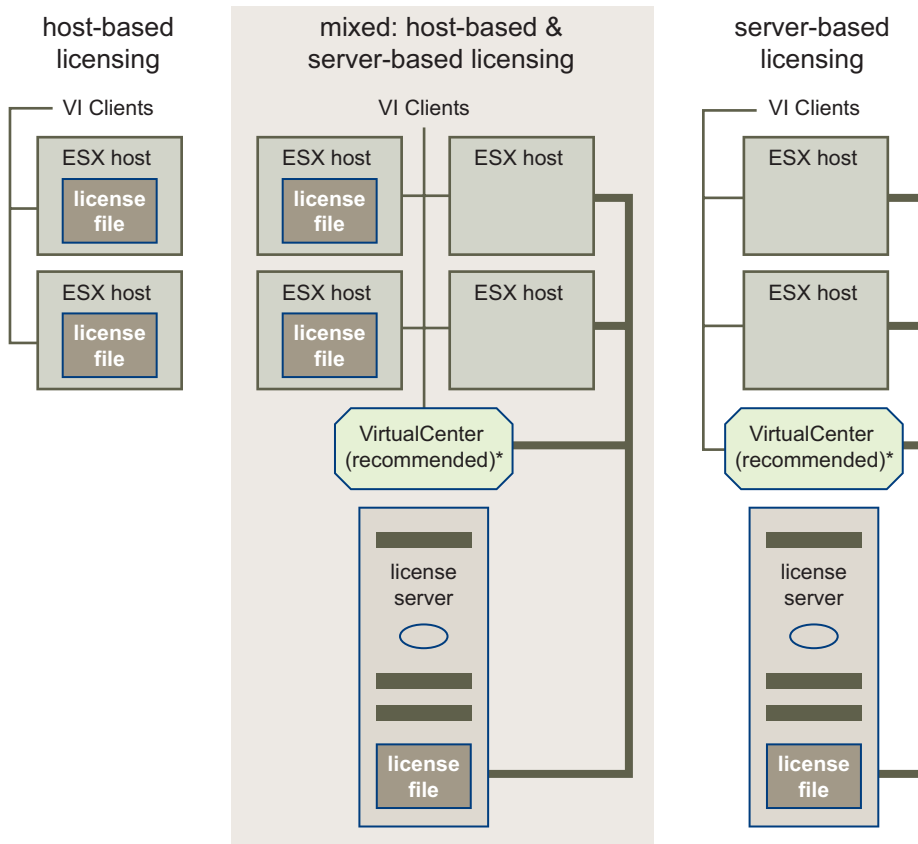
- If you have not yet received license activation codes for your VI3 purchase or have difficulties in using your license activation codes to obtain license files, email vi-hotline@vmware.com.
- If you have already obtained license files and have difficulties in configuring or troubleshooting licensed features, file a support request through <http://www.vmware.com/support>.

Host-Based and License Server-Based License Modes

VirtualCenter and ESX Server support two modes of licensing: license server-based and host-based. In host-based licensing mode, the license files are stored on individual ESX Server hosts. In license server-based licensing mode, licenses are stored on a license server, which makes these licenses available to one or more hosts. You can run a mixed environment employing both host-based and license server-based licensing.

VirtualCenter and features that require VirtualCenter, such as VMotion™, must be licensed in license server-based mode. ESX Server-specific features can be licensed in either license server-based or host-based mode.

Figure 3-1 illustrates the three types of license environments.



* Some features, such as VMotion and VMware HA, require VirtualCenter.

Figure 3-1. License File Locations in Host-Based, Mixed, and License Server-Based Environments

License Server-Based Licensing

License server-based licensing simplifies license management in large, dynamic environments by allowing a VMware license server to administer licenses. With license server-based licensing, you maintain all your VirtualCenter Management Server and ESX Server licenses from one console.

Server-based licensing is based on industry-standard FLEXnet mechanisms. With server-based licensing, a license server manages a license pool, which is a central repository holding your entire licensed entitlement. When a host requires a particular

licensed functionality, the license for that entitlement is checked out from the license pool. License keys are released back to the pool when they are no longer being used and are available again to any host.

The advantages of license server-based licensing include:

- You administer all licensing from a single location.
- New licenses are allocated and reallocated using any combination of ESX Server form factors. For example, you can use the same 32-processor license for sixteen 2-processor hosts, eight 4-processor hosts, four 8-processor hosts, two 16-processor hosts, or any combination totaling 32 processors.
- Ongoing license management is simplified by allowing licenses to be assigned and reassigned as needed. Assignment changes as the needs of an environment change, such as when hosts are added or removed, or premium features like VMotion, DRS, or HA are transferred among hosts.
- During periods of license server unavailability, although new licenses cannot be issued, existing VirtualCenter Server licensed functionality continues to operate indefinitely and existing ESX Server licensed functionality continues to operate within a 14-day grace period. See [“License Server Availability”](#) on page 45 for more information.

VMware recommends using the license server-based licensing mode for large, changing environments.

Host-Based Licensing

The host-based licensing mode is similar to the licensing mode of previous releases. With host-based licensing, your total entitlement for purchased features is divided on a per-machine basis, divided among separate license files residing on ESX Server hosts and the VirtualCenter Server.

With host-based licensing, when someone activates a licensed feature, the feature for that entitlement must reside in the license file on that host. With host-based licensing, you maintain separate license files on each ESX Server host. Distribution of unused licenses is not automatic, and there is no dependence on an external connection for licensing. Host-based license files are placed directly on individual ESX Server hosts and replace the serial numbers used by previous versions of ESX Server version 2.x.

The advantages of host-based licensing include:

- Host-based files require no license server to be installed for ESX Server host-only environments.
- In a VirtualCenter and license server environment, host-based licensing allows ESX Server host licenses to be modified during periods of license server unavailability. For example, with host-based licensing you can manually move virtual SMP license keys between hosts without a license server connection.

License Key Functionality

Specific entitlement to run VMware software is determined by license keys. You purchase such keys based on the numbers of processors and on the functionality you want in your entitlement.

Most licensing for ESX Server and VirtualCenter features is on a per-processor basis, meaning that a host requires a feature license for each of its processors in order to activate a feature. Other features are licensed on a per-feature basis, meaning that a single license is required to activate a single instance of the feature, regardless of how many processors it uses.

Licensed features also differ in their operation based on whether they are considered to be ESX Server or VirtualCenter features. ESX Server features can be licensed using either host-based or license server-based licensing mechanisms. They do not require VirtualCenter or a license server to use. VirtualCenter features require license server-based licensing. ESX Server features and VirtualCenter features also differ in their behavior when the license server is not available. See [“License Server Availability”](#) on page 45 for more information.

[Table 3-1](#) summarizes the license feature types for VMware Infrastructure 3.

Table 3-1. Summary of License Feature Types

Feature	ESX Server or VirtualCenter	Per-Processor or Per-Feature
ESX Server (Starter or Standard)	ESX Server	Per-Processor
VirtualCenter Management Server	VirtualCenter	Per-Feature
VirtualCenter Agent for ESX Server	VirtualCenter	Per-Processor
VMware Consolidated Backup (VCB)	ESX Server	Per-Processor
VMotion	VirtualCenter	Per-Processor
VMware HA	VirtualCenter	Per-Processor
VMware DRS	VirtualCenter	Per-Processor

Per-Processor Licensing

Most ESX Server licensing is on a per-processor basis for each host, meaning that an ESX Server host with two processors requires two license keys to activate a given feature, and a four-processor host requires four license keys to activate the feature. This per-processor licensing applies to basic features, as well as add-on functionality. Special considerations include:

- Dual-core and quad-core processors count as one processor.
- You cannot partially license a multiprocessor machine.

For example, imagine that your virtual infrastructure includes four dual-processor machines, and you want to use migration with VMotion between two of these machines. You can buy a license for one instance of VirtualCenter Server, eight processor licenses for ESX Server, and four processor licenses for VMotion. (If you wanted to use VMotion between all four machines, instead of between two machines, eight processor licenses for VMotion would be required.)

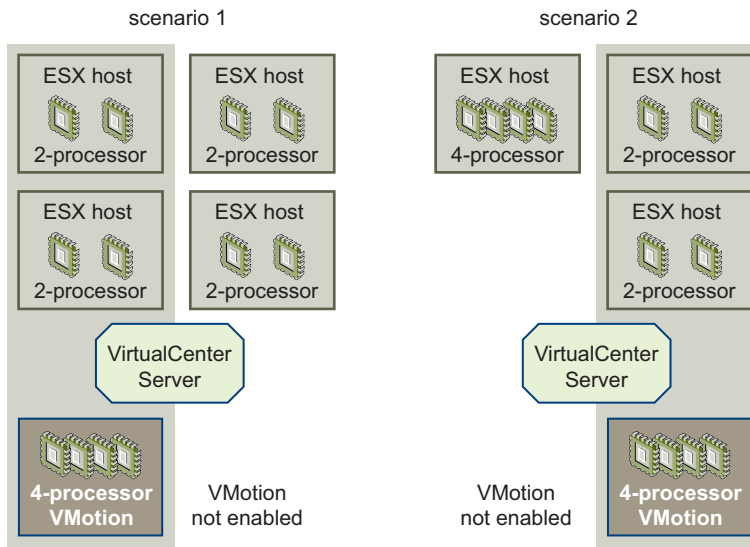


Figure 3-2. Two Example Licensing Scenarios Showing Different Uses for the Same Licenses

Scenario 1 displays four VMotion processor licenses enabling a cluster of two dual-processor machines. In the figure, the licenses have been applied to the two ESX Server hosts contained in the shaded box. You can change the machines on which your VMotion licenses reside, allowing you to put any pair of your dual-processor machines

into a VMotion cluster. However, you cannot perform VMotion with a machine from which you have removed a VMotion license keys.

Scenario 2 adds one 4-processor machine, requiring you to retire two dual-processor machines to enable the new hardware with the same licenses. Possible alternatives (not diagrammed) include the following:

- If you do not want to retire any machines, four more ESX Server processor license purchases are required.
- If you want to add the 4 processor machine to the VMotion cluster, you need four additional licenses for a total of eight processor licenses for VMotion.
- If you want to keep all four dual-processor hosts, add the 4-processor host, and license them all for VMotion, you need twelve total ESX Server processor licenses and twelve total VMotion processor licenses.

NOTE Refer to [Table 2-1, “Supported Processor Configurations,”](#) on page 29 for details on the maximum number of supported processors per host.

The following features are licensed on a per-processor basis:

- **ESX Server license type** – To power on a virtual machine, a host must have licensing on a per-processor basis. This means a dual-processor host requires two matching ESX Server licenses. A four-processor machine requires four matching ESX Server licenses. For a description of ESX Server license types, see [“ESX Server License Types”](#) on page 53.
- **VMware Consolidated Backup (VCB)** – To leverage the new Consolidated Backup capabilities—and backup of all virtual machines running on an ESX Server host—a VCB license key must be available for each processor within that host. Refer to the *Virtual Machine Backup Guide* for a description of this feature.
- **VirtualCenter Agent for ESX Server** – This agent is installed on a ESX Server host when it is added to your VirtualCenter Management Server. You must have one agent license key for each ESX Server processor to be added to your VirtualCenter Server.
- **VMotion** – To migrate a powered-on virtual machine between hosts, each ESX Server processor involved must have a VMotion license key. For example, if you use VMotion from a dual-processor ESX Server host to another dual-processor host, you must have four VMotion licenses. Refer to the *SAN Configuration Guide* for a description of this feature. Refer to *Basic System Administration* for a description of virtual machine configuration.

- **VMware HA** – To automatically restart virtual machines whose ESX Server host has failed, the VirtualCenter Server must have an HA license key for each ESX Server processor in the HA cluster. Refer to the *Resource Management Guide* for a description of this feature.
- **VMware DRS** – To provide automatic load balancing of virtual machines among hosts, the VirtualCenter Server must have a DRS license key for each ESX Server processor in the DRS cluster. Refer to the *Resource Management Guide* for a description of this feature.

NOTE As a prerequisite, DRS requires appropriate VMotion license keys for all hosts in the DRS cluster.

Per-Feature Licensing

Features that are licensed on a per-feature basis require only one license key per feature instance, regardless of the number of processors used. The VirtualCenter Management Server is currently the only feature licensed on a per-feature basis.

Obtaining License Files

The process of obtaining license files varies slightly depending on how your purchase of VMware Infrastructure 3 was made. The first step in obtaining license files is to obtain one or more license activation codes, which you receive in one of three ways:

- If you purchased VMware Infrastructure 3 from a VMware partner, such as Dell, Hewlett-Packard, or IBM, you receive an email containing one or more partner activation codes and a link to a partner activation portal. Enter these codes into the partner activation portal to register your purchase to your VMware store account. After you register the purchase, you receive an email containing a license activation code.
- For other new purchases of VMware Infrastructure 3, you receive an email containing a license activation code.
- If you receive upgrade entitlements for VMware Infrastructure 3 through a service and support subscription, you receive one or more emails containing license activation codes. Typically, you receive one license activation code per line item on your original ESX Server 2.x/VirtualCenter 1.x order.

When you have received the email containing your license activation codes, follow the instructions in the email to access the Web-based license activation portal and generate license files.

For additional information on the license activation process, see the license activation portal online Help.

Setting Up License Server-Based Licensing

You can configure license server-based licensing at installation time. After installation, you can make changes to licensing through the Virtual Infrastructure Client. This section discusses:

- [“Installing the License File”](#) on page 42
- [“Location of the License Server”](#) on page 43
- [“Configuring License Server-Based Licensing”](#) on page 43
- [“Changing the Default License Server Ports”](#) on page 45
- [“License Server Availability”](#) on page 45
- [“Changing from Host-Based to License Server-Based Licensing”](#) on page 49
- [“Using an Existing FLEXnet License Server”](#) on page 50

Installing the License File

Save your license file as a plain text file. Use the name `vmware.lic` on a file system you can access from your license server machine.

NOTE The file extension `.lic` is required.

You can then import this file into your license server during installation:

- See [“Installing the VirtualCenter Server”](#) for instructions regarding the recommended license server installation.
- See [“Installing a Standalone License Server”](#) on page 62 for instructions on the standalone license server.

The license server can only use one license file at a time. If you have obtained multiple license files (for example, from separate orders) and you want to manage all of these licenses from a single license server, you must use a text editor to combine these files into a single license file. See [“Editing the License File”](#) on page 58 for more information.

Location of the License Server

VMware strongly recommends that you follow the default installation and place your license server on the same machine as your VirtualCenter Server. This has the advantage of simplicity of setup, as well as guaranteeing VirtualCenter-to-license server communications. Change this only if you have a good reason, such as an existing FLEXnet license server. To access the license server documentation, choose:

Start > Programs > VMware > VMware License Server > VMware License Server User Guide.

Configuring License Server-Based Licensing

The first procedure in this section describes VirtualCenter license server-based licensing configuration. If your environment used the default VirtualCenter installation, or if you have no VirtualCenter Server, go directly to [“To configure license server-based licensing for an ESX Server host”](#) on page 44.

To configure license server-based licensing for VirtualCenter Server

- 1 From the VI Client, choose **Administration > Server Settings**.
- 2 Click **License Server** in the list on the left.
- 3 Select the **Use the Following License Server** radio button.
- 4 Enter the machine name and, optionally, a port in the field.

If you do not specify a port, the default port, 27000, is used.

For example, with the default license server port 27000 on a license server called `license`, your entry might look like this:

```
license.vmware.com:27000
```

- 5 (Optional) If you do not want VirtualCenter to override the host's current license setting, deselect the check box for **Change host license server settings to match VirtualCenter's setting when they are added to inventory**.

Selecting this check box causes VirtualCenter Server to override the host's current license setting and instead use the license server used by VirtualCenter.

- 6 Click **OK** to save your changes.

You do not have to change any other settings to enable license server-based licensing.

The total number of licenses consumed and available on the license server are summarized on the **Licenses** tab in the **Admin** view of the VI Client connected to the VirtualCenter Server. This tab was labeled "License Viewer" in earlier versions of VirtualCenter.

NOTE If you did not select the check box for the optional setting, follow the procedure in the next section to manually configure ESX Server hosts to use license server-based licensing.

To configure license server-based licensing for an ESX Server host

- 1 From the VI Client, select the host in the inventory.
- 2 Click the **Configuration** tab.
- 3 To set the license server:
 - a Click **Edit** to the right of **License Sources**.
The License Sources dialog box appears.
 - b Select the radio button for **Use License Server**.
This is the default configuration.
 - c Enter the license server machine name and, optionally, a port into the **Address** field. If you do not specify a port, the default port, 27000, is used.

For example, with the default license server port 27000 on a license server called `license-1`, your entry might look like this:

`license-1.vmware.com:27000`
 - d Click **OK** to close the dialog box and save your changes.
- 4 Set the ESX Server License Type:
 - a Click **Edit** to the right of **ESX Server License Type**.
The ESX Server License Type dialog box appears.
 - b Select either **Starter** or **Standard** license types, or select **Unlicensed** to release this host's licenses back to the license server.

For more information on license types, see ["ESX Server License Types"](#) on page 53.
 - c Click **OK** to close the dialog box and save your changes.

- 5 To configure add-on licenses:
 - a Click **Edit** to the right of **Add-Ons**.

The Add-Ons dialog box appears.

- b Select the add-ons you want to license, and click **OK**.

The total number of licenses consumed and available on the license server are summarized on the **Licenses** tab in the **Admin** view of the VI Client connected to the VirtualCenter Server. This tab was labeled "License Viewer" in earlier versions of VirtualCenter.

Changing the Default License Server Ports

By default, VirtualCenter and ESX Server software is configured to use TCP/IP ports 27000 and 27010 to communicate with the license server. If you did not use the default ports during license server installation, you must update the configuration on each ESX Server host.

If you change the default ports for the license server, log on to the ESX Server host service console and open the ports you want.

To open a specific port in the service console firewall

- 1 Log on to the service console as the root user.
- 2 Execute this command:

```
esxcfg-firewall --openport <portnumber>,tcp
```

License Server Availability

The license server-based licensing mechanisms used by VMware software are designed to prevent the license server from being a single point of failure. The license server acts primarily as a license distribution mechanism. If your license server becomes unavailable, you cannot issue any new licenses to enable new hosts or new features. However, all licensed functionality currently operating at the time the license server becomes unavailable continues to operate as follows:

- All VirtualCenter licensed features continue to operate indefinitely, relying on a cached version of the license state. This includes not only basic VirtualCenter Server operation, but licenses for VirtualCenter add-ons, such as VMotion and DRS.

- For ESX Server licensed features, there is a 14-day grace period during which hosts continue operation, relying on a cached version of the license state, even across reboots. After the grace period expires, certain ESX Server operations, such as powering on virtual machines, become unavailable.

During the ESX Server grace period, when the license server is unavailable, the following operations are unaffected:

- **Virtual machines** continue to run. Virtual Infrastructure Clients can configure and operate virtual machines.
- **ESX Server hosts** continue to run. You can connect to any ESX Server host in the VirtualCenter inventory for operation and maintenance. Connections to the VirtualCenter Server remain. VI Clients can operate and maintain virtual machines from their host even if the VirtualCenter Server connection is also lost.

During the grace period, restricted operations include:

- Adding ESX Server hosts to the VirtualCenter inventory. You cannot change host VirtualCenter agent licenses.
- Adding or removing hosts from a cluster. You cannot change host membership for the current VMotion, HA, or DRS configuration.
- Adding or removing license keys.

When the grace period has expired, cached license information is no longer stored. As a result, the following operations are affected:

- **Virtual machines** can no longer be powered on. Running virtual machines continue to run but cannot be rebooted.

When the license server becomes available again, hosts automatically reconnect to the license server. No rebooting or manual action is required to restore license availability. The grace period timer is automatically reset whenever the license server becomes available again.

[Table 3-2](#) displays ESX Server licensed operations permitted while the license server is unavailable. Operations that are not permitted are operations that require the acquisition of new licenses from the license server.

Table 3-2. Permitted ESX Server Operations When the License Server Is Unavailable

Component	Attempted Action	During Grace Period	After Grace Period Expires
Virtual machine	Power on	Permitted	Not Permitted
	Create/delete	Permitted	Permitted
	Suspend/resume	Permitted	Permitted
	Configure virtual machine with VI Client	Permitted	Permitted
ESX Server host	Continue operations	Permitted	Permitted
	Power on/power off	Permitted	Permitted
	Configure ESX Server host with VI Client	Permitted	Permitted
	Modify license file for host-based licensing	Permitted	Permitted
	Restart virtual machines within the failed host's HA cluster	Permitted	Not Permitted
Any component	Add or remove license keys	Not Permitted	Not Permitted

[Table 3-3](#) lists VirtualCenter licensed operations that are permitted when the license server is unavailable. Operations that are not permitted are operations that require the acquisition of new licenses from the license server.

Table 3-3. Permitted VirtualCenter Operations When the License Server is Unavailable

Component	Attempted Action	When License Server is Unavailable
VirtualCenter Server	Remove an ESX Server host from inventory (see next entry)	Permitted
	Add an ESX Server host to inventory	Not Permitted
	Connect/reconnect to an ESX Server host in inventory	Permitted
	Move a powered-off virtual machine between hosts in inventory (cold migration)	Permitted
	Move an ESX Server host among folders in inventory	Permitted
	Move an ESX Server host out of a VMotion-DRS-HA cluster (see next entry)	Permitted
	Move an ESX Server host into a VMotion-DRS-HA cluster	Not Permitted
	Configure VirtualCenter Server with VI Client	Permitted
	Start VMotion between hosts in inventory	Permitted
	Continue load balancing within a DRS cluster	Permitted
Any component	Add or remove license keys	Not Permitted



CAUTION If you release licenses for licensed features while the license server is unavailable, the released licenses cannot be redistributed until the license server becomes available again. For example, if you remove the network adapter associated with VMotion while the license server is unavailable, that VMotion license is released and is unavailable until the license server is available again. Removing a host from the VirtualCenter inventory or removing a host from a cluster has a similar effect.

VirtualCenter Server uses a “heartbeat” mechanism to check whether the license server is reachable and to see if there have been any changes in the license file. The heartbeat interval is five minutes. Therefore, it might take VirtualCenter Server as long as five minutes to detect if there are license changes or if the license server has become unavailable.

When the license server becomes unavailable, or if a change in the license file causes a checked-out license to be removed, VirtualCenter Server marks the affected licenses as “Unlicensed Use”, and the licensed features continue to operate as described above.

When the license server becomes available again, or when licenses are re-added to the license file, VirtualCenter Server checks out the licenses again and reverts them to the Licensed state. If a license cannot be checked out, the license remains in the Unlicensed Use state.

If license server availability is a particular concern in your environment, consider one of the following strategies:

- Install the license server on the same machine as the VirtualCenter Server. This is the default option provided by the VirtualCenter installer.
- Install the license server in a virtual machine, and place that virtual machine in an HA cluster. VMware HA will automatically restart the license server machine on another ESX Server host in case of failure.
- Use host-based license files on ESX Server hosts.

Changing from Host-Based to License Server-Based Licensing

You can change your ESX Server hosts from host-based licensing to license server-based licensing. In order to do this, you must generate a new license file, install a license server (if you do not already have one installed), and configure your hosts to use the new licensing mode.

To change ESX Server hosts from host-based licensing to license server-based licensing

- 1 Use the VMware license redemption portal to generate and download a new license server-based license file containing all the licenses for your ESX Server hosts and any associated VirtualCenter server features.

The license redemption portal allows you to generate both host-based and server-based license files from the same license activation code.

- 2 If you have not already installed a license server, do so as follows:
 - To install a license server as part of a VirtualCenter installation, see [Chapter 4, “Installing VMware VirtualCenter,”](#) on page 57.
 - To install a standalone license server, see [“Installing a Standalone License Server”](#) on page 62.
 - To use an existing FLEXnet license server already installed in your environment, see [“Using an Existing FLEXnet License Server”](#) on page 50.
- 3 Configure your VirtualCenter Server and ESX Server hosts as described in [“Configuring License Server-Based Licensing”](#) on page 43.

Using an Existing FLEXnet License Server

In most cases, VMware recommends installing the license server on the same machine as VirtualCenter Server. However, if you already have a FLEXnet license server in your environment providing licenses for other products, you might want to install the VMware license server on that system.

NOTE The VMware license server is supported only on Windows operating systems. You cannot install the VMware license server on a Linux-based FLEXnet server. See [“License Server Software Requirements”](#) on page 24 for more information.

To install the VMware license server on your existing FLEXnet server, use the standalone license server installer as described in [“Installing a Standalone License Server”](#) on page 62. This installs VMware’s license server vendor daemon, which can coexist with other vendor daemons already installed on the server.

Setting Up Host-Based Licensing

Host-based licensing requires a valid license file on each ESX Server host. This section discusses the following host-based licensing topics:

- [“Configuring an ESX Server Machine for Host-Based Licensing”](#) on page 50
- [“Host-Based and License Server-Based Machines in the Same Environment”](#) on page 51
- [“Configuring Licensing for a Mixed ESX Server 2.x and ESX Server 3.x Environment”](#) on page 52
- [“Changing from License Server-Based to Host-Based Licensing”](#) on page 52

Configuring an ESX Server Machine for Host-Based Licensing

When you receive your license file, rename it to `vmware.lic` and place it on a file system you can access from your Virtual Infrastructure (VI) Client.

NOTE The file extension `.lic` is required.

To use the VI Client to configure host-based licensing

- 1 From the VI Client, select the host in the inventory.
- 2 Click the **Configuration** tab.
- 3 Click **Edit** to the right of **License Sources**.

The License Sources dialog box appears.

- 4 Select the radio button for **Use Host License File**.
- 5 Click **Browse** and locate the license file.

This file must be located on the client machine, not on the ESX Server host.

NOTE Files must have a `.lic` extension appear in the file browser.

- 6 Click **OK** to save your changes.

Host-Based and License Server-Based Machines in the Same Environment

Using host-based licenses for ESX Server features and license server-based licensing for VirtualCenter features in the same environment is permitted. However, doing so requires changes to the default VirtualCenter configuration settings. If you do not change the VirtualCenter settings, the settings can override host-based license files:

- When the VirtualCenter Server restarts
- When the host-based ESX Server machines are added to inventory again

Any host-based license file on the ESX Server machine remains unchanged but ignored.



WARNING If you restore an ESX Server machine to host-based licensing without changing the VirtualCenter default configuration, the VirtualCenter Server settings might override the host-based settings on the ESX Server machine.

To change VirtualCenter settings to allow host-based ESX Server licensing

- 1 From the VI Client, choose **Administration > Server Settings**.
- 2 Click **License Server** in the list on the left.
- 3 Deselect the check box for **Change host license server settings to match VirtualCenter's setting when they are added to inventory**.
- 4 Click **OK** to save your changes.
- 5 **Remove** and **Add** any affected ESX Server machine in the inventory.

Now it is safe to reconfigure host-based licensing on any changed ESX Server machines. See [“Configuring an ESX Server Machine for Host-Based Licensing”](#) on page 50.

Configuring Licensing for a Mixed ESX Server 2.x and ESX Server 3.x Environment

You can use VirtualCenter Server 2.0 to manage a mixed environment of both ESX Server 2.x and ESX Server 3.x hosts. You receive license activation codes with purchases of VMware Infrastructure 3 Standard edition and VMware Infrastructure 3 Enterprise edition that can be redeemed for both ESX Server 2.x serial numbers and for VMware Infrastructure 3 license files.

To configure licensing for the ESX Server 2.x hosts in the mixed environment

- 1 Leave the licensing on existing ESX Server 2.x hosts using serial numbers unchanged.
- 2 For new ESX Server 2.x installations, redeem your license activation code(s) on the license redemption portal for ESX Server 2.x serial numbers. Provide these serial numbers at the time of installation or configuration.
- 3 Redeem your license activation code(s) to generate a license server-based license file containing licenses for VirtualCenter Management Server, VirtualCenter Management Agents, VMotion, and ESX Server 3.x. If necessary, combine multiple generated license files to produce a single file. See [“Editing the License File”](#) on page 58.

Your generated license file can include ESX Server 3.x licenses for the ESX Server 2.x hosts for which you obtained ESX Server 2.x serial numbers in [Step 2](#). This allows you to easily distribute licenses to these hosts if they are later upgraded to ESX Server 3.x.

- 4 Install and configure VirtualCenter Server 2.x to use the license server-based license file you have generated. See [Chapter 4, “Installing VMware VirtualCenter,”](#) on page 57.

Changing from License Server-Based to Host-Based Licensing

You can change your ESX Server hosts from license server-based mode to host-based licensing mode. VirtualCenter Server and additional features such as VMotion, VMware DRS, and VMware HA must remain in license server-based mode. In order to change the licensing mode for your ESX Server hosts, you must generate new license files for each host and configure the hosts to use the new licensing mode.

To change ESX Server hosts from license server-based to host-based licensing mode

- 1 Use the VMware license redemption portal to generate and download new host-based license files for each ESX Server host.

The license redemption portal allows you to generate both host-based and server-based license files from the same license activation code. For host-based licensing, you need one license file for each individual ESX Server host.
- 2 If you are using VirtualCenter Server, change your VirtualCenter Server settings so that VirtualCenter Server does not override host license settings, as described in [“Host-Based and License Server-Based Machines in the Same Environment”](#) on page 51.
- 3 Configure your ESX Server host as described in [“Configuring an ESX Server Machine for Host-Based Licensing”](#) on page 50.

ESX Server License Types

When you purchased your VMware Infrastructure software, you purchased one of three available editions, which are:

- **VMware Infrastructure Starter edition** – Provides virtualization for the small business and branch office environments. Its limited production-oriented features include:
 - NAS or local storage
 - Deployable on a server with up to four physical CPUs and up to 8GB physical memory
- **VMware Infrastructure Standard edition** – Provides an enterprise-class virtualized infrastructure suite for any workload. All standard functionality is enabled, and all optional add-on licenses (purchased separately) can be configured with this edition. Includes all production-oriented features, such as:
 - NAS, iSCSI, and SAN usage
 - Up to four-way Virtual SMP
- **VMware Infrastructure Enterprise edition** – Provides an enterprise-class virtualized infrastructure suite for the dynamic data center. It includes all the features of VMware Infrastructure Standard edition, and also includes all optional add-on licenses: VMotion, VMware HA, VMware DRS, and VMware Consolidated Backup.

These three VMware Infrastructure editions correspond to two license types for ESX Server:

- **ESX Server Standard** – This license type includes full access to the full feature set of ESX Server version 3. All standard functionality is enabled and all optional add-on licenses can be configured with the standard license type. If you have purchased either VMware Infrastructure Standard edition or VMware Infrastructure Enterprise edition, select this license type when configuring your host.
- **ESX Server Starter** – This license type includes limited access to the feature set of ESX Server version 3. Certain standard functionality is disabled or available only with an optional add-on license, at additional cost. Some optional add-on licenses cannot be configured with the starter license type. If you have purchased VMware Infrastructure Starter edition, select this license type when configuring your host .

The following tables compare and describe the specific feature entitlement for each license type.

The exact capabilities of ESX Server software vary by license type. [Table 3-4](#) displays ESX Server features arranged by license type.

Table 3-4. License Type Features for ESX Server Machines

Feature	ESX Server Standard	ESX Server Starter
Maximum number of virtual machines	Unlimited ¹	Unlimited
SAN support	Yes	Not available
iSCSI support	Yes	Not available
NAS support	Yes	Yes
Virtual SMP™ support	Yes	Not available
VMware Consolidated Backup (VCB)	Add-on ²	Not available

1. The maximum number of virtual machines is not limited by licensing
2. This is an optional feature available at additional cost.

The add-ons available to VirtualCenter software also depend on the ESX Server edition license, as described in [Table 3-5](#).

Table 3-5. VirtualCenter Server Add-Ons by License Type

Feature	ESX Server Standard	ESX Server Starter
VirtualCenter Management Agent	Yes	Yes
VMotion	Add-on ¹	Add-on ¹
VMware HA	Add-on ¹	Add-on ¹
VMware DRS	Add-on ¹	Add-on ¹

1. This is an optional feature available at additional cost.

License File

Both server-based and host-based operation require license files. This section contains the following topics:

- [“License File Contents”](#) on page 55
- [“License File Locations”](#) on page 57
- [“Editing the License File”](#) on page 58
- [“Sample License Files”](#) on page 61

License File Contents

[Example 3-3](#) shows an example license server-based license file. License files are text files containing two types of information: license mode and license keys.

- **License mode** – The first data appearing in a license file is license mode information. Mode determines whether the license keys can be served on a license server or must be stored on a host. See [“Host-Based and License Server-Based License Modes”](#) on page 35. There is no mode section in host-based license files.

This section also specifies the TCP/IP ports used by the license server to communicate with ESX Server hosts. If you want to modify these default ports, you can do so by editing this section.

A license mode header looks similar to the following:

```
SERVER this_host ANY 27000
VENDOR VMWARELM port=27010
USE SERVER
```

- **License key** – After the mode data, the file contains encrypted license keys, one for each feature to which you are entitled. [Table 3-6](#) lists the available license keys.

Table 3-6. License Keys

Feature Name	License File Key	License Mode Available
ESX Server Starter edition	PROD_ESX_STARTER	license server-based or host-based
ESX Server Standard edition	PROD_ESX_FULL	license server-based or host-based
VMware Consolidated Backup	ESX_FULL_BACKUP	license server-based or host-based
VirtualCenter Management Server	PROD_VC	license server-based only
VirtualCenter Management Agent	VC_ESXHOST	license server-based only
VMware VMotion	VC_VMOTION	license server-based only
VMware DRS	VC_DRS	license server-based only
VMware HA	VC_DAS	license server-based only

License server-based files and host-based files can be differentiated by two distinguishing features:

- Host-based license files contain no license mode section. License server-based files contain a license mode section as the file header.
- Host-based license files contain the string ‘licenseType=Host’ as part of each license key block in the file. License server-based license files contain the string ‘licenseType=Server’ as part of each license key block in the file, as shown in the examples below.

[Example 3-1](#) shows a typical host-based license key, with the license type string highlighted.

Example 3-1. Host-Based License Key, Showing License Type String

```
VENDOR_STRING=licenseType=Host;capacityType=cpuPackage;gp=14;exclude=BACKUP;count=2 \
HOSTID=ANY ISSUED=22-Jun-2006 NOTICE=FulfillmentId=1202 \
SIGN="CD1A 101F 853C 465A 2771 N905 25A5 8AE3 28F5 8EE2 78F2 \
D078 7125 2408 28BE 0A92 7B23 89FC 45F1 3B11 7704 1C83 82B7 \
37CF E7BE 6E4D 91F5 449C 484B 35F4"
```


Example 3-2 shows a typical license server-based license key, with the license type string highlighted.

Example 3-2. License Server-Based License Key, Showing License Type String

```
INCREMENT ESX_FULL_BACKUP VMWARELM 2005.05 22-dec-2010 32 \
VENDOR_STRING=licenseType=Server;capacityType=cpuPackage \
ISSUED=21-Dec-2005 NOTICE=FulfillmentId=307 SIGN="0354 DA0C \
8DEC 0E06 E589 225C 5C7C BF3D 2CE7 C286 278D 5F5B 72E3 A73A \
130B 1EFC 6830 1D4C 8BD6 331B F962 1854 F345 56AE B3E1 ACA3 \
3F05 0E69 3BC7 D8E2"
```

License File Locations

A license file resides on every license server and every ESX Server machine:

- **Host-based license files** configured through the VI Client are placed at the following location. To add new licenses, edit the license file and re-upload the new file.

/etc/vmware/vmware.lic

NOTE In license server-based mode, this file exists but contains no license keys.

- **Server-based license files** configured through the VI Client are placed at the following location on the machine running the VMware license server.

C:\Program Files\VMware\VMware License Server\vmware.lic

NOTE In VirtualCenter 2.0, the default location of the license file was C:\Documents and Settings\All Users\Application Data\VMware\VMware License Server\vmware.lic. This has been changed in VirtualCenter 2.0.1.

You can upload a host-based license file to an ESX Server host using the VI Client.

To upload a host-based license file

- 1 In the VI Client inventory, select the ESX Server host to which you want to upload the file.
- 2 Click the **Configuration** tab.
- 3 Click **Edit** to the right of **License Sources**.
The License Sources dialog box appears.
- 4 Select the radio button for **Use Host License File**.
- 5 Click **Browse** and locate the license file.

You can change the location of your license server-based license file or reload the license file using VMware License Server Tools.

To change the location of or reload the license file

- 1 On the computer on which the license server application is installed, launch VMware License Server Tools by choosing **Start > Programs > VMware > VMware License Server > VMware License Server Tools**.
- 2 Click the **Config Services** tab.
- 3 Click **Browse** next to the Path to license file field, and choose a license file.
- 4 Click the **Start/Stop/Reread** tab.
- 5 Click **Stop**.
- 6 Click **Start**.
- 7 Click **ReRead License File** to load the new license file.

NOTE During license server installation, the installer copies the contents of the license file you select to C:\Program Files\VMware\VMware License Server\vmware.lic. If you subsequently use VMware License Server Tools to change the license file, the license server uses the new location specified for the license file. VMware License Server Tools does not copy the new license file to C:\Program Files\VMware\VMware License Server\vmware.lic.

To add new licenses, edit the license file and restart the VMware license server.

Refer to [Figure 3-1, “License File Locations in Host-Based, Mixed, and License Server-Based Environments,”](#) on page 36 for a visual representation.

Editing the License File

You can use a plain text editor to edit license files. You can combine license files (for example, to add newly purchased licenses to an existing license file, or to combine entitlements from two separate purchases into a single license file). In some cases, you can split license files apart. You can only combine license files of the same type (host-based or license server-based). You can combine evaluation licenses and production licenses in a single file, but products may require configuration changes when the evaluation licenses expire.

To combine license files

- 1 Copy the license keys from one file and paste them into the other.
If the license file is server-based, do not copy the block of license mode information at the top of the file. See [Example 3-3](#) for a sample license server-based license file with license mode information labeled.
- 2 Save the edited license file as a plain text file using the filename `vmware.lic`.
- 3 Transfer the edited license file to the appropriate location:
 - For license server-based license files, copy the edited license file to `C:\Program Files\VMware\VMware License Server\vmware.lic` on the VirtualCenter Server machine.
 - For host-based license files, upload the license file to the ESX Server host as described in [“To upload a host-based license file”](#) on page 57.
- 4 Activate the edited license file as described in [“Activating an Edited License File”](#) on page 60.

Splitting license files is done a bit differently depending on whether you have host-based or license server-based license files. In a host-based license file, all features are allocated in 2-processor blocks to allow for maximum flexibility in splitting and combining license files. For example, a host-based license file containing an 8 processor entitlement for ESX Server Standard edition contains 4 separate ESX Server Standard license keys. Each key provides licensing for two processors. You could split this file into two license files for two 4-processor hosts, or into four license files for four 2-processor hosts.

In contrast, license server-based license files generally contain a single license key block for each feature. You can split a license server-based file to allocate different features to different license servers, but you cannot split your allotment for a single feature. For example, a license file containing an 8 processor entitlement for ESX Server Standard edition and an 8 processor entitlement for VMotion contains a single ESX Server Standard license key and a single VMotion license key. You could split this file into a file containing the ESX Server Standard allotment and a file containing the VMotion allotment, but you cannot divide either individual allotment between two files.

If you want to divide your purchased allotment for a particular feature among multiple license servers, do this when you generate your license files. The license activation portal allows you to specify a quantity for each license key included in the file.

License-File Editing Tips

When editing your license file, keep in mind the following tips:

- Back up your license file before you edit it.
VMware recommends editing a backup copy of the license file. However, you can always download your original license files from the license redemption portal.
- Do not duplicate or delete the block of license mode information at the top of the file.
- When copying and pasting a license feature into the license file, be sure to select the entire block of feature information, which spans several lines. Incomplete feature entries are ignored.
- Do not edit the license file to change between server-based and host-based licensing. Use the VI Client to reconfigure licensing mode changes.
- Do not combine host-based and license server-based licensing information in a single file. The license file will not work. A single license file can contain either host-based or license server-based license information.
- Save the license file in plain text format.

Activating an Edited License File

To activate an edited license file, you must do one of the following tasks:

- License server-based – Restart the license server Windows service or reload the license file as described in [“To change the location of or reload the license file”](#) on page 58.
- Host-based – Reload the license file with the VI Client as described in [“To upload a host-based license file”](#) on page 57, or reboot the ESX Server host.

To restart the license server Windows Service

The following sequence is for Windows 2000 Professional. The menus and commands for other versions of Windows can vary.

- 1 Choose **Start > Settings > Control Panel**.
- 2 Double-click **Administrative Tools**.
- 3 Double-click **Services**.
- 4 Scroll down until you can right-click **VMware License Server**.
- 5 Choose **Restart** from the pop-up menu.

To restart the ESX Server host

- 1 Log on to the service console or start an ssh session.
- 2 Type `reboot` and press Enter.

Sample License Files

Example 3-3 shows a sample license server-based license file, with the license mode and license key sections labeled. For a table showing which features correspond to which license keys, see Table 3-6, “License Keys,” on page 56.

Example 3-3. Sample License Server-Based License File

SERVER this_host ANY 27000	License Mode absent in host-based file
VENDOR VMWARELM port=27010	
USE_SERVER	License Key #1 VMware Consolidated Backup
INCREMENT ESX_FULL_BACKUP VMWARELM 2005.05 22-dec-2010 32 \	
VENDOR_STRING=licenseType=Server;capacityType=cpuPackage \	
ISSUED=21-Dec-2005 NOTICE=FulfillmentId=307 SIGN="0354 DA0C \	
8DEC 0E06 E589 225C 5C7C BF3D 2CE7 C286 278D 5F5B 72E3 A73A \	License Key #2 Virtual SMP
130B 1EFC 6830 1D4C 8BD6 331B F962 1854 F345 56AE B3E1 ACA3 \	
3F05 0E69 3BC7 D8E2"	
INCREMENT ESX_FULL_VSMP VMWARELM 2005.05 22-dec-2010 32 \	
VENDOR_STRING=licenseType=Server;capacityType=cpuPackage \	License Key #3 VMware HA
ISSUED=21-Dec-2005 NOTICE=FulfillmentId=306 SIGN="01A9 133B \	
CE95 2C6F BC0B 655C C338 7DFB 99E0 37E4 50DF 5D34 A2C7 E261 \	
42A2 18C0 3044 D1FC 0B06 7057 EECD A197 892F 25FD 60B4 E8C1 \	
C4DC 9030 FC52 F8AD"	License Key #4 VMware DRS
INCREMENT VC_DAS VMWARELM 2005.05 22-dec-2010 32 \	
VENDOR_STRING=licenseType=Server;capacityType=cpuPackage \	
ISSUED=21-Dec-2005 NOTICE=FulfillmentId=312 SIGN="0E67 7096 \	
BA2F 4C22 9267 46BB EDD6 B294 189F F590 E787 FD59 50A9 FC59 \	
545C 1AC3 09A9 9DFA EBB1 754A EB8B 2D0E 335F CE15 93AA 1A28 \	
2E6C CC3F 6ACF 9D59"	
INCREMENT VC_DRS VMWARELM 2005.05 22-dec-2010 32 \	
VENDOR_STRING=licenseType=Server;capacityType=cpuPackage \	
ISSUED=21-Dec-2005 NOTICE=FulfillmentId=311 SIGN="0068 1798 \	
6390 E449 ABBC 7AFE 27AD 4576 D51E 491D 75FB C762 2EAC 8A23 \	
F90D 17BE 6335 34F9 1382 A0FD A8D4 8EC3 07DB 3310 DD46 A196 \	
4C51 0914 79D3 538B"	

Installing a Standalone License Server

This section describes a standalone installation of the license server. Use this installer for ESX Server host environments that use no VirtualCenter Management Server.

NOTE VMware strongly recommends the default VirtualCenter Server installation in which the license server is automatically installed on the same machine.

To install the VMware license server software, you must have:

- Hardware that meets “[System Requirements](#)” on page 21
- A static IP address or machine name to be used by your license server

To install a VirtualCenter license server

- 1 As Administrator on the Windows system, double-click the VMware installation icon or choose **Start > Run** and enter the location of the executable—for example, `VMware-licenseserver.exe`—in the Run window.

A splash screen appears. The VirtualCenter license server installer prepares to install the components.

The Welcome page appears.

- 2 Verify you are installing the license server, and click **Next**.

The License Agreement page appears.

- 3 Read the license agreement, click the **Accept** button, and click **Next**.

The Customer Information page appears.

- 4 Enter your user name and company name. Click **Next**.

The Destination Folder page appears.

- 5 Select the folder in which you want to install the license server. Click **Next**.

The Licensing page appears.

- 6 Select the text file containing your license keys:
 - a Locate the email you received from VMware containing your license keys. Save this email as a text file on a drive you can reach from the installer.
 - b Type the location of the license file, or click **Browse** to locate this file.
 - c Click **Next** to continue.

- 7 Click **Install** to begin the installation.
A progress dialog box appears. Installation might take a few minutes.
- 8 Click **Finish** to complete the license server installation.

Troubleshooting Licensing

This section provides guidelines for troubleshooting your license setup. If you are not able to resolve your problems with licensing using the information given in this section, contact VMware for support as follows:

- If you have not yet received license activation codes for your VI3 purchase or have difficulties in using your license activation codes to obtain license files, email vi-hotline@vmware.com.
- If you have already obtained license files and have difficulties in configuring or troubleshooting licensed features, file a support request through <http://www.vmware.com/support>.

Receiving License Activation Codes

VMware sends license activation codes and licensing information to the license administrator listed for a particular purchase. If you are not the license administrator, contact your organization's license administrator for your license activation codes.

If you need to change the license administrator for your order, contact vi-hotline@vmware.com. Include the relevant order numbers in your email.

If you purchase VMware Infrastructure 3 from a VMware partner, you must register your purchase using the partner activation code(s) supplied by the partner in order to receive license activation codes.

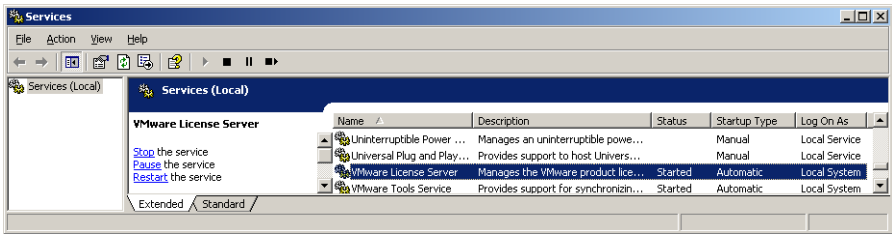
Checking the License Server

If you are having trouble communicating with your license server, check the following:

- Check that the license server Windows service is running.
- Check that license server is listening.
- Check the license server status.

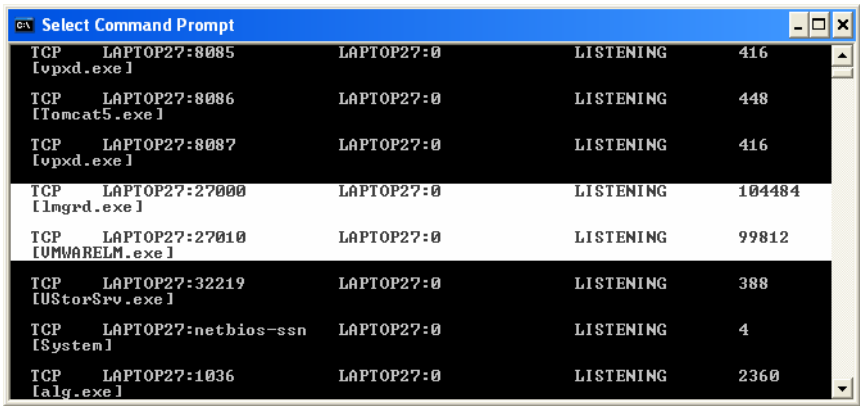
To check that the license server Windows service is running

- 1 On the machine on which the license server is installed, choose **Start > Control Panel > Administrative Tools > Services** to display the Services control panel.
- 2 Verify that the Status column for the VMware License Server entry reads “Started”.
- 3 If the VMware License Server is not started, start it by right-clicking on the service and choosing **Start**.



To check that the license server is listening

- 1 On the machine on which the license server is installed, choose **Start > Command Prompt**.
- 2 Type **netstat -ab** at the command line.
- 3 Verify that the `lmgrd.exe` process is listening on port 27000 and that the `VMWARELM.exe` process is listening on port 27010. If not, the license server might not be installed or might not be started.



To check the license server status

- 1 On the machine on which the license server is installed, choose **Start > Programs > VMware > VMware License Server > VMware License Server Tools** to launch the LMTOOLS utility.
- 2 Click the **Server Status** tab to display the Server Status page.
- 3 Click **Perform Status Inquiry**.

License server information, including the location of the license file, is displayed at the bottom of the page.

Checking the License File

If your license server is operating properly or if you are using host-based licensing, but you still cannot use licensed features, there might be a problem with your license file. Check the following:

- Ensure that you are using the correct type of license file. If you are using a license server, use a license server-based file. If you are using host-based licensing, make sure that you are using a host-based license file on each host.

License server-based files contain a block of header text at the top, and the string 'VENDOR_STRING=licenseType=Server' appears in each license key in the file. Host-based license files have no header text, and the string 'VENDOR_STRING=licenseType=Host' appears in each license key in the file.

- If you are using a license server-based license file, check that the license mode header information appears only once and at the top of the file.
- Check that the license file contains the correct keys for the features you want to use. See [Table 3-6, "License Keys,"](#) on page 56 for a list of keys.
- If you have edited the license file, check that you have not mixed license server-based and host-based keys in a single file and that you have followed the guidelines in ["License-File Editing Tips"](#) on page 60.

Checking License Configuration

If your license server (if used) appears to be working correctly, and your license file is correct, check that you have correctly configured licensing for your hosts using the VI Client:

- If you are using license server-based licensing, follow the instructions in [“Configuring License Server-Based Licensing”](#) on page 43.
- If you are using host-based licensing, follow the instructions [“Configuring an ESX Server Machine for Host-Based Licensing”](#) on page 50.