ESX Server 3 Installation Guide

ESX Server 3.5 and VirtualCenter 2.5

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

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Contents

About This Book

This manual, the *Installation Guide*, describes how to install new configurations of VMware® VirtualCenter and ESX Server 3.

The *Installation Guide* covers ESX Server 3.5. To read about ESX Server 3i version 3.5, see http://www.vmware.com/support/pubs/vi_pubs.html.

For ease of discussion, this book uses the following product naming conventions:

- For topics specific to ESX Server 3.5, this book uses the term "ESX Server 3."
- For topics specific to ESX Server 3i version 3.5, this book uses the term "ESX Server 3i."
- For topics common to both products, this book uses the term "ESX Server."
- When the identification of a specific release is important to a discussion, this book refers to the product by its full, versioned name.
- When a discussion applies to all versions of ESX Server for VMware Infrastructure 3, this book uses the term "ESX Server 3.x."

Intended Audience

This manual is intended for anyone who needs to install ESX Server 3.5 and VirtualCenter 2.5. 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

VMware welcomes your suggestions for improving our documentation. If you have comments, send your feedback to:

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VMware Infrastructure Documentation

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

Abbreviations Used in Figures

The figures in this manual use the abbreviations listed in Table 1.

Table 1. Abbreviations

Abbreviation	Description
database	VirtualCenter database
datastore	Storage for the managed host
dsk#	Storage disk for the managed host
host*n*	VirtualCenter managed hosts
SAN	Storage area network type datastore shared between managed hosts
tmplt	Template
user#	User with access permissions
VC	VirtualCenter
VM#	Virtual machines on a managed host

Technical Support and Education Resources

The following sections describe the technical support resources available to you. You can access the most current versions of this manual and other books by going to:

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

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.

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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/mgrreg/index.cfm.

Introduction to VMware Infrastructure

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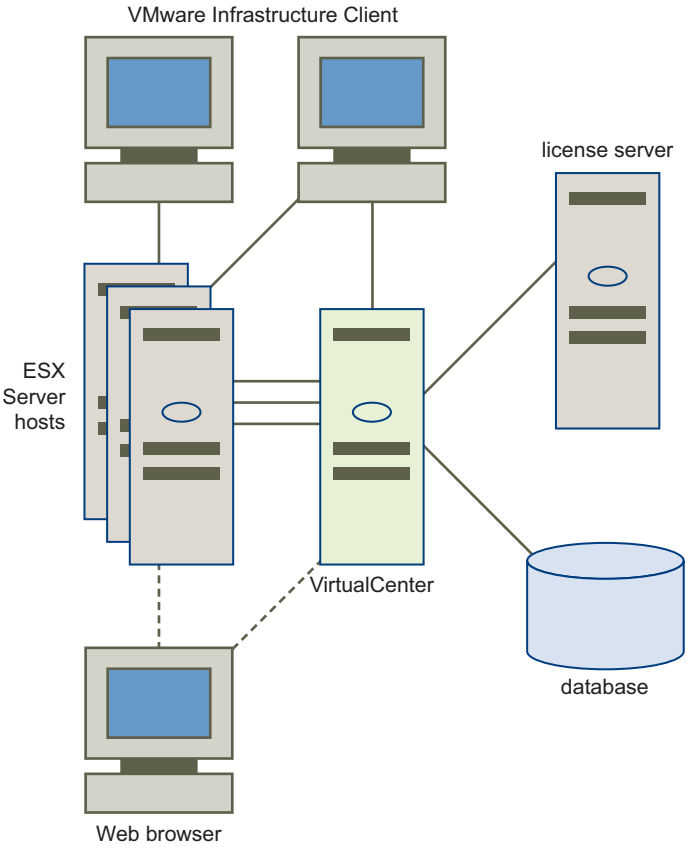
This book describes each separate installer for setting up VMware ESX Server 3 and VirtualCenter components. This chapter describes the components individually, so you know which you need to install.

This chapter contains the following topics:

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

  ESX Server 3 installation includes documentation in the form of man pages available from the service console. See "Installing VMware ESX Server Software" on page 81.

- **VirtualCenter Server** – This server installs on a Windows machine, either physical or virtual, 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 installed with the VirtualCenter Server. See "Installing VMware Infrastructure Management Software" on page 71.

- **VirtualCenter Plugins** – Optional applications that provide additional capabilities and features to VirtualCenter. Generally, plugins are released separately, install on top of VirtualCenter, and can be upgraded independently. You can install server components of plugins on the same computer where the VirtualCenter Server resides, or on a separate one. After the server component of a plugin is installed, you can activate the plugin's client component, which enhances the VI Client with appropriate UI options.

  Documentation provided with each plugin offers information on how server components of plugins are installed.

  For information on how to install the client component, verify which plugins are installed, and how to disable or uninstall plugins that you are not using, see *Basic System Administration*.

The following plugins are available:

- VMware Converter – Enables you to convert physical or virtual machines into ESX Server virtual machines. After converting the virtual machines, you can add them to your VirtualCenter inventory.
- VMware Update Manager – Provides security monitoring and patching support for ESX Server hosts and virtual machines.

  In addition to an independent server component installation, this release supports the combined installation for the VirtualCenter Server and Update Manager. See "Installing VMware Infrastructure Management Software" on page 71. If you are upgrading, see the *Upgrade Guide*. For information on Update Manager, see the *Update Manager Administration Guide*.

- **VI Client** – The VI Client installs on a Windows machine and is the primary method of interaction with VMware Infrastructure. The VI Client acts as:
  - A **console** to operate virtual machines.
  - An **administration interface** into the VirtualCenter Servers and ESX Server hosts.

  The VI Client is downloadable from the VirtualCenter Server and ESX Server hosts. The VI Client installation includes documentation for administrators and for console users. See "Installing VMware Infrastructure Management" on page 65.

- **Web Access –** A browser lets you download the VI Client from the VirtualCenter Server or ESX Server hosts. When you have appropriate login credentials, Web Access 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 the VirtualCenter Servers and ESX Server hosts appropriately for your licensing agreement. Administrators make changes to software licenses using the VI Client. See "Setting Up Centralized Licensing" on page 49.
- **Database** – The VirtualCenter Server uses a database to organize all the configuration data for the VMware Infrastructure environment. For small deployments, the bundled Microsoft SQL Server 2005 Express database lets you set up a limited numbers of hosts and virtual machines (5 hosts and 50 virtual machines). VirtualCenter supports several other database products for larger deployments. See "Preparing the VirtualCenter Server Database" on page 66.

What's New for Installation

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

What's New About Installing VirtualCenter Version 2.5

New features introduced in VirtualCenter 2.5 include:

- An installation wizard that installs VirtualCenter, the VI Client, and plug-in components
- New evaluation mode
- New license server support of a multiple license file directory
- A feature that detects plugins installed on a VirtualCenter Server during a VI Client installation

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

What's New About Installing ESX Server 3.5

New features introduced in ESX Server 3.5 include:

- New evaluation mode offering full access to all ESX Server features for a limited time
- SATA disk drives support for ESX Server 3.5 installation

New features introduced in ESX Server version 3.0.1 include a new upgrade feature that allows migration upgrades without virtual machine downtime.

New features introduced in ESX Server version 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 VI Client installation, downloadable from a changed Web interface

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

System Requirements 2

This chapter describes the hardware and operating system requirements for hosts running VirtualCenter and ESX Server 3. Use the information in this chapter to ensure that your environment meets the requirements for installation.

This chapter contains the following topics:

VMware Infrastructure Requirements

VirtualCenter manages ESX Server hosts using a server and three types of remote management clients.

VirtualCenter Server Requirements

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

Hardware Requirements

The 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).

- **Microsoft SQL Server 2005 Express disk requirements** – The bundled 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** – Gigabit recommended.

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 (download Update Rollup 1 from http://www.microsoft.com/windows2000/server/evaluation/news/bulletins/rollup.mspx)
- Windows XP Pro SP2
- Windows 2003 Server SP1 (all releases except 64-bit)
- Windows 2003 Server R2

NOTE For any operating system except Windows Server 2003 SP1, install Microsoft Windows Installer 3.1, otherwise your VirtualCenter installation can fail. See http://support.microsoft.com/?id=893803 for information on downloading Windows Installer 3.1.

VirtualCenter 2.x installation is not supported on 64-bit operating systems.

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

VirtualCenter Database Requirements

VirtualCenter supports the database formats listed in Table 2-1.

Table 2-1. Supported Database Formats (SEE UPDATE)

Database Type	Service Pack, Patch, and Driver Requirements
Microsoft SQL Server 2000 Standard Microsoft SQL Server 2000 Enterprise	SP4 For Windows 2000 and Windows XP, apply MDAC 2.8 SP1 to the client. Use SQL Server driver for the client.
Microsoft SQL Server 2005 Enterprise	SP1 or SP2 For Windows 2000 and Windows XP, apply MDAC 2.8 SP1 to the client. Use SQL native client driver for the client.
Microsoft SQL Server 2005 Express SP2	For Windows 2000 and Windows XP, apply MDAC 2.8 SP1 to the client. Use SQL native client driver for the client.
Oracle 9i release 2 Standard Oracle 9i release 2 Enterprise	Apply patch 9.2.0.8.0 to the server and client.
Oracle 10g Standard Release 1 (10.1.0.3.0) Oracle 10g Enterprise Release 1 (10.1.0.3.0)	None
Oracle 10g Standard Release 2 (10.2.0.1.0) Oracle 10g Enterprise Release 2 (10.2.0.1.0)	First apply patch 10.2.0.3.0 to the client and server. Then apply patch 5699495 to the client.

Each database requires some configuration adjustments in addition to the basic installation. See "Preparing the VirtualCenter Server Database" on page 66.

End of Support Life for Microsoft Access Databases

Support for Microsoft Access was discontinued with VMware VirtualCenter version 2.0. VirtualCenter 2.5 comes with a bundled version of Microsoft SQL Server 2005 Express for small deployments (up to 5 hosts and 50 virtual machines).

VI Client Requirements

The following sections list VI Client hardware and software requirements.

VI Client Hardware Requirements

The VI 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** – Gigabit recommended.

VI Client Software Requirements

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

- Windows 2000 Pro SP4
- Windows 2000 Server SP4 with Update Rollup 1 (download Update Rollup 1 from http://www.microsoft.com/windows2000/server/evaluation/news/bulletins/rollup.mspx)
- Windows XP Pro SP2
- Windows 2003 SP1 (all releases except 64-bit)
- Windows 2003 Server R2
- Windows Vista Business
- Windows Vista Enterprise

The VI Client requires the Microsoft .NET 2.0 Framework. If your system does not have it installed, the VI Client installer installs it.

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** – Gigabit recommended.

VMware recommends that you install the license server on the same machine as your VirtualCenter Server to ensure connectivity. The VMware Infrastructure Management Installation CD installs a license server when you install VirtualCenter.

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 3 Requirements

This section discusses the minimum and maximum hardware configurations supported by ESX Server 3 version 3.5.

Minimum Server Hardware Requirements

You need the following hardware and system resources to install and use ESX Server 3.

- At least two processors:
  - 1500 MHz Intel Xeon and later, or AMD Opteron (32-bit mode) for ESX Server 3
  - 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.
  - **Fibre Channel**. See the *Storage / SAN Compatibility Guide*.
  - **RAID adapters** supported are HP Smart Array, Dell PercRAID (Adaptec RAID and LSI MegaRAID), and IBM (Adaptec) ServeRAID controllers.
- 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 hardware iSCSI, a disk attached to an iSCSI controller, such as the QLogic qla405x.
- For SATA, a disk connected through supported dual SAS-SATA controllers that are using SAS drivers.

ESX Server 3 supports installing and booting from the following storage systems:

- **ATA disk drives** – Installing ESX Server 3 on an ATA drive or ATA RAID is supported. However, ensure that your specific drive controller is included in the supported hardware.

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

- **Serial ATA (SATA) disk drives** – SATA disk drives, plugged into dual SATA/SAS controllers, are supported for installing ESX Server 3 and for storing virtual machines on VMFS partitions. Ensure that your SATA drives are connected through supported SATA/SAS controllers:
  - **mptscsi_pcie** — LSI1068E (LSISAS3442E)
  - **mptscsi_pcix** — LSI1068 (SAS 5)
  - **aacraid_esx30** — IBM serveraid 8k SAS controller
  - **cciss** — Smart Array P400/256 controller
- **megaraid_sas**—Dell PERC 5.0.1 controller

NOTE Sharing VMFS datastores on SATA disks across multiple ESX Server 3 hosts is not supported.

- **SCSI disk drives** – SCSI disk drives are supported for installing ESX Server 3. They can also store virtual machines on VMFS partitions.
- **Storage area networks** (SANs) – SANs, both Fibre Channel and iSCSI, are supported for installing ESX Server 3. They can also store virtual machines on VMFS datastores. For information about pre-installation and configuration tasks and known issues with installing and booting from Fibre Channel 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 3 on a SAN, see the latest version of the *ESX Server SAN Compatibility Guide* at www.vmware.com/support/pubs/vi_pubs.html.

Enhanced Performance Recommendations

The lists in previous sections suggest a basic ESX Server 3 configuration. In practice, you can use multiple physical disks, which include SCSI disks, Fibre Channel LUNs, RAID LUNs, and so on.

Here are some recommendations for enhanced performance:

- **RAM** – Having sufficient RAM for all your virtual machines is important to achieving good performance. ESX Server 3 hosts require more RAM than typical servers. An ESX Server 3 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 3 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 3 service console

  Running these example virtual machines with a more reasonable 512MB RAM requires the ESX Server 3 host to be equipped with at least 2.2GB RAM.

  - 2048MB for the virtual machines (512MB × 4)
  - 272MB for the ESX Server 3 service console

  These calculations do not take into account variable overhead memory for each virtual machine. See the *Resource Management Guide*.

  NOTE The ESX Server 3 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 3 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 3 performance. For certain workloads, larger caches improve ESX Server 3 performance.
- **Hardware compatibility** – To ensure the best I/O performance and workload management, VMware ESX Server 3 provides its own drivers for supported devices. Be sure that the devices you use in your server are supported. For additional details on I/O device compatibility, download the *ESX Server I/O Compatibility Guide* from www.vmware.com/support/pubs/vi_pubs.html.

Hardware and Software Compatibility

For more information on supported hardware and software, download the ESX Server Compatibility Guides from 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 the combinations of HBAs and storage devices currently tested by VMware and its storage partners.
- **Backup software compatibility** – Describes the backup packages tested by VMware.

Supported Guest Operating Systems

The VMware *Guest Operating System Installation Guide* includes information on supported guest operating systems. You can download this document at:

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

ESX Server offers support for a number of 64-bit guest operating systems. See the *Guest Operating System Installation 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 Virtualization Technology (VT). 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 lets you enable VT support.

To determine whether your server has the necessary support, you can use a CPU Compatibility Tool at http://www.vmware.com/download/vi/drivers_tools.html.

Virtual Machine Requirements

Each ESX Server machine has the following requirements.

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

  NOTE If you 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

VirtualCenter and ESX Server 3 Licensing Overview

3

This chapter describes the licensing models available with ESX Server 3 and VirtualCenter.

This chapter contains the following topics:

Licensing Terminology

Terms you might encounter during the license redemption and configuration process are defined below:

- **License activation code** – A license activation code (LAC) 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 purchased your products from an authorized VMware reseller, in which case you receive a partner activation code.
- **Partner activation code** – A partner activation code is a unique code identifying orders placed through VMware partners. If you purchased VMware Infrastructure 3 from an authorized VMware reseller, use this code to register your purchase to your VMware store account.
- **License activation portal** – The license activation portal is a self-service Web portal that you can use to redeem your license activation codes and download license files for VMware Infrastructure 3.
- **Partner activation portal** – A partner activation portal is a self-service Web portal you use to register a purchase made from an authorized VMware reseller to your VMware store account. You enter your partner activation code into the portal and download your license files from the license activation portal.

ESX Server 3 Editions

Depending on the edition of VMware Infrastructure software you purchased, you might be entitled to different ESX Server 3 licence types.

A few editions include limited access to the feature set of ESX Server 3. Certain standard functionality is available only with an optional add-on license, at additional cost. Other editions include full access to the full feature set of ESX Server 3.

ESX Server editions require FLEXnet license files that can be centralized or on a single host. When configuring your host, specify the licence type for your ESX Server 3. For instructions, see "To configure centralized licensing for an ESX Server host" on page 51.

Licenses from previous releases of ESX Server work with ESX Server 3.5. However, licensing capabilities added to ESX Server 3.5 editions (for example, VMware Consolidated Backup) are not supported with previous editions of ESX Server.

Table 3-1 displays ESX Server 3 features arranged by edition.

Table 3-1. Edition Features for ESX Server 3 Machines

Feature	VI Foundation	VI Standard	VI Enterprise
License type	Flex license files (centralized or single host)	Flex license files (centralized or single host)	Flex license files (centralized or single host)
VMFS	Yes	Yes	Yes
Virtual SMP support	Yes	Yes	Yes
VMware Consolidated Backup (VCB)	Yes	Yes	Yes
VMware Update Manager	Yes	Yes	Yes
VMware HA	Add-on	Yes	Yes
Server VMotion and Storage VMotion	Add-on	Add-on	Yes
VMware DRS and DPM (Distributed Resource Management and Distributed Power Management)	Add-on	Add-on	Yes
Guided server consolidation, with purchase of VirtualCenter Server	Yes	Yes	Yes
Manageable by the VI Client	Yes	Yes	Yes
Remote CLI access	Yes	Yes	Yes
Manageable by VirtualCenter in production mode	Yes	Yes	Yes
Manageable by VirtualCenter in evaluation mode	Yes	Yes	Yes
VirtualCenter Management Agent	Yes	Yes	Yes

VirtualCenter Server Editions

At least one instance of a VirtualCenter license is required for VI Foundation, VI Standard, and VI Enterprise editions. The following VirtualCenter editions are available:

- **VirtualCenter Foundation** – This edition lets you manage up to three ESX Server hosts. If you need to manage more than three hosts, upgrade to VirtualCenter edition.
- **VirtualCenter** – This is an enterprise level edition that lets you manage up to the system maximum number of hosts. For information about system maximums, see *Configuration Maximums for VMware Infrastructure 3*.

Two types of FLEXnet licensing are available: single-host and centralized. For VirtualCenter, all licenses must be centralized.

You can convert VirtualCenter Foundation edition to VirtualCenter edition by adding an appropriate license file and switching the editions. The software does not need to be re-installed. For information on switching between the editions, see "To configure centralized licensing for the VirtualCenter Server" on page 50.

VirtualCenter and ESX Server 3 Licensing Model

Unless you are using evaluation mode, software licenses are required for most operations in VirtualCenter and ESX Server 3, such as adding hosts to your VirtualCenter inventory. However, you can install, launch, and configure VirtualCenter and ESX Server without a software license. See "Running VMware VirtualCenter and VMware ESX Server in Evaluation Mode" on page 41. Two modes of licensing are available: single-host and centralized.

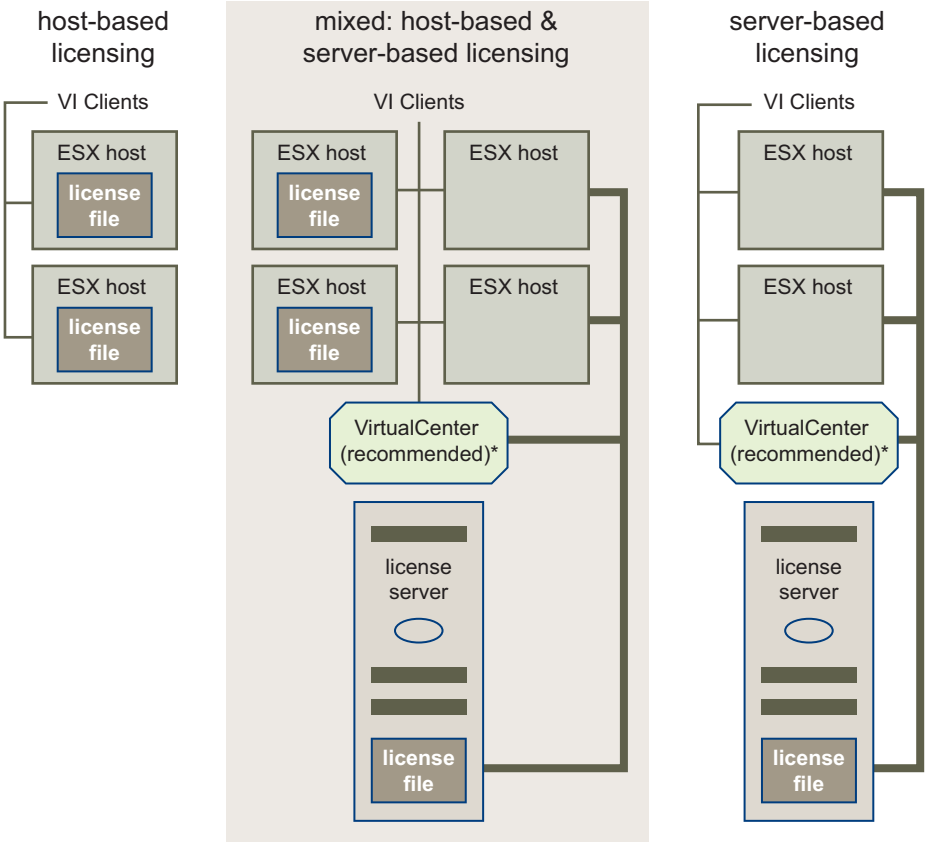
Single-Host and Centralized License Types

For single-host licenses, the license files are stored on individual ESX Server hosts. Centralized licenses are stored on a license server, which makes these licenses available to one or more hosts. You can run a mixed environment using both single-host and centralized licensing.

VirtualCenter and features that require VirtualCenter, such as VMotion, must be licensed in centralized mode. ESX Server features can be licensed in either centralized or single-host mode.

Figure 3-1 illustrates the three types of license environments.

Figure 3-1. License File Locations in Single-Host, Mixed, and Centralized Environments



* Features such as VMotion and VMware HA require VirtualCenter.

Centralized Licensing

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

Centralized licensing is based on FLEXnet mechanisms. With centralized 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 centralized 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 35.

VMware recommends using the centralized license type for large, changing environments.

Single-Host Licensing

With single-host licensing, your total entitlement for purchased features is divided among separate license files residing on ESX Server hosts and the VirtualCenter Server.

With single-host licensing, when someone activates a licensed feature, the feature for that entitlement must reside in the license file on that host. With single-host 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. Single-host 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 single-host licensing include:

- Single-host files require no license server to be installed for ESX Server host-only environments.
- In a VirtualCenter and license server environment, single-host licensing allows ESX Server host licenses to be modified during periods of license server unavailability.

License Key Functionality

Specific entitlement to run VMware software is determined by license keys. Depending on the ESX Server and VirtualCenter features you want to use, purchase keys based on one of the following:

- **Per-processor basis** – To activate a feature, a host requires a feature license for each of its processors.
- **Per-instance basis** – To activate a single instance of certain feature, a single license is required regardless of how many processors are used.

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 single-host or centralized licensing mechanisms. They do not require VirtualCenter or a license server to use. VirtualCenter features require centralized 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 35.

Table 3-2 summarizes the license feature types for VMware Infrastructure 3.

Table 3-2. Summary of License Feature Types

Feature	ESX Server or VirtualCenter	Per-Processor or Per-Instance
ESX Server	ESX Server	Per-Processor
VirtualCenter Server	VirtualCenter	Per-Instance
VirtualCenter Agent for ESX Server	VirtualCenter	Per-Processor
VMware Consolidated Backup (VCB)	ESX Server	Per-Processor
Server VMotion and Storage VMotion	VirtualCenter	Per-Processor
VMware HA	VirtualCenter	Per-Processor
VMware DRS and DPM	VirtualCenter	Per-Processor

Per-Processor Licensing

For most VMware Infrastructure products, you purchase licenses on a per-processor basis, which means that you need to indicate the total number of processors, not hosts, that will run the products. You can deploy and redeploy the purchased processor capacity, sold in increments of two processors, on any combination of hosts.

For example, you purchase ESX Server licenses for ten processors and VMotion licenses for six processors. You can then deploy those licenses on any of the following combinations of servers:

- ESX Server on five 2-processor hosts. Enable VMotion on three hosts.
- ESX Server on three 2-processor hosts and one 4-processor host. Enable VMotion on three 2-processor hosts, or on one 2-processor host and a 4-processor host.
- ESX Server on two 4-processor hosts and one 2-processor host. Enable VMotion on one 4-processor host and one 2-processor host.
- ESX Server on one 8-processor host and one 2-processor host. VMotion between these two hosts cannot be enabled unless you purchase an additional 4-processor VMotion license.

Special considerations include:

- Dual-core and quad-core processors, such as Intel x86 processors that combine two or four independent central processing units on a single chip, count as one processor.
- You cannot partially license a multiprocessor host. For example, a 4-CPU host requires a license with the capacity for four processors.
- Single-processor licensing is supported for server-based licenses. In general, for server-based licensing, checkout of licenses in odd quantities is supported. However, host-based files cannot be generated with odd quantities. They must be generated in multiples of two.

The following features are licensed on a per-processor basis:

- **ESX Server** – 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. See "ESX Server 3 Editions" on page 28.
- **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. See the *Virtual Machine Backup Guide* for a description of this feature.
- **VirtualCenter Agent for ESX Server** – This agent is installed on an ESX Server host when it is added to your VirtualCenter Server. You must have one agent license key for each ESX Server processor to be added to your VirtualCenter Server.

- **Server VMotion and Storage 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. See *Basic System Administration*.
- **VMware HA** – To 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. See the *Resource Management Guide*.
- **VMware DRS and DPM** – To provide load balancing of virtual machines among hosts and distributed power management, the VirtualCenter Server must have a DRS license key for each ESX Server processor in the DRS cluster. See the *Resource Management Guide*. As a prerequisite, DRS requires appropriate VMotion license keys for all hosts in the DRS cluster.

Per-Instance Licensing

Features that are licensed on a per-instance basis require only one license key per feature instance, regardless of the number of processors used. The VirtualCenter Server is currently the only feature licensed on a per-instance basis.

For information on different editions of VirtualCenter, see "VirtualCenter Server Editions" on page 30.

License Expiration Considerations

When the FLEXnet license server expires a license, the VI Client does not immediately display a message informing you that the license is expiring. The message can appear anytime in the 24 hours after the FLEXnet license server expires the license.

If you change the license server system time while the VI Client is running, the VI Client might not report the license expiration.

License Server Availability

VMware provides the following mechanisms that help 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 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. VI 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 VirtualCenter agent licenses for hosts.
- 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, 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 reconnect to the license server. No rebooting or manual action is required to restore license availability. The grace period timer is reset whenever the license server becomes available again.

Table 3-3 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 3-3. 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 and delete.	Permitted	Permitted
	Suspend and resume.	Permitted	Permitted
	Configure virtual machine with VI Client.	Permitted	Permitted
ESX Server host	Continue operations.	Permitted	Permitted
	Power on and power off.	Permitted	Permitted
	Configure ESX Server host with VI Client.	Permitted	Permitted
	Modify license file for single-host licensing.	Permitted	Permitted
	Restart virtual machines within the failed host's HA cluster.	Permitted	Not Permitted
	Add or remove license keys.	Not Permitted	Not Permitted

Table 3-4 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 3-4. 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 the VirtualCenter Server with VI Client.	Permitted
	Start VMotion between hosts in inventory.	Permitted
	Continue load balancing within a DRS cluster.	Permitted
	Add or remove license keys.	Not Permitted

NOTE 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.

The VirtualCenter Server uses a "heartbeat" mechanism to check whether the license server is reachable and to determine if there have been any changes in the license file. The heartbeat interval is five minutes. It might take the VirtualCenter Server up to 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, the 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, the 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 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 restarts the license server machine on another ESX Server host in case of failure.
- Use single-host license files on ESX Server hosts.

Using an Existing FLEXnet License Server

In most cases, VMware recommends installing the license server on the same machine as the VirtualCenter Server. However, if you have a FLEXnet license server in your environment providing licenses for other products, 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 21.

To install the VMware license server on your existing FLEXnet server, use the standalone license server installer as described in "Installing a License Server" on page 60. This installs the VMware license server vendor daemon, which can coexist with other vendor daemons installed on the server.

Contacting Support

If you require assistance with licensing, contact VMware for support as follows:

- If you have not received license activation codes for your VI3 purchase or have difficulties using your license activation codes to obtain license files, send email to vi-hotline@vmware.com.
- If you obtain license files and have difficulties configuring or troubleshooting licensed features, file a support request at http://www.vmware.com/support.

Running VMware VirtualCenter and VMware ESX Server in Evaluation Mode

4

This chapter provides information on how to install and run VirtualCenter 2.5 and ESX Server 3.5 in an evaluation mode and how to obtain licenses when the evaluation mode expires.

This chapter contains the following topics:

Using ESX Server and VirtualCenter in Evaluation Mode

Before purchasing and activating licenses for your ESX Server 3.5 and VirtualCenter 2.5, you can install both products and run them in evaluation mode. When run in evaluation mode, intended for demonstration and evaluation purposes, your software is completely operational immediately after installation, does not require any licensing configuration, and provides full functionality of ESX Server and VirtualCenter for 60 days from the time you install them.

During the 60-day evaluation period, the software notifies you of the time remaining until the evaluation expires. The evaluation period cannot be paused and it cannot be restarted.

Licensing VirtualCenter and ESX Server After the Evaluation Period Expires

After the 60-day evaluation period expires, unless you obtain licenses for your software, you are no longer able to perform most operations in VirtualCenter and ESX Server. For example, you cannot power on virtual machines, add new hosts, or use advanced ESX Server and VirtualCenter features.

If you do not license VirtualCenter before the evaluation period expires, all of the hosts in the VirtualCenter inventory are disconnected.

NOTE Reinstalling the VirtualCenter Server after the 60-day evaluation expires does not restart the evaluation period from the beginning.

Table 4-1 details the ESX Server behavior after evaluation mode expires. The operations that are not permitted require the acquisition of new licenses.

Table 4-1. ESX Server Operations After the 60-Day Evaluation Period

Component	Attempted Action	After 60 Days
Virtual machine	Power on	Not Permitted
	Create/delete	Permitted
	Suspend/resume	Permitted
	Configure virtual machine with VI Client	Permitted
ESX Server host	Continue operations on existing hosts	Permitted
	Power on/power off	Permitted
	Configure ESX Server host with VI Client	Permitted
	Restart virtual machines within the failed host's HA cluster	Not Permitted
	Add or remove license keys	Permitted

Considerations When You Switch ESX Server and VirtualCenter to Licensed Modes

When you switch your VirtualCenter and ESX Server from evaluation mode to the licensed mode, consider the following:

- If the number of ESX Server hosts you add to your inventory exceeds the number allowed by your current licensing type, you can no longer manage the excess hosts. Delete the extra hosts from the VirtualCenter inventory or use the VI Client to directly access the hosts and configure their licensing.
- Have all required licenses on your license server, otherwise you will not be able to use all features available to you during the 60-day evaluation.

Licensing VirtualCenter and ESX Server

5

This chapter provides procedures for redeeming license files and configuring license options.

This chapter contains the following topics:

Licensing Process

Figure 5-1 summarizes the license configuration processes for ESX Server 3.

Figure 5-1. License Configuration Process for ESX Server 3

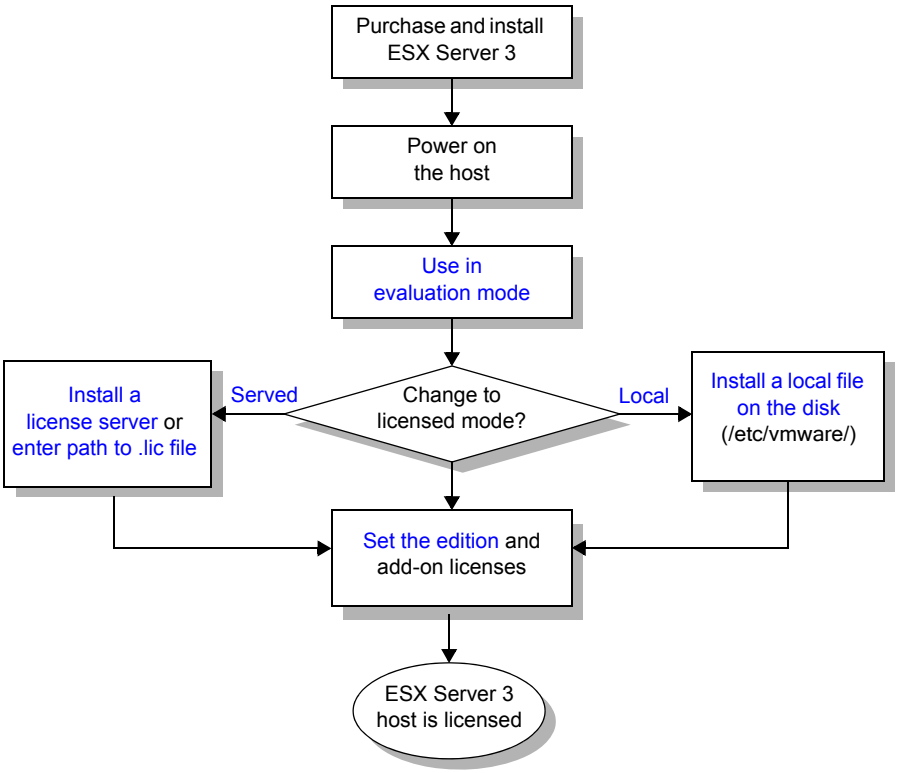
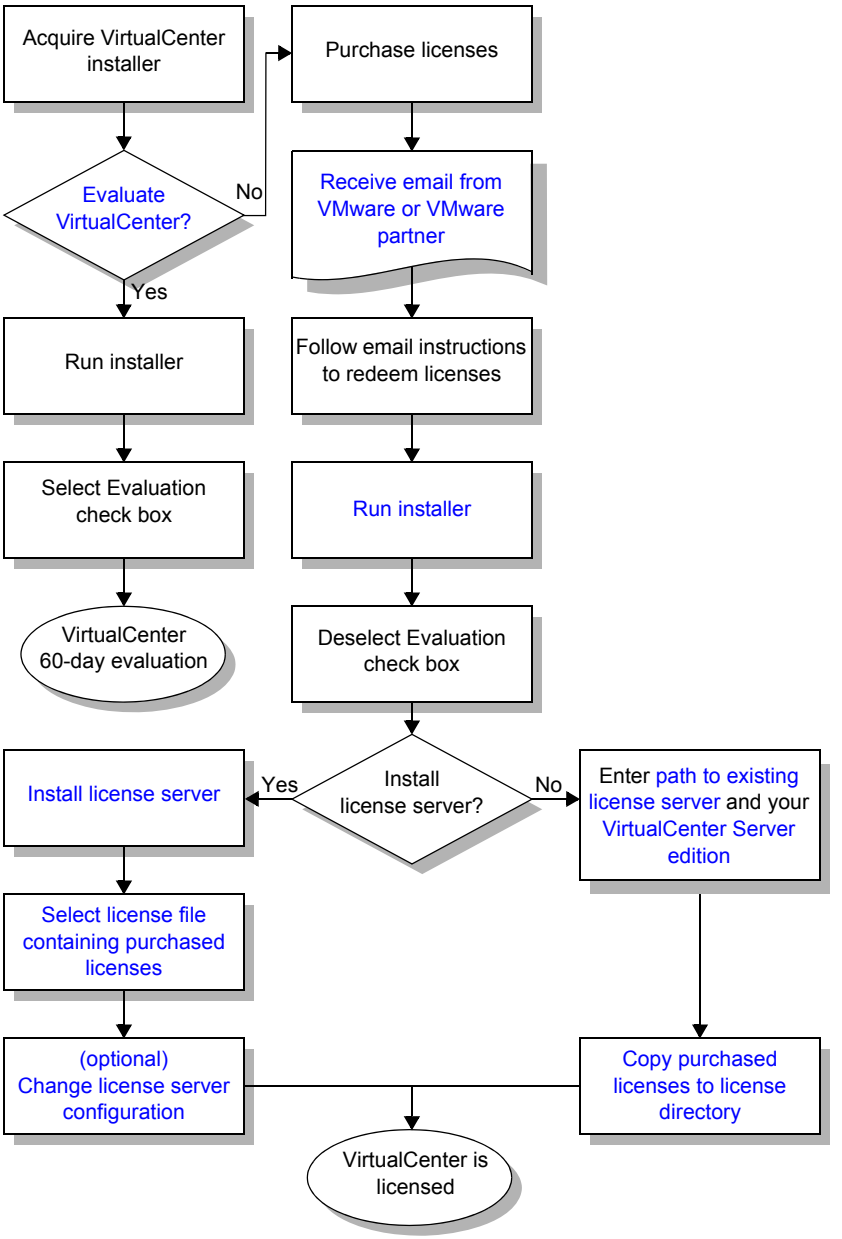


Figure 5-2 summarizes the license configuration processes for the VirtualCenter Server.

Figure 5-2. License Configuration Process for the VirtualCenter Server



After you purchase VMware Infrastructure software, do the following to obtain and use your licenses:

1 Decide which licensing model to use.

   VMware Infrastructure 3 uses FLEXnet licensing, which offers a choice of license types: centralized, single-host, or mixed. See "Single-Host and Centralized License Types" on page 30.

2 Register your purchase.

   Whether you purchased VMware Infrastructure 3 from an authorized VMware reseller or directly from VMware, register your purchase to your VMware store account. See "Obtaining License Files" on page 48.

3 Obtain license files.

   After you register your purchase, use the Web-based license activation portal to generate and download license files appropriate to the licensing model you chose in Step 1. See "Obtaining License Files" on page 48.

4 Install VirtualCenter and ESX Server.

5 Configure your licensing according to the license type you chose in Step 1:

   - To configure centralized licensing, see "Setting Up Centralized Licensing" on page 49.
   - To configure single-host licensing, see "Setting Up Single-Host Licensing" on page 53.
   - To configure a mixed license environment, see "Single-Host and Centralized Licensing in the Same Environment" on page 54.

Obtaining License Files

The process of obtaining license files varies depending on how you made your purchase of VMware Infrastructure 3. 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 an authorized VMware reseller, such as Dell, Hewlett-Packard, or IBM, you receive an email message containing instructions on how to redeem and activate your licenses. Enter the partner activation code into the partner activation portal to register your purchase.
- For other new purchases of VMware Infrastructure 3, you receive an email containing a license activation code.

When you receive the email containing your activation codes, follow the instructions in the email to register license activation codes and generate license files through the Web-based license activation portal.

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

Setting Up Centralized Licensing

You can configure centralized licensing at installation time. After installation, you can make changes to licensing through the VI Client.

Installing License Files

After you obtain your license files, save them as plain text ASCII files in a directory you can access from your license server machine. Use the `.lic` extension when saving your license files.

NOTE The file extension `.lic` is required.

When the VMware license server is installed, you can import the files into your license server. Centralized license files are placed at the following default location on the machine running the license server:

```
C:\Program Files\VMware\VMware License Server\Licenses
```

See "Installing a License Server" on page 60 for instructions on installing a standalone license server.

See "Installing VMware Infrastructure Management Software" on page 71 for instructions regarding the recommended license server installation.

Location of the License Server

VMware 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 Licensing

The first procedure in this section describes VirtualCenter centralized licensing configuration. If your environment uses the default VirtualCenter installation, or if you have no VirtualCenter Server, go directly to "To configure centralized licensing for an ESX Server host" on page 51.

To configure centralized licensing for the VirtualCenter Server

1 From the VI Client, choose **Administration > VirtualCenter Management Server Configuration**.

2 Click **License Server** in the list on the left.

3 Click the **Use the Following License Server** button.

4 To set the license server:

   a Click **Edit** to the right of **License Sources**.

   b Click **Use License Server**.

      This is the default configuration.

   c Enter the port number and license server machine name in the **Address** field, as in port@host.

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

      ```
      27000@license-1.vmware.com
      ```

   d Click **OK** to close the dialog box and save your changes.

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 the 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 centralized 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.)

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 centralized licensing.

To configure centralized licensing for an ESX Server host

1 From the VI Client, select the host in the inventory.

2 Click the **Configuration** tab.

3 Under Software, click **Licensed Features**.

4 To set the license server:

   a Click **Edit** to the right of **License Sources**.

   The License Sources dialog box appears.

   b Click the **Use License Server** button.

   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.

5 Set the ESX Server edition:

   a Click **Edit** to the right of **ESX Server License Type**.

   b Specify the edition for the host, or select **Unlicensed** to release this host's licenses back to the license server. The **ESX Server License Type** dialog box displays only those editions that are available to your ESX Server host.

   c Click **OK** to close the dialog box and save your changes.

6 To configure add-on licenses:

   a Click **Edit** to the right of **Add-Ons**.

   The Add-Ons dialog box appears.

   b Select the add-on products you want to use 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.)

To configure local license server licensing for the VirtualCenter Server

1 From the VI Client, choose **Administration > VirtualCenter Management Server Configuration**.

2 Click **License Server** in the list on the left.

3 Click the **Use license services on this VirtualCenter Server** button.

4 (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 the VirtualCenter Server to override the host's current license setting and instead use the license server used by VirtualCenter.

Make sure that you use an IP address that is accessible from the ESX Server host. If you configure VirtualCenter to use a local license server and the host name of the local license server (VirtualCenter's host) is not resolvable from the ESX Server host, the ESX Server host is not able to acquire licenses from the local license server.

5 Click **OK** to save your changes.

You do not have to change any other settings to enable local license server 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 "To configure centralized licensing for an ESX Server host" on page 51 to manually configure ESX Server hosts to use license server licensing.

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 in 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 in to the service console as the root user.

2 Execute this command:

```
esxcfg-firewall --openPort <portnumber>,tcp,out,"License Server"
```

Changing from Single-Host to Centralized Licensing

You can change your ESX Server hosts from single-host licensing to centralized licensing. You must generate a new license file, install a license server (if you do not have one installed), and configure your hosts to use the new license type.

To change ESX Server hosts from single-host licensing to centralized licensing

1 Use the VMware license activation portal to generate and download a new centralized license file containing all the licenses for your ESX Server hosts and any associated VirtualCenter Server features.

The license activation portal lets you generate both single-host and centralized license files from the same license activation code.

2 If you have not installed a license server, do so as follows:

- To use a FLEXnet license server installed in your environment, see "Using an Existing FLEXnet License Server" on page 39.
- To install a standalone license server, see "Installing a License Server" on page 60.
- To install a license server as part of a VirtualCenter installation, see Chapter 6, "Installing VMware Infrastructure Management," on page 65.

3 Configure your VirtualCenter Server and ESX Server hosts as described in "Configuring License Server Licensing" on page 50.

Setting Up Single-Host Licensing

Single-host licensing requires a valid license file on each ESX Server host.

Configuring an ESX Server Machine for Single-Host Licensing

When you receive your license file, rename it to `vmware.lic` and place it on a file system you can access from your VI Client.

NOTE The file extension `.lic` is required.

To use the VI Client to configure single-host licensing

1 From the VI Client, select the host in the inventory.

2 Click the **Configuration** tab.

3 Under Software, click **Licensed Features**.

4 Click **Edit** to the right of **License Sources**.

The License Sources dialog box appears.

5 Click the **Use Host License File** button.

6 Click **Browse** and locate the license file.

This file must be located on the client machine, not on the ESX Server host. License files must have a `.lic` extension appear in the file browser.

7 Click **OK** to save your changes.

Single-Host and Centralized Licensing in the Same Environment

Using single-host licenses for ESX Server features and centralized 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 single-host license files:

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

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

CAUTION If you restore an ESX Server machine to single-host licensing without changing the VirtualCenter default configuration, the VirtualCenter Server settings might override the single-host settings on the ESX Server machine.

To change VirtualCenter settings to allow single-host 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 single-host licensing on any changed ESX Server machines.

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

You can use the VirtualCenter Server 2.x 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 activation 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 centralized license file containing licenses for VirtualCenter Server, VirtualCenter Management Agents, VMotion, and ESX Server 3.x.

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 lets you distribute licenses to these hosts if they are later upgraded to ESX Server 3.x.

4 Install and configure the VirtualCenter Server 2.x to use the centralized license file you generated.

See Chapter 6, “Installing VMware Infrastructure Management,” on page 65.

Changing from Centralized to Single-Host Licensing

You can change your ESX Server hosts from the centralized license type to the single-host license type. The VirtualCenter Server and additional features such as VMotion, VMware DRS, and VMware HA must remain in centralized mode. To change the license type for your ESX Server hosts, generate new license files for each host and configure the hosts to use the new license type.

To change ESX Server hosts from a centralized license to a single-host license

1 Use the VMware license activation portal to generate and download new single-host license files for each ESX Server host.

   The license activation portal lets you generate both single-host and centralized license files from the same license activation code. For single-host licensing, you need one license file for each individual ESX Server host.

2 If you are using the VirtualCenter Server, change your VirtualCenter Server settings so that the VirtualCenter Server does not override host license settings, as described in "Single-Host and Centralized Licensing in the Same Environment" on page 54.

3 Configure your ESX Server host as described in "Configuring an ESX Server Machine for Single-Host Licensing" on page 53.

License File Contents

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

License type – Specifies the TCP/IP ports the license server uses to communicate with ESX Server hosts. VMware recommends that you not modify these default ports. If you do need to edit the ports, use an ASCII text editor and validate your edited license at http://www.vmware.com/checklicense/.

A license type header looks similar to the following:

```
SERVER this_host ANY 27000
VENDOR VMWARELM port=27010
USE SERVER
```

This section appears only in a license server file and indicates that license keys should be served on a license server. There is no mode section in single-host license files.

License key – Contains encrypted license keys, one for each feature to which you are entitled. Table 5-1 lists the available license keys.

Table 5-1. License Keys

Feature Name	License File Key	License Type Available
ESX Server Foundation edition	PROD_ESX_STARTER	Centralized or single-host
ESX Server Standard edition ESX Server Enterprise edition	PROD_ESX_FULL	Centralized or single-host
VMware Consolidated Backup	ESX_FULL_BACKUP	Centralized or single-host
VirtualCenter Server Foundation	PROD_VC_EXPRESS	Centralized only
VirtualCenter Server	PROD_VC	Centralized only
VirtualCenter Management Agent	VC_ESXHOST	Centralized only
VMware Server VMotion VMware Storage VMotion	VC_VMOTION	Centralized only
VMware DRS VMware DPM	VC_DRS	Centralized only
VMware HA	VC_DAS	Centralized only

Centralized files and single-host files are differentiated by two features:

- Single-host license files contain no license type section. Centralized files contain a license type section as the file header.
- Single-host license files contain the string '`licenseType=Host`' as part of each license key block in the file. Centralized license files contain the string '`licenseType=Server`' as part of each license key block in the file, as shown in the examples below.

Example 5-1 shows a typical single-host license key.

Example 5-1. Single-Host License Key

```
INCREMENT PROD_ESX_FULL VMWARELM 2005.05 31-dec-2008 uncounted \
        VENDOR_STRING="licenseType=Host;vmodl=esxFull;desc=ESX Server \
        Enterprise;capacityType=cpuPackage;gp=14;exclude=BACKUP;count=8" \
        HOSTID=ANY ISSUED=06-AUG-2007 \
        NOTICE="FulfillmentId=777;Name=VMware Internal" TS_OK \
        SIGN="095A 14A7 ..."
```

Example 5-2 shows a typical centralized license key.

Example 5-2. Centralized License Key

```
INCREMENT PROD_ESX_FULL VMWARELM 2005.05 31-dec-2008 8 \
        VENDOR_STRING="licenseType=Server;vmodl=esxFull;desc=ESX Server \
        Enterprise;capacityType=cpuPackage;gp=14;exclude=BACKUP" \
        ISSUED=06-AUG-2007 NOTICE="FulfillmentId=1201;Name=VMware \
        Internal" TS_OK SIGN="1F7F 98D5 ..."
```

License File Locations

A license file resides on every ESX Server machine or every license server, depending on whether you use centralized or single-host licensing:

- **Centralized license files** are placed at the following default location on the machine running the VMware license server:

  `C:\Program Files\VMware\VMware License Server\Licenses`

  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 location no longer exists.

  You can add new license files to the license directory. See "Adding New License Files to License Servers" on page 59.

- **Single-host license files** are placed at the following default location on the machine running ESX Server.

  `/etc/vmware/vmware.lic`

  NOTE In centralized mode, this file exists on the ESX Server machine but contains no license keys.

  You can add new licenses to the single-host by using the license activation portal. See "Adding New License Files to Single Hosts" on page 60.

Adding New License Files to License Servers

The license server supports a license directory for multiple license files. If you obtained multiple license files (for example, from separate orders) and want to manage all these licenses from the same license server, add them to the license server directory and restart the server.

To add new licenses to the license server directory

1 Add the new license file to the following default directory on the machine running the VMware license server:

```
C:\Program Files\VMware\VMware License Server\Licenses
```

2 Restart the VMware License Server service.

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

To restart the license server Windows Service

1 Choose **Start > Settings > Control Panel**.

2 Double-click **Administrative Tools**.

3 Double-click **Services**.

4 Scroll and right-click **VMware License Server**.

5 Choose **Restart** from the pop-up menu.

You can change the default location of your centralized directory, or your license file.

To change the default location of the license directory

1 On the computer that runs the license server application, 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 from the license directory.

If you want the license server to use the entire license directory, manually remove the name of the file leaving only the name of the directory.

4 Click the **Start/Stop/Reread** tab.

5 Click **Stop**.

6 Click **Start**.

7 Click **ReRead License File** to load the new license files.

Adding New License Files to Single Hosts

Host-based licensing does not support a multiple-license-file directory. If you have multiple license files, you need to combine them into a single license file by using the license activation portal. For example, you can add newly purchased licenses to an existing license file, or combine entitlements from two separate purchases into a single license file. You can combine evaluation licenses and production licenses in a single file, but products might require configuration changes when the evaluation licenses expire.

You can combine the files by using the VMware Web-based license activation portal. For example, you can combine two ESX Server license files into a single license file. See "Obtaining License Files" on page 48.

Installing a License Server

This section describes an independent installation of the license server. Skip this section if you are using the VMware Infrastructure Management installer, as described in "Installing VMware Infrastructure Management Software" on page 71. The VMware Infrastructure Management installer installs a license server.

To check whether a license server is installed, select **Start > Programs > VMware** and look for **VMware License Server**. If a license server is installed, VMware recommends reinstalling or upgrading the license server to the latest version.

Install the license server on the same machine where the VirtualCenter Server resides, or on a separate machine. To ensure the best license pool availability, VMware recommends installing the license server on the same machine where the VirtualCenter Server resides.

Use this procedure with any installation when you want to have a standalone license server on a machine other than your VirtualCenter Server host.

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

- Hardware that meets "System Requirements" on page 17.
- A static IP address or machine name to be used by your license server.

The following procedure assumes that you have Administrator privileges on a Windows system.

To install a VMware license server

1 Insert the VMware Infrastructure Installation CD.

If the VMware Infrastructure Management Installer appears, click cancel to exit.

2 Navigate to the \vpx folder on the installation CD and double-click VMware-licenseserver.exe.

3 Verify that you are installing the license server and click **Next**.

4 To accept the license agreement, select **I accept the terms in the license agreement** and click **Next**.

5 Select the folder in which you want to install the license server and click **Next**.

6 Type the full path to your license file or click **Browse** to locate this file and click **Next**.

The license file should be located in a directory you can access from your license server machine.

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

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

After you install the license server, you can access information about using and configuring the server by clicking **Start > Programs > VMware > VMware License Server > VMware License Server User Guide**.

See also "Obtaining License Files" on page 48 and "Installing License Files" on page 49.

Troubleshooting Licensing

This section provides guidelines for troubleshooting your license setup. If you cannot resolve your problems using the information given in this section, contact VMware for support as follows:

- If you have not received license activation codes for your VI3 purchase or have difficulties in using your license activation codes to obtain license files, send email to vi-hotline@vmware.com.
- If you obtained license files and have difficulties in configuring or troubleshooting licensed features, file a support request at 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 purchases VMware Infrastructure 3 from an authorized VMware reseller, register your purchase using the partner activation code(s) supplied by the partner to generate your license files.

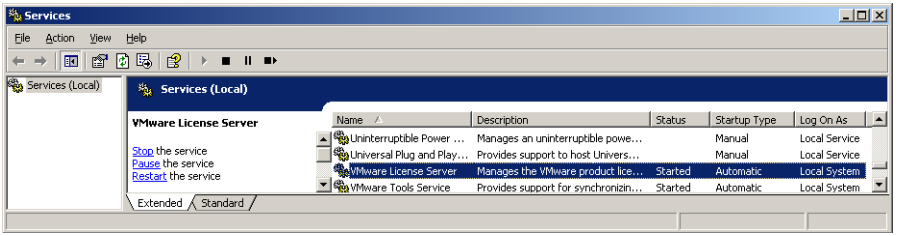
Checking the License Server

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, right-click the service and choose **Start**.



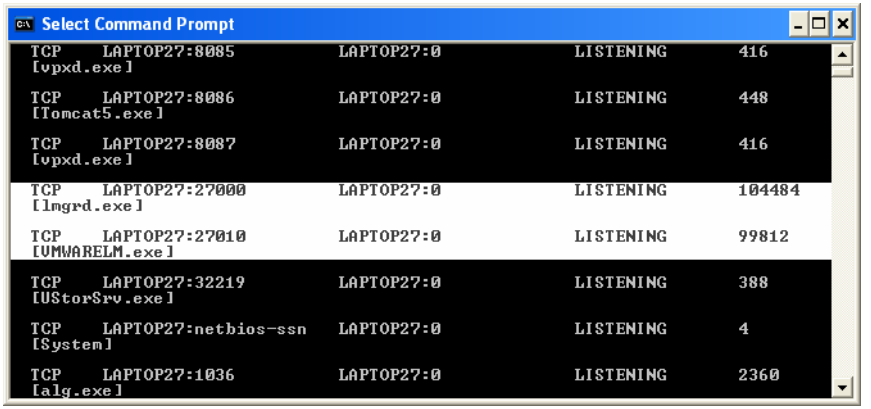
To check that the license server is listening

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, appears at the bottom of the page.

Checking the License File

If your license server is operating properly or if you are using single-host licensing, but you cannot use licensed features, you have a problem with your license file. Check the following:

- Validate your license file at http://www.vmware.com/checklicense/.
- Ensure that you are using the correct type of license file. If you are using a license server, use a centralized file. If you are using single-host licensing, make sure that you are using a single-host license file on each host.

  Centralized 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. Single-host 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 centralized license file, check that the license type 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 5-1, "License Keys," on page 57 for a list of keys.
- If you edited the license file, check that you did not mix centralized and single-host keys in a single file.

Checking License Configuration

If your license server (if used) is working correctly, and your license file is correct, check that you correctly configured licensing for your hosts using the VI Client:

- If you are using centralized licensing, follow the instructions in "Configuring License Server Licensing" on page 50.
- If you are using single-host licensing, follow the instructions "Configuring an ESX Server Machine for Single-Host Licensing" on page 53.

Installing VMware Infrastructure Management

6

This chapter describes how to prepare your VirtualCenter database, install VMware Infrastructure Management software, and configure communication between components. You can install VMware Infrastructure Management software on a physical system or on a virtual machine running on an ESX Server 3 host.

You can install VMware Infrastructure on a physical system or in a virtual machine running on an ESX Server host.

This chapter contains the following topics:

Preparing the VirtualCenter Server Database

The VMware VirtualCenter Server requires a database to store and organize server data. VirtualCenter version 2 server supports Oracle, SQL Server, and Microsoft SQL Server 2005 Express.

VirtualCenter requires administration credentials (ID and password) to log in to an Oracle or SQL database. Contact your DBA for these credentials, or install the bundled Microsoft SQL Server 2005 Express database.

NOTE Microsoft SQL Server 2005 Express is intended to be used for small deployments of up to 5 hosts and 50 virtual machines.

The database topics are covered in the following sections:

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.

Before you begin this procedure, review the required database patches specified in Table 2-1, "Supported Database Formats (SEE UPDATE)," on page 19. If you do not prepare your database correctly, the VirtualCenter installer might display error and warning messages.

To prepare an Oracle database to work locally with VirtualCenter

1 Download Oracle 9i or Oracle 10g from the Oracle Web site, install it, and create a database (VirtualCenter).

2 Download Oracle ODBC from the Oracle Web site if you are using Oracle 9i. If you downloaded Oracle 10g, the ODBC is included in the product media.

3 Install the Oracle ODBC corresponding driver through the Oracle Universal Installer (directions are provided with the driver).

4 (SEE UPDATE) 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.

To connect Oracle locally

1 Create a new tablespace specifically for VirtualCenter using the following SQL statement:

```
CREATE TABLESPACE "VPX" DATAFILE 'C:\Oracle\ORADATA\VPX\VPX.dat'
               SIZE 1000M AUTOEXTEND ON NEXT 500K;
```

2 Create a user, such as vpxAdmin, for accessing this tablespace through ODBC:

```
CREATE USER vpxAdmin IDENTIFIED BY vpxadmin DEFAULT TABLESPACE vpx;
```

3 Either grant `dba` permission to the user, or grant the following permissions to the user:

```
grant connect to <user>
grant resource to <user>
grant create view to <user>
grant create any sequence to <user> # For VirtualCenter upgrade only
grant create any table to <user> # For VirtualCenter upgrade only
grant execute on dbms_job to <user>
grant execute on dbms_lock to <user>
grant unlimited tablespace to <user> # To ensure space limitation is not
               an issue
```

4 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.

Before you begin this procedure, review the required database patches specified in Table 2-1, “Supported Database Formats (SEE UPDATE),” on page 19. If you do not prepare your database correctly, the VirtualCenter installer might display error and warning messages.

To prepare an Oracle database to work remotely with VirtualCenter

1 Install the Oracle client on the VirtualCenter Server machine.

2 (SEE UPDATE) Download and install the ODBC driver.

3 Edit the `tnsnames.ora` file located at `Ora9I` or `10g`, as appropriate.

```
C:\Oracle\Oraxx\NETWORK\ADMIN
```

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

4 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 the VirtualCenter Server, you can establish a connection with a SQL Server database. The following procedure describes how to configure a SQL Server ODBC connection.

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

If you use SQL Server for VirtualCenter, do not use the master database.

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

Before you begin this procedure, review the required database patches specified in Table 2-1, "Supported Database Formats (SEE UPDATE)," on page 19. If you do not prepare your database correctly, the VirtualCenter installer might display error and warning messages.

To prepare a SQL Server database to work with VirtualCenter

1 On your Microsoft SQL Server, create a SQL Server database using Enterprise Manager on the SQL Server.

2 On your Microsoft SQL Server, create a SQL Server database user with database operator (DBO) rights.

The default database for the DBO user is what you defined in Step 1.

Make sure the database user has either a **sysadmin** server role or the **db_owner** fixed database role on the VirtualCenter database and the MSDB database. (SEE UPDATE)

The **db_owner** role on the MSDB database is required for installation and upgrade only. This role can be revoked after the installation or upgrade process is completed.

3 On your VirtualCenter Server, open the Windows ODBC Data Source Administrator.

4 Select **Settings** > **Control Panel** > **Administrative Tools** > **Data Sources (ODBC)**.

5 Select the **System DSN** tab.

6 To modify an existing SQL Server ODBC connection:

   a Select the appropriate ODBC connection from the **System Data Source** list and click **Configure**.

   b Proceed with Step 8.

7 To create a new SQL Server ODBC connection:

   a Click **Add**.

   b For SQL Server 2000, select **SQL Server** and click **Finish**.

   For SQL Server 2005, select **SQL Native Client** and click **Finish**.

8 Type an ODBC data store name (DSN) name in the **Name** field.

   For example, type `VMware VirtualCenter`.

9 (Optional) Type an ODBC DSN description in the **Description** field.

10 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.

11 Click **Next**.

12 Select one of the authentication methods:

   - If you are using local SQL Server, select **Windows NT authentication**. It is also known as "trusted authentication" and is supported only if the SQL Server is running on the same system as the VirtualCenter Server.
   - If you are using remote SQL Server, select **SQL Server authentication**. Windows NT authentication is not supported on remote SQL servers.

13 Type your SQL Server login name and password and click **Next**.

   Ask your database administrator for this information.

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.

To close the ODBC Data Source Administrator, click **Close**.

17 Ensure that the SQL Agent is running on your database server.

This applies to SQL Server 2000 and SQL Server 2005 editions.

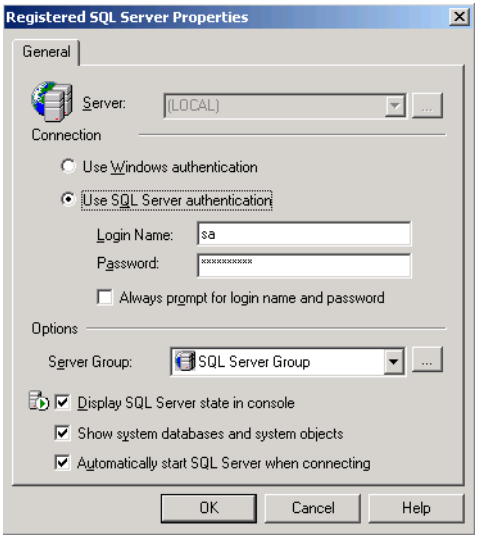
To identify the authentication type

1 Open SQL Server Enterprise Manager.

2 Click the **Properties** tab to view properties.

3 Check the mode.

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



Configuring Microsoft SQL Server 2005 Express

The Microsoft SQL Server 2005 Express database package is installed and configured when you select Microsoft SQL Server 2005 Express as your database during VirtualCenter installation or upgrade. This is shown in "Installing VMware Infrastructure Management Software" on page 71. No additional configuration is required.

If Microsoft SQL Server 2005 Express is already installed, review the required database patches specified in Table 2-1, "Supported Database Formats (SEE UPDATE)," on page 19. If you do not prepare your database correctly, the VirtualCenter installer might display error and warning messages.

See www.microsoft.com/sql/editions/express/default.mspx.

NOTE VMware recommends Microsoft SQL Server 2005 Express for small deployments only (up to 5 hosts and 50 virtual machines).

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. See the documentation for the database type you are using.
- Scheduling regular backups of the database.
- Backing up the database before any VirtualCenter upgrade.

See your database documentation for information on backing up your database.

Installing VMware Infrastructure Management Software

This section describes how to install management software by using the VMware Infrastructure Management CD or download package. The VMware Infrastructure Management CD allows you to choose the components you want to install and installs all selected components in a single procedure.

VirtualCenter Server Prerequisites

Before you begin the installation procedure, ensure that you have done the following:

- Ensure that your hardware meets "System Requirements" on page 17.
- Make sure that the system you use for your VirtualCenter installation belongs to a domain rather than a workgroup. If assigned to a workgroup, the VirtualCenter Server is not able to discover all domains and systems available on the network when using such features as VirtualCenter Consolidation. To determine whether the system belongs to a workgroup or a domain, right-click **My Computer** and click **Properties** and the **Computer Name** tab. The Computer Name tab displays either a Workgroup label or a Domain label.
- Create a VirtualCenter database, unless you want to use SQL Server 2005 Express. See "Preparing the VirtualCenter Server Database" on page 66.
- Obtain and assign a static IP address and host name to the Windows server that will host the 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.
- You can deploy VirtualCenter behind a firewall. However, make sure there is no Network Address Translation (NAT) firewall between VirtualCenter and the hosts it will manage.
- The installer automatically installs a license server for you, unless you enter a path to an existing license server.
  - If you want to use an existing license server, obtain the host name or IP address.
  - If you are going to allow the installer to install a license server, you need a valid served license file.

    Because the license server does not support license files on a network share, place your license files in a directory on a system where you are installing the license server.

Components Installed

The VMware Infrastructure Management installer includes the following components:

- **VMware VirtualCenter Server** – A Windows service to manage ESX Server hosts.
- **VI Client** – A client application used to connect directly to an ESX Server or indirectly to an ESX Server through a VirtualCenter Server.

- **Microsoft.NET Framework** – Software used by the VirtualCenter Server, Database Upgrade wizard, and the VI Client.
- **Microsoft SQL Server 2005 Express** – A free version of the Microsoft SQL Server database for smaller-scale applications. If you enter a path to an existing database, the installer does not install Microsoft SQL Server 2005 Express.
- **VMware Update Manager (optional)** – A VirtualCenter plugin that provides security monitoring and patching support for ESX Server hosts and virtual machines.
- **VMware Converter Enterprise for VirtualCenter Server (optional)** – A VirtualCenter plugin that enables you to convert your physical machines to virtual machines.
- **VMware license server** – A Windows service allowing all VMware products to be licensed from a central pool and managed from one console. If you enter a path to an existing license server, the installer does not install a license server.

Installation Procedure

This procedure describes how to install all VMware Infrastructure management components.

To install VMware Infrastructure Management

1 As Administrator on the Windows system, insert the installation CD.

2 When the VMware Infrastructure Management Installer screen appears, click **Next**.

If the VMware Infrastructure Management Installer screen does not appear, double-click the autorun.exe icon.

3 Read the Introduction page and click **Next**.

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

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

6 Select one of the installation types and click **Next**.

The choices are:

- Install the VI Client.
- Install the VirtualCenter Server.
- Choose a custom installation to install multiple components.

7 Select the option corresponding with the database you configured.

If you have not configured a supported database, click **Install Microsoft SQL Server 2005 Express**. This database is suitable for small deployments of up to 5 hosts and 50 virtual machines.

If you have configured a supported database, click **Use an existing database** and enter your database connection information:

a Type the 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. Click **OK** and re-enter your database connection information until you can continue.

8 Select one of the following options:

- To use VirtualCenter in evaluation mode, select **I want to evaluate VirtualCenter Server** and click **Next**.

  If you choose this option, the enterprise-level edition of VirtualCenter is installed in evaluation mode. The VMware License Server is also installed so that you can switch to licensed mode during or after the evaluation period.

- To use VirtualCenter in licensed mode with an existing license server:

  i Select **Use an existing License Server**.

  ii Enter the path to your existing license server.

  iii Select the VirtualCenter edition that you purchased and click **Next**.

  If you choose this option, the VMware License Server is not installed.

- To use VirtualCenter in licensed mode when you do not have an existing license server:

  i Leave both check boxes unselected.

  ii Select the VirtualCenter edition that you purchased and click **Next**.

  If you choose this option, the VMware License Server is installed.

9 Enter the port and proxy information that you want to use or accept the default information shown on screen and click **Next**. This step applies only to custom installations.

The default port for HTTPS is 443. If you configure VirtualCenter to use a different port for HTTPS, you must use the configured port number when you log in to VirtualCenter.

10 Enter information about the system on which you are installing VirtualCenter and click **Next**.

Enter:

- The IP address or domain name of the system on which you are installing VirtualCenter.
- The login and password that you use to login to the system on which you are installing VirtualCenter.

11 For VMware Update Manager, you can use the same database that you use for VirtualCenter, or you can use another database. See Step 7.

12 For VMware Update Manager, enter the port and proxy information that you want to use or accept the default information shown on screen. This step applies only to custom installations.

13 For VMware Converter, enter the port information that you want to use or accept the default information shown on screen. This step applies only to custom installations.

Click **Next** to continue through the deployment options screens.

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

If you do not want to accept the default destination folders:

- For VMware Infrastructure, click **Change** to select another location and click **Next**.
- For downloading patches, click **Change** to select another location and click **Next**.

CAUTION To install the VMware Infrastructure components on a drive other than the `C:` drive, verify there is enough space in the `C:\WINDOWS\Installer` folder to install the Microsoft Windows Installer `.msi` file. If you do not have enough space, because of a known issue with Windows Installer, your VMware Infrastructure installation might fail.

15 Click **Install**.

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

16 Click **Finish** to complete the VMware Infrastructure 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. (SEE UPDATE)

During normal operations, VirtualCenter is listening for data from its managed hosts and clients on designated ports. Additionally, the managed hosts are listening for data from VirtualCenter on designated ports. If a firewall exists 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, see the VMware SDK documentation. For a more thorough discussion of firewall configuration, see the *Server Configuration Guide*.

Connecting to Your VirtualCenter Server Through a Firewall

The default ports that the VirtualCenter Server uses to listen for connections from the VI Client are ports 80, 443, and 902. The 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, 443, and 902 in the firewall to allow data transfer from the VI Client to the VirtualCenter Server. To enable the 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 VI Client data, see *Basic System Administration*.

To tunnel the VI Client data through the firewall to the receiving port on the VirtualCenter Server, see *Basic System Administration*. VMware does not recommended this method because it disables the VirtualCenter console function.

Connecting to Your Managed Hosts Through a Firewall

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

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 the VirtualCenter Server. This port must not be blocked by firewalls.

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

(SEE UPDATE) 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.

Connecting Hosts with the License Server Through a Firewall

Ports 27000 and 27010 are the default ports that the license server uses to communicate with ESX Server hosts. If you are using centralized licensing with your ESX Server hosts and have a firewall between your ESX Server hosts and your license server, open these ports.

You can change the default ports by editing the license file. When you edit the license file, use an ASCII text editor. Validate the edited license file at http://www.vmware.com/checklicense/. After changing the ports, open the new ports you chose 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*.

Uninstalling VMware Infrastructure Components

The VMware Infrastructure components are uninstalled separately, even if they are on the same machine. You must have Administrator privileges to uninstall the VirtualCenter component.

CAUTION 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 VI Clients connected to the service. This can cause data loss.

Uninstalling the VMware Infrastructure components does not uninstall the Microsoft .NET Framework. Do not uninstall the Microsoft .NET Framework if you have other applications on your system that depend upon it.

To uninstall a VMware Infrastructure Component 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 VMware Infrastructure component, scroll through the list of installed programs, select the component to remove, and click **Change** or **Remove**.

3 Click **Yes** to confirm that you want to remove the program.

4 Click **Finish**.

Installing VirtualCenter in a Virtual Machine

You can install your VirtualCenter components in a Windows virtual machine, which runs on an ESX Server host. Deploying your VirtualCenter in the virtual machine has the following advantages:

- Rather than dedicating a separate server to your VirtualCenter, you can place it in a virtual machine running on the same ESX Server host where your other virtual machines run.
- You can provide high availability for the VirtualCenter Server by using VMware HA.
- You can migrate the virtual machine containing your VirtualCenter from one host to another, enabling maintenance and other activities.
- You can create snapshots of the VirtualCenter virtual machine and use them for backups, archiving, and so on.

To install VirtualCenter in a Virtual Machine

1 On a standalone server, install the ESX Server.

See "Installing VMware ESX Server Software" on page 81.

2 On any machine that has network access to your ESX Server host, install the VI Client.

To install only the VI Client, perform a custom installation as described in "To install VMware Infrastructure Management" on page 73.

3 Using the VI Client, access the ESX Server host directly to create the virtual machine for hosting VirtualCenter.

   For information on creating virtual machines, see *Basic System Administration*.

4 In the virtual machine, install VirtualCenter following procedures described in this chapter.

For more details on installing and running VirtualCenter in a virtual machine, see *Running VirtualCenter in a Virtual Machine* at www.vmware.com/pdf/vi3_vc_in_vm.pdf

Installing VMware ESX Server Software

7

This chapter describes how to install and configure ESX Server.

This chapter contains the following topics:

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 3.5 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 83.
- **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 83.

Using Remote Management Applications

If you use remote management applications—such as Integrated Lights-Out (iLO), Dell Remote Access Card (DRAC), IBM management module (MM), or Remote Supervisor Adapter II (RSA II)—to install ESX Server, be careful 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, run the media test provided by the ESX Server Installer.

If a remote installation from an ISO image fails, carry out the remote installation from the physical CD-ROM media.

Installation on SATA Drives

When installing ESX Server SATA drives, consider the following situations:

- Ensure that your SATA drives are connected through supported SAS controllers:
  - **mptscsi_pcie** — LSI1068E (LSISAS3442E)
  - **mptscsi_pcix** — LSI1068 (SAS 5)
  - **aacraid_esx30** — IBM serveraid 8k SAS controller
  - **cciss** — Smart Array P400/256 controller
  - **megaraid_sas** — Dell PERC 5.0.1 controller
- Do not use SATA disks to create VMFS datastores shared across multiple ESX Server hosts.

See "ESX Server 3 Requirements" on page 21 for complete hardware requirements.
See "ESX Server Partitioning" on page 95 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.

(SEE UPDATE) An ESX Server host supports only the first 256 LUNs loaded at boot time. 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, reduce the number of LUNs on that controller to 256 or less.

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

VMware recommends that you do not rearrange drive controllers among PCI slots after you install 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 the *SAN Configuration Guide* for post-installation configuration. See "Required Partitions" on page 95 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.

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

CAUTION VMware recommends that you disconnect the SAN before you begin the ESX Server install process. There is one exception: If you are booting from a SAN, then only the system LUN should be presented to the ESX Server. All other LUNs should not be presented to the ESX Server during the install process.

Installing ESX Server

See the *Upgrade Guide* to upgrade from a previous ESX Server version.

Prepare for this installation by reading "Preparing to Install" on page 81.

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.

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.

To install ESX Server

1 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.

2 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.

3 Click **Test** to have the installer inspect the installation CD media for errors.

- If you click **Skip**, continue now with Step 4.
- 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 and click **OK**.

The Welcome page appears.

4 Click **Next** (graphical installer) or **OK** (text installer).

The Select Keyboard page appears.

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

The Mouse Configuration page appears.

6 Select your mouse and click **Next** (graphical installer) or **OK** (text installer).

Mouse configuration is not a critical setting. After ESX Server is installed, the setting is ignored. See "Mouse Selection" on page 88.

7 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 the *Upgrade Guide*. Do not continue with this procedure.

8 Accept the VMware license agreement.

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** and click **Next**.
- If you are using the text installer, read through the end user license agreement and select **Accept End User License** and click **OK**.

If any drives or LUNs are initialized, 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.

9 Select a partitioning option.

- **Recommended** – Configures default partitions, based on the capacity of the hard drive. Continue with "Recommended Partitioning" on page 88.
- **Advanced** – You specify all partition settings. Continue with "Advanced Partitioning" on page 89.

10 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.

  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**.

11 To add default options to the boot command, enter them into the **General kernel parameters** field.

   Any options you enter are passed to the ESX Server kernel every time it boots.

12 Click **Next** (graphical installer) or **OK** (text installer) to continue the installation.

13 Select the network interface for use by the ESX Server console. If you are using the text installer, click **OK**.

   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 VI Client.

14 Configure the ESX Server host network IP address. If you are using the text installer, click **OK**.

   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.

15 Enter the ESX Server host name. Type the complete machine name, including the domain where appropriate.

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

VI Clients can use either the host name or the IP address to access the ESX Server host.

16 If your network requires a VLAN ID, enter a VLAN ID.

17 Select **Create a default network for virtual machines** to create a default port group for virtual machines. This option is selected by default.

If you select **Create a default network for virtual machines**, your virtual machines 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*.

18 Click **Next** (graphical installer) or **OK** (text installer).

19 Set your time zone. See "Setting Your Time Zone" on page 92.

20 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.

21 Confirm your installation configuration and click **Next** (graphical installer) or **OK** (text installer).

CAUTION 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.

22 Click **Finish** to exit.

Mouse Selection

Here are some 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.

Recommended Partitioning

Follow this procedure to select **Recommended** as a partitioning option in "To install ESX Server" on page 84.

To partition your hard drive using the recommended partitioning

1 Select a volume on which to install the ESX Server software.

2 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 partition 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 Click **Next** (graphical installer) or **OK** (text installer), and continue with "To install ESX Server" on page 84.

Advanced Partitioning

With advanced or 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 "ESX Server Partitioning" on page 95 for descriptions of required and optional partitions.

Follow this procedure to select **Advanced** as a partitioning option in "To install ESX Server" on page 84. This procedure describes how to partition your hard drive using manual partitioning.

To partition local storage

1 Select a volume on which to install the ESX Server software.

2 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.

6 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

7 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.
- **Additional size options** – Fixed size

8 To create a root partition, use the following settings:

- **Mount Point** – `/`
- **File System** – `ext3`
- **Size (MB)** – VMware recommends at least 5GB for the root partition, but you can fill the remaining capacity of the drive.
- **Additional size options** – Fill all space up to (MB)

CAUTION If you do not format a `/` partition, the installation fails at the last step. Format all necessary partitions before proceeding to the next step of the installation.

9 (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. VMware recommends 2000MB for the log partition
- **Additional size options** – Fill all space up to (MB)

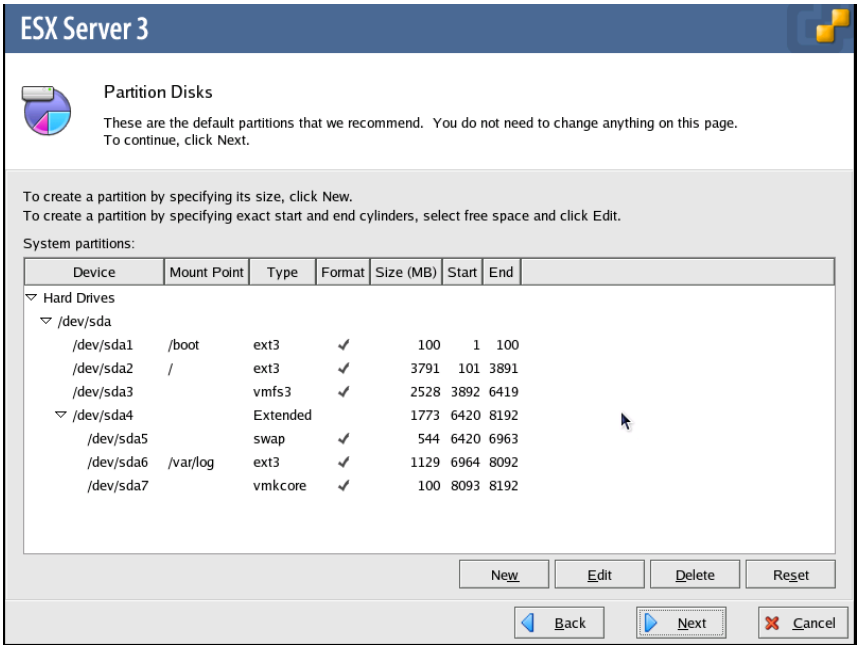
10 (Optional) Create additional logical partitions.

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.

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.



11 Click **Next** (graphical installer) or **OK** (text installer) to continue with "To install ESX Server" on page 84.

Setting Your Time Zone

The graphical installer lets you 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 20 on page 87.

To set the time zone using a location

1 Click the **Location** tab to display a list of cities.

2 Select a city in your time zone from the scrolling list.

3 Select the check box for using UTC, if appropriate.

4 Click **Next** to continue the installation with Step 20 on page 87.

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 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 20 on page 87.

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 20 on page 87.

Postinstallation Considerations

This section discusses installation logs and hardware and driver additions.

Locating the Installation Logs

After you install and reboot, log in 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. See *Basic System Administration*.

Booting or rebooting the machine does not make the service console detect newly installed hardware. To make the service console detects newly installed hardware, log in 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 in 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 the `/etc/modules.conf` file.

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.

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 3.5. With the addition of new drivers in ESX Server 3.5, further customization of `vmware-device.map.local` might not be necessary.

Downloading the VI Client

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

You must obtain the URL of an ESX Server host. This is the IP address or machine name.

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 VMware ESX Server welcome page appears.

3 Click the **Download the VI Client** link under **Getting Started**.

A security warning dialog box appears.

4 Click **Yes**.

5 Install the client.

See "To install VMware Infrastructure Management" on page 73.

ESX Server Partitioning

A

ESX Server hosts have required and optional partitions.

This appendix contains the following topics:

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.

For `/var/log`, 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 to perform a remote or scripted installation from the ESX Server machine.

Table A-1 describes the required partitions.

Table A-1. ESX Server Required Partitions

Mount Point	Type	Recommended Storage by Host Disk Configuration: Internal Disk with External SAN, NAS, or iSCSI	Recommended Storage by Host Disk Configuration: SAN Only	Recommended Storage by Host Disk Configuration: Internal Disk Only	Partition Description
/boot	ext3	100MB Location: internal disk	100MB Location: LUN0	100MB	Stores information required to boot the ESX Server host system. For example, this is where the grub and LILO boot loaders reside. The boot drive usually defaults to the specified /boot partition location.
Not applicable	swap	544MB Location: internal disk	544MB Location: LUN0	544MB	Allows ESX Server to use disk space when more memory is needed than the physical RAM allows. The minimum value is 100MB. **Note**: Do not confuse the ESX Server swap partition with virtual machine swap space. See the *Resource Management Guide*.
/	ext3	5GB Location: internal disk	5GB Location: LUN0	5GB	Contains the ESX Server operating system and services, accessible through the service console. Also contains 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 A-1. ESX Server Required Partitions (Continued)

Mount Point	Type	Recommended Storage by Host Disk Configuration: Internal Disk with External SAN, NAS, or iSCSI	Recommended Storage by Host Disk Configuration: SAN Only	Recommended Storage by Host Disk Configuration: Internal Disk Only	Partition Description
Not applicable	VMFS3	1.2GB	1.2GB	1.2GB	**A VMFS partition is required. However, VMFS partitions do not need to be located on a local or boot drive.** VMFS partitions can be located on a: ■ Local SCSI volume ■ Networked SCSI volume ■ SAN Used to store virtual machine virtual disks. VMware recommends 8GB storage per virtual machine. **Notes**: ■ Any number of VMFS volumes can be created on each LUN as long as the space is available. ■ VMFS2 is supported in read-only mode to import legacy virtual machines. ■ If you want the ESX Server host to boot from a SAN, read "LUN Requirements" on page 83 for VMFS partitioning requirements.

Table A-1. ESX Server Required Partitions (Continued)

Mount Point	Type	Recommended Storage by Host Disk Configuration: Internal Disk with External SAN, NAS, or iSCSI	Recommended Storage by Host Disk Configuration: SAN Only	Recommended Storage by Host Disk Configuration: Internal Disk Only	Partition Description
Not applicable	vmkcore	100MB Location: any disk	100MB per host sharing the SAN Location: Core LUN	100MB	**A 100MB vmkcore partition is required for each ESX Server host.** Can be located on a local SCSI volume, a networked SCSI volume, or a SAN. It cannot be located on a software iSCSI volume. 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.
/var/log	ext3	2000MB Location: internal disk	2000MB Location: LUN0	2000MB	Optional. Used to store log files.

Optional Partitions

Table A-2 describes the optional partitions.

For `/tmp` and `/home`, VMware recommends separate partitions to prevent unexpected disk space constraints from compromising ESX Server operations.

Table A-2. ESX Server Optional Partitions

		Recommended Storage by Host Disk Configuration			
Mount Point	**Type**	**Internal Disk with External SAN/NAS/ iSCSI**	**SAN Only**	**Internal Disk Only**	**Partition Description**
/home	ext3	512MB			Optional. Used for storage by individual users.
/tmp	ext3	1024MB	1024MB Location: LUN0	1024MB	Optional. Used to store temporary files.
Not applicable	vfat	any disk			Optional. 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.

Remote and Scripted Installations

B

You can install ESX Server using remote and scripted installations.

This appendix contains the following topics:

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.

For 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, you must respond to the prompt that appears.

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

After you install ESX Server 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 service console as root.

2 Open the following file in a text editor such as vi:
`/usr/lib/vmware/webAccess/tomcat/apache-tomcat-5.5.17/webapps/ui/WEB-INF/struts-config.xml`

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 you set up the script, 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 to comment out the network command, which causes the installer to prompt you for network information during the installation. See "Editing the Kickstart Configuration File" on page 107.

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 must access 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 lets you create a kickstart configuration file using a graphical interface.

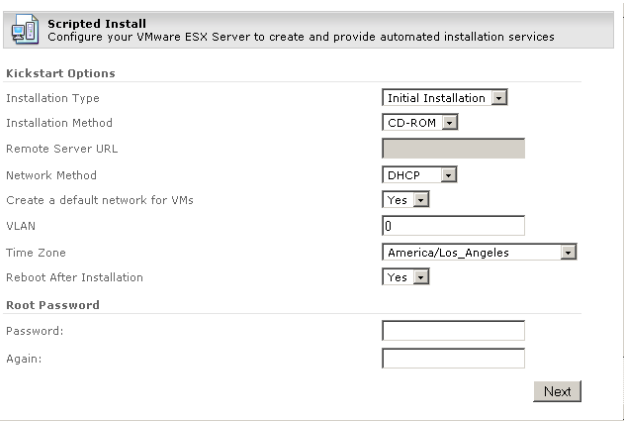
To set up the script

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.



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

a In the **Installation Type** list, select **Initial Installation** to perform a new installation. Select **Upgrade** 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 default directory location of your root folder along with the name of the server that contains the ESX Server installation files, like this:

  ```
  http://<hostname>:/default location
  ftp://<hostname>:/default location
  ```

  For example:

  ```
  ftp://<hostname>:/var/ftp/pub/build
  ```

  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.

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 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.

Select this option to create a port group for the service console and a port group for the virtual machines. If you do not select this option, only the service console port group is created, and you must create the port group for the virtual machines manually.

f In the **Time Zone** list, select the time zone for the server you will 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.

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.

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 7.

5 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.

Include the full domain name if you are running with domains.

6 Click **Next** to continue.

The Partition Configuration page appears.

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

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

  See Appendix A, "ESX Server Partitioning," on page 95 for 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 let your boot and swap partitions grow.

8 From the **Licensing Mode** list, specify one of the following:

- **Post Install** – Choose this option to configure licensing manually after installation.
- **Use License Server** – Choose this option to retrieve licenses from a license server.
- **Use Host License File** – Choose this option to upload a license file.

9 Click **Next** to continue.

10 If you selected the License Server licensing type, enter the centralized licensing information.

- **License Server** – Enter the license server to use.
- **Port** – Enter the port to which to connect.
- **ESX Server Edition** – Select the edition you purchased.

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

12 Click **Next** to continue to the next configuration screen.

13 Click **Download Kickstart File** to create a kickstart configuration file.

Running a Scripted Installation from the Kickstart File

After you create 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.

3 Insert the ESX Server Installation CD into the CD-ROM drive.

4 Boot up the machine.

The mode selection page appears.

5 Type **`esx ks=floppy`**.

6 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.

See 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.

%include Section

Use the %include section to direct the kickstart parser to additional kickstart files that might include more kickstart commands. The section contains the following command:

```
%include </path/to/file>
```

You can add several %include sections to your kickstart file.

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. Some commands are VMware specific. The VMware specific commands are listed in Table B-1. See the *Red Hat Enterprise Linux 3: System Administration Guide* for information on optional commands that are not VMware specific.

Table B-1. Kickstart Commands for ESX Server Installation

Command	Description
`autostep` (optional)	Similar to `interactive`. Use mostly for debugging.
`auth` or `authconfig` (required)	Set up authentication for the system.
`--enablemd5`	Uses md5 based user passwords.
`--enablenis`	Enables NIS support. By default, this command uses whatever domain it finds on the network.
`--nisdomain=<domain>`	Sets the NIS domain. Requires `--enablenis`.
`--nisserver`	Sets the NIS server (broadcasts by default.) Requires `--enablenis`.
`--useshadow` or `--enableshadow`	Enables shadow password file.
`--enablekrb5`	Enables Kerberos 5 to authenticate users.
`--krb5realm=`	Specifies the Kerberos 5 realm to which your system belongs.
`--krb5kdc=`	Specifies the KDCs that serve requests for the realm. Separate the names of multiple KDCs with commas.
`--krb5adminserver=`	Specifies the KDC in your realm that is also running the KADM5 administration server.
`bootloader` (required)	Sets up the GRUB loader.
`--append=`	Specifies extra kernel parameters for when the system is booting.
`--driveorder=`	Specifies which drive is first in the BIOS boot order.
`--location=[mbr|partition|none]`	Specifies where the boot loader is installed. The values are: `mbr` (for the master boot record), `partition` (for the first sector of the partition with the vmnix kernel), or `none` (do not install the boot loader).
`--md5pass=`	Sets the GRUB boot loader password with the md5 encrypted password.
`--password=`	Sets the GRUB boot loader password.

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

Command	Description
`--upgrade`	Upgrades the existing boot loader configuration and preserves any old entries.
`clearpart` (optional)	Removes partitions from the system before creating new partitions. Not required if you use the `upgrade` command.
`--linux`	Removes all Linux partitions.
`--all`	Removes all partitions from the system.
`--drives=`	Specifies which drives to clear partitions from.
`--initlabel`	Initializes the disk label to the default for your architecture.
`firewall` (optional)	Configures firewall options in kickstart.
`--enabled`	Rejects all incoming connections unless they are a response to outbound requests.
`--disabled`	Allows all incoming connections.
`--high`	Deprecated; same as `--enabled`.
`--medium`	Deprecated; same as `--enabled`.
`--trust=`	Specifies devices whose traffic is allowed to go through the firewall.
`--ssh`	Allows the specified service to pass through the firewall.
`--telnet`	Allows the specified service to pass through the firewall.
`--smtp`	Allows the specified service to pass through the firewall.
`--http`	Allows the specified service to pass through the firewall.
`--ftp`	Allows the specified service to pass through the firewall.
`--port=`	Specifies ports allowed through the firewall.
`install` (optional)	Specifies that this is a fresh installation rather than an upgrade.
`<cdrom|nfs|url>`	Specifies the type of installation. The values are: ■ `cdrom` installs from the CD-ROM drive ■ `nfs` installs from the specified NFS server ■ `url` downloads across the network
`--server=`	Specifies which NFS server to connect to. Use with `nfs`.
`--dir=`	Specifies which directory on the NFS server to mount. Use with `nfs`.
`<url>`	Defines the location of the Weasel runtime environment. Used with `url (http/ftp)`.

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

Command	Description
`interactive` (optional)	Uses the information provided in the kickstart file during the installation, but allows for inspection and modification of the given values.
`keyboard` (required)	Sets the keyboard type for the system.
`<keyboardType>`	Specifies the keyboard map for the selected keyboard type.
`lang` (required)	Sets the language to use during installation.
`<languageType>`	Specifies the value for the selected language, for example `lang en_US`.
`langsupport` (required)	Sets the language(s) to install on the system.
`<languageType>`	Specifies the value for the language support. Use the same language codes you used with `lang`.
`--default`	Specifies which language will be a default when installing more than one language.
`mouse` (required)	Configures the mouse for the system, both in GUI and text modes.
`<mouseType>`	Specifies the type of mouse.
`--device=`	Specifies the device the mouse is on.
`--emulthree`	Lets you use a two-button mouse as a three-button mouse. Simultaneous clicks on the left and right mouse buttons are recognized as the middle mouse button by the X Window System.
`network` (optional)	Configures network information for the system.
`--addvmportgroup=<1 or 0>` (VMware specific)	If set to 1 (default), creates a port group for virtual machines. If you do not want to create a port group, set the value to 0.
`--vlanid=<vlanid>` (VMware specific)	Specifies a VLAN to use for networking. Set to an integer between 0 and 4095.
`--bootproto=[dhcp|static]`	Specifies network settings.
`--device=`	Specifies an Ethernet device for installation.
`--ip=`	Sets an IP address for the machine to be installed.
`--gateway=`	Designates the default gateway as an IP address.
`--nameserver=`	Designates the primary name server as an IP address.
`--nodns`	Directs not to configure a DNS server.
`--netmask=`	Specifies netmask for the installed system.
`--hostname=`	Specifies the host name for the installed system.

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

Command	Description
`part` or `partition`	Creates a partition on the system. Not required if the `upgrade` command is used.
`<mntpoint>`	Specifies where the partition will be mounted.
`--size=`	Defines the minimum partition size in megabytes.
`--grow`	Specifies that the partition can grow to fill any available space or up to the maximum size setting.
`--maxsize=`	Specifies the maximum size in megabytes for a partition to grow.
`--ondisk=` or `--ondrive=`	Specifies the disk on which partitions will be created. For example, `part --ondisk=sda` creates partitions on the first SCSI drive on the system.
`--fstype=`	Sets the file system type for the partition.
`--badblocks`	Specifies that the partition should be checked for bad sectors.
`reboot` (optional)	Reboots the system after scripted installation is finished.
`rootpw` (required)	Sets the root password for the system.
`[--iscrypted]`	Specifies that the password is encrypted.
`<password>`	Specifies the password value.
`text` (optional)	Performs the kickstart installation in text mode.
`timezone` (required)	Sets the time zone for the system.
`[--utc]`	Sets the system hardware clock to UTC (Greenwich Mean) time.
`<timezone>`	Specifies the time zone for the system.
`upgrade` (optional)	Upgrades the system.
`vmaccepteula` (required)	Accepts the ESX Server license agreement.

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

Command	Description

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

`zerombr` (optional)	Zeroes out the master boot record.

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

%post Section

The %post section lets you specify a script to run after installation. This section is optional and must come after the commands section. See 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 did not specify single-host 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 $1$MpéRëÈíÌ$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
```

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Updates for the ESX Server 3 Installation Guide

Last Updated: May 14, 2010

This document provides updates to the ESX Server 3.5 and VirtualCenter 2.5 version of the *ESX Server 3 Installation Guide*. Updated descriptions, procedures, and graphics are organized by page number so that 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 updates to the *ESX Server 3 Installation Guide*:

Updates for the Table of Supported Database Formats on Page 19

The following row should appear in Table 2-1:

Microsoft SQL Server 2005 Standard	Install SP1 or SP2 for Microsoft SQL Server 2005. For Windows 2000 and Windows XP, apply MDAC 2.8 SP1 to the client. Use the SQL Native Client driver for the client.

Table 2-1 does not mention support for versions later than 10.2.0.3.0 of Oracle 10g Enterprise Release 2, and the support for two new Oracle patches. The row should appear as follows:

Oracle Database10g Release 2 (10.2.0.1.0) Standard Edition Oracle Database 10g Release 2 (10.2.0.1.0) Enterprise Edition	After applying patch 10.2.0.3.0 to the client and server, apply patch 5699495 to the client. Also apply patches 6085625 and 6452485 to the server. **Note:** VMware supports 10.2.0.3.0 and later versions of Oracle Database 10g Release 2.

Update to the To prepare an Oracle database to work locally with VirtualCenter Procedure on Page 66

Step 4 in the To prepare an Oracle database to work locally with VirtualCenter procedure is applicable only if you are using Oracle 9i. If you are using Oracle 10g, the database is configured to use 300 open cursors by default.

Update for the To prepare an Oracle database to work remotely with VirtualCenter Procedure on Page 67

The To prepare an Oracle database to work remotely with VirtualCenter procedure should be replaced with the following steps:

1 Install the Oracle client on the VirtualCenter Server machine.

2 Edit the `tnsnames.ora` file located in `Ora9i` or `10g`, as appropriate.

```
C:\Oracle\Oraxx\NETWORK\ADMIN
```

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

3 Create a new tablespace specifically for VirtualCenter by running the following SQL statement:

```
CREATE TABLESPACE "VPX" DATAFILE 'C:\Oracle\ORADATA\VPX\VPX.dat'
               SIZE 1000M AUTOEXTEND ON NEXT 500K;
```

4 Create a user (for example, vpxAdmin), for accessing the tablespace through ODBC:

```
CREATE USER vpxAdmin IDENTIFIED BY vpxadmin DEFAULT TABLESPACE vpx;
```

5 Either grant `dba` permission to the user, or grant the following permissions to the user:

```
grant connect to <user>
grant resource to <user>
grant create view to <user>
grant execute on dbms_job to <user>
grant execute on dbms_lock to <user>
grant unlimited tablespace to <user> # To ensure space limitation is not
               an issue
```

6 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)
)
)
```

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

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

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

Updates for the To prepare a SQL Server database to work with VirtualCenter Procedure on Page 68

The following text should appear in the To prepare a SQL Server database to work with VirtualCenter procedure:

Make sure that the database user has the following permissions:

- **Microsoft SQL Server 2000** – Make sure that the database user has the db_owner fixed database role on the VirtualCenter database and the MSDB database. The db_owner role on the MSDB database is required for installation and upgrade only. You can revoke this role after the installation or upgrade process is completed. Do not grant the System Administrators server role to the database user. However, if the System Administrators role was previously granted while the database was used with VirtualCenter Server 2.0.x, do not revoke the System Administrators role. Leave it as is.
- **Microsoft SQL Server 2005** – Make sure that the database login has either the sysadmin server role or the db_owner fixed database role on the VirtualCenter database and on the MSDB database. The db_owner role on the MSDB database is required for installation and upgrade only. You can revoke this role after the installation or upgrade process is complete.

Updates for the Configuring Communication Between VirtualCenter Components Section on Page 76

The following text should appear in the Configuring Communication Between VirtualCenter Components section:

Port 443 is required for communication from VirtualCenter to ESX Server hosts.

Update for the To enable a VirtualCenter managed host to receive data on the default port Procedure on Page 77

The To enable a VirtualCenter managed host to receive data on the default port procedure should contain the following information about the type of ports that must be opened to enable data reception:

To allow data transfer to the VirtualCenter managed host from the VirtualCenter Server or another VirtualCenter managed host, open port 902 in the firewall for incoming TCP connections and outgoing UDP connections.

Update for the LUN Requirements Section on Page 83

In the LUN Requirements section, information provided on the number of LUNs supported during the boot time should be as follows:

When an ESX Server host is restarting, it supports only the first 256 LUNs loaded at boot time. If your boot volume is not one of the first 256 LUNs, the ESX Server host might stop responding at startup. The total number of LUNs in the system should not be more than 256. If you have controllers loading 256 LUNs before the boot volume, reduce the number of LUNs on the controllers to 256 or less.