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Contents

About vSphere Virtual Machine Administration

vSphere Virtual Machine Administration describes how to create, configure, and manage virtual machines in the VMware vSphere® environment.

At VMware, we value inclusion. To foster this principle within our customer, partner, and internal community, we have updated this guide to remove instances of non-inclusive language.

This guide provides introductions to the tasks that you can perform within the system and also cross-references to the documentation that describes the tasks in detail.

This information focuses on managing virtual machines and includes the following information. ■ Creating and deploying virtual machines, templates, and clones ■ Deploying OVF templates ■ Using content libraries to manage templates and other library items ■ Configuring virtual machine hardware and virtual machine options ■ Managing multi-tiered applications with VMware vSphere vApp ■ Monitoring solutions with the vCenter Solutions Manager ■ Managing virtual machines, including using snapshots ■ Upgrading virtual machines ■ Troubleshooting virtual machines vSphere Virtual Machine Administration covers VMware ESXi™ and VMware vCenter Server®.

Intended Audience

This information is written for experienced Windows or Linux system administrators who are familiar with virtualization.

Updated Information

This vSphere Virtual Machine Administration is updated with each release of the product or when necessary.

This table provides the update history of the .

Revision	Description
18 JUL 2024	■ Updated the Install the VMware Remote Console Application procedure.

25 JUN 2024	Initial release.

Introduction to VMware vSphere Virtual Machines

1

A virtual machine is a software computer that, like a physical computer, runs an operating system and applications. The virtual machine consists of a set of specification and configuration files and is backed by the physical resources of a host. Every virtual machine has virtual devices that provide the same functionality as physical hardware but are more portable, more secure, and easier to manage.

Before you start creating and managing virtual machines, you benefit from some background information, for example, the virtual machine files, life cycle, components, and so on.

Read the following topics next:

- Virtual Machine Files
- Virtual Machines and the Virtual Infrastructure
- Virtual Machine Lifecycle
- Virtual Machine Components
- Virtual Machine Hardware Available to vSphere Virtual Machines
- Virtual Machine Options
- The vSphere Client
- Where to Go From Here

Virtual Machine Files

A virtual machine consists of several files that are stored on a storage device. The key files are the configuration file, virtual disk file, NVRAM setting file, and log file. You configure virtual machine settings through the vSphere Client, ESXCLI, or the vSphere Web Services SDK.

Caution Do not change, move, or delete virtual machine files without instructions from a VMware Technical Support representative.

Table 1-1. Virtual Machine Files

File	Usage	Description
.vmx	*vmname*.vmx	Virtual machine configuration file
.vmxf	*vmname*.vmxf	Additional virtual machine configuration files
.vmdk	*vmname*.vmdk	Virtual disk characteristics
-flat.vmdk	*vmname*-flat.vmdk	Virtual machine data disk
.nvram	*vmname*.nvram or nvram	Virtual machine BIOS or EFI configuration
.vmem	*vmname*.vmem	Virtual machine paging backup file
.vmsd	*vmname*.vmsd	Virtual machine snapshots information (metadata) file
.vmsn	*vmname*.vmsn	Virtual machine memory snapshot file
.vswp	*vmname*.vswp	Virtual machine swap file
.vmss	*vmname*.vmss	Virtual machine suspend file
.log	vmware.log	Current virtual machine log file
-#.log	vmware-#.log (where # is a number starting with 1)	Old virtual machine log files

Additional files are created when you perform certain tasks with the virtual machine.

■ A .hlog file is a log file that is used by vCenter Server to keep track of virtual machine files that must be removed after a certain operation completes. ■ A .vmtx file is created when you convert a virtual machine to a template. The .vmtx file replaces the virtual machine configuration file (.vmx file).

Virtual Machines and the Virtual Infrastructure

The infrastructure that supports virtual machines consists of at least two software layers, virtualization and management. In vSphere, ESXi provides the virtualization capabilities that aggregate and present the host hardware to virtual machines as a normalized set of resources.
Virtual machines run on ESXi hosts that vCenter Server manages.

vCenter Server can pool the resources of multiple hosts and lets you effectively monitor and manage your data center infrastructure. You can manage resources for virtual machines, provision virtual machines, schedule tasks, collect statistics logs, create templates, and more. vCenter Server also provides vSphere vMotion™, vSphere Storage vMotion, vSphere Distributed Resource Scheduler (DRS), vSphere High Availability (HA), and vSphere Fault Tolerance. These services enable efficient and automated resource management and high availability for virtual machines.

The vSphere Client is the primary interface for managing vCenter Server, ESXi hosts, and virtual machines. The vSphere Client also provides console access to virtual machines.

Note For information about running virtual machines on an isolated ESXi host, see the vSphere Single Host Management documentation.

The vSphere Client presents the organizational hierarchy of managed objects in inventory views. Inventories are the hierarchal structure used by vCenter Server or the host to organize managed objects. This hierarchy includes the monitored objects in vCenter Server.

In the vCenter Server hierarchy that you see in the vSphere Client, a data center is the top-level container of ESXi hosts, folders, clusters, resource pools, vSphere vApps, virtual machines, and so on.

Datastores are virtual representations of underlying physical storage resources. Datastores hide the idiosyncrasies of the underlying physical storage and present a uniform model for the storage resources required by virtual machines. A datastore is the storage location (for example, a physical disk or LUN on a RAID, or a SAN) for virtual machine files.

For some resources, options, or hardware to be available to virtual machines, the host must have the appropriate vSphere license. Licensing in vSphere is applicable to ESXi hosts, vCenter Server, and solutions. Licensing can be based on different criteria, depending on the specifics of each product. For details about vSphere licensing, see the vCenter Server and Host Management documentation.

Virtual Machine Lifecycle

You have many options for creating and deploying virtual machines. You can create a single virtual machine and install a guest operating system and VMware Tools on it. You can clone an existing virtual machine or convert it to a template. You can also deploy OVF or OVA templates.

The vSphere Client **New Virtual Machine** wizard and the **Edit Settings** dialog box let you add, configure, or remove most of the virtual machine's hardware, options, and resources. You monitor CPU, memory, disk, network, and storage metrics through the performance charts in the vSphere Client. Snapshots let you capture the state of the virtual machine, including the virtual machine memory, settings, and virtual disks. You can roll back to the previous virtual machine state when needed.

With vSphere vApps, you can manage multi-tiered applications. You use vSphere Lifecycle Manager to perform orchestrated upgrades to upgrade the virtual hardware and VMware Tools of virtual machines in the inventory at the same time.

When a virtual machine is no longer needed, you can remove it from the inventory without deleting it from the datastore, or you can delete the virtual machine and all its files.

Virtual Machine Components

Virtual machines typically have an operating system, VMware Tools, and virtual resources and hardware. You manage these components like you manage the components of a physical computer.

Operating System

You install a guest operating system on a virtual machine the same way you install an operating system on a physical computer. You must have a CD/DVD-ROM or ISO image containing the installation files from an operating system vendor.

After installation, you are responsible for securing and patching the operating system.

VMware Tools

VMware Tools is a suite of utilities that enhances the performance of the virtual machine guest operating system and improves management of the virtual machine. It includes device drivers and other software that is essential for your VM. With VMware Tools, you have more control over the virtual machine interface.

Compatibility Setting

In the vSphere Client, you assign each virtual machine to a compatible ESXi host version, cluster, or data center by applying a compatibility setting. The compatibility setting determines which ESXi host versions the virtual machine can run on and the hardware features available to the virtual machine.

Hardware Devices

Each virtual hardware device performs the same function for the virtual machine as hardware on a physical computer does. Every virtual machine has CPU, memory, and disk resources. CPU virtualization emphasizes performance and runs directly on the processor whenever possible. The underlying physical resources are used whenever possible. The virtualization layer runs instructions only as needed to make virtual machines operate as if they were running directly on a physical machine.

All recent operating systems provide support for virtual memory, allowing software to use more memory than the machine physically has. Similarly, the ESXi hypervisor provides support for overcommitting virtual machine memory, where the amount of guest memory configured for all virtual machines might be larger than the amount of the host's physical memory.

You access the hardware devices in the **Edit Settings** dialog box. Not all devices are configurable. Some hardware devices are part of the virtual motherboard and appear in the expanded device list of the **Edit Settings** dialog box, but you cannot modify or remove them. For a list of hardware devices and their functions, see Virtual Machine Hardware Available to vSphere Virtual Machines.

In the **Edit Settings** dialog box you can also add virtual hardware devices to the virtual machine. You can use the memory or CPU hotplug options to add memory or CPU resources to a virtual machine while the virtual machine is running. You can deactivate Memory or CPU hotplug to avoid adding memory or CPUs while the virtual machine is running. Memory hotplug is supported on all 64 bit operating systems, but to use the added memory, the guest operating system must also support this feature. See the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility

A vSphere administrator or other privileged user can determine who can access or modify a virtual machine by setting permissions on the virtual machine. See the vSphere Security documentation.

Virtual Machine Hardware Available to vSphere Virtual Machines

VMware provides devices, resources, profiles, and vServices that you can configure or add to your virtual machine.

Not all hardware devices are available to every virtual machine. The host that the virtual machine runs on and the guest operating system must support devices that you add or configurations that you make. To verify support for a device in your environment, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility or the Guest Operating System Installation Guide at http://partnerweb.vmware.com/GOSIG/home.html.

Sometimes, the host might not have the required vSphere license for a resource or device. Licensing in vSphere is applicable to ESXi hosts, vCenter Server, and solutions and can be based on different criteria, depending on the specifics of each product. For information about vSphere licensing, see the vCenter Server and Host Management documentation.

The PCI and SIO virtual hardware devices are part of the virtual motherboard, but cannot be configured or removed.

Starting with vSphere 7.0, you cannot add, remove, or configure floppy drives, parallel ports, or SCSI devices. For information, see https://kb.vmware.com/s/article/78978.

Table 1-2. Virtual Machine Hardware and Descriptions

Hardware Device	Description
CPU	You can configure a virtual machine that runs on an ESXi host to have one or more virtual processors. A virtual machine cannot have more virtual CPUs than the actual number of logical CPUs on the host. You can change the number of CPUs allocated to a virtual machine and configure advanced CPU features, such as the CPU Identification Mask and hyperthreaded core sharing.
Chipset	The motherboard uses VMware proprietary devices based on the following chips: ■ Intel 440BX AGPset 82443BX Host Bridge/Controller ■ Intel 82371AB (PIIX4) PCI ISA IDE Xcelerator ■ National Semiconductor PC87338 ACPI 1.0 and PC98/99 Compliant SuperI/O ■ Intel 82093AA I/O Advanced Programmable Interrupt Controller
DVD/CD-ROM Drive	Installed by default when you create a virtual machine. You can configure DVD/CD-ROM devices to connect to client devices, host devices, or datastore ISO files. You can add, remove, or configure DVD/CD-ROM devices.
Hard Disk	Stores the operating system of a virtual machine, program files, and other data associated with its activities. A virtual disk is a large physical file, or a set of files, that can be copied, moved, archived, and backed up as easily as any other file.