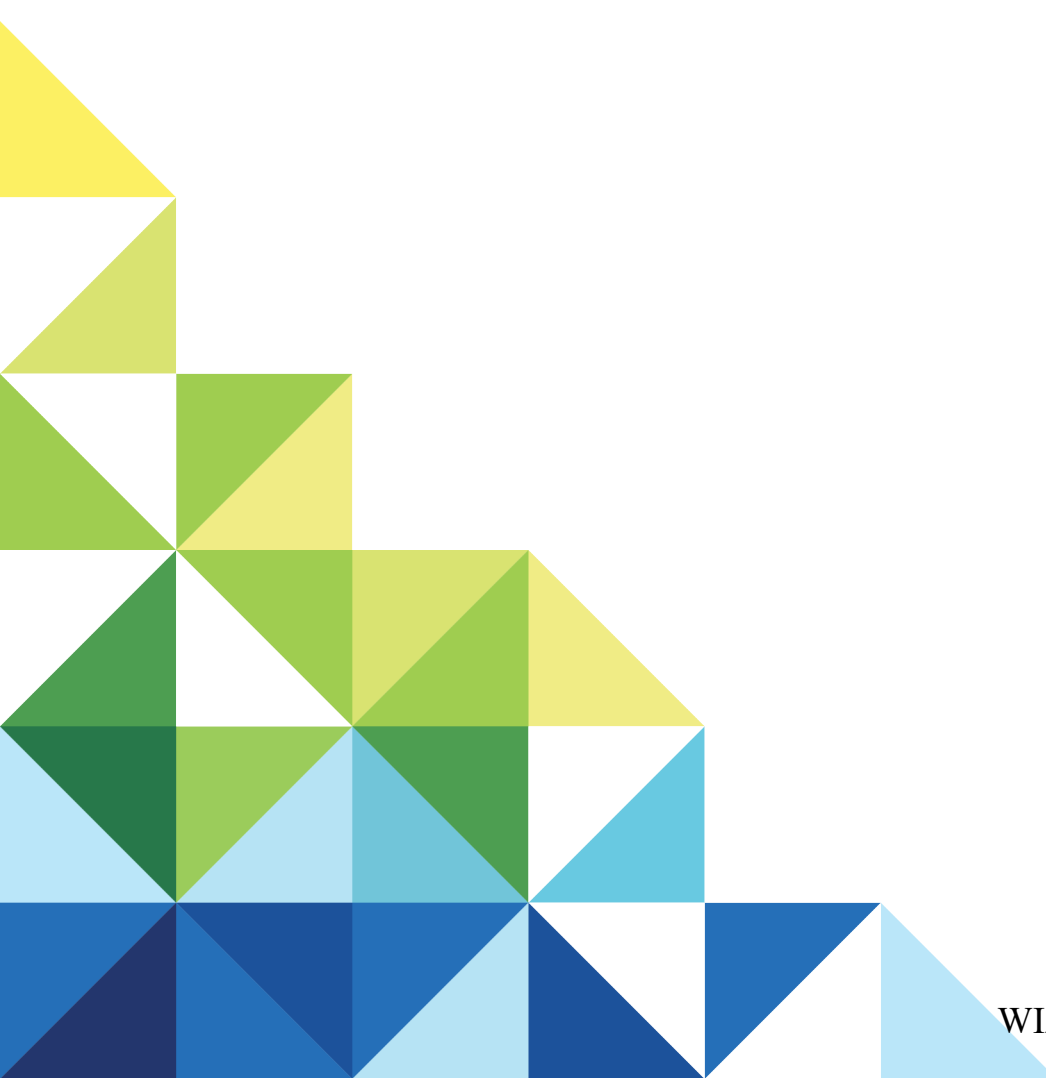


Using VMware Workstation Pro

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Using VMware Workstation Pro

Using VMware Workstation Pro describes how to use VMware Workstation Pro™ to create, configure, and manage virtual machines.

Intended Audience

This information is intended for anyone who wants to install, upgrade, or use Workstation Pro. The information is written for experienced Windows or Linux system administrators who are familiar with virtual machine technology and datacenter operations.

Creating Virtual Machines

You can create a new virtual machine in Workstation Pro by using the **New Virtual Machine** wizard, clone an existing Workstation Pro virtual machine or virtual machine template, import third-party and Open Virtualization Format (OVF) virtual machines, and create a virtual machine from a physical machine.

You can also create shared virtual machines, which can be used by remote users, and virtual machines that run on remote hosts. See [Chapter 9 Using Remote Connections and Sharing Virtual Machines](#).

This chapter includes the following topics:

- [Understanding Virtual Machines](#)
- [Preparing to Create a New Virtual Machine](#)
- [Create a New Virtual Machine on the Local Host](#)
- [Cloning Virtual Machines](#)
- [Virtualize a Physical Machine](#)
- [Importing Virtual Machines](#)
- [Installing and Upgrading VMware Tools](#)
- [Virtual Machine Files](#)

Understanding Virtual Machines

A virtual machine is a software computer that, like a physical machine, runs an operating system and applications. A virtual machine uses the physical resources of the physical machine on which it runs, which is called the host system. Virtual machines have virtual devices that provide the same functionality as physical hardware, but with the additional benefits of portability, manageability, and security.

A virtual machine has an operating system and virtual resources that you manage in much the same way that you manage a physical computer. For example, you install an operating system in a virtual machine in the same way that you install an operating system on a physical computer. You must have a CD-ROM, DVD, or ISO image that contains the installation files from an operating system vendor.

Preparing to Create a New Virtual Machine

You use the **New Virtual Machine** wizard to create a new virtual machine in Workstation Pro. The wizard prompts you to make decisions about many aspects of the virtual machine. You should make these decisions before you start the **New Virtual Machine** wizard.

Worksheet for Creating a Virtual Machine

You can print this worksheet and write down the values to specify when you run the **New Virtual Machine** wizard.

Table 3-1. Worksheet: Creating a Virtual Machine

Option	Fill In Your Value Here
Hardware compatibility setting	
Guest operating system source	
Guest operating system type (for manual installation)	
Easy Install information for Windows guests	
■ Product key ■ Operating system version ■ Full name ■ Password ■ Credentials for automatic login	
Easy Install information for Linux guests	
■ Full name ■ User name ■ Password	
Virtual machine name	
Virtual machine location	
Number of processors	
Memory allocation	
Network connection type	
I/O controller type	
Hard disk	
Virtual hard disk type	
Disk capacity	
Virtual disk file name and location	

Selecting a Virtual Machine Configuration

When you start the **New Virtual Machine** wizard, the wizard prompts you to select a typical or custom configuration.

Typical Configuration

If you select a typical configuration, you must specify or accept defaults for a few basic virtual machine settings.

- How you want to install the guest operating system.
- A name for the virtual machine and a location for the virtual machine files.
- The size of the virtual disk and whether to split the disk into multiple virtual disk files.
- Whether to customize specific hardware settings, including memory allocation, number of virtual processors, and network connection type.

Custom Configuration

You must select a custom configuration if you need to perform any of the following hardware customizations.

- Create a virtual machine that has a different Workstation Pro version than the default hardware compatibility setting.
- Select the I/O controller type for the SCSI controller.
- Select the virtual disk device type.
- Configure a physical disk or an existing virtual disk instead of create a new virtual disk.
- Allocate all virtual disk space rather than let disk space gradually grow to the maximum disk size.

Selecting the Virtual Machine Hardware Compatibility Setting

All virtual machines have a hardware version. The hardware version indicates which virtual hardware features that the virtual machine supports, such as BIOS or UEFI, number of virtual slots, maximum number of CPUs, maximum memory configuration, and other hardware characteristics. The virtual machine hardware compatibility setting determines the hardware features of the virtual machine.

If you select a typical configuration, the wizard uses the default hardware compatibility setting configured in the Workstation Pro preferences. By default, the default hardware compatibility setting is the installed Workstation Pro version.

If you select a custom configuration, the **New Virtual Machine** wizard prompts you to select a hardware compatibility setting for the virtual machine. When you select a hardware compatibility setting, a list of the VMware products and versions that are compatible with your selection appears. Limitations and features that are not available for your selection are also listed. If a feature compatibility check box is available for your selection, you can select that check box to see a list of the additional limitations.

To deploy virtual machines to run on a different VMware product, you might need to select a hardware compatibility setting that is compatible with that product.

Selecting a Guest Operating System

The **New Virtual Machine** prompts you to select the source media for the operating system that will run inside the virtual machine. You can specify an installer disc inserted in a physical drive, an ISO image file, or you can instruct the **New Virtual Machine** wizard to create a virtual machine that has a blank hard disk.

If you select an installer disc or an ISO image file and the operating system supports Easy Install, the guest operating system installation is automated and VMware Tools is installed. If the installer disc or ISO image file contains a product key number and is already set up to perform an unattended installation, the only benefit of using Easy Install is the automatic installation of VMware Tools.

Note For remote virtual machines, you must specify whether the physical drive or ISO image file is located on the local host or remote host before you select the installer disc or ISO image file.

If you instruct the **New Virtual Machine** wizard to create a virtual machine that has a blank hard disk, the wizard prompts you to specify an operating system and version and you must install the guest operating system manually after the virtual machine is created. Workstation Pro uses this information to set the appropriate default values, name files associated with the virtual machine, adjust performance settings, and work around special behaviors and bugs in the guest operating system. If the operating system you plan to install is not listed in the wizard, select **Other** for both the operating system and version.

If you are installing an operating system that supports Easy Install but you do not want to use Easy Install, you can instruct the wizard to create a virtual machine that has a blank disk and install the guest operating system manually.

Providing Easy Install Information

When the **New Virtual Wizard** detects an operating system that supports Easy Install, the wizard prompts you for information about the guest operating system. After the virtual machine is created, the guest operating system installation is automated and VMware Tools is installed.

For Windows guest operating systems, you must provide the following Easy Install information.

Table 3-2. Easy Install Information for Windows Guests

Easy Install Prompt	Description
Windows product key	(Optional) Type a product key unless the installation media contains a volume license product key. If you provide a product key here, you are not prompted to provide a product key when you install the guest operating system.
Version of Windows to install	Select the Windows operating system edition to install.
Full name	The name to use to register the guest operating system. Do not use the name Administrator or Guest. If you use one of these names, you must enter a different name when you install the guest operating system.

Table 3-2. Easy Install Information for Windows Guests (Continued)

Easy Install Prompt	Description
Password	(Optional) The password to use for an account with Administrator permissions on Windows operating systems other than Windows 2000. On Windows 2000, this is the password for the Administrator account. On Windows XP Home, an Administrator account without a password is created and you are automatically logged in to the guest operating system.
Log on automatically (requires a password)	(Optional) Save your login credentials and bypass the login dialog box when you power on the virtual machine. You must enter a name and password to use this feature.

For Linux guest operating systems, you must provide the following Easy Install information.

Table 3-3. Easy Install Information for Linux Guests

Prompt	Description
Full name	The name to use to register the guest operating system, if registration is required. Workstation Pro uses the first name to create the host name for the virtual machine.
User name	Your user name. You can use lowercase letters, numbers, and dashes, but avoid using user names that begin with a dash. Do not use the name root. Some operating systems set up sudo access for this user and other operating systems require this user to use su to obtain root privileges.
Password	The password for the User name and the root user.

See [Use Easy Install to Install a Guest Operating System](#).

Specifying the Virtual Machine Name and File Location

The **New Virtual Machine** wizard prompts you for a virtual machine name and a directory for the virtual machine files.

The name of the default directory for virtual machine files is derived from the name of the guest operating system, for example, Microsoft Windows 10 x64.

For standard virtual machines, the default directory for virtual machine files is located in the virtual machine directory. For best performance, do not place the virtual machines directory on a network drive. If other users need to access the virtual machine, consider placing the virtual machine files in a location that is accessible to those users.

For shared virtual machines, the default directory for virtual machine files is located in the shared virtual machines directory. Shared virtual machine files must reside in the shared virtual machines directory.

Virtual Machines Directory

Workstation Pro stores standard virtual machines in the virtual machines directory.

The default location of the virtual machines directory depends on the host operating system.

Table 3-4. Default Virtual Machines Directory

Host Operating System	Default Location
Windows Server 2008 R2 Windows Server 2012 R2	C:\Documents and Settings\ <i>username</i> \My Documents\My Virtual Machines <i>username</i> is the name of the currently logged-in user.
Windows 7 Windows 8 Windows 10	C:\Users\ <i>username</i> \Documents\Virtual Machines <i>username</i> is the name of the currently logged in user.
Linux	<i>homedir</i> /vmware <i>homedir</i> is the home directory of the currently logged in user.

Shared Virtual Machines Directory

Workstation Pro stores shared virtual machines in the shared virtual machines directory, where VMware Workstation Server manages them.

The default location of the shared virtual machines directory depends on the host operating system.

Table 3-5. Default Shared Virtual Machines Directory

Host Operating System	Default Shared Virtual Machines Directory
Windows Server 2008 R2, Windows Server 2012 R2	C:\Documents and Settings\All Users\Documents\Shared Virtual Machines
Windows 7 Windows 8 Windows 10	C:\Users\Public\Documents\Shared Virtual Machines
Linux	/var/lib/vmware/Shared VMs

Selecting the Firmware Type

Depending on the guest operating system, when you use a custom configuration, the New Virtual Machine wizard prompts you to select the firmware type the virtual machine uses when it boots.

This option appears in the **New Virtual Machine Wizard** when the guest operating system is supported with the UEFI firmware type. Otherwise, the BIOS firmware type is selected by default.

Table 3-6. Firmware Type Options

Option	Description
BIOS	The virtual machine firmware uses BIOS when booting.
UEFI	The virtual machine uses UEFI when booting. If you select UEFI, depending on the guest operating system, you might have the option of enabling UEFI Secure Boot.

See [Configure a Firmware Type](#).

Selecting the Number of Processors for a Virtual Machine

When you select a custom configuration, the **New Virtual Machine** wizard prompts you to specify the number of processors for the virtual machine.

Specifying multiple virtual processors is supported only on host machines that have at least two logical processors. Single-processor hosts that have hyperthreading enabled or dual-core CPUs are considered to have two logical processors. Multiprocessor hosts that have two CPUs are considered to have at least two logical processors, regardless of whether they are dual-core or have hyperthreading enabled.

For Windows virtual machines running mostly office and Internet productivity applications, using multiple virtual processors is not beneficial, so the default single virtual processor is ideal. For server workloads and data-intensive computing applications, adding extra virtual processors may provide an increase in application performance.

Application	Recommended number of processors
Desktop applications	1 processor
Server operating systems	2 processors
Video encoding, modeling, and scientific	4 processors

In some circumstances, adding additional processors can decrease the overall performance of the virtual machine and your computer. This can occur if the operating system or application is not using the processors efficiently. In this case, reducing the number of processors is recommended.

Assigning all processors on your computer to the virtual machine results in extremely poor performance. The host operating system must continue to perform background tasks even if no applications are running. If you assign all processors to a virtual machine, this prevents important tasks from being completed.

Allocating Memory for a Virtual Machine

When you select a custom configuration, the **New Virtual Machine** wizard prompts you to specify the default settings for memory allocation.

Color-coded icons correspond to the maximum recommended memory, recommended memory, and guest operating system recommended minimum memory values. To adjust the memory allocated to the virtual machine, move the slider along the range of values. The high end of the range is determined by the amount of memory allocated to all running virtual machines. If you allow virtual machine memory to be swapped, this value changes to reflect the specified amount of swapping.

The maximum amount of memory for each virtual machine is 64GB.

The total amount of memory that you can assign to all virtual machines running on a single host machine is limited only by the amount of RAM on the host machine.

You can change the amount of memory available to all virtual machines by modifying Workstation Pro memory settings.

Selecting the Network Connection Type for a Virtual Machine

When you select a custom configuration, the **New Virtual Machine** wizard prompts you to configure the network connection type for the virtual machine.

If you are creating a remote virtual machine, you must select either a custom network or no network connection.

Table 3-7. Network Connection Settings

Setting	Description
Use bridged networking	Configure a bridged network connection for the virtual machine. With bridged networking, the virtual machine has direct access to an external Ethernet network. The virtual machine must have its own IP address on the external network. If your host system is on a network and you have a separate IP address for your virtual machine (or can get an IP address from a DHCP server), select this setting. Other computers on the network can then communicate directly with the virtual machine.
Use network address translation (NAT)	Configure a NAT connection for the virtual machine. With NAT, the virtual machine and the host system share a single network identity that is not visible outside the network. Select NAT if you do not have a separate IP address for the virtual machine, but you want to be able to connect to the Internet.
Use host-only networking	Configure a host-only network connection for the virtual machine. Host-only networking provides a network connection between the virtual machine and the host system, using a virtual network adapter that is visible to the host operating system. With host-only networking, the virtual machine can communicate only with the host system and other virtual machines in the host-only network. Select host-only networking to set up an isolated virtual network.
Do not use a network connection	Do not configure a network connection for the virtual machine.
Custom (Windows host) or Named Network (Linux host)	(Remote virtual machine only) Select a specific virtual network.

See [Chapter 8 Configuring Network Connections](#) for information about virtual switches, virtual network adapters, the virtual DHCP server, and the NAT device.

Selecting the I/O Controller Type for a Virtual Machine

When you select a custom configuration, the **New Virtual Machine** wizard prompts you to select the I/O controller type for the virtual machine. Workstation Pro automatically configures your virtual machine with the SCSI controller best suited for the guest operating system, but you can change the controller.

Workstation Pro installs an IDE controller and a SCSI controller in the virtual machine. SATA controllers are supported for some guest operating systems. The IDE controller is always ATAPI. For the SCSI controller, you can choose BusLogic, LSI Logic, or LSI Logic SAS. If you are creating a remote virtual machine on an ESX host, you can also select a VMware Paravirtual SCSI (PVSCSI) adapter.

BusLogic and LSI Logic adapters have parallel interfaces. The LSI Logic SAS adapter has a serial interface. The LSI Logic adapter has improved performance and works better with generic SCSI devices. The LSI Logic adapter is also supported by ESX Server 2.0 and later.

PVSCSI adapters are high-performance storage adapters that can provide greater throughput and lower CPU utilization. They are best suited for environments where hardware or applications drive a very high amount of I/O throughput, such as SAN environments. PVSCSI adapters are not suited for DAS environments.

Note The choice of SCSI controller does not affect whether the virtual disk can be an IDE, SCSI, or SATA disk.

Some guest operating systems, such as Windows XP, do not include a driver for the LSI Logic or LSI Logic SAS adapter. You must download the driver from the LSI Logic Web site. Drivers for a Mylex (BusLogic) compatible host bus adapter are not obvious on the LSI Logic Web site. Search the support area for the numeric string in the model number, for example, search for 958 for BT/KT-958 drivers.

See the *VMware Guest Operating System Installation Guide* for driver support information. For guest operating system support information and known issues, as well as SATA support, see the online Compatibility Guide on the VMware Web site.

Selecting a Hard Disk for a Virtual Machine

When you select a custom configuration, the **New Virtual Machine** wizard prompts you to configure a hard disk for the virtual machine.

Virtual hard disks are the best choice for most virtual machines because they are easy to set up and can be moved to new locations on the same host system or to different host systems. In a typical configuration, Workstation Pro creates a new virtual hard disk for the virtual machine.

In some cases, you might want to select an existing virtual hard disk or give the virtual machine access to a physical hard disk or unused partition on the host system.

- [Selecting the Virtual Hard Disk Type for a Virtual Machine](#)

If you instruct the **New Virtual Machine** wizard to create a new virtual disk during a custom configuration, the wizard prompts you to select the virtual hard disk type for the virtual machine.

- [Selecting the Disk Mode](#)

When you select a custom configuration on a Linux host, you can use the **New Virtual Machine** wizard to configure normal or independent mode for a disk.

- [Prepare to Use a Physical Disk or Unused Partition](#)

You must perform certain tasks before you configure a virtual machine to use a physical disk or unused partition on the host system.

- [Specifying Disk Capacity for a Virtual Machine](#)

If you instruct the **New Virtual Machine** wizard to create a new virtual disk during a custom configuration, the wizard prompts you to set the size of the virtual disk and specify whether to split the disk into multiple virtual disk (.vmdk) files.

- [Specifying the Name and Location of Virtual Disk Files](#)

During a custom configuration, if you instruct the **New Virtual Machine** wizard to create a new virtual disk, use an existing virtual disk, or use a physical disk, the wizard prompts you for the name and location of a virtual disk (.vmdk) file.

Selecting the Virtual Hard Disk Type for a Virtual Machine

If you instruct the **New Virtual Machine** wizard to create a new virtual disk during a custom configuration, the wizard prompts you to select the virtual hard disk type for the virtual machine.

You can set up a virtual disk as an IDE disk for any guest operating system. You can set up a virtual disk as a SCSI disk for any guest operating system that has a driver for the LSI Logic or BusLogic SCSI controller available in the virtual machine. You can set up a virtual disk as a SATA disk for some guest operating systems. You can set up a virtual disk as an NVMe disk for guest operating systems that support the NVMe disk type.

You can change virtual disk node and mode settings after a virtual machine is created.

Selecting the Disk Mode

When you select a custom configuration on a Linux host, you can use the **New Virtual Machine** wizard to configure normal or independent mode for a disk.

In normal mode, disks are included in snapshots that you take of the virtual machine. If you do not want data on the disk to be recorded when you take a snapshot of the virtual machine, configure the disk to be independent.

If you configure a disk to be independent, you can further specify whether changes you make to the disk are to persist or be discarded when you power off the virtual machine or restore a snapshot.

You can also exclude virtual disks from snapshots by modifying virtual machine settings.

Prepare to Use a Physical Disk or Unused Partition

You must perform certain tasks before you configure a virtual machine to use a physical disk or unused partition on the host system.

You must perform these tasks before you run the **New Virtual Machine** wizard to add a physical disk to a new virtual machine, and before you add a physical disk to an existing virtual machine.

Procedure

- 1 If a partition is mounted by the host or in use by another virtual machine, unmount it.

The virtual machine and guest operating system access a physical disk partition while the host continues to run its operating system. Corruption is possible if you allow the virtual machine to modify a partition that is simultaneously mounted on the host operating system.

Option	Description
The partition is mapped to a Windows Server 2008 R2 or Windows Server 2012 R2 host	a Select Start > Settings > Control Panel > Administrative Tools > Computer Management > Storage > Disk Management .
	b Select a partition and select Action > All Tasks > Change Drive Letter and Paths .
	c Click Remove .
The partition is mapped to a Windows 7, Windows 8, or Windows 10 host	a Select Start > Control Panel .
	b In the menu bar, click the arrow next to Control Panel .
	c From the drop-down menu, select All Control Panel Items > Administrative Tools > Computer Management > Storage > Disk Management (Local) .
	d Right-click a partition and choose Change Drive Letter and Paths .
	e Click Remove and OK .

- 2 Check the guest operating system documentation regarding the type of partition on which the guest operating system can be installed.

On Windows 7 hosts, you cannot use the system partition, or the physical disk that contains it, in a virtual machine. Other operating systems, such as Linux, can be installed on a primary or an extended partition on any part of the drive.

- 3 If the physical partition or disk contains data that you need in the future, back up the data.
- 4 If you use a Windows host IDE disk in a physical disk configuration, verify that it is not configured as the slave on the secondary IDE channel if the master on that channel is a CD-ROM drive.
- 5 On a Linux host, set the device group membership or device ownership appropriately.

- a Verify that the master physical disk device or devices are readable and writable by the user who runs Workstation Pro.

Physical devices, such as `/dev/hda` (IDE physical disk) and `/dev/sdb` (SCSI physical disk), belong to group-id `disk` on most distributions. If this is the case, you can add Workstation Pro users to the `disk` group. Another option is to change the owner of the device. Consider all the security issues involved in this option.

- b Grant Workstation Pro users access to all `/dev/hd[abcd]` physical devices that contain operating systems or boot managers.

When permissions are set correctly, the physical disk configuration files in Workstation Pro control access. This reliability provides boot managers access to configuration files and other files they might need to boot operating systems. For example, LILO needs to read `/boot` on a Linux partition to boot a non-Linux operating system that might be on another drive.

Specifying Disk Capacity for a Virtual Machine

If you instruct the **New Virtual Machine** wizard to create a new virtual disk during a custom configuration, the wizard prompts you to set the size of the virtual disk and specify whether to split the disk into multiple virtual disk (.vmdk) files.

A virtual disk is made up of one or more virtual disk files. Virtual disk files store the contents of the virtual machine hard disk drive. Almost all of the file content is virtual machine data. A small portion of the file is allotted to virtual machine overhead. If the virtual machine is connected directly to a physical disk, the virtual disk file stores information about the partitions that the virtual machine is allowed to access.

You can set a size between 0.001 GB and 8 TB for a virtual disk file. You can also select whether to store a virtual disk as a single file or split it into multiple files.

Select **Split virtual disk into multiple files** if the virtual disk is stored on a file system that has a file size limitation. When you split a virtual disk less than 950 GB, a series of 2-GB virtual disk files are created. When you split a virtual disk greater than 950 GB, two virtual disk files are created. The maximum size of the first virtual disk file is 1.9 TB and the second virtual disk file stores the rest of the data.

For custom configurations, you can select **Allocate all disk space now** to allocate all disk space immediately rather than allow the disk space to gradually grow to the maximum amount. Allocating all the disk space immediately might provide better performance, but it is a time-consuming operation that requires as much physical disk space as you specify for the virtual disk. If you allocate all the disk space immediately, you cannot use the shrink disk feature.

After you create a virtual machine, you can edit virtual disk settings and add additional virtual disks.

Disk Size Compatibility

The size of a virtual disk is limited to 8 TB. However, your hardware version, bus type, and controller type also impact the size of your virtual disks.

Workstation Hardware Version	Bus Type	Controller Type	Maximum Disk Size
10, 11, 12, 14	IDE	ATAPI	8192 GB (8TB)
10, 11, 12, 14	SCSI	BusLogic	2040 GB (2TB)
10, 11, 12, 14	SCSI	LSI Logic	8192 GB (8TB)
10, 11, 12, 14	SCSI	LSI Logic SAS	8192 GB (8TB)
10, 11, 12, 14	SATA	AHCI	8192 GB (8TB)
14	NVMe	NVMe	8192 GB (8TB)
9, 8, 7, 6.5	All	All	2040 GB (2TB)
6.0, 5	All	All	950 GB

To discover your SCSI controller type, open the virtual machine .vmx file. The value of the setting `scsi0.virtualDev` determines your SCSI controller type.

Value	SCSI Controller Type
Blank or not present	BusLogic
lsilogic	LSI Logic
lsisas1068	LSI Logic SAS

Specifying the Name and Location of Virtual Disk Files

During a custom configuration, if you instruct the **New Virtual Machine** wizard to create a new virtual disk, use an existing virtual disk, or use a physical disk, the wizard prompts you for the name and location of a virtual disk (.vmdk) file.

Table 3-8. Required Information for Each Disk Type

Type of Disk	Description
New virtual disk	If you specified that all disk space should be stored in a single file, Workstation Pro uses the filename that you provide to create one 40GB disk file. If you specified that disk space should be stored in multiple files, Workstation Pro generates subsequent filenames by using the filename that you provide. If you specified that files can increase in size, subsequent filenames include an s in the file number, for example, Windows 7-s001.vmdk. If you specified that all disk space should be allocated when the virtual disk is created, subsequent filenames include an f in the file number, for example, Windows 7-f001.vmdk.
Existing virtual disk	You select the name and location of an existing virtual disk file.
Physical disk	After the wizard prompts you to select a physical device and specify whether to use the entire disk or individual partitions, you must specify a virtual disk file. Workstation Pro uses this virtual disk file to store partition access configuration information for the physical disk.

Note Earlier VMware products use the .dsk extension for virtual disk files.

Customizing Virtual Machine Hardware

You can click **Customize Hardware** on the last page of the **New Virtual Machine** wizard to customize the virtual machine hardware.

You can change the default hardware settings, including memory allocation, number of virtual CPUs, CD/DVD and floppy drive settings, and the network connection type.

Create a New Virtual Machine on the Local Host

You create a new virtual machine on the local host system by running the **New Virtual Machine** wizard.

You can also use the **New Virtual Machine** wizard to create shared virtual machines, which can be used by remote users, and remote virtual machines, which run on remote hosts. See [Chapter 9 Using Remote Connections and Sharing Virtual Machines](#).

Prerequisites

- Verify that you have the information the **New Virtual Machine** wizard requires to create a virtual machine. See [Preparing to Create a New Virtual Machine](#).
- Verify that the guest operating system you plan to install is supported. See the online VMware Compatibility Guide on the VMware Web site.
- See the *VMware Guest Operating System Installation Guide* for information about the guest operating system that you plan to install.
- If you are installing the guest operating system from an installer disc, insert the installer disc in the CD-ROM drive in the host system.
- If you are installing the guest operating system from an ISO image file, verify that the ISO image file is in a directory that is accessible to the host system.
- If the virtual machine will use a physical disk or unused partition on the host system, perform the appropriate preparation tasks. See [Prepare to Use a Physical Disk or Unused Partition](#).

Procedure

- 1 Start the **New Virtual Machine** wizard.

Option	Description
Windows host	■ If the host is not connected to a remote server, select File > New Virtual Machine. ■ If the host is connected to a remote server, select File > New Virtual Machine > On this Computer.
Linux host	Select File > New Virtual Machine .

- 2 Select the configuration type.

Option	Description
Typical	The wizard prompts you to specify or accept defaults for basic virtual machine settings. The typical configuration type is appropriate in most instances.
Custom	You must select the custom configuration type to make a different virtual machine version than the default hardware compatibility setting, specify the I/O adapter type for SCSI adapters, specify whether to create an IDE, SCSI, SATA, or NVMe virtual disk, use a physical disk instead of a virtual disk, use an existing virtual disk, or allocate all virtual disk space rather than let disk space gradually grow to the maximum disk size.

- 3 If you selected the **Custom** option, select a hardware compatibility setting.

The hardware compatibility setting determines the hardware features of the virtual machine.

4 Select the source of the guest operating system.

Option	Description
Use a physical disc	Select the physical drive where you inserted the installation disc.
Use an ISO image	Type or browse to the location of the ISO image file for the guest operating system.
Install the guest operating system later	Create a virtual machine that has a blank disk. You must install the guest operating system manually after you create the virtual machine.

5 Specify information about the guest operating system.

Option	Description
You are using Easy Install	Type the Easy Install information for the guest operating system.
You are not using Easy Install	Select the guest operating system type and version. If the guest operating system is not listed, select Other .

6 Type a virtual machine name and type or browse to the directory for the virtual machine files.

7 Follow the prompts to configure the virtual machine.

If you selected a typical configuration, the wizard prompts you to configure the virtual disk size and specify whether the disk should be split into multiple files. If you selected a custom configuration, the wizard prompts you to configure the firmware type, virtual machine processors, memory allocation, networking configuration, I/O controller types, virtual disk type and mode, and virtual disk.

Note For the firmware type, if you select UEFI and if the guest operating system supports UEFI Secure Boot, you can select the option to enable UEFI Secure Boot.

8 (Optional) Click **Customize Hardware** to customize the hardware configuration.

You can also modify virtual hardware settings after you create the virtual machine.

9 (Optional) Select **Power on this virtual machine after creation** to power on the virtual machine after you create it.

This option is not available if you are installing the guest operating system manually.

10 Click **Finish** to create the virtual machine.

If you are using Easy Install, guest operating system installation begins when the virtual machine powers on. The guest operating system installation is automated and typically runs without requiring any input from you. After the guest operating system is installed, Easy Install installs VMware Tools.

If you are not using Easy Install, the virtual machine appears in the library.

What to do next

If you used Easy Install and the virtual machine did not power on when you finished the **New Virtual Machine** wizard, power on the virtual machine to start the guest operating system installation. See [Use Easy Install to Install a Guest Operating System](#).

If you did not use Easy Install, install the guest operating system manually. See [Install a Guest Operating System Manually](#).

Use Easy Install to Install a Guest Operating System

When you use Easy Install, you usually do not need to provide information during guest operating system installation.

If you did not provide all of the Easy Install information in the **New Virtual Machine** wizard, you might be prompted for a product key, user name, or password.

Also, if the guest operating system installation consists of multiple discs or ISO image files, the installer might prompt you for the next disk.

Procedure

- If the installer prompts you for a product key, user name, or password, click in the virtual machine window and type the required information.

Mouse and keyboard input are captured by the virtual machine.

- If you are using physical discs and the installer prompts you for the next disk, use the CD-ROM or DVD drive on the host system.
- If you are using multiple ISO image files and the installer prompts you for the next disk, select the next ISO image file.

Option	Description
Windows host	Click Change Disk and browse to the next ISO image file.
Linux host	- Select VM > Removable Devices > CD/DVD > Settings and browse to the next ISO image file. - Select Connected. - Click Save.

Install a Guest Operating System Manually

Installing a guest operating system in a virtual machine is similar to installing an operating system on a physical computer. If you do not use Easy Install when you create a virtual machine in the **New Virtual Machine** wizard, you must install the guest operating system manually.

You can install a guest operating system from an installer disc or ISO image file. You can also use a PXE server to install the guest operating system over a network connection. If the host configuration does not permit the virtual machine to boot from an installer disc, you can create an ISO image file from the installer disc.

Prerequisites

- Verify that the operating system is supported. See the online VMware Compatibility Guide on the VMware Web site.

- See the *VMware Guest Operating System Installation Guide* for information on the guest operating system that you are installing.

Procedure

- 1 If you are installing the guest operating system from an installer disc, configure the virtual machine to use a physical CD-ROM or DVD drive and configure the drive to connect at power on.
 - a Select the virtual machine and select **VM > Settings**.
 - b On the **Hardware** tab, select **CD/DVD drive**.
 - c Select **Connect at power on**.
 - d (Remote virtual machine only) Select the location of the CD-ROM or DVD drive.
 - e Select **Use physical drive** and select a the drive.
 - f Click **OK** to save your changes.
- 2 If you are installing the guest operating system from an ISO image file, configure the CD/DVD drive in the virtual machine to point to the ISO image file and configure the drive to connect at power on.
 - a Select the virtual machine and select **VM > Settings**.
 - b On the **Hardware** tab, select **CD/DVD drive**.
 - c Select **Connect at power on**.
 - d (Remote virtual machine only) Select the location of the ISO image file.
 - e Select **Use ISO image file** and browse to the location of the ISO image file.
 - f Click **OK** to save your changes.
- 3 If you are installing the guest operating system from an installer disc, insert the disc in the CD-ROM or DVD drive.
- 4 Power on the virtual machine.
- 5 Follow the installation instructions provided by the operating system vendor.
- 6 If the operating system consists of multiple installer discs and you are prompted to insert the next disc, insert the next disc in the physical drive.
- 7 If the operating system consists of multiple ISO image files, select the image file for the next CD.
 - a Select **VM > Removable Devices > CD/DVD > Disconnect** and disconnect from the current ISO image file.
 - b Select **VM > Removable Devices > CD/DVD > Settings** and select the next ISO image file.
 - c Select **Connected** and click **OK**.
- 8 Use the standard tools in the operating system to configure its settings.

What to do next

Install VMware Tools. You should install VMware Tools before you activate the license for the operating system. See [Installing VMware Tools](#).

Installing a Guest Operating System on a Physical Disk or Unused Partition

You can install a guest operating system directly on a physical disk or unused partition on the host system.

A physical disk directly accesses an existing local disk or partition. You can use physical disks to run one or more guest operating systems from existing disk partitions.

Workstation Pro supports physical disks up to 2 TB capacity. Booting from an operating system already set up on an existing SCSI disk or partition is not supported.

Running an operating system natively on the host system and switching to running it inside a virtual machine is similar to pulling the hard drive out of one computer and installing it in a second computer that has a different motherboard and hardware. The steps you take depend on the guest operating system in the virtual machine. In most cases, a guest operating system that is installed on a physical disk or unused partition cannot boot outside of the virtual machine, even though the data is available to the host system. See the *Dual-Boot Computers and Virtual Machines* technical note on the VMware Web site for information about using an operating system that can also boot outside of a virtual machine.

After you configure a virtual machine to use one or more partitions on a physical disk, do not modify the partition tables by running `fdisk` or a similar utility in the guest operating system. If you use `fdisk` or a similar utility on the host operating system to modify the partition table of the physical disk, you must recreate the virtual machine physical disk. All files that were on the physical disk are lost when you modify the partition table.

Important You cannot use a physical disk to share files between the host system and a guest operating system. Making the same partition visible to both the host system and a guest operating system can cause data corruption. Instead, use shared folder to share files between the host system and a guest operating system.

Create a Virtual Machine Shortcut

You can use a shortcut to select a virtual machine from your desktop.

Prerequisites

A virtual machine must be present in the Workstation Pro Virtual Machine Library.

This feature is available on Windows host systems only.

Procedure

- 1 Select a virtual machine from the virtual machine library.

- 2 Drag the virtual machine to the host desktop or to a folder.

A shortcut is created for the virtual machine.

You can select the virtual machine by double-clicking the shortcut.

Cloning Virtual Machines

Installing a guest operating system and applications can be time consuming. With clones, you can make many copies of a virtual machine from a single installation and configuration process. Cloning a virtual machine is faster and easier than copying it.

Clones are useful when you must deploy many identical virtual machines to a group. For example, an MIS department can clone a virtual machine that has a suite of preconfigured office applications for each employee. You can also configure a virtual machine that has a complete development environment and then clone it repeatedly as a baseline configuration for software testing.

The existing virtual machine is called the parent virtual machine. When the cloning operation is complete, the clone becomes a separate virtual machine.

Changes made to a clone do not affect the parent virtual machine, and changes made to the parent virtual machine do not appear in a clone. The MAC address and UUID for a clone are different from the parent virtual machine.

- [Using Linked Clones](#)

A linked clone is a copy of a virtual machine that shares virtual disks with the parent virtual machine in an ongoing manner.

- [Using Full Clones](#)

A full clone is a complete and independent copy of a virtual machine. It shares nothing with the parent virtual machine after the cloning operation. Ongoing operation of a full clone is entirely separate from the parent virtual machine.

- [Enable Template Mode for a Parent Virtual Machine of Linked Clones](#)

To prevent the parent virtual machine for a linked clone from being deleted, you can designate the parent as a template. When template mode is enabled, the virtual machine, and snapshots of the virtual machine, cannot be deleted.

- [Clone a Virtual Machine](#)

The **Clone Virtual Machine** wizard guides you through the process of cloning a virtual machine. You do not need to locate and manually copy the parent virtual machine files.

Using Linked Clones

A linked clone is a copy of a virtual machine that shares virtual disks with the parent virtual machine in an ongoing manner.

Because a linked clone is made from a snapshot of the parent, disk space is conserved and multiple virtual machines can use the same software installation. All files available on the parent at the moment you take the snapshot continue to remain available to the linked clone.

Ongoing changes to the virtual disk of the parent do not affect the linked clone, and changes to the disk of the linked clone do not affect the parent. A linked clone must have access to the parent. Without access to the parent, you cannot use a linked clone.

Because linked clones are created swiftly, you can create a unique virtual machine for each task. You can also share a virtual machine with other users by storing the virtual machine on your local network where other users can quickly make a linked clone. For example, a support team can reproduce a bug in a virtual machine, and an engineer can quickly make a linked clone of that virtual machine to work on the bug.

You can make a linked clone from a linked clone, but the performance of the linked clone degrades. If you make a full clone from a linked clone, the full clone is an independent virtual machine that does not require access to the linked clone or its parent. You should make a linked clone of the parent virtual machine, if possible.

Important You cannot delete a linked clone snapshot without destroying the linked clone. You can safely delete the snapshot only if you also delete the clone that depends on it.

Using Full Clones

A full clone is a complete and independent copy of a virtual machine. It shares nothing with the parent virtual machine after the cloning operation. Ongoing operation of a full clone is entirely separate from the parent virtual machine.

Because a full clone does not share virtual disks with the parent virtual machine, full clones generally perform better than linked clones. Full clones take longer to create than linked clones. Creating a full clone can take several minutes if the files involved are large.

Because a full clone duplicates only the state of the virtual machine at the instant of the cloning operation, it does not have access to snapshots of the parent virtual machine.

Enable Template Mode for a Parent Virtual Machine of Linked Clones

To prevent the parent virtual machine for a linked clone from being deleted, you can designate the parent as a template. When template mode is enabled, the virtual machine, and snapshots of the virtual machine, cannot be deleted.

Note You cannot enable template mode for a shared or remote virtual machine.

Prerequisites

If the parent does not have at least one snapshot, create a snapshot. See [Taking Snapshots of Virtual Machines](#).

Procedure

- 1 Select the virtual machine to use as a parent of the linked clone and select **VM > Settings**.
- 2 On the **Options** tab, select **Advanced**.

- 3 Select **Enable Template mode (to be used for cloning)** and click **OK**.

Clone a Virtual Machine

The **Clone Virtual Machine** wizard guides you through the process of cloning a virtual machine. You do not need to locate and manually copy the parent virtual machine files.

Prerequisites

- Familiarize yourself with the different types of clones. See [Using Full Clones](#) and [Using Linked Clones](#).
- Run a defragmentation utility in the guest operating system to defragment the drives on the parent virtual machine.
- If the parent virtual machine is a Workstation 4.x and Workstation 4.x-compatible virtual machine, upgrade it to Workstation 5.x or later.
- If you are creating a linked clone, enable template mode for the parent virtual machine. See [Enable Template Mode for a Parent Virtual Machine of Linked Clones](#).
- Power off the parent virtual machine.

Procedure

- 1 Select the parent virtual machine and select **VM > Manage > Clone**.
- 2 Select the state of the parent from which you want to create a clone.

You can create a clone from the current state of the parent virtual machine or from an existing snapshot. If you select the current state, Workstation Pro creates a snapshot of the parent virtual machine before cloning it.

Note You cannot clone from the current state if template mode is enabled for the parent virtual machine.

- 3 Specify whether to create a linked clone or a full clone.
- 4 Type a name and a location for the cloned virtual machine.
- 5 Click **Finish** to create the clone and **Close** to exit the wizard.

A full clone can take several minutes to create, depending on the size of the virtual disk that is being duplicated.

- 6 If the parent virtual machine uses a static IP address, change the static IP address of the clone before the clone connects to the network to prevent IP address conflicts.

Although the wizard creates a new MAC address and UUID for the clone, other configuration information, such as the virtual machine name and static IP address configuration, is identical to that of the parent virtual machine.

The summary view for a linked clone shows the path to the virtual machine configuration (.vmx) file of the parent virtual machine.

Virtualize a Physical Machine

You can create a virtual machine from a Windows physical machine in Workstation Pro. When you virtualize a physical machine, you capture all of the applications, documents, and settings on the physical machine in a new virtual machine. Workstation Pro must be running on a Windows host system to use this feature.

Prerequisites

- Verify that the physical machine that you want to virtualize is running Windows. You cannot create a virtual machine from a non-Windows physical machine in Workstation Pro.

Note You can create a virtual machine from a Linux physical machine using vCenter Converter Standalone. For more information, see the vCenter Converter Standalone documentation.

- Verify that you have administrative access on the physical machine that you want to virtualize and on the Workstation Pro host system.
- Verify that the Workstation Pro host system has network access to the physical machine that you want to virtualize.
- Verify that on the Workstation Pro host system you have disabled User Account Control (UAC). For instructions, see [Prepare a Windows Physical Machine for Virtualization](#).
- Turn off firewall applications running on the physical machine that you want to virtualize.
- Prepare the physical machine for virtualization. See [Prepare a Windows Physical Machine for Virtualization](#).

Procedure

- 1 Power on the physical machine that you want to virtualize.
- 2 On the Windows host system, in Workstation Pro, select **File > Virtualize a Physical Machine**.

If you have never virtualized a physical machine or imported a third-party virtual machine in Workstation Pro, you need to download and install VMware vCenter Converter Standalone. After the VMware vCenter Converter Standalone installation is finished, you must restart the virtualization wizard.
- 3 Type the hostname or IP address, user name, and password for the physical machine that you want to virtualize.

You must use the Administrator account or a user account that is a member of the local Administrators group.
- 4 Type a name for the new virtual machine and specify a location on the host system in which to store the virtual machine files.
- 5 Type the user name and password for your user account on the host system.

- 6 Click **Finish** to create a virtual machine from the physical machine.

The amount of time required to create the virtual machine depends on the size of the hard disk on the physical machine.

VMware Tools installation begins the first time you power on the new virtual machine.

Prepare a Windows Physical Machine for Virtualization

To avoid problems related to permissions and network access, you must perform certain steps to prepare a Windows physical machine before you run the **Virtualize a Physical Machine** wizard.

Procedure

- ◆ Disable User Account Control (UAC) on the Windows physical machine.
 - On Windows Vista, open the **User Accounts** control panel, select **Turn User Account Control On or Off**, and deselect **Use User Account Control (UAC) to help protect your computer**.
 - On Windows 7 or later, open the **Change User Account Control Settings** control panel and drag the slider to **Never notify**.

Troubleshoot Windows Authentication Problems During Physical Machine Virtualization

User authentication fails when the **Virtualize a Physical Machine** wizard attempts to connect a Windows physical machine.

Problem

After you provide user credentials for the physical machine, the **Virtualize a Physical Machine** wizard reports that your user credentials are incorrect or you have insufficient permissions to connect to the physical machine.

Cause

Simple file sharing or User Account Control (UAC) is enabled on the physical machine.

Solution

Perform the steps in [Prepare a Windows Physical Machine for Virtualization](#) and rerun the **Virtualize a Physical Machine** wizard.

Troubleshoot Windows Activation Problems

A virtual machine that you create from a physical machine prompts you to activate Windows when you use it in Workstation Pro.

Problem

After you create a virtual machine from a Windows Vista or Windows 7 physical machine, or from a physical PC that came with Windows preinstalled, you were required to reactivate Windows in the virtual machine.

Cause

When you create a virtual machine from a Windows Vista or Windows 7 physical machine, the operating system detects that the computer hardware has changed. When you make a significant hardware change, Microsoft requires you to activate Windows again.

The OEM versions of Windows that are preinstalled on some new computers are customized for those computers. OEM licenses of Windows are not transferrable.

Solution

Any virtual machine that was created from a physical machine that had its Windows license key successfully activated needs to be reactivated when you run it in Workstation Pro.

The activation process in Windows Vista and Windows 7 is different from the Windows XP activation process. In Windows 7, retail activation keys are good for only one use. If you enter the same activation key in Workstation Pro that you used previously, you cannot successfully activate the virtual machine.

The activation wizard tells you that the activation key was already used and prompts you to call the Microsoft activation hotline to get a second key. If you did not previously call the hotline for the same license key, you should receive a new activation key. Your call is not transferred to an operator unless you call repeatedly for the same key.

See the Microsoft Web site for more information about why reactivation is necessary.

Importing Virtual Machines

You can import virtual machines in other formats into Workstation Pro.

Import a Windows XP Mode Virtual Machine

You can import a Windows XP Mode virtual machine and run it in Workstation Pro. When you import a Windows XP Mode virtual machine, Workstation Pro creates a new virtual machine in VMware runtime (.vmx) format.

You can power on only one Windows XP Mode virtual machine at a time in Workstation Pro. If you move a Windows XP Mode virtual machine to another host system, it becomes a new virtual machine and you must activate it.

Note Changes made to the original Windows XP Mode virtual machine through Virtual PC do not affect the virtual machine imported in Workstation Pro.

Prerequisites

- Verify that the Windows 7 Professional, Enterprise, or Ultimate edition operating system is running on the host system. Importing Windows XP Mode virtual machines is not supported on Linux host systems or on host systems that are running other versions of Windows.
- Download and install the Windows XP Mode virtual machine on the host system.

Procedure

- 1 Select **File > Open** and browse to the virtual machine configuration (.vmc) file.

If you have never virtualized a physical machine or imported a third-party virtual machine in Workstation Pro, you need to download and install VMware vCenter Converter Standalone. After the VMware vCenter Converter Standalone installation is finished, you must restart the import.

- 2 Type a name for the new virtual machine, type or browse to the directory for the virtual machine files, and click **Import**.

Workstation Pro begins importing the Windows XP Mode virtual machine.

After Workstation Pro successfully imports the Windows XP Mode virtual machine, a new virtual machine appears in the virtual machine library.

Import an Open Virtualization Format Virtual Machine

You can import an Open Virtualization Format (OVF) virtual machine and run it in Workstation Pro. Workstation Pro converts the virtual machine from OVF format to VMware runtime (.vmx) format. You can import both .ovf and .ova files.

OVF is a platform-independent, efficient, extensible, and open packaging and distribution format for virtual machines. For example, you can import OVF virtual machines exported from VMware Fusion™ or Oracle VM VirtualBox into Workstation Pro. You can import OVF 1.x files only.

You can also use the standalone OVF Tool to convert an OVF virtual machine to VMware runtime format. The standalone version of the OVF Tool is installed in the Workstation Pro installation directory under OVFTool. See the *OVF Tool User Guide* on the VMware Web site for information on using the OVF Tool.

Procedure

- 1 In Workstation Pro, select **File > Open**.
- 2 Browse to the .ovf or .ova file and click **Open**.
- 3 Type a name for the virtual machine, type or browse to the directory for the virtual machine files, and click **Import**.

Workstation Pro performs OVF specification conformance and virtual hardware compliance checks. A status bar indicates the progress of the import process.

- 4 If the import fails, click **Retry** to try again, or click **Cancel** to cancel the import.

If you retry the import, Workstation Pro relaxes the OVF specification conformance and virtual hardware compliance checks and you might not be able to use the virtual machine in Workstation Pro.

After Workstation Pro successfully imports the OVF virtual machine, the virtual machine appears in the virtual machine library.

Import a VMware vCenter Server Appliance

You can import a VMware vCenter[®] Server Appliance[™] and run it in Workstation Pro. You can import both .ovf and .ova files.

Procedure

- 1 In Workstation Pro, select **File > Open**.
- 2 Browse to the vCenter Server Appliance .ovf or .ova file and click **Open**.
- 3 Select the license agreement check box and click **Next**.
- 4 Continue through the wizard, responding to prompts and clicking through to the next dialog box.
- 5 If the import fails, click **Retry** to try again, or click **Cancel** to cancel the import.

If you retry the import, Workstation Pro relaxes the OVF specification conformance and virtual hardware compliance checks and you might not be able to use the virtual machine in Workstation Pro.

After Workstation Pro successfully imports the vCenter Server Appliance as a virtual machine, the virtual machine appears in the virtual machine library. Workstation Pro then powers on the virtual machine and applies the vCenter Server Appliance configuration.

Import a Windows Virtual PC Virtual Machine

You can import a Windows Virtual PC virtual machine and run it in Workstation Pro. Workstation Pro converts the virtual machine from Virtual PC (.vmc) format to VMware runtime (.vmx) format. This feature is supported only on Windows host systems.

Prerequisites

Download and install the Virtual PC virtual machine on the Windows host system.

Procedure

- 1 In Workstation Pro, select **File > Open**.

If you have never imported a third-party virtual machine or virtualized a physical machine in Workstation Pro, Workstation Pro installs VMware vCenter Converter Standalone. After the installation is finished, you must restart the import.
- 2 Browse to the .vmc file and click **Open**.

- 3 Type a name for the virtual machine, type or browse to the directory for the virtual machine files, and click **Import**.

After Workstation Pro successfully imports the Virtual PC virtual machine, the virtual machine appears in the virtual machine library.

Installing and Upgrading VMware Tools

Installing VMware Tools is part of the process of creating a new virtual machine. Upgrading VMware Tools is part of the process of keeping virtual machines up to current standards.

For the best performance and latest updates, install or upgrade VMware Tools to match the version of Workstation Pro that you are using. Other compatibility options are also available.

For more information about using VMware Tools, see *Installing and Configuring VMware Tools* at <http://www.vmware.com/pdf/vmware-tools-installation-configuration.pdf>.

- **Installing VMware Tools**

Installing VMware Tools is part of the process of creating a new virtual machine, and upgrading VMware Tools is part of the process of keeping your virtual machine up to current standards. Although your guest operating systems can run without VMware Tools, many VMware features are not available until you install VMware Tools. When you install VMware Tools, the utilities in the suite enhance the performance of the guest operating system in your virtual machine and improve the management of your virtual machines.

- **Upgrading VMware Tools**

You can upgrade VMware Tools manually, or you can configure virtual machines to check for and install newer versions of VMware Tools.

- **Configure Automatic Software Updates**

You can configure Workstation Pro to automatically download software updates, including new versions of VMware Tools. When automatic software updates are enabled, Workstation Pro always includes the latest support for guest operating systems and virtual machines always have the latest version of VMware Tools.

- **Configure VMware Tools Updates for a Specific Virtual Machine**

You can configure virtual machines that have Windows or Linux guest operating systems to update VMware Tools automatically. For other guest operating systems, you must manually update VMware Tools.

- **Manually Installing and Upgrading VMware Tools**

You can manually install or upgrade VMware Tools on Windows, Linux, NetWare, Solaris, and FreeBSD virtual machines.

- **Starting the VMware User Process Manually If You Do Not Use a Session Manager**

VMware Tools in Linux, Solaris, and FreeBSD guest operating systems uses the VMware user process. This program implements the fit-guest-to-window and other features.

■ Uninstalling VMware Tools

If the upgrade process of VMware Tools is incomplete, you can uninstall and then reinstall the VMware Tools.

Installing VMware Tools

Installing VMware Tools is part of the process of creating a new virtual machine, and upgrading VMware Tools is part of the process of keeping your virtual machine up to current standards. Although your guest operating systems can run without VMware Tools, many VMware features are not available until you install VMware Tools. When you install VMware Tools, the utilities in the suite enhance the performance of the guest operating system in your virtual machine and improve the management of your virtual machines.

For information about creating virtual machines, see the documentation for the applicable VMware product.

The installers for VMware Tools are ISO image files. The CD-ROM in your guest operating system detects the ISO image file. Each type of guest operating system, including Windows, Linux, and Mac OS X, has an ISO image file. When you select the command to install or upgrade VMware Tools, the virtual machine's first virtual CD-ROM disk drive temporarily connects to the VMware Tools ISO file for your guest operating system.

You can use the Windows Easy Install or Linux Easy Install feature to install VMware Tools as soon as the operating system is finished installing.

The most recent versions of the ISO files are stored on a VMware Web site. When you select the command to install or upgrade VMware Tools, the VMware product determines whether it has downloaded the most recent version of the ISO file for the specific operating system. If the latest version has not been downloaded or if no VMware Tools ISO file for that operating system has ever been downloaded, you are prompted to download the file.

- VMware Tools installer from `windows.iso` automatically detects the windows version. It does not proceed with the installation on guest operating systems earlier than Windows Vista.
- VMware Tools installer from `winPreVista.iso` does not proceed with the installation on Windows Vista and later.
- VMware Tools installer from `linux.iso` does not proceed with installation on Linux guest operating system versions earlier than RHEL5, SLES 11, Ubuntu 10.04, and other Linux distributions with `glibc` version earlier than 2.5.
- VMware Tools installer from `darwinPre15.iso` does not proceed with installation on MAC OS X guest operating systems versions 10.11 or later.
- VMware Tools installer from `darwin.iso` does not proceed with installation on MAC OS X guest operating systems versions earlier than 10.11.

The installation procedure varies, depending on the operating system. For information about installing or upgrading VMware Tools on your guest operating systems, see the topic about upgrading virtual machines in the *Virtual Machine Administration Guide*. For general instructions about installing VMware Tools, see the VMware Knowledge base article <http://kb.vmware.com/kb/1014294>.

Upgrading VMware Tools

You can upgrade VMware Tools manually, or you can configure virtual machines to check for and install newer versions of VMware Tools.

The guest operating system checks the version of VMware Tools when you power on a virtual machine. The status bar of your virtual machine displays a message when a new version is available.

For vSphere virtual machines,

A newer version of Tools is available for this VM

is displayed when the installed version of VMware Tools is out of date.

In Windows virtual machines, you can set VMware Tools to notify you when an upgrade is available. If this notification option is enabled, the VMware Tools icon in the Windows taskbar includes a yellow caution icon when a VMware Tools upgrade is available.

To install a VMware Tools upgrade, you can use the same procedure that you used for installing VMware Tools the first time. Upgrading VMware Tools means installing a new version.

For Windows and Linux guest operating systems, you can configure the virtual machine to automatically upgrade VMware Tools. Although the version check is performed when you power on the virtual machine, on Windows guest operating systems, the automatic upgrade occurs when you power off or restart the virtual machine. The status bar displays the message *Installing VMware Tools ...* when an upgrade is in progress. The procedure is mentioned below.

Note Upgrading VMware Tools on Windows guest operation systems automatically installs the WDDM graphics drivers. The WDDM graphics driver allows the sleep mode available in guest OS power settings to adjust the sleep options. For example, you can use the sleep mode setting **Change when the computer sleeps** to configure your guest OS to automatically go to sleep mode after a certain time or prevent your guest OS from automatically switching to sleep mode after being idle for some time.

Some features in a particular release of a VMware product might depend on installing or upgrading to the version of VMware Tools included in that release. Upgrading to the latest version of VMware Tools is not always necessary. Newer versions of VMware Tools are compatible with several host versions. To avoid unnecessary upgrades, evaluate whether the added features and capabilities are necessary for your environment.

Configure Automatic Software Updates

You can configure Workstation Pro to automatically download software updates, including new versions of VMware Tools. When automatic software updates are enabled, Workstation Pro always includes the latest support for guest operating systems and virtual machines always have the latest version of VMware Tools.

Prerequisites

- On a Linux host, become root. On Linux systems, non-root users are not allowed to modify the preference setting for VMware Tools updates.
- Verify that the host system is connected to the Internet.

Procedure

- 1 Select **Edit > Preferences** and select **Updates**.
- 2 Select a software update download option.

If you deselect all of the software update options, automatic software updates are disabled.

Option	Description
Check for product updates on startup	When Workstation Pro starts, it checks for new versions of the application and installed software components.
Check for software components as needed	When a software component is needed, for example, when you install or upgrade VMware Tools on a virtual machine, Workstation Pro checks for a new version of the component.
Download All Components Now	Click this button to download all software updates immediately. This option is useful if you are planning to use a virtual machine at a later time when you do not have access to the Internet.

- 3 If you use a proxy server to connect to the Internet, click **Connection Settings** and select a proxy setting.

Option	Description
No proxy	Select this option if you do not use a proxy server. This is the default setting.
Windows proxy settings	(Windows hosts only) Workstation Pro uses the host proxy settings from the Connections tab in the Internet Options control panel to access the VMware Update Server. Click Internet Options to set the guest connection options. Type a user name and password to use for proxy server authentication. If you leave either the Username or Password text box blank, Workstation Pro does not use either value.
Manual proxy settings	Select an HTTP or SOCKS proxy, specify the proxy server address and designate a port number to access the VMware Update Server. Type a user name and password to use for proxy server authentication. If you leave either the Username or Password text box blank, Workstation Pro does not use either value (Windows hosts) or it uses the user name and password set in the gnome settings (Linux hosts).

- 4 To update VMware Tools when you power on a virtual machine or shut down the guest operating system, select **Automatically update VMware Tools on a virtual machine**.

You can override this setting for a specific virtual machine by modifying virtual machine settings.

When you power on a virtual machine, you are prompted to download VMware Tools if a new version is available.

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

What to do next

To override the VMware Tools update setting for a specific virtual machine, edit the virtual machine settings. See [Configure VMware Tools Updates for a Specific Virtual Machine](#).

Configure VMware Tools Updates for a Specific Virtual Machine

You can configure virtual machines that have Windows or Linux guest operating systems to update VMware Tools automatically. For other guest operating systems, you must manually update VMware Tools.

Automatic VMware Tools updates are supported for versions of VMware Tools included in Workstation 5.5 and later virtual machines only. Automatic updates are not supported for versions of VMware Tools included in virtual machines created with VMware Server 1.x.

Important If you update VMware Tools in a Windows virtual machine that was created with Workstation 4 or 5.x, some new components are not installed. To install the new components, you must uninstall the old version of VMware Tools and install the new version of VMware Tools.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **VMware Tools**.

3 Select a VMware Tools update setting.

Option	Description
Update manually (do nothing)	You must update VMware Tools manually. The virtual machine status bar indicates when a new version of VMware Tools is available.
Update automatically	VMware Tools is updated automatically. The virtual machine status bar indicates when an update is in progress. If you are logged in to a Windows guest, a restart prompt appears after the update is complete. If you are not logged in, the operating system restarts without prompting. An auto-update check is performed as part of the boot sequence when you power on the virtual machine. If the virtual machine was suspended and you resume it or restore it to a snapshot during the boot sequence before this check, the automatic update occurs as planned. If you resume the virtual machine or restore it to a snapshot after the check, the automatic update does not occur.
Use application default (currently update manually)	Use the default VMware Tools update behavior. The default behavior is set in Workstation Pro preferences.
Note You cannot configure this option for a shared or remote virtual machine.	

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

Manually Installing and Upgrading VMware Tools

You can manually install or upgrade VMware Tools on Windows, Linux, NetWare, Solaris, and FreeBSD virtual machines.

If you are installing VMware Tools in a number of Windows virtual machines, you can automate its installation by using the VMware Tools `setup.exe` at a command prompt in the guest operating system.

See *Installing and Configuring VMware Tools* at

<http://www.vmware.com/pdf/vmware-tools-installation-configuration.pdf> for more information.

- **Manually Installing VMware Tools on a Windows Virtual Machine**

Guest operating system Windows 2000 and earlier, Windows XP, Windows Server 2003, Windows Vista, and later support VMware Tools.

- **Manually Installing VMware Tools on a Linux Virtual Machine**

For Linux virtual machines, you manually install VMware Tools from the command line. For later Linux distributions, use the integrated open-vm-tools version.

- **Manually Installing VMware Tools on a NetWare Virtual Machine**

For NetWare virtual machines, you manually install or upgrade VMware Tools by using the command line.

- **Manually Installing VMware Tools on a Solaris Virtual Machine**

For Solaris virtual machines, you manually install or upgrade VMware Tools by using the command line.

- **Manually Installing VMware Tools on a FreeBSD Virtual Machine**

For FreeBSD virtual machines, you manually install or upgrade VMware Tools by using the command line.

Manually Installing VMware Tools on a Windows Virtual Machine

Guest operating system Windows 2000 and earlier, Windows XP, Windows Server 2003, Windows Vista, and later support VMware Tools.

For Windows 2000 and later, VMware Tools installs a virtual machine upgrade helper tool. This tool restores the network configuration if you upgrade the virtual machine compatibility from ESX/ESXi 3.5 to ESX/ESXi 4.0 and later or from Workstation 5.5 to Workstation 6.0 and later.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- If you connected the virtual machine's virtual CD/DVD drive to an ISO image file when you installed the operating system, change the setting so that the virtual CD/DVD drive is configured to autodetect a physical drive.

The autodetect setting enables the virtual machine's first virtual CD/DVD drive to detect and connect to the VMware Tools ISO file for a VMware Tools installation. This ISO file is detected as a physical CD by your guest operating system. Use the virtual machine settings editor to set the CD/DVD drive to autodetect a physical drive.

- Log in as an administrator unless you are using an older Windows operating system. Any user can install VMware Tools in a Windows 95, Windows 98, or Windows ME guest operating system. For operating systems later than these, you must log in as an administrator.

Procedure

- 1 On the host, from the Workstation Pro menu bar, select **VM > Install VMware Tools**.

If an earlier version of VMware Tools is installed, the menu item is **Update VMware Tools**.

- 2 If you are installing VMware Tools for the first time, click **OK** on the Install VMware Tools information page.

If autorun is enabled for the CD-ROM drive on the guest operating system, the VMware Tools installation wizard starts.

If autorun is not enabled, to manually launch the wizard, click **Start > Run** and enter **D:\setup.exe**, where **D:** is your first virtual CD-ROM drive. Use **D:\setup64.exe** for 64-bit Windows guest operating system.

- 3 Follow the on-screen prompts.
- 4 If the New Hardware wizard appears, follow the prompts and accept the defaults.

Note If you are installing a beta or RC version of VMware Tools and you see a warning that a package or driver is not signed, click **Install Anyway** to complete the installation.

- 5 When prompted, reboot the virtual machine.

What to do next

If a new virtual hardware version is available for the virtual machine, upgrade the virtual hardware.

Manually Installing VMware Tools on a Linux Virtual Machine

For Linux virtual machines, you manually install VMware Tools from the command line. For later Linux distributions, use the integrated open-vm-tools version.

Prerequisites

For more information on OS compatibility for open-vm-tools, see the *VMware Compatibility Guide* at <https://www.vmware.com/resources/compatibility/search.php>.

- Power on the virtual machine.
- Verify that the guest operating system is running.
- Because the VMware Tools installer is written in Perl, verify that Perl is installed in the guest operating system.

Procedure

- 1 On the host, from the Workstation Pro menu bar, select **VM > Install VMware Tools**.

If an earlier version of VMware Tools is installed, the menu item is **Update VMware Tools**.

- 2 In the virtual machine, open a terminal window.
- 3 Run the `mount` command with no arguments to determine whether your Linux distribution automatically mounted the VMware Tools virtual CD-ROM image.

If the CD-ROM device is mounted, the CD-ROM device and its mount point are listed in a manner similar to the following output:

```
/dev/cdrom on /mnt/cdrom type iso9660 (ro,nosuid,nodev)
```

- 4 If the VMware Tools virtual CD-ROM image is not mounted, mount the CD-ROM drive.
 - a If a mount point directory does not already exist, create it.

```
mkdir /mnt/cdrom
```

Some Linux distributions use different mount point names. For example, on some distributions the mount point is `/media/VMware Tools` rather than `/mnt/cdrom`. Modify the command to reflect the conventions that your distribution uses.

- b Mount the CD-ROM drive.

```
mount /dev/cdrom /mnt/cdrom
```

Some Linux distributions use different device names or organize the `/dev` directory differently. If your CD-ROM drive is not `/dev/cdrom` or if the mount point for a CD-ROM is not `/mnt/cdrom`, modify the command to reflect the conventions that your distribution uses.

- 5 Change to a working directory, for example, /tmp.

```
cd /tmp
```

- 6 (Optional) Delete any previous `vmware-tools-distrib` directory before you install VMware Tools.

The location of this directory depends on where you placed it during the previous installation. Often this directory is placed in `/tmp/vmware-tools-distrib`.

- 7 List the contents of the mount point directory and note the file name of the VMware Tools tar installer.

```
ls mount-point
```

- 8 Uncompress the installer.

```
tar xpf /mnt/cdrom/VMwareTools-x.x.x-yyyy.tar.gz
```

The value `x.x.x` is the product version number, and `yyyy` is the build number of the product release.

- 9 If necessary, unmount the CD-ROM image.

```
umount /dev/cdrom
```

If your Linux distribution automatically mounted the CD-ROM, you do not need to unmount the image.

- 10 Run the installer and configure VMware Tools as a root user

```
cd vmware-tools-distrib
sudo ./vmware-install.pl
```

Usually, the `vmware-config-tools.pl` configuration file runs after the installer file finishes running. If you attempt to install a tar installation over an RPM installation, or the reverse, the installer detects the previous installation and must convert the installer database format before continuing.

Note For newer Linux distributions, users are prompted to choose the integrated open-vm-tools.

- 11 Follow the prompts to accept the default values, if appropriate for your configuration.

- 12 Follow the instructions at the end of the script.

Depending on the features you use, these instructions can include restarting the X session, restarting networking, logging in again, and starting the VMware User process. You can alternatively reboot the guest operating system to accomplish all these tasks.

What to do next

If a new virtual hardware version is available for the virtual machine, upgrade the virtual hardware.

Manually Installing VMware Tools on a NetWare Virtual Machine

For NetWare virtual machines, you manually install or upgrade VMware Tools by using the command line.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- Because the VMware Tools installer is written in Perl, verify that Perl is installed in the guest operating system.

Note VMware Tools 10.1.0 does not support the NetWare operating system.

Procedure

- 1 On the host, from the Workstation Pro menu bar, select **VM > Install VMware Tools**.
If an earlier version of VMware Tools is installed, the menu item is **Update VMware Tools**.
- 2 Load the CD-ROM driver so that the virtual CD-ROM device mounts the ISO image as a volume.

Operating System	Command
NetWare 6.5	LOAD CDDVD
NetWare 6.0 or NetWare 5.1	LOAD CD9660.NSS
NetWare 4.2 (not available in vSphere)	load cdrom

When the installation finishes, the message VMware Tools for NetWare are now running appears in the Logger Screen for NetWare 6.5 and NetWare 6.0 guest operating systems and in the Console Screen for NetWare 4.2 and 5.1 operating systems.

- 3 If the VMware Tools virtual disc (netware.iso) is attached to the virtual machine, right-click the CD-ROM icon in the status bar of the console window and select **Disconnect**.

What to do next

If a new virtual hardware version is available for the virtual machine, upgrade the virtual hardware.

Manually Installing VMware Tools on a Solaris Virtual Machine

For Solaris virtual machines, you manually install or upgrade VMware Tools by using the command line.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- Because the VMware Tools installer is written in Perl, verify that Perl is installed in the guest operating system.

Procedure

- 1 On the host, from the Workstation Pro menu bar, select **VM > Install VMware Tools**.
If an earlier version of VMware Tools is installed, the menu item is **Update VMware Tools**.
- 2 In the virtual machine, log in to the guest operating system as root and open a terminal window.

- 3 If the Solaris volume manager does not mount the CD-ROM under `/cdrom/vmwaretools`, restart the volume manager.

```
/etc/init.d/volmgt stop
/etc/init.d/volmgt start
```

- 4 Change to a working directory, for example, `/tmp`.

```
cd /tmp
```

- 5 Extract VMware Tools.

```
gunzip -c /cdrom/vmwaretools/vmware-solaris-tools.tar.gz | tar xf -
```

- 6 Run the installer and configure VMware Tools.

```
cd vmware-tools-distrib
./vmware-install.pl
```

Usually, the `vmware-config-tools.pl` configuration file runs after the installer file finishes running.

- 7 Follow the prompts to accept the default values, if appropriate for your configuration.

- 8 Follow the instructions at the end of the script.

Depending on the features you use, these instructions can include restarting the X session, restarting networking, logging in again, and starting the VMware User process. You can alternatively reboot the guest operating system to accomplish all these tasks.

What to do next

If a new virtual hardware version is available for the virtual machine, upgrade the virtual hardware.

Manually Installing VMware Tools on a FreeBSD Virtual Machine

For FreeBSD virtual machines, you manually install or upgrade VMware Tools by using the command line.

Prerequisites

- Power on the virtual machine.
- Verify that the guest operating system is running.
- Because the VMware Tools installer is written in Perl, verify that Perl is installed in the guest operating system.

Procedure

- 1 On the host, from the Workstation Pro menu bar, select **VM > Install VMware Tools**.

If an earlier version of VMware Tools is installed, the menu item is **Update VMware Tools**.

- 2 In the virtual machine, log in to the guest operating system as root and open a terminal window.

- 3 If the distribution does not automatically mount CD-ROMs, mount the VMware Tools virtual CD-ROM image.

For example, type `mount /cdrom`.

- 4 Change to a working directory, for example, `/tmp`.

```
cd /tmp
```

- 5 Untar the VMware Tools `.tar.gz` file.

```
tar xpf /cdrom/vmware-freebsd-tools.tar.gz
```

- 6 If the distribution does not use automounting, unmount the VMware Tools virtual CD-ROM image.

```
umount /cdrom
```

- 7 Run the installer and configure VMware Tools.

```
cd vmware-tools-distrib
./vmware-install.pl
```

Usually, the `vmware-config-tools.pl` configuration file runs after the installer file finishes running.

- 8 Follow the prompts to accept the default values, if appropriate for your configuration.

- 9 Follow the instructions at the end of the script.

Depending on the features you use, these instructions can include restarting the X session, restarting networking, logging in again, and starting the VMware User process. You can alternatively reboot the guest operating system to accomplish all these tasks.

What to do next

If a new virtual hardware version is available for the virtual machine, upgrade the virtual hardware.

Starting the VMware User Process Manually If You Do Not Use a Session Manager

VMware Tools in Linux, Solaris, and FreeBSD guest operating systems uses the VMware user process. This program implements the fit-guest-to-window and other features.

Normally, this process starts after you configure VMware Tools, log out of the desktop environment, and log back in. You can invoke the VMware user process by running the `vmtoolsd -n vmusr` command. The startup script that you need to modify depends on your system. You must start the process manually in the following environments:

- If you run an X session without a session manager. For example, if you use `startx` to start a desktop session and do not use `xdm`, `kdm`, or `gdm`.
- If you are using an older version of GNOME without `gdm` or `xdm`.

- If you are using a session manager or environment that does not support the Desktop Application Autostart Specification, available from <http://standards.freedesktop.org>.
- If you upgrade VMware Tools.

Procedure

- ◆ Start the VMware User process.

Option	Action
Start the VMware User process when you start an X session.	Add <code>vmtoolsd -n vmusr</code> to the appropriate X startup script, such as the <code>.xsession</code> or <code>.xinitrc</code> file.
Start the process after a VMware Tools software upgrade, or if certain features are not working.	Open a terminal window and type the <code>vmtoolsd -n vmusr</code> command.

Uninstalling VMware Tools

If the upgrade process of VMware Tools is incomplete, you can uninstall and then reinstall the VMware Tools.

Prerequisites

- Power on the virtual machine.
- Log in to the guest operating system.

Procedure

- ◆ Select a method to uninstall VMware Tools.

Operating System	Action
Windows 7, 8, 8.1, or Windows 10	In the guest operating system, select Programs > Uninstall a program .
Windows Vista and Windows Server 2008	In the guest operating system, select Programs and Features > Uninstall a program .
Windows XP and earlier	In the guest operating system, select Add/Remove Programs .
Linux	Log in as root and enter <code>vmware-uninstall-tools.pl</code> in a terminal window.
Mac OS X, OS X, or macOS	Use the Uninstall VMware Tools application, found in <code>/Library/Application Support/VMware Tools</code> .

What to do next

Reinstall VMware Tools.

Virtual Machine Files

When you create a virtual machine, Workstation Pro creates a set of files for that specific virtual machine. Virtual machine files are stored in either the virtual machines directory or the working directory. Both directories are typically on the host system.

Table 3-9. Virtual Machine Files

Extension	File Name	Description
.vmx	<i>vmname.vmx</i>	The primary configuration file, which stores virtual machine settings. If you created the virtual machine with an earlier version of Workstation Pro on a Linux host, this file might have a .cfg extension.
.log	<i>vmname.log</i> or <i>vmware.log</i>	The main log file. If you need to troubleshoot a problem, refer to this file. This file is stored in the same directory as the .vmx file.
.nvram	<i>vmname.nvram</i> or <i>nvram</i>	The NVRAM file, which stores the state of the virtual machine BIOS. This file is stored in the same directory as the .vmx file.
.vmdk	<i>vmname.vmdk</i>	Virtual disk files, which store the contents of the virtual machine hard disk drive. These files are stored in the same directory as the .vmx file. A virtual disk is made up of one or more virtual disk files. The virtual machine settings show the name of the first file in the set. This file contains pointers to the other files in the set. If you specify that all disk space should be allocated when the virtual disk is created, these files start at the maximum size and do not grow. Almost all of the file content is virtual machine data. A small portion of the file is allotted to virtual machine overhead. If the virtual machine is connected directly to a physical disk, the virtual disk file stores information about the partitions that the virtual machine is allowed to access. Note Earlier VMware products use the .dsk extension for virtual disk files.
	<i>vmname-s###.vmdk</i>	If you specified that the files can increase, filenames include an s in the file number, for example, Windows 7-s001.vmdk. If you specified that the virtual disk is divided into 2GB sections, the number of files depends on the size of the virtual disk. As data is added to a virtual disk, the files increase to a maximum of 2GB each.
	<i>vmname-f###.vmdk</i>	If all disk space was allocated when the disk was created, filenames include an f, for example, Windows 7-f001.vmdk.
	<i>vmname-disk-###.vmdk</i>	If the virtual machine has one or more snapshots, some files are redo log files. These files store changes made to a virtual disk while the virtual machine is running. The ### indicates a unique suffix that Workstation Pro adds to avoid duplicate file names.
.vmem	<i>uuid.vmem</i>	The virtual machine paging file, which backs up the guest main memory on the host file system. This file exists only when the virtual machine is running or if the virtual machine fails. It is stored in the working directory.
	<i>snapshot_name_number.vmem</i>	Each snapshot of a virtual machine that is powered on has an associated .vmem file, which contains the guest operating system main memory, saved as part of the snapshot.
.vmsd	<i>vmname.vmsd</i>	A centralized file for storing information and metadata about snapshots. It is stored in the working directory.

Table 3-9. Virtual Machine Files (Continued)

Extension	File Name	Description
.vmsn	<i>vmname</i> .Snapshot.vmsn	The snapshot state file, which stores the running state of a virtual machine at the time you take that snapshot. It is stored in the working directory.
	<i>vmname</i> .Snapshot###.vmsn	The file that stores the state of a snapshot.
.vmss	<i>vmname</i> .vmss	The suspended state file, which stores the state of a suspended virtual machine. It is stored in the working directory. Some earlier VMware products used the .std extension for suspended state files.

Other files, such as lock files, might also be present in the virtual machines directory. Some files are present only while a virtual machine is running.

Using Virtual Machines

When you use virtual machines in Workstation Pro, you can transfer files and text between virtual machines and the host system, print to host printers, connect removable devices, and change display settings. You can use folders to manage multiple virtual machines, take snapshots to preserve virtual machine states, and create screenshots and movies of virtual machines.

You can also use Workstation Pro to interact with remote virtual machines. See [Chapter 9 Using Remote Connections and Sharing Virtual Machines](#) for more information.

This chapter includes the following topics:

- [Scan for Virtual Machines to Add to the Virtual Machine Library](#)
- [Starting Virtual Machines](#)
- [Stopping Virtual Machines](#)
- [Transferring Files and Text](#)
- [Add a Host Printer to a Virtual Machine](#)
- [Using Removable Devices in Virtual Machines](#)
- [Changing the Virtual Machine Display](#)
- [Using Folders to Manage Virtual Machines](#)
- [Taking Snapshots of Virtual Machines](#)
- [Install New Software in a Virtual Machine](#)
- [Take a Screenshot of a Virtual Machine](#)
- [Delete a Virtual Machine](#)

Scan for Virtual Machines to Add to the Virtual Machine Library

You can quickly add multiple virtual machines to the virtual machine library by initiating a scan.

You can manually select and add virtual machines to the virtual machine library. Alternatively, you can initiate a scan that locates virtual machines in a folder, removable storage device, or hard disk of your choice. In the context of a scan, files with the `.vmx` extension are considered virtual machines.

Procedure

- 1 Select **File > Scan for Virtual Machines**.
- 2 In the **Select a location to scan** text box, enter or browse for a location, such as a folder, removable storage device, or hard disk.
- 3 Click **Next**.
- 4 (Optional) If Workstation Pro is scanning the location for virtual machines, but the scan is taking too long, click **Stop Scan**.
- 5 Select the virtual machines to add and the library node in which to add them.
 - a Select the virtual machines.

Option	Description
To select individual virtual machines	Click Unselect All and select the check boxes next to the virtual machines that you want to add to the library.
To select all virtual machines	If not selected, click Select All .

- b (Optional) To use the same folder hierarchy in the library, click **Match the file system folder hierarchy in the library**.
 - c To continue, click the appropriate option, depending on which option is available.

Option	Description
Finish	If the scan location is on the local machine, the Finish option is available.
Next	If the scan location is on a remote server or removable storage device, the Next option is available.

- d If the location of the virtual machines you are adding to the library is on a remote server or a removable storage device, select the options in the **Copy to local disk options** dialog box that meet your needs and click **Finish**.

Option	Description
Copy all selected virtual machines to	Select this option to copy the selected virtual machines to your local machine. If you do not select this option, the virtual machines remain on the remote server or removable storage device.
Browse	If you select the copy virtual machine option and you do not want to accept the default virtual machine location, you can browse to a location in which to copy the virtual machines.
Keep the hierarchy of the folder in target location	If you select the copy virtual machine option, you can select this option to use the same folder hierarchy used in the remote server or removable storage device in the target location on your local machine.

- e Review the progress and results of the operation on the **Result** dialog box and click the appropriate options.

Option	Description
Stop	If the process is taking too long, click Stop to cancel the operation.
Close	Click Close to close the Result dialog box.

Starting Virtual Machines

When you start a virtual machine, the guest operating system starts and you can interact with the virtual machine. You can use Workstation Pro to start virtual machines on the host system and on remote servers.

To start a virtual machine from the command line, use the `vmware` command. See [Chapter 15 Using the vmware Command](#).

■ [Start a Virtual Machine](#)

You can start a virtual machine from the **VM** menu or from the toolbar. When you use the **VM** menu, you can select a soft or hard power option or start the virtual machine in BIOS setup mode.

■ [Start a Virtual Machine That Is Running in the Background](#)

You can start a virtual machine that is running in the background when Workstation Pro is not started.

■ [Enable Autologon in a Windows Virtual Machine](#)

With Autologon, you can save your login credentials and bypass the login dialog box when you power on a Windows virtual machine. The guest operating system securely stores the password.

■ [Configure a Firmware Type](#)

You can select the firmware type for a virtual machine.

Start a Virtual Machine

You can start a virtual machine from the **VM** menu or from the toolbar. When you use the **VM** menu, you can select a soft or hard power option or start the virtual machine in BIOS setup mode.

When virtual machines are in a folder, you can perform batch power operations. See [Using Folders to Manage Virtual Machines](#).

You can use the AutoStart feature to configure shared and remote virtual machines to start when the host system starts. See [Manage Virtual Machine Power Actions on Shared and Remote Hosts](#).

Prerequisites

- If the virtual machine is on the local host, select **File > Open** and browse to the virtual machine configuration (.vmx) file.
- If the virtual machine is on a remote host, connect to the remote server. See [Connect to a Remote Server](#).

Procedure

- To select a power option when you start the virtual machine, select the virtual machine and select **VM > Power**.

Option	Description
Power On	(Hard option) Workstation Pro starts the virtual machine.
Start Up Guest	(Soft option) Workstation Pro starts the virtual machine and VMware Tools runs a script in the guest operating system. On Windows guests, if the virtual machine is configured to use DHCP, the script renews the IP address of the virtual machine. On a Linux, FreeBSD, or Solaris guest, the script starts networking for the virtual machine.
Power On to firmware	Workstation Pro starts the virtual machine in BIOS setup mode.

- To start the virtual machine from the toolbar, select the virtual machine and click the start button.

The start power control setting that is configured for the virtual machine determines whether Workstation Pro performs a hard or soft power on operation. The configured behavior appears in a tooltip when you mouse over the button.

What to do next

Click anywhere inside the virtual machine console to give the virtual machine control of the mouse and keyboard on the host system.

Start a Virtual Machine That Is Running in the Background

You can start a virtual machine that is running in the background when Workstation Pro is not started.

Prerequisites

Set the virtual machine to run in the background. See [Closing Virtual Machines and Exiting Workstation Pro](#).

Procedure

- 1 On the host system, click the virtual machine status icon that is located in the notification area of the taskbar.

A list of the virtual machines that are running in the background appears in a tooltip. The list contains the virtual machines that belong to the currently logged in user.

- 2 Select a virtual machine from the list in the tooltip.

Workstation Pro starts and displays the console view of the virtual machine.

Enable Autologon in a Windows Virtual Machine

With Autologon, you can save your login credentials and bypass the login dialog box when you power on a Windows virtual machine. The guest operating system securely stores the password.

Use the Autologon feature if you restart the guest operating system frequently and want to avoid entering your login credentials. You can also use the Autologon feature to grant users access to the guest operating system without sharing your password.

Prerequisites

- Verify that the guest operating system is Windows 2000 or later.
- Verify that you have an existing user account to enable Autologon. The account must be a local machine account, not a domain account.
- Verify that the latest version of VMware Tools is running in the guest operating system.
- Power on the virtual machine.

Procedure

- 1 Select the virtual machine, select **VM > Settings**.
- 2 On the **Options** tab, select **Autologon**.
- 3 Click **Enable**, type your login credentials, and click **OK**.

If you type an incorrect or expired password, you must type your login credentials when you power on the virtual machine.

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

When you enable Autologon or change your login credentials, the Autologon settings are saved immediately. Clicking **Cancel** in the Virtual Machine Settings dialog box does not affect the changes applied to the Autologon settings.

Configure a Firmware Type

You can select the firmware type for a virtual machine.

You can change your firmware type of a virtual machine after you create the virtual machine.

Prerequisites

- To change the firmware type of an existing virtual machine, the guest operating system is powered off.
- The software to boot the system is installed.
- If you want to select Unified Extensible Firmware Interface (UEFI) as the firmware type, verify that the following conditions are met:
 - The guest operating system to be installed on the virtual machine supports UEFI firmware.
 - The virtual machine does not have virtualization-based security (VBS) enabled.
 - The virtual machine uses hardware version 8 or later.
 - The virtual machine has a Windows 8, Windows 10, Windows 2012, or Windows 2016 guest operating system.
- If you want to select UEFI Secure Boot, verify that the following conditions are met.
 - The virtual machine uses the UEFI firmware type.
 - The virtual machine uses hardware version 14 or later.

Procedure

- 1 In the Workstation Pro interface, select **VM > Settings**.
- 2 Click the **Options** tab and click **Advanced**.

3 In the Firmware type section, make your firmware selections.

If the guest operating system is supported and the prerequisites are met, the following firmware types are selectable.

Option	Description
UEFI	UEFI is an interface between the operating system and the platform firmware. UEFI has architectural advantages over Basic Input/Output System (BIOS) firmware.
Legacy BIOS	Standard BIOS firmware.

Note

- Once a guest operating system is installed, changing the firmware type might cause the virtual machine boot process to fail.
- If you select UEFI, depending on the guest operating system, you might have the option of enabling UEFI Secure Boot. UEFI Secure Boot secures the boot process by preventing the loading of drivers and operating system loaders that are not signed with an acceptable digital signature.
- If VBS is enabled, the firmware type is set to UEFI and the UEFI Secure Boot option is selected.
- You cannot edit the firmware type or the UEFI Secure Boot setting when VBS is enabled.

4 Click **OK**.

When you start the virtual machine, it boots with the selected firmware configuration.

Stopping Virtual Machines

You can use Workstation Pro to stop virtual machines on the host system and on remote servers. You can shut down, pause, and suspend virtual machines. You can also close virtual machines and continue running them in the background.

■ [Shut Down a Virtual Machine](#)

You can shut down a virtual machine from the **VM** menu or from the toolbar. When you use the **VM** menu, you can select a hard or soft power option.

■ [Closing Virtual Machines and Exiting Workstation Pro](#)

You can close a virtual machine that is running on the local host system without powering it off. By default, Workstation Pro prompts you to select an action when you close a powered-on virtual machine and when you exit Workstation Pro while virtual machines are running on the local host system.

■ [Pause and Unpause a Virtual Machine](#)

You can pause a virtual machine multiple times for a few seconds, or up to several minutes. The pause feature is useful when a virtual machine is engaged in an lengthy, processor-intensive activity that prevents you from using the host system to do a more immediate task.

■ [Suspend and Resume a Virtual Machine](#)

Use the suspend and resume feature to save the current state of a virtual machine. When you resume the virtual machine, the applications that were running before the suspension will resume their running state with their content unchanged.

Shut Down a Virtual Machine

You can shut down a virtual machine from the **VM** menu or from the toolbar. When you use the **VM** menu, you can select a hard or soft power option.

You are not required to power off a virtual machine that is running on the local host system before you exit Workstation Pro. You can exit Workstation Pro and leave the virtual machine running in the background. See [Closing Virtual Machines and Exiting Workstation Pro](#).

When virtual machines are in a folder, you can perform batch power operations. See [Using Folders to Manage Virtual Machines](#).

Procedure

- To select a power option when you shut down the virtual machine, select the virtual machine and select **VM > Power**.

Option	Description
Power Off	(Hard option) Workstation Pro powers off the virtual machine abruptly with no consideration for work in progress.
Shut Down Guest	(Soft option) Workstation Pro sends a shut-down signal to the guest operating system. An operating system that recognizes the signal shuts down gracefully. Not all guest operating systems respond to a shut-down signal from Workstation Pro. If the guest operating system does not respond to the signal, shut down from the guest operating system as you would a physical machine.

- To shut down the virtual machine from the toolbar, select the virtual machine and click the stop button.
The stop power control setting that is configured for the virtual machine determines whether Workstation Pro performs a hard or soft power off operation. The configured behavior appears in a tooltip when you mouse over the button.
- To shut down a virtual machine that is suspended, select the virtual machine and click **VM > Power > Power Off**.

Closing Virtual Machines and Exiting Workstation Pro

You can close a virtual machine that is running on the local host system without powering it off. By default, Workstation Pro prompts you to select an action when you close a powered-on virtual machine and when you exit Workstation Pro while virtual machines are running on the local host system.

Note When you close a remote virtual machine, the virtual machine tab closes. If the virtual machine is powered on, it continues to run on the remote host.

Table 4-1. Close and Exit Actions

Action	Description
Run in Background	Continue to run the virtual machine in the background. You can interact with the virtual machine through VNC or some other service. By default, a virtual machine status icon appears in the notification area of the taskbar on the host system. When you mouse over this icon, a tooltip shows the number of virtual machines running in the background that belong to the currently logged in user.
Suspend	Suspend the virtual machine and save its current state.
Power Off	Power off the virtual machine. By default, Workstation Pro powers off the virtual machine abruptly. The effect is the same as using the power button on a physical machine.

You can configure Workstation Pro preference settings so that virtual machines always run in the background and you are not prompted to select an action. You can also configure virtual machine option settings to control power off behavior.

Configure Virtual Machines to Always Run in the Background

You can configure Workstation Pro preference settings so that virtual machines always run in the background and you are not prompted to select an action when you close powered-on virtual machines.

Procedure

- 1 Select **Edit > Preferences**.
- 2 Select **Workspace** and select **Keep VMs running after Workstation closes**.
- 3 Click **OK** to save your changes.

Pause and Unpause a Virtual Machine

You can pause a virtual machine multiple times for a few seconds, or up to several minutes. The pause feature is useful when a virtual machine is engaged in an lengthy, processor-intensive activity that prevents you from using the host system to do a more immediate task.

Note You cannot pause a remote virtual machine.

Prerequisites

Familiarize yourself with the restrictions and limitations of the pause feature. See [Pause Feature Restrictions and Limitations](#).

Procedure

- To pause a virtual machine, select the virtual machine and select **VM > Pause**.

The virtual machine display dims and a play button appears over the display. Paused virtual machines that are configured to display on more than one monitor have a play button on each monitor.

- To pause all of the powered-on virtual machines without interacting with the Workstation Pro user interface, right-click the virtual machine status icon located in the notification area on the task bar of the host computer and select **Pause All Virtual Machines**.
- To unpause a virtual machine, click the play button on the virtual machine display or deselect **VM > Pause**.

Pause Feature Restrictions and Limitations

The pause feature has certain restrictions and limitations.

- You cannot switch to Unity mode when a virtual machine is paused.
- When paused, a virtual machine does not send or receive network packets. If a virtual machine is paused for more than a few minutes, some network connections might be interrupted.
- If you take a snapshot when the virtual machine is paused, the virtual machine is not paused when you restore that snapshot. Similarly, if you suspend a virtual machine while it is paused, it is not paused when you resume the virtual machine.
- If you initiate soft power operations when a virtual machine is paused, those operations do not take effect until the virtual machine is unpaused.
- While a virtual machine is paused, LEDs and devices remain enabled, but device connection changes do not take effect until the virtual machine is unpaused.
- You cannot pause a remote virtual machine.

Suspend and Resume a Virtual Machine

Use the suspend and resume feature to save the current state of a virtual machine. When you resume the virtual machine, the applications that were running before the suspension will resume their running state with their content unchanged.

How quickly the suspend operation performs depends on the how much data changed after you started the virtual machine. The first suspend operation usually takes longer than subsequent suspend operations. When you suspend a virtual machine, Workstation Pro creates a virtual machine suspended state (.vmss or .vmem) file set in the working directory. How quickly the resume operation performs depends on how active the virtual machine is. The more active the virtual machine is, the longer it will take to resume. It also depends on whether the virtual machine suspended state (.vmss or .vmem) file set is already in the physical memory of the host system. If it is, the virtual machine will resume much faster.

After you resume a virtual machine and do more work, you cannot return to the state that the virtual machine was in when you suspended it. To return to the same state repeatedly, you must take a snapshot.

When virtual machines are in a folder, you can perform batch power operations. See [Using Folders to Manage Virtual Machines](#).

Procedure

- To select a suspend option when you suspend a virtual machine, select the virtual machine and select **VM > Power**.

Option	Description
Suspend	(Hard option) Workstation Pro suspends the virtual machine and leaves it connected to the network.
Suspend Guest	(Soft option) Workstation Pro suspends the virtual machine and disconnects it from the network. VMware Tools runs a script in the guest operating system. On Windows guests, if the virtual machine is configured to use DHCP, the script releases the IP address of the virtual machine. On Linux, FreeBSD, and Solaris guests, the script stops networking for the virtual machine.

- To suspend a virtual machine from the toolbar, select the virtual machine and click the suspend button.

The suspend power control setting that is configured for the virtual machine determines whether Workstation Pro performs a hard or soft suspend operation. The configured behavior appears in a tooltip when you mouse over the button.

- To select a resume option when you resume a suspended virtual machine, select the virtual machine and select **VM > Power**.

Option	Description
Resume	(Hard option) Workstation Pro resumes the virtual machine from the suspended state.
Resume Guest	(Soft option) Workstation Pro resumes the virtual machine from the suspended state and reconnects it to the network.

- To resume a virtual machine from the toolbar, select the virtual machine and click the resume button.

The suspend power control setting that is configured for the virtual machine determines whether Workstation Pro performs a hard or soft resume operation. The configured behavior appears in a tooltip when you mouse over the button.

- To power off a suspended virtual machine, select the virtual machine and click **VM > Power > Power Off**.

Using the Guest ACPI S1 Sleep Feature on Windows Hosts

On Windows hosts, Workstation Pro provides experimental support for guest operating system ACPI S1 sleep. Not all guest operating systems support this feature. Common guest operating system interfaces for entering standby mode are supported.

By default, ACPI S1 sleep is implemented in Workstation Pro as suspend. You can use the Workstation Pro **Resume** button to wake the guest operating system.

You can implement ACPI S1 sleep as power-on suspend. The guest operating system is not fully powered down. This feature can be useful for test and development scenarios. You can wake the virtual machine through keyboard input, mouse input, or by programming the CMOS external timer.

Transferring Files and Text

You can use the drag-and-drop feature, the copy and paste feature, shared folders, and mapped drives to transfer files and text between the host system and virtual machines and between virtual machines.

- [Using the Drag-and-Drop Feature](#)

You can use the drag-and-drop feature to move files and directories, email attachments, plain text, formatted text, and images between the host system and virtual machines.

- [Using the Copy and Paste Feature](#)

You can cut, copy, and paste text between virtual machines and between applications running in virtual machines.

- [Using Shared Folders](#)

You can use shared folders to share files among virtual machines and between virtual machines and the host system. The directories that you add as shared folders can be on the host system, or they can be network directories that are accessible from the host computer.

- [Mapping a Virtual Disk to the Host System](#)

Instead of using shared folders or copying data between a virtual machine and the host system, you can map a virtual disk to the host system. In this case, you map a virtual disk in the host file system as a separate mapped drive. Using a mapped drive lets you connect to the virtual disk without going into a virtual machine.

Using the Drag-and-Drop Feature

You can use the drag-and-drop feature to move files and directories, email attachments, plain text, formatted text, and images between the host system and virtual machines.

You can drag files or directories between the following locations.

- File managers, such as Windows Explorer, on the host system and virtual machines.
- A file manager to an application that supports drag-and-drop.
- Applications, such as zip file managers, which support drag-and-drop extraction of individual files.
- Different virtual machines.

When you drag a file or folder between the host and a virtual machine, Workstation Pro copies the file or folder to the location where you drop it. For example, if you drop a file on the desktop icon of a word processor, the word processor opens a copy of the original file. The original file does not include changes that you make to the copy.

Initially, the application opens a copy of the file that is stored in the temp directory. On Windows, the temp directory is specified in the %TEMP% environment variable. On Linux and Solaris, the temp directory is /tmp/VMwareDnD. Save the file in a different directory to protect changes that you make.

Drag-and-Drop Requirements and Restrictions

The drag-and-drop feature has certain requirements and restrictions.

- You must install VMware Tools in a virtual machine to use the drag-and-drop feature.
- The drag-and-drop feature requires Linux hosts and guests to run X Windows and Solaris 10 guests to run an Xorg X server and JDS/Gnome.
- You can drag images between applications on Windows hosts and applications on Windows guests only. Dragging images is not supported for Linux hosts or guests.
- You can drag files and directories, email attachments, plain text, and formatted text between Linux and Windows hosts and Linux, Windows, and Solaris 10 guests only.
- Dragging email attachments is restricted to images or files smaller than 4 MB.
- Dragging plain text and formatted text (including the formatting) is restricted to amounts less than 4 MB.
- Dragging text is restricted to text in languages that can be represented by Unicode characters.
- Workstation Pro uses the PNG format to encode images that are dragged. Dragging images is restricted to images smaller than 4 MB after conversion to PNG format.

Disable the Drag-and-Drop Feature

The drag-and-drop feature is enabled by default when you create a virtual machine in Workstation Pro. To prevent dragging and dropping between a virtual machine and the host system, disable the drag-and-drop feature.

Note You cannot enable or disable the drag-and-drop feature for a shared or remote virtual machine.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Guest Isolation**.
- 3 Deselect **Enable drag and drop**.
- 4 Click **OK** to save your changes.

Using the Copy and Paste Feature

You can cut, copy, and paste text between virtual machines and between applications running in virtual machines.

You can also cut, copy, and paste images, plain text, formatted text, and email attachments between applications running on the host system and applications running in virtual machines.

Copy and Paste Requirements and Restrictions

The copy and paste feature has certain requirements and restrictions.

- You must install VMware Tools in a virtual machine to use the copy and paste feature.
- The copy and paste feature works with Linux and Windows hosts and Linux, Windows, and Solaris 10 guests only.
- The copy and paste feature requires Linux hosts and guests to run X Windows and Solaris 10 guests to run an Xorg X server and JDS/Gnome.
- Copying and pasting email attachments is restricted to images or files smaller than 4 MB.
- Copying and pasting plain text and formatted text (including the formatting) is restricted to amounts less than 4MB.
- Copying and pasting text is restricted to text in languages that can be represented by Unicode characters.
- Workstation Pro uses the PNG format to encode images that are copied and pasted. Copying and pasting images is restricted to images smaller than 4 MB after conversion to PNG format.
- You cannot copy and paste files between virtual machines.

Disable the Copy and Paste Feature

The copy and paste feature is enabled by default when you create a virtual machine in Workstation Pro. To prevent copying and pasting between a virtual machine and the host system, disable the copy and paste feature.

Note You cannot enable or disable the copy and paste feature for a shared or remote virtual machine.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Guest Isolation**.
- 3 Deselect **Enable copy and paste**.
- 4 Click **OK** to save your changes.

Using Shared Folders

You can use shared folders to share files among virtual machines and between virtual machines and the host system. The directories that you add as shared folders can be on the host system, or they can be network directories that are accessible from the host computer.

Important You cannot open a file in a shared folder from more than one application at a time. For example, do not open the same file in an application on the host operating system and in another application in the guest operating system. If one of the applications writes to the file, data might be corrupted.

- [Guest Operating Systems That Support Shared Folders](#)

To use shared folders, a virtual machine must have a supported guest operating system.

- [Enable a Shared Folder for a Virtual Machine](#)

You can enable folder sharing for a specific virtual machine. To set up a folder for sharing between virtual machines, you must configure each virtual machine to use the same directory on the host system or network share.

- [Enable Shared Folders for Virtual Machines Created By Other Users](#)

If a shared folder is not created by the user who powers on the virtual machine, it is disabled by default. This is a security precaution.

- [View Shared Folders in a Windows Guest](#)

In a Windows guest operating system, you can view shared folders by using desktop icons.

- [Mounting Shared Folders in a Linux Guest](#)

After you enable a shared folder, you can mount one or more directories or subdirectories in the shared folder to any location in the file system in addition to the default location of `/mnt/hgfs`.

- [Change Shared Folder Properties](#)

After you create a shared folder, you can change the folder name, the host path, and other attributes.

- [Change the Folders That a Virtual Machine Can Share](#)

You can change the folders that a specific virtual machine is allowed to share.

- [Disable Folder Sharing for a Virtual Machine](#)

You can disable folder sharing for a specific virtual machine.

Guest Operating Systems That Support Shared Folders

To use shared folders, a virtual machine must have a supported guest operating system.

The following guest operating systems support shared folders.

- Windows Server 2003 R2
- Windows Server 2008 R2

- Windows Server 2012 R2
- Windows Server 2016
- Windows Vista
- Windows 7
- Windows 8
- Windows 10
- Linux with a kernel version of 2.6 or later
- Solaris x86 10
- Solaris x86 10 Update 1 and later

Enable a Shared Folder for a Virtual Machine

You can enable folder sharing for a specific virtual machine. To set up a folder for sharing between virtual machines, you must configure each virtual machine to use the same directory on the host system or network share.

Note You cannot enable a shared folder for a shared or remote virtual machine.

Prerequisites

- Verify that the virtual machines use a guest operating system that supports shared folders. See [Guest Operating Systems That Support Shared Folders](#).
- Verify that the latest version of VMware Tools is installed in the guest operating system.
- Verify that permission settings on the host system allow access to files in the shared folders. For example, if you are running Workstation Pro as a user named User, the virtual machine can read and write files in the shared folder only if User has permission to read and write them.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Shared Folders**.
- 3 Select a folder sharing option.

Option	Description
Always enabled	Keep folder sharing enabled, even when the virtual machine is shut down, suspended, or powered off.
Enabled until next power off or suspend	Enable folder sharing temporarily, until you power off, suspend, or shut down the virtual machine. If you restart the virtual machine, shared folders remain enabled. This setting is available only when the virtual machine is powered on.

- 4 (Optional) To map a drive to the Shared Folders directory, select **Map as a network drive in Windows guests**.

This directory contains all of the shared folders that you enable. Workstation Pro selects the drive letter.

- 5 Click **Add** to add a shared folder.

On Windows hosts, the **Add Shared Folder** wizard starts. On Linux hosts, the Shared Folder Properties dialog box opens.

- 6 Type the path on the host system to the directory to share.

If you specify a directory on a network share, such as D:\share, Workstation Pro always attempts to use that path. If the directory is later connected to the host on a different drive letter, Workstation Pro cannot locate the shared folder.

- 7 Specify the name of the shared folder as it should appear inside the virtual machine.

Characters that the guest operating system considers illegal in a share name appear differently when viewed inside the guest. For example, if you use an asterisk in a share name, you see %002A instead of * in the share name on the guest. Illegal characters are converted to their ASCII hexadecimal value.

- 8 Select shared folder attributes.

Option	Description
Enable this share	Enable the shared folder. Deselect this option to disable a shared folder without deleting it from the virtual machine configuration.
Read-only	Make the shared folder read-only. When this property is selected, the virtual machine can view and copy files from the shared folder, but it cannot add, change, or remove files. Access to files in the shared folder is also governed by permission settings on the host computer.

- 9 Click **Finish** to add the shared folder.

The shared folder appears in the Folders list. The check box next to folder name indicates that the folder is being shared. You can deselect this check box to disable sharing for the folder.

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

What to do next

View the shared folder. On Linux guests, shared folders appear under /mnt/hgfs. On Solaris guests, shared folders appear under /hgfs. To view shared folders on a Windows guest, see [View Shared Folders in a Windows Guest](#).

Enable Shared Folders for Virtual Machines Created By Other Users

If a shared folder is not created by the user who powers on the virtual machine, it is disabled by default. This is a security precaution.

Folder sharing is also disabled by default for Workstation 5.x virtual machines, regardless of who creates the folder.

Important Enabling shared folders on all virtual machines can pose a security risk because a shared folder might enable existing programs inside the virtual machine to access the host file system without your knowledge.

Procedure

- 1 Select **Edit > Preferences**.
- 2 Select **Workspace** and select **Enable all shared folders by default**.

This setting applies to shared folders on all virtual machines that are created by other users.

View Shared Folders in a Windows Guest

In a Windows guest operating system, you can view shared folders by using desktop icons.

Note If the guest operating system has VMware Tools from Workstation 4.0, shared folders appear as folders on a designated drive letter.

Procedure

- Depending on the Windows operating system version, look for **VMware Shared Folders** in **My Network Places**, **Network Neighborhood**, or **Network**.
- If you mapped the shared folder as a network drive, open **My Computer** and look for **Shared Folders on 'vmware-host'** under **Network Drives**.
- To view a specific shared folder, go directly to the folder by using the UNC path `\\vmware-host\Shared Folders\shared_folder_name`.

Mounting Shared Folders in a Linux Guest

After you enable a shared folder, you can mount one or more directories or subdirectories in the shared folder to any location in the file system in addition to the default location of `/mnt/hgfs`.

Depending on the kernel version of the Linux guest operating system, VMware Tools uses different components to provide shared-folder functionality. In Linux kernels prior to version 4.0, the VMware Tools services script loads a driver that performs the mount. Linux kernels 4.0 and later use a FUSE file system component.

You can use different mount commands to mount all shares, one share, or a subdirectory within a share to any location in the file system. The commands also vary depending on the Linux-kernel version of the guest.

Table 4-2. Mount Command Syntax

Linux Kernel Prior to 4.0	Linux Kernel 4.0 and Later	Description
<code>mount -t vmhgfs .host:/ /home/user1/shares</code>	<code>/usr/bin/vmhgfs-fuse .host:/ /home/user1/shares -o subtype=vmhgfs-fuse,allow_other</code>	Mounts all shares to /home/user1/shares
<code>mount -t vmhgfs .host:/foo /tmp/foo</code>	<code>/usr/bin/vmhgfs-fuse .host:/foo /tmp/foo -o subtype=vmhgfs-fuse,allow_other</code>	Mounts the share named foo to /tmp/foo
<code>mount -t vmhgfs .host:/foo/bar /var/lib/bar</code>	<code>/usr/bin/vmhgfs-fuse .host:/foo/bar /var/lib/bar -o subtype=vmhgfs-fuse,allow_other</code>	Mounts the subdirectory bar within the share foo to /var/lib/bar

For Linux kernel prior to version 4.0, you can use VMware-specific options in addition to the standard mount syntax. Enter the command `/sbin/mount.vmhgfs -h` to list the options.

For Linux kernel version 4.0 or later, enter the command `/usr/bin/vmhgfs-fuse -h` to list the available options.

Note The mount can fail if shared folders are disabled or if the share does not exist. You are not prompted to run the VMware Tools `vmware-config-tools.pl` configuration program again.

Optimizing Read and Write Access to Shared Files on Linux

Host-guest file sharing is integrated with the guest page cache. Files in shared folders are cached for reading and can be written to asynchronously.

Files that are being actively written to from the guest do not experience read caching benefits. To improve performance, you can use the mount command `time-to-live (ttl)` option to specify the interval that the host-guest file system (hgfs) driver uses for validating file attributes.

For example, to validate attributes every 3 seconds instead of every 1 second, which is the default, use the following command.

```
mount -o ttl=3 -t vmhgfs .host:/sharemountpoint
```

Note Lengthening the interval involves some risk. If a process in the host modifies file attributes, the guest operating system might not get the modifications as quickly and the file can become corrupted.

Using Permissions to Restrict Access to Shared Files in a Linux Guest

You can use permissions to restrict access to the files in a shared folder on a Linux guest operating system.

On a Linux host, if you create files that you want to share with a Linux guest operating system, the file permissions shown on the guest operating system are the same as the permissions on the host system. You can use the `fmask` and `dmask` commands to mask permissions bits for files and directories.

If you create files on a Windows host system that you want to share with a Linux guest operating system, read-only files are displayed as having read and execute permission for everyone and other files are shown as fully writable by everyone.

If you use a Linux guest operating system to create files for which you want to restrict permissions, use the `mount` program with the following options in the guest operating system.

- `uid`
- `gid`
- `fmask`
- `dmask`
- `ro` (read only)
- `rw` (read-write)

`rw` is the default.

If you are using a virtual machine that was created with the Windows version of Workstation Pro, or a previous release of the Linux version of Workstation Pro, you can change the owner permissions only.

Change Shared Folder Properties

After you create a shared folder, you can change the folder name, the host path, and other attributes.

Prerequisites

Create a shared folder. See [Enable a Shared Folder for a Virtual Machine](#).

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Shared Folders**.
- 3 Select the shared folder in the folders list and click **Properties**.
- 4 To change the name of the shared folder as it appears inside the virtual machine, type the new name in the **Name** text box.

Characters that the guest operating system considers illegal in a share name appear differently when viewed inside the guest. For example, if you use an asterisk in a share name, you see %002A instead of * in the share name on the guest. Illegal characters are converted to their ASCII hexadecimal value.

- 5 To change the host path for the shared folder, browse to or type the new path in the **Host path** text box.

If you specify a directory on a network share, such as `D:\share`, Workstation Pro always attempts to use that path. If the directory is later connected to the host on a different drive letter, Workstation Pro cannot locate the shared folder.

- 6 To change an attribute for the shared folder, select or deselect the attribute.

Option	Description
Enabled	Enable the shared folder. Deselect this option to disable a shared folder without deleting it from the virtual machine configuration.
Read-only	Make the shared folder read-only. When this property is selected, the virtual machine can view and copy files from the shared folder, but it cannot add, change, or remove files. Access to files in the shared folder is also governed by permission settings on the host computer.

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

Change the Folders That a Virtual Machine Can Share

You can change the folders that a specific virtual machine is allowed to share.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Shared Folders**.
- 3 In the folders list, select the check boxes next to the folders to share and deselect the check boxes next to the folders to disable.
- 4 Click **OK** to save your changes.

Disable Folder Sharing for a Virtual Machine

You can disable folder sharing for a specific virtual machine.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Shared Folders**.
- 3 Select **Disabled** to disable folder sharing.
- 4 Click **OK** to save your changes.

Mapping a Virtual Disk to the Host System

Instead of using shared folders or copying data between a virtual machine and the host system, you can map a virtual disk to the host system. In this case, you map a virtual disk in the host file system as a separate mapped drive. Using a mapped drive lets you connect to the virtual disk without going into a virtual machine.

Map or Mount a Virtual Disk to a Drive on the Host System

When you map a virtual disk and its associated volume to a drive on the host system, you can connect to the virtual disk without opening a virtual machine.

After you map the virtual disk to a drive on the host system, you cannot power on any virtual machine that uses the disk until you disconnect the disk from the host system.

Note You cannot map a virtual hard disk for a shared or remote virtual machine.

Important If you mount a virtual disk that has a snapshot and then write to the disk, you can irreparably damage a snapshot or linked clone created from the virtual machine.

Prerequisites

- Power off all virtual machines that use the virtual disk.
- Verify that the virtual disk (.vmdk) files on the virtual disk are not compressed and do not have read-only permissions.
- Verify that the virtual disk is unencrypted. You cannot map or mount encrypted disks.

Procedure

- 1 Mount the virtual disk to a drive on the host system.

Option	Description
Windows host	Select File > Map Virtual Disks .
Linux host	Select File > Mount Virtual Disks .

- 2 Map or mount the virtual disk.

Option	Description
Windows host	In the Map or Disconnect Virtual Disks dialog box, click Map .
Linux host	In the Mount or Unmount Virtual Disks dialog box, click Mount Disk .

- 3 (Optional) You can also map a virtual disk from Windows Explorer.

- a Open Explorer and browse to the .vmdk file you want to map.
- b Right-click the .vmdk file and select **Map Virtual Disk**.

The menu also allows you to map the first volume of the .vmdk file to a drive immediately. If you select that option, no further configurations are needed.

- 4 Browse to a virtual disk (.vmdk) file, select it, and click **Open**.
- 5 Select the volume to map or mount and select an unused drive letter on the host system.
- 6 Click **OK** or **Mount**.

The drive appears on the host system. You can read from or write to files on the mapped virtual disk on the host system.

7 (Optional) View the mapped or mounted drive.

Option	Description
Windows host	Select File > Map Virtual Disks . A list of mapped drives displays.
Linux host	Select File > Mount Virtual Disks . A list of mounted drives displays.

Disconnect a Virtual Disk from the Host System

To use a virtual disk from a virtual machine after it has been mapped or mounted on the host system, you must disconnect it from the host system.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Hardware** tab, select **Hard Disk**, click **Utilities**, and select **Disconnect**.

You can now power on any virtual machine that uses this disk.

Add a Host Printer to a Virtual Machine

You can print from a virtual machine to any printer available to the host computer without having to install additional drivers in the virtual machine.

The Workstation Pro printer feature uses ThinPrint technology to replicate the host system printer mapping in the virtual machine. When you enable the virtual machine printer, Workstation Pro configures a virtual serial port to communicate with the host printers.

Note You cannot add a printer to a shared or remote virtual machine.

Prerequisites

- Support for virtual printers is disabled by default. To enable virtual printer support, see [Configuring Virtual Printers on Windows Hosts](#).
- The virtual machine must be powered on or off. You cannot add a printer to a virtual machine in suspended state.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Hardware** tab, select **Add**.
- 3 In the **Add Hardware** wizard, select **Printer** and **Finish**.

The default device setting is to connect the virtual machine printer when the virtual machine is powered on.

What to do next

In a Print window, when you attempt to select a printer in Windows 7 virtual machines, you might see only the default printer, even though other printers are available. To see the other printers, right-click the default printer and point to **Printer properties**.

Using Removable Devices in Virtual Machines

You can use removable devices such as floppy drives, DVD and CD-ROM drives, USB devices, and smart card readers in virtual machines.

Some devices cannot be used by the host system and a guest operating system, or by multiple guest operating systems, simultaneously.

For example, if the host system is using a floppy drive, you must connect the floppy drive to the virtual machine before you can use it in the virtual machine. To use the floppy drive on the host again, you must disconnect it from the virtual machine. By default, a floppy drive is not connected when a virtual machine powers on.

Use a Removable Device in a Virtual Machine

You can connect and disconnect removable devices in a virtual machine. You can also change the settings for a removable device by modifying virtual machine settings.

Prerequisites

- Power on the virtual machine.
- If you are connecting or disconnecting a USB device, familiarize yourself with the way Workstation Pro handles USB devices. See [Connecting USB Devices to Virtual Machines](#).

Procedure

- To connect a removable device, select the virtual machine, select **VM > Removable Devices**, select the device, and select **Connect**.

If the device is connected to the host system through a USB hub, the virtual machine sees only the USB device, not the hub.

A check mark appears next to the name of the device when the device is connected to the virtual machine and a device icon appears on the virtual machine taskbar.

- To change the settings for a removable device, select **VM > Removable Devices**, select the device, and select **Settings**.
- To disconnect a removable device, select the virtual machine, select **VM > Removable Devices**, select the device, and select **Disconnect**.

You can also disconnect the device by clicking or right-clicking the device icon on the virtual machine taskbar. Using the taskbar icon is especially useful if you run the virtual machine in full screen mode.

Connecting USB Devices to Virtual Machines

When a virtual machine is running, its window is the active window. If you plug a USB device into the host system, the device connects to the virtual machine instead of the host by default. If a USB device connected to the host system does not connect to a virtual machine at power on, you must manually connect the device to the virtual machine.

When you connect a USB device to a virtual machine, Workstation Pro retains the connection to the affected port on the host system. You can suspend or power off the virtual machine, or unplug the device. When you plug in the device again or resume the virtual machine, Workstation Pro reconnects the device. Workstation Pro retains the connection by writing an autoconnect entry to the virtual machine configuration (.vmx) file.

If Workstation Pro cannot reconnect to the device, for example, because you disconnected the device, the device is removed and Workstation Pro displays a message to indicate that it cannot connect to the device. You can connect to the device manually if it is still available. To manually connect a USB device to the virtual machine, select **VM > Removable Devices > Device Name > Connect (Disconnect from host)**.

Follow the device manufacturer's procedures for unplugging the device from the host computer when you physically unplug the device, move the device from host system to a virtual machine, move the device between virtual machines, or move the device from a virtual machine to the host computer. Following these procedures is especially important for data storage devices, such as zip drives. If you move a data storage device too soon after saving a file and the operating system did not actually write the data to the disk, you can lose data.

- [Installing USB Drivers on Windows Hosts](#)

When a particular USB device is connected to a virtual machine for the first time, the host detects it as a new device named VMware USB Device and installs the appropriate VMware driver.

- [Disable Automatic Connection of USB Devices](#)

You can disable the autoconnect feature if you do not want USB devices to connect to a virtual machine when you power it on.

- [Connect USB HIDs to a Virtual Machine](#)

To connect USB human interface devices (HIDs) to a virtual machine, you must configure the virtual machine to show all USB input devices in the **Removable Devices** menu.

- [Install a PDA Driver and Synchronize With a Virtual Machine](#)

To install a PDA driver in a virtual machine, you must synchronize the PDA with the virtual machine.

Installing USB Drivers on Windows Hosts

When a particular USB device is connected to a virtual machine for the first time, the host detects it as a new device named VMware USB Device and installs the appropriate VMware driver.

The Windows operating system prompts you to run the Microsoft Windows Found New Hardware wizard. Select the default action to install the software automatically. After the software is installed, the guest operating system detects the USB device and searches for a suitable driver.

Disable Automatic Connection of USB Devices

You can disable the autoconnect feature if you do not want USB devices to connect to a virtual machine when you power it on.

Prerequisites

Power off the virtual machine.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Hardware** tab, select **USB Controller**.
- 3 Deselect **Automatically connect new USB devices** to disable automatic connection of USB devices.
- 4 Click **OK** to save your changes.

Connect USB HID's to a Virtual Machine

To connect USB human interface devices (HIDs) to a virtual machine, you must configure the virtual machine to show all USB input devices in the **Removable Devices** menu.

By default, USB HID's, such as USB 1.1 and 2.0 mouse and keyboard devices, do not appear in the **Removable Devices** menu in a virtual machine, even though they are plugged in to USB ports on the host system.

An HID that is connected to a virtual machine is not available to the host system.

Note You cannot configure a shared or remote virtual machine to show all USB input devices.

Prerequisites

- Power off the virtual machine.
- If you are using a KVM switch for a mouse or keyboard, disable automatic connection of USB devices. See [Disable Automatic Connection of USB Devices](#).

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Hardware** tab, select **USB Controller**.
- 3 Select **Show all USB input devices**.
This option allows users to use special USB HID's inside the virtual machine.
- 4 Click **OK** to save your changes.

- 5 Power on the virtual machine.

HIDs appear in the **Removable Devices** menu.

Install a PDA Driver and Synchronize With a Virtual Machine

To install a PDA driver in a virtual machine, you must synchronize the PDA with the virtual machine.

Procedure

- 1 Connect the PDA to the host system and synchronize it with the host system.
The PDA driver should begin installing in the virtual machine.
- 2 Allow the virtual machine to install the PDA driver.
- 3 If connection warning messages appear, dismiss them.
- 4 If the PDA disconnects from the host system before the virtual machine can synchronize with it, synchronize the PDA with the host system again.

The total time required to load the VMware USB device driver in the host system and install the PDA driver in the virtual machine might exceed the device connection timeout value. A second synchronization attempt usually succeeds.

Troubleshooting USB Device Control Sharing

Only the host system or the virtual machine can have control of a particular USB device at any one time. Device control operates differently, depending on whether the host system is a Linux or a Windows computer.

When you connect a device to a virtual machine, it is disconnected from the host system or from the virtual machine that previously had control of the device. When you disconnect a device from a virtual machine, it is returned to the host system.

Under some circumstances, if a USB storage device is in use on the host system, for example, one or more files stored on the device are open on the host, an error appears in the virtual machine when you try to connect to the device. You must let the host system complete its operation or close any application connected to the device on the host system and connect to the device in the virtual machine again.

Troubleshoot USB Device Control Issues on a Linux Host

You have problems connecting or disconnecting USB devices on a Linux host system.

Problem

You are prompted to disconnect the driver on the host system when you connect a USB device to the virtual machine or disconnecting the device fails.

Cause

On Linux host systems, guest operating systems can use devices that are not claimed by a host operating system driver. A related issue sometimes affects devices that rely on automatic connection, such as PDAs. Occasionally, even if you successfully use autoconnection to connect the device to the virtual machine, you might experience problems with the connection to the device.

Solution

- 1 If you have problems with autoconnection, perform these steps.
 - a Select the virtual machine and select **VM > Removable Devices** to disconnect and reconnect the device.
 - b If the problem persists, unplug the device and plug it in again.
 - c If a warning message indicates that the device is in use, disable the device in the hotplug configuration files in the `/etc/hotplug` directory.

The documentation for the Linux distribution contains information on editing these configuration files.

- 2 If disconnection fails, either disable the driver or unload the driver manually.

Option	Description
Disable the driver	If the driver was automatically loaded by hotplug, disable it in the hotplug configuration files in the <code>/etc/hotplug</code> directory. See the documentation for your Linux distribution for information on editing these configuration files.
Unload the driver manually	Become root (<code>su -</code>) and use the <code>rmmod</code> command.

Using Smart Cards in Virtual Machines

Virtual machines can connect to smart card readers that interface to serial ports, parallel ports, USB ports, PCMCIA slots, and PCI slots. A virtual machine considers a smart card reader to be a type of USB device.

A smart card is a plastic card that has an embedded computer chip. Many government agencies and large enterprises use smart cards to send secure communication, digitally sign documents, and authenticate users who access their computer networks. Users plug a smart card reader into their computer and insert their smart card in the reader. They are then prompted for their PIN to log in.

You can select a smart card reader from the **Removable Devices** menu in a virtual machine. A smart card can be shared between virtual machines, or between the host system and one or more virtual machines. Sharing is enabled by default.

When you plug a smart card reader into the host system, the reader appears as two separate USB devices in Workstation Pro. This is because you can use smart cards in one of two mutually exclusive modes.

Shared mode	(Recommended) The smart card reader device is available as Shared <i>smart_card_reader_model</i> in the Removable Devices menu. In Windows XP guest operating systems, the shared reader appears as USB Smart Card Reader after it is connected to the virtual machine. In Windows Vista and Windows 7 guest operating systems, the generic smart card reader device name appears under the Windows Device Manager list. The smart card reader can be shared among applications on the host system and among applications in different guest operating systems.
USB passthrough mode	The smart card reader device is available as <i>smart_card_reader_model</i> in the Removable Devices menu. In USB passthrough mode, a single virtual machine directly controls the physical smart card reader. A USB passthrough smart card reader cannot be used by applications on the host system or by applications in other virtual machines. You should use USB passthrough mode only if connection in shared mode does not work well for your scenario. You might need to install the driver provided by the manufacturer to use USB passthrough mode.

You can use smart cards with Windows operating systems and most Linux distributions. VMware provides full smart card support for Windows virtual machines running on Linux hosts. Using smart cards in Linux typically requires third-party software to effectively authenticate to a domain or enable secure communications.

Note Although smart cards should work with common Linux browsers, email applications, and directory services, these products have not been tested or certified by VMware.

Use a Smart Card in a Virtual Machine

You can configure a virtual machine to use the smart card reader on the host system.

Prerequisites

- Verify that the virtual machine has a USB controller. A USB controller is required, regardless of whether the smart card reader is a USB device. A USB controller is added by default when you create a virtual machine.
- Connect the smart card reader to the host system.
- Start the virtual machine

Procedure

- To connect the smart card reader to the virtual machine, select the virtual machine and select **VM > Removable Devices > Shared <smart_card_reader_model> > Connect**.

If the smart card reader is a USB device, two items appear for it in the menu. Both items use the model name of the reader, but one item name begins with Shared.

- To disconnect the smart card reader from the virtual machine, select **VM > Removable Devices > Shared <smart_card_reader_model> > Disconnect**.

- To remove the smart card from the virtual machine, select **VM > Removable Devices > Shared <smart_card_reader_model> > Remove Smart Card**.

The smart card is removed from the virtual machine, but it remains connected on the host system. If the smart card is physically removed from the smart card reader, this option is disabled.

- To insert the smart card to the virtual machine, select **VM > Removable Devices > Shared <smart_card_reader_model> > Insert Smart Card**.

If the smart card is physically inserted in the smart card reader, the smart card is also inserted in the virtual machine.

Disable Smart Card Sharing

By default, you can share a smart card between virtual machines or between the host system and one or more virtual machines. You might want to disable smart card sharing if you are using a PCMCIA smart card reader, deploying virtual machines for enterprise use and do not want to support drivers for various smart card readers, or the host system has drivers but the virtual machines do not.

The setting that controls smart card sharing is located in the Workstation Pro global configuration file.

Procedure

- 1 Find the global configuration file on the host system.

Operating System	Location
Windows Server 2008 R2, Windows Server 2012 R2, Windows Server 2016, Windows 7, Windows 8, Windows 10 hosts	%PROGRAMDATA%\VMware\VMware Workstation\config.ini
Linux hosts	/etc/vmware/config

- 2 If the global configuration file does not yet exist on the host system, select **Edit > Preferences** and change at least one Workstation Pro preference setting.

Workstation Pro creates the global configuration file when you change Workstation Pro preference settings.

- 3 Open the global configuration file in a text editor and set the `usb.ccid.useSharedMode` property to **FALSE**.

For example: `usb.ccid.useSharedMode = "FALSE"`

- 4 Save and close the global configuration file.
- 5 Set permissions on the global configuration file so that other users cannot change it.

Switch to a Virtual Smart Card Reader on a Linux Host

Because of the way smart card reader functionality is implemented on Linux hosts, you must exit Workstation Pro and restart the `pcscd` daemon on the host system before you can switch from the non-virtual smart card reader to the virtual smart card reader.

Procedure

- 1 Select the virtual machine, select **VM > Removable Devices**, select the smart card reader, and select **Disconnect**.
- 2 Power off the virtual machine and exit Workstation Pro.
- 3 Physically disconnect the smart card reader from the host system.
- 4 Restart the `pcscd` daemon on the host system.
- 5 Physically connect the smart card reader to the host system.
- 6 Start Workstation Pro and start the virtual machine.
- 7 Select the virtual machine, select **VM > Removable Devices**, select the smart card reader, and select **Connect**.

Changing the Virtual Machine Display

You can change the way Workstation Pro displays virtual machines and virtual machine applications. You can use full screen mode to make the virtual machine display fill the screen and use multiple monitors.

You can also match the Workstation Pro console with the guest operating system display size.

■ [Use Full Screen Mode](#)

In full screen mode, the virtual machine display fills the screen and you cannot see the borders of the Workstation Pro window.

■ [Use Exclusive Mode](#)

Like full screen mode, exclusive mode causes the Workstation Pro virtual machine display to fill the screen. You might want to use exclusive mode to run graphics-intensive applications, such as games, in full screen mode.

■ [Use Unity Mode](#)

You can switch virtual machines that have Windows XP or later guest operating systems to Unity mode to display applications directly on the host system desktop.

■ [Use Multiple Monitors for One Virtual Machine](#)

If the host system has multiple monitors, you can configure a virtual machine to use multiple monitors. You can use the multiple-monitor feature when the virtual machine is in full screen mode.

- [Use Multiple Monitors for Multiple Virtual Machines](#)

If the host system has multiple monitors, you can run a different virtual machine on each monitor.

- [Fit the Workstation Pro Console to the Guest Operating System Display](#)

You can control the size of the virtual machine display and match the Workstation Pro console with the display size of the guest operating system for an active virtual machine.

Use Full Screen Mode

In full screen mode, the virtual machine display fills the screen and you cannot see the borders of the Workstation Pro window.

You can configure the guest operating system to report battery information. This feature is useful when you run a virtual machine in full screen mode on a laptop. See [Report Battery Information in the Guest](#).

Prerequisites

- Verify that the latest version of VMware Tools is installed in the guest operating system.
- Verify that the guest operating system display mode is larger than the host system display mode. If the guest operating system display mode is smaller than the host system display mode, you might not be able to enter full screen mode. If you cannot enter full screen mode, add the line `mks.maxRefreshRate=1000` to the virtual machine configuration (.vmx) file.
- Power on the virtual machine.
- If you have multiple monitors, move the Workstation Pro window onto the monitor to use for full screen mode.

Procedure

- To enter full screen mode, select the virtual machine and select **View > Full Screen**.
- Press Ctrl+Alt+right arrow to switch to the next powered-on virtual machine and Ctrl+Alt+left arrow to switch to the previous powered-on virtual machine.
- When in full screen mode, you can also use the tabs on the full screen toolbar to switch between powered-on virtual machines.
- To hide the full screen toolbar while you are using full screen mode, click the push pin icon on the full screen toolbar and move the mouse pointer off of the toolbar.

The toolbar is unpinned and slides up to the top of the monitor and disappears.

- To show the full screen toolbar after it has been hidden, point to the top of the screen until the toolbar appears and click the push pin icon.
- To exit full screen mode, on the full screen toolbar select **View > Full Screen**, and deselect **Full Screen**.

Report Battery Information in the Guest

If you run a virtual machine on a laptop in full screen mode, configure the option to report battery information in the guest so that you can determine when the battery is running low.

Prerequisites

Power off the virtual machine.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Power**.
- 3 Select **Report battery information to guest**.
- 4 Click **OK** to save your changes.

Use Exclusive Mode

Like full screen mode, exclusive mode causes the Workstation Pro virtual machine display to fill the screen. You might want to use exclusive mode to run graphics-intensive applications, such as games, in full screen mode.

Exclusive mode has certain advantages and limitations.

- The full screen toolbar is not engaged when you move the mouse to the top of the screen. To configure virtual machine settings, you must exit exclusive mode.
- When input is grabbed by the virtual machine, only the ungrab shortcut is respected. You can change the ungrab shortcut to reduce the chance of unintentionally pressing it.
- On a Windows host, exclusive mode does not use multiple monitors.

Prerequisites

- Verify that the latest version of VMware Tools is installed in the guest operating system.
- Power on the virtual machine.
- If you have multiple monitors, move the Workstation Pro window onto the monitor to use for exclusive mode.
- Enter full screen mode. See [Use Full Screen Mode](#).

Procedure

- 1 Enter full screen mode.
- 2 Select **View > Exclusive Mode** from the full screen toolbar.

What to do next

To exit exclusive mode, press Ctrl+Alt.

On a Windows or Linux host, pressing Ctrl+Alt returns you to full screen mode.

Use Unity Mode

You can switch virtual machines that have Windows XP or later guest operating systems to Unity mode to display applications directly on the host system desktop.

In Unity mode, virtual machine applications appear on the host system desktop, you can use the virtual machine **Start** or **Applications** menu from the host system, and the virtual machine console view is hidden. Items for open virtual machine applications appear on the host system taskbar in the same way as open host applications.

On host system and virtual machine applications that are displayed in Unity mode, you can use keyboard shortcuts to copy, cut, and paste images, plain text, formatted text, and email attachments between applications. You can also drag and drop and copy and paste files between the host system and the guest operating system.

If you save a file or attempt to open a file from an application in Unity mode, the file system you see is the file system inside the virtual machine. You cannot open a file from the host operating system or save a file to the host operating system.

For some guest operating systems, application windows in Unity mode can appear only on the monitor that is set as the primary display when you have multiple monitors. If the host and guest operating systems are Windows XP or later, the application windows can appear on additional monitors.

Unity mode is not available in full screen mode on Windows.

Note You cannot use Unity mode with a remote virtual machine.

Prerequisites

- Verify that the latest version of VMware Tools is installed in the guest operating system.
- Verify that the guest operating system is Windows XP or later.
- Power on the virtual machine.
- If you are entering Unity mode, open applications in the virtual machine to use in Unity mode.

Procedure

- To enter Unity mode, select the virtual machine and select **View > Unity**.

The console view in the

Workstation Pro

window is hidden, and open applications appear in application windows on the host system desktop.

A check mark appears next to **Unity** in the **View** menu.

- To navigate between multiple **Start** or **Applications** menus when multiple virtual machines are in Unity mode, press the arrow keys, Tab, or Shift+Tab to cycle through the virtual machine menus and press Enter and the spacebar to select a virtual machine.
- To exit Unity mode, select **View > Unity** and deselect **Unity**.

Use Multiple Monitors for One Virtual Machine

If the host system has multiple monitors, you can configure a virtual machine to use multiple monitors. You can use the multiple-monitor feature when the virtual machine is in full screen mode.

Note You do not need to use the Windows display properties settings in a Windows guest operating system to configure multiple monitors.

Prerequisites

- Verify that the virtual machine is a Workstation 6.x or later virtual machine.
- Verify that the latest version of VMware Tools is installed in the guest operating system.
- Verify that the Windows or Linux guest operating system is supported.

Procedure

- 1 Select the virtual machine and select **View > Autosize > Autofit Guest** to verify that the virtual machine can resize correctly.
- 2 Power on the virtual machine and select **View > Full Screen**.
- 3 On the full screen toolbar, click the **Cycle Multiple Monitors** button.

On a Windows host, you can mouse over a button on the toolbar to see its name. The guest operating system desktop extends to the additional monitor or monitors.

- 4 (Optional) Click the **Cycle Multiple Monitors** button again if the host system has more than two monitors and you want the virtual machine to use all of the monitors.

The order in which the virtual machine uses the monitors depends on the order in which the monitors were added to the host operating system. If you continue to click the button, you return to fewer monitors.

Limitations for Multiple Monitors

The use of more than two monitors with a virtual machine has certain limitations.

- If you attempt to use more than two monitors with a virtual machine, your virtual machine must support more than two monitors for this feature to function.
- More than two monitors is supported on Windows and Linux host and guest operating systems.
- Windows XP guests support more than three monitors. However, only three monitors can be in use by a Windows XP guest at one time. If more than three monitors are connected to a Windows XP guest, use the **Cycle multiple monitors** button to cycle through the monitors to the configuration you want to use.

Use Multiple Monitors for Multiple Virtual Machines

If the host system has multiple monitors, you can run a different virtual machine on each monitor.

Prerequisites

Verify that the latest version of VMware Tools is installed in the guest operating system.

Procedure

- 1 Open a second Workstation Pro window.

Option	Description
Open a new window from Workstation Pro	Select File > New Window . On Linux hosts, the windows operate in a single Workstation Pro process.
(Linux hosts only) Run a separate Workstation Pro process in a different X server	Use the <code>vmware</code> command with the <code>-W</code> flag, for example, <code>vmware -W &</code> .

- 2 Start one or more virtual machines in each Workstation Pro window.
- 3 Drag each Workstation Pro window to the monitor on which you want to use it.

If a virtual machine is running in one Workstation Pro window and you want to run that virtual machine in another Workstation Pro window, you must close the virtual machine in the first window before you attempt to open it in the other window.
- 4 To switch mouse and keyboard input from the virtual machine on the first monitor to the virtual machine on the second monitor, move the pointer from one screen to the other screen and click inside the second monitor.

Fit the Workstation Pro Console to the Guest Operating System Display

You can control the size of the virtual machine display and match the Workstation Pro console with the display size of the guest operating system for an active virtual machine.

The fit options are redundant if the corresponding Autofit option is active because the console and the guest operating system display are the same size.

Prerequisites

- For a Linux virtual machine, familiarize yourself with the considerations for resizing displays. See [Considerations for Resizing Displays in Linux Virtual Machines](#).
- For a Solaris virtual machine, familiarize yourself with the considerations for resizing displays. See [Considerations for Resizing Displays in Solaris Virtual Machines](#).

Procedure

- To configure a display size option, select **View > Autosize** and select an Autofit option.

Option	Description
Autofit Guest	The virtual machine resizes the guest display resolution to match the size of the Workstation Pro console.
Stretch Guest	The virtual machine changes the guest display to fit the full screen. The guest display resolution is not changed.
Center Guest	The virtual machine centers the guest display in the full screen. The guest display resolution is not changed.
Autofit Window	The Workstation Pro console maintains the size of the virtual machine display resolution. If the guest operating system changes its resolution, the Workstation Pro console resizes to match the new resolution.

- To configure a fit option, select **View** and select a fit option.

Option	Description
Fit Window Now	The Workstation Pro console changes to match the current display size of the guest operating system.
Fit Guest Now	The guest operating system display size changes to match the current Workstation Pro console.

Considerations for Resizing Displays in Linux Virtual Machines

Certain considerations apply to resizing displays in Linux virtual machines.

- If you have virtual machines that were suspended under a version of VMware Tools earlier than version 5.5, display resizing does not work until the virtual machines are powered off and powered on again. Rebooting the guest operating system is not sufficient.
- To use the resizing options, you must update VMware Tools to the latest version in the guest operating system.
- You cannot use the **Autofit Guest** and **Fit Guest Now** options unless VMware Tools is running in the guest operating system.
- The resizing restrictions that the X11 Windows system imposes on physical host systems also apply to guest operating systems.
 - You cannot resize to a mode that is not defined. The VMware Tools configuration script can add a large number of mode lines, but you cannot resize in 1-pixel increments as you can in Windows. VMware Tools adds modelines in 100-pixel increments. This means that you cannot resize a guest larger than the largest mode defined in the X11 configuration file. If you attempt to resize larger than that mode, a black border appears and the guest operating system size stops increasing.
 - The X server always starts up in the largest defined resolution. The XDM/KDM/GDM login screen always appears at the largest size. Because Gnome and KDE allow you to specify your preferred resolution, you can reduce the guest display size after you log in.

Considerations for Resizing Displays in Solaris Virtual Machines

Certain considerations apply to resizing displays in Solaris virtual machines.

- To use the display resizing options, you must update VMware Tools to the latest version in the guest operating system.
- You cannot use the **Autofit Guest** and **Fit Guest Now** options unless VMware Tools is running in the guest operating system.
- Solaris 10 guests must be running an Xorg X server and JDS/Gnome.

Working with Nonstandard Resolutions

A guest operating system and its applications might react unexpectedly when the Workstation Pro console size is not a standard VESA resolution.

For example, you can use **Autofit Guest** and **Fit Guest Now** to set the guest operating system screen resolution smaller than 640×480, but some installers do not run at resolutions smaller than 640×480. Programs might refuse to run. Error messages might include phrases such as VGA Required to Install or You must have VGA to install.

If the host computer screen resolution is high enough, you can enlarge the window and select **Fit Guest Now**. If the host computer screen resolution does not allow you to enlarge the Workstation Pro console sufficiently, you can manually set the guest operating system's screen resolution to 640×480 or larger.

Using Folders to Manage Virtual Machines

You can use folders to organize and manage multiple virtual machines in the library. When virtual machines are in a folder, you can manage them on the folder tab and perform batch power operations.

■ [Add a Virtual Machine to a Folder](#)

When you add a virtual machine to a folder, it remains an independent entity, but you can also perform batch power operations. For example you can power on, suspend, and resume each virtual machine in a folder separately, or you can power on, suspend, and resume all of the virtual machines in a folder at the same time.

■ [Remove a Virtual Machine from a Folder](#)

You can remove a virtual machine from a folder or move it to a different folder or subfolder.

■ [Manage Virtual Machines in a Folder](#)

When virtual machines are in a folder, you can manage them as a unit. For example, you can select multiple virtual machines on the folder tab and perform power operations on several virtual machines at the same time.

■ [Change the Power On Delay](#)

By default, when you power on several virtual machines in a folder, Workstation Pro delays 10 seconds before powering on the next virtual machine. The power on delay avoids overloading the CPU on the host system when you power on multiple virtual machines. You can change the default power on delay setting by modifying a Workstation Pro preference.

■ [Convert a Team](#)

If you created a team in an earlier version, you must convert the team before you can use the virtual machines in the current version of Workstation Pro.

Add a Virtual Machine to a Folder

When you add a virtual machine to a folder, it remains an independent entity, but you can also perform batch power operations. For example you can power on, suspend, and resume each virtual machine in a folder separately, or you can power on, suspend, and resume all of the virtual machines in a folder at the same time.

Procedure

- 1 If the folder does not already exist, create it.

Option	Description
Create a folder at the top level of the library	Right-click My Computer , select New Folder , and type a name for the folder. The folder appears under My Computer in the library.
Create a subfolder	Right-click the folder, select New Folder , and type a name for the folder. The new folder appears under the folder in the library.

You can create an unlimited number of folders or subfolders.

- 2 To add a virtual machine to a folder, select the virtual machine in the library and drag it to the folder.

The virtual machine appears under the folder in the library. You can add an unlimited number of virtual machines to a folder.

Remove a Virtual Machine from a Folder

You can remove a virtual machine from a folder or move it to a different folder or subfolder.

Procedure

- To remove a virtual machine from a folder, select the virtual machine in the library and drag it to **My Computer**.

The virtual machine appears under **My Computer** in the library.

- To move a virtual machine to a different folder or subfolder, select the virtual machine in the library and drag it to the folder or subfolder.

The virtual machine appears under the folder or subfolder in the library.

Manage Virtual Machines in a Folder

When virtual machines are in a folder, you can manage them as a unit. For example, you can select multiple virtual machines on the folder tab and perform power operations on several virtual machines at the same time.

When you power on several virtual machines at the same time, Workstation Pro delays 10 seconds before powering on the next virtual machine by default. Workstation Pro performs power operations on virtual machines in the order in which they appear on the folder tab.

You can change the default power on delay setting by modifying a Workstation Pro preference. See [Change the Power On Delay](#).

Procedure

- To perform a power operation on several virtual machines at the same time, use Ctrl-Click to select the virtual machines on the folder tab and select the power operation from the toolbar or from the **VM** menu.

All of the virtual machines that you select must be in the same power state.

- To perform a power operation on all of the virtual machines at the same time, select the folder in the library and select the power operation from the toolbar or from the **VM** menu.

All of the virtual machines in the folder must be in the same power state.

- To display thumbnails for virtual machines on the folder tab, select a thumbnail size from the drop-down menu on the folder tab.

When a virtual machine is powered on, Workstation Pro updates the thumbnail in real time to show the actual content of the virtual machine. When a virtual machine is suspended, the thumbnail shows a screenshot of the virtual machine at the time that it was suspended.

- To display virtual machine names on the folder tab, select **Details** from the drop-down menu on the folder tab.
- To open the tab for a virtual machine, double-click the virtual machine on the folder tab.

Change the Power On Delay

By default, when you power on several virtual machines in a folder, Workstation Pro delays 10 seconds before powering on the next virtual machine. The power on delay avoids overloading the CPU on the host system when you power on multiple virtual machines. You can change the default power on delay setting by modifying a Workstation Pro preference.

Procedure

- 1 Select **Edit > Preferences** and select **Workspace**.
- 2 Select the number of seconds for the delay from the **Seconds between powering on multiple VMs** drop-down menu.
- 3 Click **OK** to save your changes.

Convert a Team

If you created a team in an earlier version, you must convert the team before you can use the virtual machines in the current version of Workstation Pro.

Procedure

- 1 Open the team in Workstation Pro or browse to the location of the virtual machine team configuration (.vmtm) file and drag it to the library.

A dialog box appears that prompts you to convert the team.

- 2 Click **Convert Team** to convert the team.

After the team is converted, the .vmtm file is deleted and the virtual machines are added to a new folder in the library.

After you convert a team, the virtual machines keep their packet loss and bandwidth settings. LAN segment information appears in the network adapter settings for each virtual machine, where you can modify it.

Taking Snapshots of Virtual Machines

Taking a snapshot of a virtual machine saves its current state and enables you to return to the same state repeatedly. When you take a snapshot, Workstation Pro captures the entire state of the virtual machine. You can use the snapshot manager to review and act on the snapshots for an active virtual machine.

- [Using Snapshots to Preserve Virtual Machine States](#)

A snapshot includes the contents of the virtual machine memory, virtual machine settings, and the state of all the virtual disks. When you revert to a snapshot, you return the memory, settings, and virtual disks of the virtual machine to the state they were in when you took the snapshot.

- [Using the Snapshot Manager](#)

You can review all snapshots for a virtual machine and act on them directly in the snapshot manager.

- [Take a Snapshot of a Virtual Machine](#)

When you take a snapshot, you preserve the state of a virtual machine at a specific moment in time and the virtual machine continues to run. Taking a snapshot enables you to return to the same state repeatedly. You can take a snapshot while a virtual machine is powered on, powered off, or suspended.

- [Revert to a Snapshot](#)

You can restore a virtual machine to a previous state by reverting to a snapshot.

- [Take or Revert to a Snapshot at Power Off](#)

You can configure a virtual machine to revert to a snapshot or take a new snapshot when you power off the virtual machine. This feature is useful if you need to discard changes when a virtual machine is powered off.

- [Enable AutoProtect Snapshots](#)

The AutoProtect feature preserves the state of a virtual machine by taking snapshots at regular intervals that you specify. This process is in addition to manual snapshots, which you can take at any time.

- **Enable Background Snapshots**

When you enable background snapshots, you can continue working while Workstation Pro preserves the state of a virtual machine. A progress indicator for the background snapshot appears in a corner of the Workstation Pro window.

- **Exclude a Virtual Disk from Snapshots**

You can configure snapshots so that Workstation Pro preserves states only for certain virtual disks.

- **Delete a Snapshot**

When you delete a snapshot, you delete the state of the virtual machine that you preserved and you can never return to that state again. Deleting a snapshot does not affect the current state of the virtual machine.

- **Troubleshooting Snapshot Problems**

You can use a variety of procedures for diagnosing and fixing problems with snapshots.

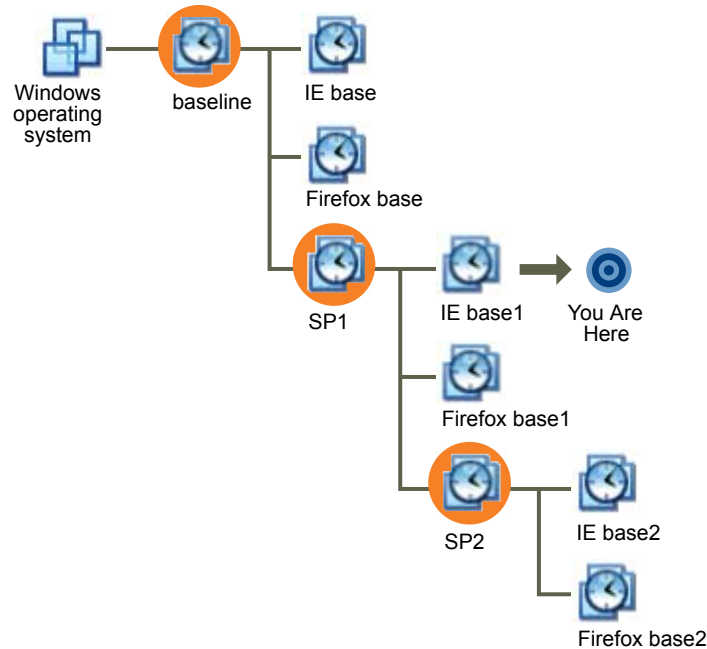
Using Snapshots to Preserve Virtual Machine States

A snapshot includes the contents of the virtual machine memory, virtual machine settings, and the state of all the virtual disks. When you revert to a snapshot, you return the memory, settings, and virtual disks of the virtual machine to the state they were in when you took the snapshot.

You might want to take snapshots in a linear process if you plan to make changes in a virtual machine. For example, you can take a snapshot, continue to use the virtual machine from that point, take another snapshot at a later point, and so on. You can revert to the snapshot of a previous known working state of the project if the changes do not work as expected.

For local virtual machines, you can take more than 100 snapshots for each linear process. For shared and remote virtual machines, you can take a maximum of 31 snapshots for each linear process.

If you are testing software, you might want to save multiple snapshots as branches from a single baseline in a process tree. For example, you can take a snapshot before installing different versions of an application to make sure that each installation begins from an identical baseline.

Figure 4-1. Snapshots as Restoration Points in a Process Tree

Multiple snapshots have a parent-child relationship. The parent snapshot of a virtual machine is the snapshot on which the current state is based. After you take a snapshot, that stored state is the parent snapshot of the virtual machine. If you revert to an earlier snapshot, the earlier snapshot becomes the parent snapshot of the virtual machine.

In a linear process, each snapshot has one parent and one child, except for the last snapshot, which has no children. In a process tree, each snapshot has one parent, one snapshot can have more than one child, and many snapshots have no children.

Using the Snapshot Manager

You can review all snapshots for a virtual machine and act on them directly in the snapshot manager.

You must use the snapshot manager to perform the following tasks.

- Show AutoProtect snapshots in the **Snapshot** menu.
- Prevent an AutoProtect snapshot from being deleted.
- Rename a snapshot or change its description.
- Delete a snapshot.

All other snapshot actions are available as menu items in the **Snapshot** menu under the **VM** menu.

When you open the snapshot manager for a virtual machine, the snapshot tree appears. The snapshot tree shows all of the snapshots for the virtual machine and the relationships between the snapshots.

The **You Are Here** icon in the snapshot tree shows the current state of the virtual machine. The other icons that appear in the snapshot tree represent AutoProtect snapshots, snapshots of powered-on virtual machines, snapshots of powered-off virtual machines, and snapshots that are used to create linked clones.

The snapshot manager is available as a menu item in the **Snapshot** menu under the **VM** menu.

Take a Snapshot of a Virtual Machine

When you take a snapshot, you preserve the state of a virtual machine at a specific moment in time and the virtual machine continues to run. Taking a snapshot enables you to return to the same state repeatedly. You can take a snapshot while a virtual machine is powered on, powered off, or suspended.

Avoid taking snapshots when applications in the virtual machine are communicating with other computers, especially in production environments. For example, if you take a snapshot while the virtual machine is downloading a file from a server on the network, the virtual machine continues downloading the file after you take the snapshot. If you revert to the snapshot, communications between the virtual machine and the server are confused and the file transfer fails.

Note Workstation 4 virtual machines do not support multiple snapshots. You must upgrade the virtual machine to Workstation 7.x or later to take multiple snapshots.

Prerequisites

- Verify that the virtual is not configured to use a physical disk. You cannot take a snapshot of a virtual machine that uses a physical disk.
- To have the virtual machine revert to suspend, power on, or power off when you start it, be sure it is in that state before you take the snapshot. When you revert to a snapshot, you return the memory, settings, and virtual disks of the virtual machine to the state they were in when you took the snapshot.
- Complete any suspend operations.
- Verify that the virtual machine is not communicating with another computer.
- For better performance, defragment the guest operating system drives.
- If the virtual machine has multiple disks in different disk modes, power off the virtual machine. For example, if a configuration requires you to use an independent disk, you must power off the virtual machine before you take a snapshot.
- If the virtual machine was created with Workstation 4, delete any existing snapshots or upgrade the virtual machine to Workstation 5.x or later.

Procedure

- 1 Select the virtual machine and select **VM > Snapshot > Take Snapshot**.
- 2 Type a unique name for the snapshot.
- 3 (Optional) Type a description for the snapshot.

The description is useful for recording notes about the virtual machine state captured in the snapshot.

- 4 Click **OK** to take the snapshot.

Revert to a Snapshot

You can restore a virtual machine to a previous state by reverting to a snapshot.

If you take a snapshot of a virtual machine and add any kind of disk, reverting to the snapshot removes the disk from the virtual machine. If associated disk (.vmdk) files are not used by another snapshot, the disk files are deleted.

Important If you add an independent disk to a virtual machine and take a snapshot, reverting to the snapshot does not affect the state of the independent disk.

Procedure

- To revert to the parent snapshot, select the virtual machine and select **VM > Snapshot > Revert to Snapshot**.
- To revert to any snapshot, select the virtual machine, select **VM > Snapshot**, select the snapshot, and click **Go To**.

Take or Revert to a Snapshot at Power Off

You can configure a virtual machine to revert to a snapshot or take a new snapshot when you power off the virtual machine. This feature is useful if you need to discard changes when a virtual machine is powered off.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **Snapshots**.
- 3 Select a power off option.

Option	Description
Just power off	Powers off the virtual machine without making any changes to snapshots.
Revert to snapshot	Reverts to the parent snapshot of the current state of the virtual machine.
Ask me	Prompts you to power off, revert, or take a snapshot when the virtual machine is powered off.

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

Enable AutoProtect Snapshots

The AutoProtect feature preserves the state of a virtual machine by taking snapshots at regular intervals that you specify. This process is in addition to manual snapshots, which you can take at any time.

When AutoProtect snapshots are enabled for a virtual machine, Workstation Pro shows an estimate of the minimum amount of disk space taken by AutoProtect snapshots on the **Virtual Machine Settings** window. This minimum is affected by the memory settings for the virtual machine. The more virtual machine memory a virtual machine has, the more disk space is available for AutoProtect snapshots.

The AutoProtect feature has certain restrictions.

- Because AutoProtect takes snapshots only while a virtual machine is powered on, AutoProtect snapshots cannot be cloned. You can clone a virtual machine only if it is powered off.
- AutoProtect snapshots are not taken in Workstation Player, even if AutoProtect is enabled for the virtual machine in Workstation Pro.
- You cannot configure the AutoProtect feature for a shared or remote virtual machine.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Options** tab, select **AutoProtect** and select **Enable AutoProtect**.
- 3 Select the interval between snapshots.

Option	Description
Half-Hourly	Snapshots are taken every half hour.
Hourly	Snapshots are taken every hour.
Daily	Snapshots are taken daily.

The interval is measured only when the virtual machine is powered on. For example, if you set AutoProtect to take snapshots hourly and then power off the virtual machine five minutes later, the next AutoProtect snapshot takes place 55 minutes after you power on the virtual machine again, regardless of the length of time the virtual machine was powered off.

Workstation Pro saves only one snapshot per tier, even if a snapshot matches more than one tier.

- 4 Select the maximum number of AutoProtect snapshots to retain.

After the maximum number of AutoProtect snapshots is reached, Workstation Pro deletes the oldest AutoProtect snapshot each time a new AutoProtect snapshot is taken. This setting does not affect the number of manual snapshots that you can take and keep.

- 5 Select **OK** to save your changes.

Enable Background Snapshots

When you enable background snapshots, you can continue working while Workstation Pro preserves the state of a virtual machine. A progress indicator for the background snapshot appears in a corner of the Workstation Pro window.

Important Enabling background snapshots for a host with slow hard disks can adversely affect performance. If you experience significant performance problems when taking or restoring snapshots, disable background snapshots.

Prerequisites

On a Linux host, run Workstation Pro as the root user. Only root users are allowed to change background snapshot settings.

Procedure

- 1 Select **Edit > Preferences**.
- 2 On the **Priority** tab, select **Take snapshots in the background**.
- 3 Click **OK** to save your changes.
- 4 Restart the virtual machines.

Virtual machines must be powered off and then powered on, rather than restarted, for background snapshot changes to take effect.

Exclude a Virtual Disk from Snapshots

You can configure snapshots so that Workstation Pro preserves states only for certain virtual disks.

In certain configurations, you might want to revert some disks to a snapshot while other disks retain all changes. For example, you might want a snapshot to preserve a disk with the operating system and applications, but always keep the changes to a disk with documents.

Prerequisites

- Power off the virtual machine.
- Delete existing snapshots.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Hardware** tab, select the drive to exclude and click **Advanced**.
- 3 Select **Independent** and select the disk mode.

Option	Description
Persistent	Changes are immediately and permanently written to the disk. Disks in persistent mode behave like conventional disks on a physical computer.
Nonpersistent	Changes to the disk are discarded when you power off or restore a snapshot. In nonpersistent mode, a virtual disk is in the same state every time you restart the virtual machine. Changes to the disk are written to and read from a redo log file that is deleted when you power off or reset the virtual machine.

Delete a Snapshot

When you delete a snapshot, you delete the state of the virtual machine that you preserved and you can never return to that state again. Deleting a snapshot does not affect the current state of the virtual machine.

If a snapshot is used to create a clone, the snapshot becomes locked. If you delete a locked snapshot, the clones created from the snapshot no longer operate.

You cannot delete a snapshot if the associated virtual machine is designated as a template for cloning.

Procedure

- 1 Select the virtual machine and select **VM > Snapshot > Snapshot Manager**.
- 2 If you are deleting an AutoProtect snapshot, select **Show AutoProtect snapshots**.
- 3 Select the snapshot.
- 4 Select an option to delete the snapshot.

Option	Action
Delete a single snapshot	Click Delete .
Delete the snapshot and all of its children	Right-click and select Delete Snapshot and Children .
Delete all snapshots	Right-click, select Select All , and click Delete .

- 5 Click **Close** to close the snapshot manager.

Troubleshooting Snapshot Problems

You can use a variety of procedures for diagnosing and fixing problems with snapshots.

Guest Operating System Has Startup Problems

The guest operating system experiences problems during startup.

Problem

The guest operating system does not start up properly.

Cause

Keeping more than 99 snapshots for each branch in a process tree can cause startup problems.

Solution

Delete some snapshots or create a full clone of the virtual machine.

Take Snapshot Option Is Disabled

The Snapshot Manager **Take Snapshot** option is disabled.

Problem

You cannot select the **Take Snapshot** option in the Snapshot Manager.

Cause

The virtual machine might have multiple disks in different disk modes.

Solution

If your configuration requires an independent disk, you must power off the virtual machine before you take a snapshot.

Performance Is Slow When You Take a Snapshot

Significant performance problems occur when you take or restore snapshots.

Problem

Performance is slow when you take or restore snapshots.

Cause

The host operating system has a slow hard disk.

Solution

Upgrade the hard disk or disable background snapshots to improve performance. See [Enable Background Snapshots](#) for information on background snapshots.

Install New Software in a Virtual Machine

Installing new software in a virtual machine is similar to installing new software on a physical computer. Only a few additional steps are required.

Prerequisites

- Verify that VMware Tools is installed in the guest operating system. Installing VMware Tools before installing the software minimizes the likelihood that you will have to reactivate the software if the virtual machine configuration changes.
- Verify that the virtual machine has access to the CD-ROM drive, ISO image file, or floppy drive where the installation software is located.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Hardware** tab, select **Memory**, set the final memory size for the virtual machine, and click **OK**.

Some applications use a product activation feature that creates a key based on the virtual hardware in the virtual machine where it is installed. Changes in the configuration of the virtual machine might require you to reactivate the software. Setting the memory size minimizes the number of significant changes.

- 3 Install the new software according to the manufacturer's instructions.

Disable Acceleration if a Program Does Not Run

When you install or run software inside a virtual machine, Workstation Pro might appear to stop responding. This problem typically occurs early in the program's execution. In many cases, you can get past the problem by temporarily disabling acceleration in the virtual machine.

Procedure

- 1 Select the virtual machine and select **VM > Settings**.
- 2 On the **Hardware** tab, select **Processors**.
- 3 Select **Disable acceleration for binary translation** to disable acceleration.
- 4 Click **OK** to save your changes.

What to do next

After you pass the point where the program encountered problems, re-enable acceleration. Because disabling acceleration slows down virtual machine performance, you should use it only for getting past the problem with running the program

Take a Screenshot of a Virtual Machine

You can take a screenshot of a virtual machine and save it to the clipboard, to a file, or to both a file and the clipboard.

When you take a screenshot of a virtual machine, the image is saved as a portable network graphics (.png) file by default. On Windows hosts, you can also save the screenshot as a bitmap (.bmp) file.

On Linux hosts, saving a screenshot to the clipboard is supported only on systems running Gnome 2.12 or later.

Procedure

- 1 Select **Edit > Preferences**.

- 2 Select **Workspace** and select a save screenshots option.

You can select both options to save screenshots to both a file and the clipboard.

Option	Description
Clipboard	Save the screenshot to the clipboard.
File	Save screenshots to a file. You can select: ■ Always ask for location ■ Save to Desktop ■ Browse for custom location By default, Workstation Pro saves screenshots to .png files on the Desktop of the host computer. If you save the file to the desktop, the filename is generated from the virtual machine name and the time at which the screenshot is taken. To save screenshots to .bmp files on Windows hosts, select Always ask for location and specify the file type when you save the screenshot.

- 3 Click **OK** to save your changes.
- 4 To take the screenshot, select the virtual machine, select **VM > Capture Screen**.

Delete a Virtual Machine

You can delete a virtual machine and all of its files from the host file system.

Important Do not delete a virtual machine if it was used to make a linked clone and you want to continue to use the linked clone. A linked clone stops working if it cannot find the virtual disk files for the parent virtual machine.

Prerequisites

Power off the virtual machine.

Procedure

- ◆ Select the virtual machine and select **VM > Manage > Delete from Disk**.

Configuring Virtual Machine Hardware Settings

12

You can use virtual machine hardware settings to add, remove, and modify virtual devices for a virtual machine.

To configure hardware settings for a selected virtual machine, select **VM > Settings** and click the **Hardware** tab. When you select a device in the left pane, the configuration options for that device appear in the right pane.

This chapter includes the following topics:

- [Adding Hardware to a Virtual Machine](#)
- [Removing Hardware from a Virtual Machine](#)
- [Adjusting Virtual Machine Memory](#)
- [Configuring Virtual Machine Processor Settings](#)
- [Configuring and Maintaining Virtual Hard Disks](#)
- [Configuring CD-ROM and DVD Drive Settings](#)
- [Configuring Floppy Drive Settings](#)
- [Configuring Virtual Network Adapter Settings](#)
- [Configuring USB Controller Settings](#)
- [Configuring Sound Card Settings](#)
- [Configuring Parallel Port Settings](#)
- [Configuring Serial Port Settings](#)
- [Configuring Generic SCSI Device Settings](#)
- [Configuring Printer Settings](#)
- [Configuring Display Settings](#)
- [Installing a Guest Operating System on a Physical Disk or Unused Partition](#)

Adding Hardware to a Virtual Machine

You can use virtual machine hardware settings to add hardware to an existing virtual machine.

To add hardware to a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and click **Add**.

Note You cannot add hardware to a virtual machine while it is in a suspended state.

The **Add Hardware** wizard prompts you to select the type of device that you want to add and to specify device-specific configuration settings. You can modify many of the configuration settings after the device is created by changing virtual machine hardware settings.

You can add the following types of devices to a virtual machine.

Virtual hard disks	A virtual hard disk is a set of files that appears as a physical disk drive to the guest operating system. You can configure a virtual hard disk as an IDE, SCSI, SATA, or NVMe device. You can add up to 4 IDE devices, up to 60 SCSI devices, up to 120 SATA devices (4 controllers and 30 devices per controller), and up to 60 NVMe devices (4 controllers and 15 devices per controller) to a virtual machine. You can also give a virtual machine direct access to a physical disk.
CD-ROM and DVD drives	You can configure a virtual CD-ROM or DVD drive as an IDE, SCSI, or SATA device. You can add up to 4 IDE devices, up to 60 SCSI devices, and up to 120 SATA devices (4 controllers and 30 devices per controller). You can connect virtual CD-ROM and DVD drives to a physical drive on the host system or to an ISO image file.
Floppy drives	You can add up to two floppy drives. A virtual floppy drive can connect to a physical drive on the host system, to an existing floppy image file, or to a blank floppy image file.
Network adapters	You can add up to 10 virtual network adapters to a virtual machine.
USB controller	You can add one USB controller to a virtual machine. A virtual machine must have a USB controller to use USB devices or smart card readers. For smart card readers, a virtual machine must have a USB controller regardless of whether the smart card reader is actually a USB device.
Sound card	If the host system is configured for sound and has a sound card installed, you can enable sound for virtual machines.
Parallel (LPT) ports	You can attach up to three bidirectional parallel ports to a virtual machine. Virtual parallel ports can output to parallel ports or to files on the host operating system.
Serial (COM) ports	You can add up to four serials ports to a virtual machine. Virtual serial ports can output to physical serial ports, files on the host operating system, or named pipes.

Printers

You can print from a virtual machine to any printer available to the host system without installing additional drivers in the virtual machine. Workstation Pro uses ThinPrint technology to replicate the host machine printer mapping in the virtual machine. When you enable the virtual machine printer, Workstation Pro configures a virtual serial port to communicate with the host printers.

Generic SCSI devices

You can add up to 60 SCSI devices to a virtual machine. A generic SCSI device gives the guest operating system direct access to a SCSI device connected to the host system. Generic SCSI devices can include scanners, tape drives, CD-ROM drives, and DVD drives.

Removing Hardware from a Virtual Machine

You can remove certain types of hardware from a virtual machine.

To remove hardware from a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, select the device, and click **Remove**.

Note You cannot remove hardware from a virtual machine while it is in suspended state.

You can remove the following types of devices from a virtual machine.

- Virtual hard disks
- CD-ROM and DVD drives
- Floppy drives
- Virtual network adapters
- USB controllers
- Sound cards
- Printers
- Generic SCSI devices

You cannot remove the Memory, Processors, and Display device types.

You must power off a virtual machine before you remove a virtual network adapter, sound card, parallel port, serial port, or generic SCSI device. You must also power off Workstation 5 virtual machines before you remove a USB controller.

Adjusting Virtual Machine Memory

You can adjust the amount of memory that is allocated to a virtual machine. You must power off a virtual machine before you change its memory allocation setting.

To adjust the memory allocation for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and click **Memory**.

The Memory panel includes information to help you select the appropriate amount of memory for the virtual machine. The high end of the range is determined by the amount of memory that is allocated to all running virtual machines. If you allow virtual machine memory to be swapped, this value changes to reflect the specified amount of swapping.

The color-coded icons on the Memory panel indicate the maximum recommended memory, the recommended memory, and the guest operating system recommended minimum memory amounts. To adjust the memory, move the slider along the range of values, or type a value in the **Memory for this virtual machine** text box.

Note Allocating more than the maximum memory to a virtual machine might cause memory swapping. It can also negatively affect host system performance, including the ability to run Workstation Pro.

Configuring Virtual Machine Processor Settings

You can configure processor settings for a virtual machine, including the number of processors, the number of cores per processor, and the preferred execution mode for the virtualization engine.

To configure processor settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select **Processors**.

Table 12-1. Processor Settings

Setting	Description
Number of processors and Number of cores per processor	Select the number of processors and the number of cores per processor. Workstation Pro supports up to 16-way virtual Symmetric Multiprocessing (SMP) for guest operating systems running on multiprocessor host machines. You can assign processors and cores per processor to a virtual machine on any host machine that has at least two logical processors.
Virtualize Intel VT-x/EPT or AMD-V/RVI	Workstation Pro forces the virtual machine execution mode to VT-x/EPT or AMD-RVI. Physical Address Extension (PAE) mode must be enabled to use virtualized AMD-V/RVI. If the execution mode is not supported by the host system, virtualized VT-x/EPT or AMD/RVI is not available. If you migrate the virtual machine to another VMware product, virtualized VT-x/EPT or AMD-V/RVI might not be available. Note You cannot configure this setting for a shared or remote virtual machine.

Table 12-1. Processor Settings (Continued)

Setting	Description
Virtualize CPU performance counters	Turn on this feature if you plan to use performance monitoring applications such as VTune or OProfile to optimize or debug software that runs inside the virtual machine. This feature is available only if the virtual machine compatibility is Workstation 9 or later.
Virtualize IOMMU (IO memory management unit)	Select this feature to provide the Intel Virtualization Technology for Directed I/O for virtual machines. Note You cannot configure this setting for a shared or remote virtual machine. When you enable virtualization-based security (VBS) for a virtual machine, Workstation Pro automatically selects the Virtual IOMMU feature for you.

Configuring and Maintaining Virtual Hard Disks

You can configure virtual hard disk node and mode settings. You can also use command in the **Utilities** menu to perform common disk maintenance tasks, such as defragmenting, compacting, and expanding a disk.

To perform actions on a virtual hard disk for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the virtual hard disk.

■ Defragmenting Virtual Hard Disks

Like physical disk drives, virtual hard disks can become fragmented. Defragmenting disks rearranges files, programs, and unused space on the virtual disk so that programs run faster and files open more quickly. Defragmenting does not reclaim unused space on a virtual disk.

■ Expanding Virtual Hard Disks

Expanding a virtual hard disk adds storage space to the virtual machine.

■ Compacting Virtual Hard Disks

Compacting a virtual hard disk can reclaim unused space in the virtual disk. Modern disks and operating systems are much more efficient at managing disk space than in the recent past. Therefore, do not expect the compacting procedure to return large amounts of disk space to the host drive.

■ Changing Virtual Hard Disk Node and Mode Settings

You can change virtual hard disk node and mode settings.

Defragmenting Virtual Hard Disks

Like physical disk drives, virtual hard disks can become fragmented. Defragmenting disks rearranges files, programs, and unused space on the virtual disk so that programs run faster and files open more quickly. Defragmenting does not reclaim unused space on a virtual disk.

There must be adequate free working space on the host system to defragment a virtual hard disk. If the disk is contained in a single file, for example, you need free space equal to the size of the disk file. Other virtual hard disk configurations require less free space. You cannot defragment a virtual hard disk while it is mapped or mounted.

To defragment a virtual hard disk for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, select the virtual hard disk, and select **Defragment** from the **Utilities** menu.

Note Defragmenting a virtual hard disk can take several minutes.

Expanding Virtual Hard Disks

Expanding a virtual hard disk adds storage space to the virtual machine.

When you expand a virtual hard disk, the added space is not immediately available to the virtual machine. To make the added space available, you must use a disk management tool to increase the size of the existing partition on the virtual hard disk to match the expanded size.

The disk management tool that you use depends on the virtual machine guest operating system. Many operating systems, including Windows Vista, Windows 7, and some versions of Linux, provide built-in disk management tools that can resize partitions. Third-party disk management tools are also available, such as Symantec/Norton PartitionMagic, EASEUS Partition Master, Acronis Disk Director, and the open-source tool GParted.

When you expand the size of a virtual hard disk, the sizes of partitions and file systems are not affected.

To expand a virtual hard disk for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, select the virtual hard disk, and select **Expand** from the **Utilities** menu.

Note As an alternative to expanding a virtual hard disk, you can add a new virtual hard disk to the virtual machine.

Compacting Virtual Hard Disks

Compacting a virtual hard disk can reclaim unused space in the virtual disk. Modern disks and operating systems are much more efficient at managing disk space than in the recent past. Therefore, do not expect the compacting procedure to return large amounts of disk space to the host drive.

You cannot compact a virtual hard disk if disk space is preallocated or if the virtual hard disk is mapped or mounted.

To compact a virtual hard disk for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, select the virtual hard disk, and select **Compact** from the **Utilities** menu.

Changing Virtual Hard Disk Node and Mode Settings

You can change virtual hard disk node and mode settings.

To change the node and mode settings for a virtual hard disk on a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, select the virtual hard disk, and click **Advanced**. By default, changes are immediately written to the disk. The data on the disk is saved when you take a snapshot of the virtual machine.

Table 12-2. Virtual Hard Disk Node and Mode Settings

Setting	Description
Virtual device node	Select the SCSI, IDE, SATA, or NVMe device identifier to use for the drive. For example, if you select SCSI 0:2, the guest operating system detects the drive as ID 2 on controller 0. You determine whether the virtual disk is seen as a SCSI, IDE, SATA, or NVMe device at the time that you create it.
Independent	If the Independent check box is unavailable, the virtual machine might have snapshots. After you delete the snapshots, the check box becomes available. Caution Independent disks do not participate in snapshots. Only select Independent mode for a disk in a virtual machine if you are prepared to give up the ability to take snapshots of the virtual machine when powered on. Although independent disks are not commonly used, they are useful in specific situations. For example, you have a virtual machine with two virtual disks. The second disk is configured to hold the Linux swap file or the Windows page file. The data on this disk has no value once the virtual machine is powered off. Therefore, you have no need to save the data from the second disk in a snapshot of the virtual machine. You can economize host disk space by not storing that data when a snapshot is taken. Accomplish this economy of host disk space by making the second disk independent. Specify independent disks as Persistent or Nonpersistent. While the virtual machine is running, a non-persistent disk stores all of the changes made to a disk in a separate file. When the virtual machine is shut down, the changes are discarded. Discarding the changes is useful in certain situations. For example, you have a virtual machine configured for a school setting or kiosk. The virtual machine has all the necessary software loaded, such as browsers, programming tools, computer-aided learning software, and so on. Students can use the virtual machine normally during the day. When the virtual machine is powered off at the end of the day, all changes made are discarded. When the virtual machine is powered on the following day, the non-persistent disk is exactly as it was at the beginning of the previous day. The disk contains no new malware or misconfigured software. Students can save their work to a USB thumb drive or network location as needed.

Configuring CD-ROM and DVD Drive Settings

You can configure CD-ROM and DVD drive settings, including the virtual device node and legacy emulation modes.

To configure CD-ROM and DVD drive settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the drive.

■ [Configuring CD-ROM and DVD Drive Status and Connection Settings](#)

Device status and connection settings control when a CD-ROM or DVD drive is connected to a virtual machine, whether to use a specific drive or allow Workstation Pro to detect a drive, and whether to use an ISO image file instead of a physical drive.

■ Changing Virtual Device Node and Legacy Emulation Settings

You can use the advanced settings to change the virtual device node and legacy emulation settings for a CD-ROM or DVD drive. You must power off the virtual machine before you change these settings.

Configuring CD-ROM and DVD Drive Status and Connection Settings

Device status and connection settings control when a CD-ROM or DVD drive is connected to a virtual machine, whether to use a specific drive or allow Workstation Pro to detect a drive, and whether to use an ISO image file instead of a physical drive.

To configure device status and connection settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the drive.

Table 12-3. Device Status and Connection Settings

Setting	Description								
Connected	Connect the drive or ISO image file while the virtual machine is running.								
Connect at power on	Connect the drive or ISO image path when you power on the virtual machine.								
Connection	Select the location of the physical drive or ISO image file.								
	<table> <tr> <td>Remote Server</td><td>(Remote virtual machine only) The physical drive or ISO image file is located on the remote host.</td></tr> <tr> <td>Local Client</td><td>(Remote virtual machine only) The physical drive or ISO image file is located on the local host.</td></tr> <tr> <td>Local (Across Sessions)</td><td>(Shared virtual machine only) The physical drive or ISO image file can be used across multiple sessions.</td></tr> <tr> <td>Local (Single Session)</td><td>(Shared virtual machine only) The physical drive or ISO image file can be used only in this session.</td></tr> </table>	Remote Server	(Remote virtual machine only) The physical drive or ISO image file is located on the remote host.	Local Client	(Remote virtual machine only) The physical drive or ISO image file is located on the local host.	Local (Across Sessions)	(Shared virtual machine only) The physical drive or ISO image file can be used across multiple sessions.	Local (Single Session)	(Shared virtual machine only) The physical drive or ISO image file can be used only in this session.
Remote Server	(Remote virtual machine only) The physical drive or ISO image file is located on the remote host.								
Local Client	(Remote virtual machine only) The physical drive or ISO image file is located on the local host.								
Local (Across Sessions)	(Shared virtual machine only) The physical drive or ISO image file can be used across multiple sessions.								
Local (Single Session)	(Shared virtual machine only) The physical drive or ISO image file can be used only in this session.								
Use physical drive	Select a specific drive or select Auto detect to allow Workstation Pro to detect a drive to use.								
Use ISO image file	Specify or select an ISO image file for the virtual machine to use.								

To disable or enable access to a CD-ROM or DVD drive while a virtual machine is running, select the virtual machine, select **VM > Removable Devices > CD/DVD**, and select **Disconnect** or **Connect**.

Changing Virtual Device Node and Legacy Emulation Settings

You can use the advanced settings to change the virtual device node and legacy emulation settings for a CD-ROM or DVD drive. You must power off the virtual machine before you change these settings.

To configure virtual device and legacy emulation settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, select the drive, and click **Advanced**.

Use the settings to select which SCSI, IDE, SATA, or NVMe device identifier to use for the drive. For example, if you select SCSI 0:2, the guest operating system detects the drive as ID 2 on controller 0. You can select the IDE, SCSI, SATA, or NVMe node options regardless of the physical device type. For example, if the physical drive is an IDE device, you can select a SCSI node. In this case, the virtual machine detects the drive as a SCSI device.

If you select the **Legacy emulation** setting, the virtual hardware works as it did in an earlier release of Workstation Pro. By default, Workstation Pro attempts to make the advanced features of your drive available, but sometimes this setting might cause the drive to not work with the virtual machine. Selecting the **Legacy emulation** setting reverts Workstation Pro to the previous emulation mode for the drive. Legacy emulation is helpful for troubleshooting purposes.

Configuring Floppy Drive Settings

You can configure when a floppy drive is connected to a virtual machine, whether to use a specific drive or allow Workstation Pro to detect a drive, and whether to use an disk drive image file instead of a physical drive.

To configure floppy drive settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the floppy drive.

Table 12-4. Floppy Drive Settings

Setting	Description								
Connected	Connect the drive or floppy image file while the virtual machine is running.								
Connect at power on	Connect the floppy drive when you power on the virtual machine.								
Location	Select the location of the physical drive or floppy image file.								
	<table> <tr> <td>Remote Server</td><td>(Remote virtual machine only) The physical drive or floppy image file is located on the remote host.</td></tr> <tr> <td>Local Client</td><td>(Remote virtual machine only) The physical drive or floppy image file is located on the local host.</td></tr> <tr> <td>Local (Across Sessions)</td><td>(Shared virtual machine only) The physical drive or floppy image file can be used across multiple sessions.</td></tr> <tr> <td>Local (Single Session)</td><td>(Shared virtual machine only) The physical drive or floppy image file can be used only in this session.</td></tr> </table>	Remote Server	(Remote virtual machine only) The physical drive or floppy image file is located on the remote host.	Local Client	(Remote virtual machine only) The physical drive or floppy image file is located on the local host.	Local (Across Sessions)	(Shared virtual machine only) The physical drive or floppy image file can be used across multiple sessions.	Local (Single Session)	(Shared virtual machine only) The physical drive or floppy image file can be used only in this session.
Remote Server	(Remote virtual machine only) The physical drive or floppy image file is located on the remote host.								
Local Client	(Remote virtual machine only) The physical drive or floppy image file is located on the local host.								
Local (Across Sessions)	(Shared virtual machine only) The physical drive or floppy image file can be used across multiple sessions.								
Local (Single Session)	(Shared virtual machine only) The physical drive or floppy image file can be used only in this session.								
Use a physical drive	Select a specific floppy drive or select Auto detect to allow Workstation Pro to detect a drive to use.								
Use a floppy image file	Create or browse to a floppy image (.img or .flp) file. Select Read only to prevent changes from being made to the file.								

To disable or enable access to a floppy drive while a virtual machine is running, select the virtual machine, select **VM > Removable Devices > Floppy**, and select **Disconnect** or **Connect**.

Configuring Virtual Network Adapter Settings

You can configure when a virtual network adapter is connected to a virtual machine and the type of network connection that the adapter provides.

The type of network configuration that you can select depends on whether the virtual machine is a local, shared, or remote virtual machine.

To configure virtual network adapter settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the virtual network adapter.

- [Configuring Virtual Network Adapter Device Status Settings](#)

Device status settings control when a virtual network adapter is connected to a virtual machine.

- [Configuring a Network Connection](#)

You can configure the type of network connection that a virtual network adapter provides.

- [Configuring Virtual Network Adapter Advanced Settings](#)

You can use the advanced virtual network adapter settings to limit the bandwidth, specify the acceptable packet loss percentage, and create network latency for incoming and outgoing data transfers for a virtual machine.

Configuring Virtual Network Adapter Device Status Settings

Device status settings control when a virtual network adapter is connected to a virtual machine.

To configure virtual network adapter device status settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the virtual network adapter.

Table 12-5. Device Status Settings

Setting	Description
Connected	Connect the virtual network adapter while the virtual machine is running.
Connect at power on	Connect the virtual network adapter when you power on the virtual machine.

Configuring a Network Connection

You can configure the type of network connection that a virtual network adapter provides.

For a local virtual machine, you can configure bridged, NAT, or host-only networking, or you can select a custom network or LAN segment. For a shared virtual machine, you can select bridged, NAT, or host-only networking from a drop-down menu. For a remote virtual machine, you must select a custom network.

To configure a network connection for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the virtual network adapter.

- [Configuring Bridged Networking](#)

When you configure bridged networking, the virtual machine uses physical network adapters on the host system to connect a network.

- **Configuring Network Address Translation**

When you configure Network Address Translation (NAT), the virtual machine shares the IP address and MAC address of the host system.

- **Configuring Host-Only Networking**

When you configure host-only networking, Workstation Pro creates a virtual private network (VPN) connection between the virtual machine and the host system.

- **Configuring a Custom Network Configuration**

A custom network is a network that you create by using the virtual network editor. You can select a custom network when you modify the network connection setting for a local virtual machine. For a remote virtual machine, you must select a custom network. You cannot select a custom network for a shared virtual machine.

- **Configuring LAN Segments**

When you select a LAN segment, the virtual machine uses a private network that can be shared with other virtual machines. LAN segments are useful for multitier testing, network performance analysis, and situations where virtual machine isolation are important.

Configuring Bridged Networking

When you configure bridged networking, the virtual machine uses physical network adapters on the host system to connect a network.

If the host system is on a network, bridged networking is often the easiest way to give a virtual machine access to that network.

With bridged networking, the virtual machine appears as an additional computer on the same physical Ethernet network as the host system. The virtual machine can transparently use the services available on the network, including file servers, printers, and gateways. Physical hosts and other virtual machines configured with bridged networking can also use the resources of the virtual machine.

When you use bridged networking, the virtual machine must have its own identity on the network. For example, on a TCP/IP network, the virtual machine must have its own IP address. Virtual machines typically acquire an IP address and other network details from a DHCP server. In some configurations, you might need to set the IP address and other details manually.

Users who boot multiple operating systems often assign the same address to all systems because they assume that only one operating system will be running at the same time. If the host system is set up to boot multiple operating systems and you run one or more of them in virtual machines, configure each operating system with a unique network address.

When the **Replicate physical connection state** option is selected, the IP address is automatically renewed when you move from one wired or wireless network to another. This setting is useful for virtual machines than run on laptops or other mobile devices.

Configuring Network Address Translation

When you configure Network Address Translation (NAT), the virtual machine shares the IP address and MAC address of the host system.

The virtual machine and the host system share the a single identity that is not visible outside the network. The virtual machine does not have its own IP address. Instead, a separate private network is set up on the host system and the virtual machine obtains an address on that network from the VMware virtual DHCP server. The VMware NAT device passes network data between one or more virtual machines and the external network. The VMware NAT device identifies incoming data packets that are intended for each virtual machine and sends them to the correct destination.

With NAT, a virtual machine can use many standard protocols to connect to other machines on the external network. For example, you can use HTTP to browse Web sites, FTP to transfer files, and Telnet to log in to other systems. You can also connect to a TCP/IP network by using a Token Ring adapter on the host system.

In the default configuration, systems on the external network cannot initiate connections to the virtual machine. For example, the default configuration does not let you use the virtual machine as a Web server to send Web pages to systems on the external network. This limitation protects the guest operating system from being compromised before you can install security software.

By default, NAT is used when you use the **New Virtual Machine** wizard to create a virtual machine.

The virtual machine uses NAT to connect to the Internet or other TCP/IP network by using the networking connection on the host system. NAT works with Ethernet, DSL, and phone modems. A separate private network is set up on the host system. The virtual machine obtains an address on that network from the VMware virtual DHCP server.

Configuring Host-Only Networking

When you configure host-only networking, Workstation Pro creates a virtual private network (VPN) connection between the virtual machine and the host system.

A VPN is typically not visible outside the host system. Multiple virtual machines configured with host-only networking on the same host system are on the same network. The VMware DHCP server provides addresses on the network.

If you install the proper routing or proxy software on the host system, you can establish a connection between the host virtual network adapter and a physical network adapter on the host system. With this configuration, you can connect the virtual machine to a Token Ring or other non-Ethernet network.

Configuring a Custom Network Configuration

A custom network is a network that you create by using the virtual network editor. You can select a custom network when you modify the network connection setting for a local virtual machine. For a remote virtual machine, you must select a custom network. You cannot select a custom network for a shared virtual machine.

A custom network can be connected to one or more external networks, or it can run entirely on the host system. You can use the virtual network editor to access multiple network cards in the host system and create multiple virtual networks.

For more information, see [Chapter 13 Using the Virtual Network Editor](#).

Configuring LAN Segments

When you select a LAN segment, the virtual machine uses a private network that can be shared with other virtual machines. LAN segments are useful for multitier testing, network performance analysis, and situations where virtual machine isolation are important.

You cannot configure a LAN segment for a shared or remote virtual machine.

If you add an existing virtual machine to a LAN segment, the virtual machine might be configured to expect an IP address from a DHCP server. Unlike host-only and NAT networking, Workstation Pro does not provide a DHCP server for LAN segments. You must manually configure IP addressing for virtual machines on a LAN segment. You can either configure a DHCP server on the LAN segment to allocate IP addresses, or you can configure a fixed IP address for each virtual machine on the LAN segment.

If you convert a team that was created in an earlier version of Workstation Pro, the LAN segment that was configured for the team appears in the **LAN segment** drop-down menu for each virtual machine.

You can click **LAN Segments** to create new LAN segments or delete and rename existing LAN segments. Deleting a LAN segment disconnects all virtual network adapters that are configured for that LAN segment. When you delete a LAN segment, you must manually configure its disconnected virtual network adapter to reconnect the virtual machine to the network.

Configuring Virtual Network Adapter Advanced Settings

You can use the advanced virtual network adapter settings to limit the bandwidth, specify the acceptable packet loss percentage, and create network latency for incoming and outgoing data transfers for a virtual machine.

The advanced virtual network adapter settings allow you to simulate a network environment that differs from your own.

To configure advanced virtual network adapter settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, select the virtual network adapter, and click **Advanced**.

Note You cannot configure advanced virtual network adapter settings for a shared or remote virtual machine.

Table 12-6. Virtual Network Adapter Advanced Settings

Setting	Description
Bandwidth and Kbps	To limit incoming or outgoing data transfers to the data transfer rate for a specific network connection type, select the network connection type from the Bandwidth drop-down menu. The value in the Kbps text box changes to the data transfer rate, in kilobits per second, of the network connection type that you select. For example, if you select Leased Line T1 (1.544 Mbps), the value in the Kbps text box changes to 1544. To limit incoming or outgoing data transfers to a specific data transfer rate, select Custom and type the data transfer rate in kilobits per second in the Kbps text box. The default bandwidth setting for both incoming and outgoing data transfers is Unlimited.
Packet Loss (%)	The acceptable packet loss percentage for incoming or outgoing data transfers. The default setting is 0.0%.
Latency (ms)	To simulate network latency for incoming and outgoing data transfers, set the number of milliseconds (ms) of latency. The latency range is 0 to 2,000 ms. Note Expect actual network latency to be up to 10 ms above the number you set. For example, if you set latency at 200 ms, expect the actual latency to be between 200 to 210 ms.
MAC Address	To assign a new MAC address to the network adapter, either type a new address in this text box or click Generate to have Workstation Pro generate a new address.

Configuring USB Controller Settings

You can configure whether a USB controller supports isochronous USB and Bluetooth devices, when to connect new USB devices to the host system, and whether human interface devices (HIDs) appear in the **Removable Devices** menu.

Note You typically cannot configure USB controller settings for a shared or remote virtual machine.

To configure USB controller settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and click **USB Controller**.

Table 12-7. USB Controller Settings

Setting	Description
USB Compatibility	Selecting USB 2.0 or 3.0 enables support for isochronous USB devices, including Web cams, speakers, and microphones.
Automatically connect new USB devices	Connect new USB devices to the virtual machine. If this setting is not selected, new USB devices are connected only to the host system.
Show all USB input devices	Human interface devices (HIDs), such as USB 1.1 and 2.0 mouse and keyboard devices, appear in the Removable Devices menu. Icons for HIDs appear in the status bar. An HID that is connected to the guest operating system is not available to the host system. The virtual machine must be powered off when you change this setting.
Share Bluetooth devices with the virtual machine	Enable support for Bluetooth devices.

To connect or disconnect USB devices while a virtual machine is running, select the virtual machine and select **VM > Removable Devices**. With the two-port USB controller, you can connect to both USB 1.1 and USB 2.0 devices.

Important Before you unplug a USB device or select a removable device to disconnect a USB device from a virtual machine, follow the device manufacturer's procedures for safely unplugging the device from a physical computer.

Configuring Sound Card Settings

You can configure when a sound card is connected to a virtual machine. You can also configure whether a virtual machine uses a specific sound card or the default sound card in the host system.

To configure sound card settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and click **Sound Card**.

Note You cannot change sound card settings for a remote virtual machine.

Table 12-8. Sound Card Settings

Setting	Description
Connected	Connect the sound device while the virtual machine is running.
Connect at power on	Connect the sound device when you power on the virtual machine.
Use default host sound card	Make the virtual machine use the default sound card in the host system.
Specify host sound card	(Windows hosts only) Select a specific host sound card for the virtual machine to use.
Use physical sound card	(Linux hosts only) Select a specific host sound card to for the virtual machine to use.
Enable Echo Cancellation	Enable echo cancellation for the sound card.

Configuring Parallel Port Settings

You can configure when a parallel port is connected to a virtual machine and whether to send output to a physical port or to a file on the host system.

To configure parallel port settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the parallel port.

Table 12-9. Parallel Port Settings

Setting	Description
Connected	Connect the port while the virtual machine is running.
Connect at power on	Connect the port when you power on the virtual machine. If the guest operating system cannot access the parallel port device when you power on the virtual machine, deselect this setting. You can use the Removable Devices menu to enable access to the parallel port after the virtual machine is powered on.

Table 12-9. Parallel Port Settings (Continued)

Setting	Description
Use a physical parallel port	Select a host parallel port for the virtual machine to use.
Use output file	Send output from the virtual parallel port to a file on the host system. Either locate an existing output file or browse to a directory and type a filename to create a new output file.

Configuring Serial Port Settings

You can configure when a serial port is connected to a virtual machine. You can also configure whether to send output to a physical port or to a file on the host system, set up a direct connection between two virtual machines, and specify whether the guest operating system uses the port in polled mode.

To configure serial port settings for a selected virtual machine, select the virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the serial port.

Table 12-10. Serial Port Settings

Setting	Description
Connected	Connect the port while the virtual machine is running.
Connect at power on	Connect the port when you power on the virtual machine.
Use a physical serial port	Select a host serial port.
Use output file	Send output from the virtual serial port to a file on the host system. Either locate an existing output file or navigate to the desired directory and type a filename for the file to create.
Use named pipe or Use socket (named pipe)	Set up a direct connection between two virtual machines or a connection between a virtual machine and an application on the host system.
Yield CPU on poll	The guest operating system uses the port in polled mode rather than interrupt mode. It yields processor time if its only task is to poll the virtual serial port. If the guest operating system uses the serial port in interrupt mode, do not select this setting. Note This setting is useful for developers who are using debugging tools that communicate over a serial connection. Selecting this setting can improve performance when the guest operating system uses the serial port in polled mode.

Configuring Generic SCSI Device Settings

You can configure when a generic SCSI device is connected to a virtual machine, specify the physical SCSI device to connect to on the host system, and select the SCSI identifier to use for the drive.

To configure generic SCSI device settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select the generic SCSI device.

Note You cannot configure a generic SCSI device for a shared or remote virtual machine.

Table 12-11. Generic SCSI Device Settings

Setting	Description
Connected	Connect the device while the virtual machine is running.
Connect at power on	Connect the device when you power on the virtual machine.
Specify the physical SCSI device to connect to	Select a host SCSI device. (Windows hosts) Select a device. The menu shows the SCSI devices that are available on the host system. (Linux hosts) Type the name of the <code>/dev/sg</code> entry for the device to install in the virtual machine. For example, if the device is named <code>sga</code>, type <code>/dev/sga</code>.
Virtual device node	Select the SCSI device identifier to use for the drive. For example, if you select SCSI 0:2, the guest operating system sees the drive as ID 2 on controller 0. The virtual machine must be powered off when you change this setting.

Note For specific Windows guest operating systems, you might need to perform additional configuration steps to use a generic SCSI device.

Configuring Printer Settings

You can configure when a printer is connected to a virtual machine.

To configure printer settings for a selected virtual machine, select **VM > Settings**, click the **Hardware** tab, and select **Printer**.

Table 12-12. Printer Settings

Setting	Description
Connected	Connect the printer while the virtual machine is running.
Connect at power on	Connect the printer when you power on the virtual machine.

Configuring Display Settings

You can specify monitor resolution settings, configure multiple monitors, and select accelerated graphics capabilities for a virtual machine.

To configure display settings for a virtual machine, select the virtual machine, select **VM > Settings**, click the **Hardware** tab, and select **Display** (local virtual machine) or **Video card** (shared or remote virtual machine).

Note Only Workstation 6.x and later virtual machines support specifying resolution settings and setting the number of monitors that the guest operating system can use.

Table 12-13. Display Settings

Setting	Description
Accelerate 3D graphics	Select this setting if you run applications that use DirectX 9 or DirectX 10 accelerated graphics. Accelerated graphics capabilities apply to Windows XP or later guests on hosts running Windows or Linux. The virtual machine must be a Workstation 6.x or later virtual machine and must have VMware Tools installed from Workstation 7.x or later.
Use host setting for monitors	
Specify monitor settings	Set the number of monitors that the virtual machine will see, regardless of the number of monitors on the host system. This setting is useful if you use a multimonitor host system and you need to test in a virtual machine that has only one monitor. It is also useful if you are developing a multimonitor application in a virtual machine and the host system has only one monitor. After you power on the virtual machine, the guest operating system sees the number of monitors that you specified. Select a resolution from the list or type a setting that has the format <i>width x height</i>, where <i>width</i> and <i>height</i> are the number of pixels. Note You cannot configure the resolution setting for a shared or remote virtual machine.
Graphics memory	Select the maximum amount of guest memory that can be used for graphics memory using the drop down menu. The default value of video memory varies by guest OS.
Display Scaling	Enables display scaling for the virtual machine display. The user interface is automatically adjusted when the display changes.

Installing a Guest Operating System on a Physical Disk or Unused Partition

You can install a guest operating system directly on a physical disk or unused partition on the host system.

A physical disk directly accesses an existing local disk or partition. You can use physical disks to run one or more guest operating systems from existing disk partitions.

Workstation Pro supports physical disks up to 2 TB capacity. Booting from an operating system already set up on an existing SCSI disk or partition is not supported.

Running an operating system natively on the host system and switching to running it inside a virtual machine is similar to pulling the hard drive out of one computer and installing it in a second computer that has a different motherboard and hardware. The steps you take depend on the guest operating system in the virtual machine. In most cases, a guest operating system that is installed on a physical disk or unused partition cannot boot outside of the virtual machine, even though the data is available to the host system. See the *Dual-Boot Computers and Virtual Machines* technical note on the VMware Web site for information about using an operating system that can also boot outside of a virtual machine.

After you configure a virtual machine to use one or more partitions on a physical disk, do not modify the partition tables by running `fdisk` or a similar utility in the guest operating system. If you use `fdisk` or a similar utility on the host operating system to modify the partition table of the physical disk, you must recreate the virtual machine physical disk. All files that were on the physical disk are lost when you modify the partition table.

Important You cannot use a physical disk to share files between the host system and a guest operating system. Making the same partition visible to both the host system and a guest operating system can cause data corruption. Instead, use shared folder to share files between the host system and a guest operating system.
