

Getting Started Guide

VMware Express



For Linux Systems

The VMware Express Support Web site is available for getting the most up-to-date technical documentation and troubleshooting information at <http://www.vmware.com/support/express/>. A shortcut is provided to the web site in the VMware Express Help menu (Help > Support).

If you purchased VMware Express from a computer retail store, or from the VMware Web site, technical support is available directly from VMware, Inc. If you received VMware Express from a distribution partner or vendor listed at <http://www.vmware.com/support/express/#oemlinks>, technical support is available directly from the distribution partner.

To learn more about VMware products, visit the VMware Web site at <http://www.vmware.com>

You can upgrade from VMware Express to VMware Workstation using Help > VMware Workstation upgrade offer, or go to <https://www.vmware.com/store/expressupgrade.cfm>

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1

Installing and Configuring VMware Express

Installing and Configuring VMware Express

INTRODUCTION

Welcome to VMware Express for Linux Systems. VMware Express is a fast and flexible way to run your Windows applications under Linux. It gives you a virtual Windows 98 or Windows 95 computer running in a window on your Linux desktop.

The first section of the Getting Started Guide will step you through the basics of installing a Windows 98 or Windows 95 guest operating system for use with VMware Express. The guide also provides technical notes to help you get the most out of VMware Express.

For additional documentation and other support resources, please visit the VMware support site on the Web at <http://www.vmware.com/support/express/>.

The key steps in getting started with VMware Express are:

1. Install VMware Express.
2. Use the Configuration Wizard to configure your virtual machine.
3. Install Windows 98 or Windows 95 inside the virtual machine.
4. Install VMware Tools inside the virtual machine.
5. Install and use your choice of Windows applications.

Before you begin, be sure you have:

- A computer and host operating system that meet the system requirements for running VMware Express.
- VMware Express CD-ROM disc
- The included registration card, with your serial number.
- Installation CD or disks for your guest operating system.

SYSTEM REQUIREMENTS

Hardware requirements for the host machine

- Standard x86-based PC
- Pentium II 266MHz and faster recommended.
Compatible processors include:
 - Intel Pentium III, Pentium II, Celeron, and Pentium Pro
 - AMD™ Athlon™, K6®, and K6-2
- Multiprocessor systems supported
- 128MB RAM recommended, 96MB minimum
- Super VGA video adapter supported by the XFree86 Server (to take advantage of the VMware full-screen option)
- 8MB disk space for VMware Express software installation

- Additional disk space required for the guest operating system and Windows applications. Typical installations requires:
 - 210MB for Windows 98 SE
 - 165MB for Windows 98 SE
 - 90MB for Windows 95 OSR2
 - 55MB for Windows 95
- Double-speed or faster CD-ROM drive

Software requirements for the host machine

- Standard Linux distribution with X server, glibc version 2 or higher, and one of the following:
 - For single-processor systems: kernel 2.0.32 or higher kernel in the 2.0.x series, or kernel in the 2.2.x series.
 - For SMP systems: kernel in the 2.2x series

Note: VMware Express has been tested with host systems running:

- Red Hat Linux 5.x, 6.x and 7.0
- Caldera OpenLinux 2.2 and 2.3
- SuSE Linux 6.x and 7.0
- TurboLinux 6.0

VMware may run on other Linux distributions; attempting to do so is recommended for expert Linux users only.

Note: glibc must be installed on your host system. In general, if a file called *lib-names.h* exists in the */usr/include/gnu* directory, then glibc is most likely installed; otherwise install it.

- VMware Express requires an X server
 - XFree86-3.3.3.1 or higher release
 - XFree86 server version 3.3.4 or higher recommended

If you are using a recent Linux distribution, it should include an appropriate X server by default. If you want to find out what XFree86 server is running on your computer, as root, run `X -version`.

Software for the virtual machine

- Guest operating system
 - Windows 98 Second Edition
 - Windows 98
 - Windows 95 (retail and OSR releases)
- Optional Windows applications

INSTALL VMWARE EXPRESS

Fastest Installation Method

This section describes the fastest method of installing the software using the VMware Express CD-ROM disc. It is also possible to install the software from the tar and RPM packages on the VMware Express CD. If you would like to install VMware Express using the tar file or RPM packages, please skip ahead to the corresponding sections below.

The steps below describe how to install VMware Express from the 'vmware-distrib' directory on the VMware Express CD onto your Linux host system:

1. You should be logged on to your Linux host with the user name you will use when running VMware Express.
2. Insert the VMware Express CD in your CD-ROM drive. You may have to mount it manually if your Linux system does not automatically mount the CD. To mount the CD manually follow the steps below:
 - a) become the super user (root) by typing `su`
 - b) make CD accessible to Linux using the following command:


```
mount -t iso9660 -o mode=0755 /dev/cdrom /mnt/cdrom
```
3. Change to the [path to your CD-ROM]/vmware-distrib directory on the CD.
4. If you are not logged in as the super user, do so by typing `su`
5. Start the installation by typing `./vmware-install.pl`
Note: This script can be used to reconfigure VMware Express whenever you upgrade your kernel. It is not necessary to reinstall VMware Express.
6. Acknowledge the end user license agreement (EULA). You may page through it using the space bar key. If you do not get the *Do you accept ...* prompt, you may press `Q` to get to the next prompt.
7. If you already have Samba running on your host computer, when the configuration script prompts you *Do you want this script to automatically configure your system to allow your virtual machines to access the host file system?* Answer `No`. If Samba is not already running on your host computer, answer `Yes` to this question and the VMware installer will configure it for you.
8. Press `Enter` to display the Samba license information. You may press the space bar to page through it, then press `Q` to continue to the next prompt.
9. The configuration script asks *Do you want this script to probe for an unused subnet?* Answer `Yes`. If the probe is not successful, the script will ask you to supply the needed information for the subnet that your virtual machines will use.
10. Press `Enter` to display the DHCP server copyright information. You may press the space bar to page through it, then press `Q` to continue to the next prompt.
11. The configuration script will prompt you for a user name and password to use with the Samba configuration. Enter the user name you used in step 1 above.
12. Return to your user account by typing `exit`. At this point you should be logged in with the user name you will use when running VMware Express.

You are now ready to license VMware Express. Proceed to the section titled **LICENSE THE SOFTWARE** later in this chapter.

RPM Installation Method

The steps below describe how to install the VMware Express RPM package from the CD onto your Linux host system:

Note: If you download a newer RPM package for VMware Express, refer to <http://www.vmware.com/support/express/> for installation instructions.

1. You should be logged on to your Linux host with the user name you will use when running VMware.
2. Insert the VMware Express CD in your CD-ROM drive. You may have to mount it manually if your Linux system does not automatically mount the CD. To mount the CD manually follow the steps below:
 - a) become the super user (root) by typing `su`
 - b) make CD accessible to Linux using the following command:

```
mount -t iso9660 -o mode=0755 /dev/cdrom /mnt/cdrom
```
3. Change to the `[path to your CD-ROM]/` directory on the CD.
4. If you are not logged in as the super user, do so by typing `su`
5. Install the RPM package by typing the following command:

```
rpm -Uhv VMware-express-2.0.3-<xxx>.i386.rpm
```

where `<xxx>` is the build number of the RPM package on your CD.

Note: VMware Workstation and VMware Express for Linux use the same RPM package names. RPM looks at the version and build numbers to determine which is newer.

As a result, you may receive a message that says something like Package `<A>` (which is newer than ``) is already installed. where `<A>` is the program already installed on your computer and `` is the program you are attempting to install.

If this happens, you can force RPM to install the “older” version with the command:

```
rpm -Uhv filename.rpm --oldpackage
```

where `filename.rpm` is the file you want to install.

6. Run the configuration script by typing the following command:

```
vmware-config.pl
```

Note: This script can be used to reconfigure VMware Express whenever you upgrade your kernel. It is not necessary to reinstall VMware Express.
7. Acknowledge the end user license agreement (EULA). You may page through it using the space bar key. If you do not get the *Do you accept ...* prompt, you may press `Q` to get to the next prompt.
8. If you already have Samba running on your host computer, when the configuration script prompts you *Do you want this script to automatically configure your system to allow your virtual machines to access the host file system?* Answer `No`. If Samba is not already running on your host computer, answer `Yes` to this question and the VMware installer will configure it for you.
9. Press `Enter` to display the Samba license information. You may press the space bar to page through it, then press `Q` to continue to the next prompt.
10. The configuration script asks *Do you want this script to probe for an unused subnet?* Answer `Yes`. If the probe is not successful, the script will ask you to supply the needed information for the subnet that your virtual machines will use.

11. Press Enter to display the DHCP server copyright information. You may press the space bar to page through it, then press Q to continue to the next prompt.
12. The configuration script will prompt you for a user name and password to use with the Samba configuration. Enter the user name you used in step 1 above.
13. Return to your user account by typing `exit`. At this point you should be logged in with the user name you will use when running VMware Express.

You are now ready to license VMware Express. Proceed to the section titled **LICENSE THE SOFTWARE** below in this chapter.

Tar File Installation Method

The steps below describe how to install the VMware Express tar file from the CD onto your Linux host system:

Note: If you download a newer tar file for VMware Express, refer to <http://www.vmware.com/support/express/> for installation instructions.

1. You should be logged on to your Linux host with the user name you will use when running VMware.
2. Insert the VMware Express CD in your CD-ROM drive. You may have to mount it manually if your Linux system does not automatically mount the CD. To mount the CD manually follow the steps below:
 - a) become the super user (root) by typing `su`
 - b) make CD accessible to Linux using the following command:


```
mount -t iso9660 -o mode=0755 /dev/cdrom /mnt/cdrom
```
3. Change to the top-level directory on the CD.
4. Copy the tar file on the CD to a directory on your hard drive. For example, to copy the file to your system's /tmp directory, type the following command:


```
cp VMware-express-2.0.3-<xxx>.tar.gz /tmp
```

 where <xxx> is the build number of the tar file on your CD.
5. Change to the directory where you copied the file. For example, you can change into the /tmp directory by typing `cd /tmp`
6. Extract the tar file by typing the following command:


```
tar xzf VMware-express-2.0.3-<xxx>.tar.gz
```
7. Change directories to the VMware Express installation directory, by typing the following command:


```
cd vmware-distrib
```
8. If you are not logged in as the super user, do so by typing `su`
9. Start the installation by typing `./vmware-install.pl`

Note: This script can be used to reconfigure VMware Express whenever you upgrade your kernel. It is not necessary to reinstall VMware Express.
10. Acknowledge the end user license agreement (EULA). You may page through it using the space bar key. If you do not get the *Do you accept ...* prompt, you may press Q to get to the next prompt.

11. If you already have Samba running on your host computer, when the configuration script prompts you *Do you want this script to automatically configure your system to allow your virtual machines to access the host file system?* Answer **No**. If Samba is not already running on your host computer, answer **Yes** to this question and the VMware installer will configure it for you.
12. Press **Enter** to display the Samba license information. You may press the space bar to page through it, then press **Q** to continue to the next prompt.
13. The configuration script asks *Do you want this script to probe for an unused subnet?* Answer **Yes**. If the probe is not successful, the script will ask you to supply the needed information for the subnet that your virtual machines will use.
14. Press **Enter** to display the DHCP server copyright information. You may press the space bar to page through it, then press **Q** to continue to the next prompt.
15. The configuration script will prompt you for a user name and password to use with the Samba configuration. Enter the user name you used in step 1 above.
16. Return to your user account by typing `exit`. At this point you should be logged in with the user name you will use when running VMware Express.

You are now ready to license VMware Express. Proceed to the section titled **LICENSE THE SOFTWARE** later in this chapter.

LICENSE THE SOFTWARE

This section describes how to license the software using the serial number on the included registration card.

1. You should be logged on to your Linux host with the user name you will use when running VMware Express.
2. Locate the serial number on the registration card included in the VMware Express package. You will need the serial number to license the product in the next step. Keep the serial number in a safe place after use.
3. Start VMware Express by typing `vmware` from within a terminal window.

The first time you run VMware Express, you will be prompted to enter the 20-character serial number located on the registration card. Enter your serial number and click **OK**.

Once you have entered the serial number, it will be saved in your license file and VMware will not ask you for it again. For your convenience, VMware will automatically send the serial number to the VMware Web site when you use certain Web links built into the product (for example, **Help > Register Now!** and **Help > Support**). This allows us to direct you to the correct Web page for registration and support for your product.

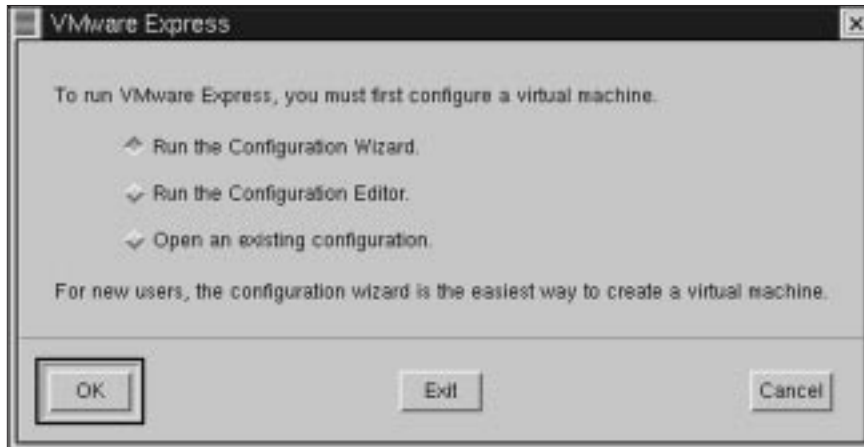
You are now ready to configure a virtual machine using VMware Express. Proceed to the next section titled **CONFIGURE A VIRTUAL MACHINE**.

CONFIGURE A VIRTUAL MACHINE

1. VMware Express should be already running. If not make sure you are logged on your Linux host with the user name you will use when running VMware Express, then start VMware by typing `vmware`.
2. Start the configuration wizard.

When VMware Express is started, the startup screen has three options:

- Run the Configuration Wizard
- Run the Configuration Editor
- Open an existing configuration



The default selection is Run the Configuration Wizard.

Click the OK button to start the Configuration Wizard. The Configuration Wizard can also be started from the File menu (select File > Wizard).



The Configuration Wizard will present you with a series of screens that you navigate using the Next and Prev buttons at the bottom. At each screen, follow the instructions, then click the Next button to proceed to the next screen.

There is also a Finish button, which is initially dimmed. When there is enough information for the Configuration Wizard to finish the configuration, this button displays. Click the Finish button to have the configuration wizard fill in all of the remaining options with default values. Clicking Finish is the fastest way of configuring your virtual machine.

Click the Help button to open a pop-up window with context-sensitive help. That text will also include links to relevant help topics (text in blue – clicking on it will take you to the corresponding help topic).

VMware Express stores your virtual disk file and other files associated with your virtual machine together in one directory. Each virtual machine should have its own directory. The default location is the directory `~UserHome/vmware/VM` or `/home/UserHome/vmware/VM` where *UserHome* is the currently logged in user's name.

If you create more than one virtual machine, you will need to specify a different directory for each additional virtual machine. Enter the path to the new directory in the appropriate screen in the Configuration Wizard and the wizard will create the directory for you.

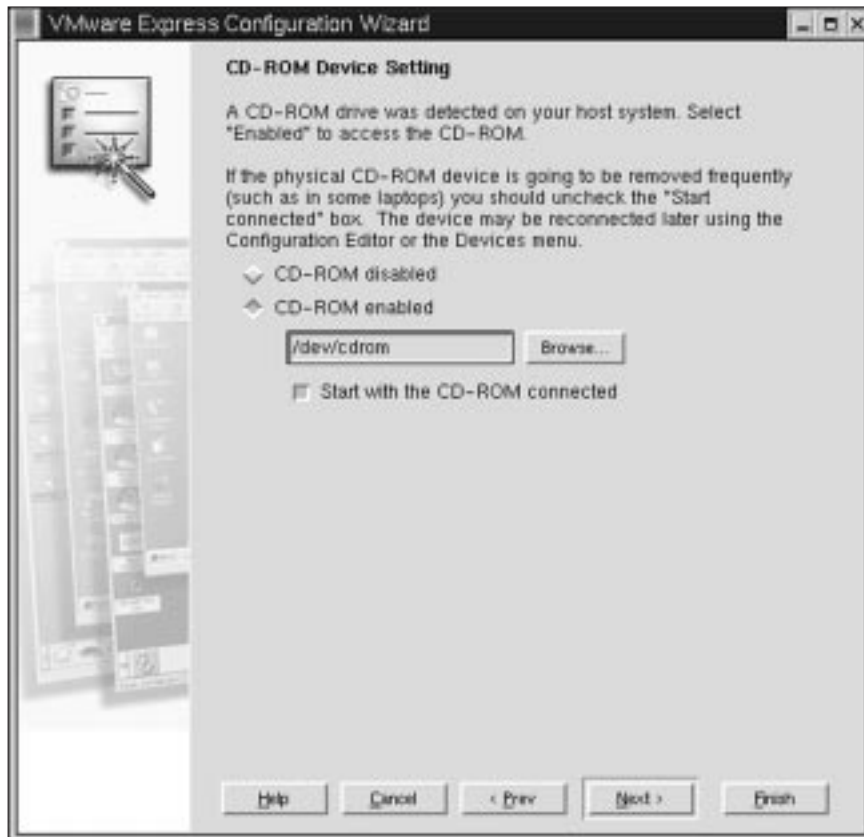
Note: VMware Express allows you to run only one virtual machine at a time.

3. Select the size of the virtual disk.

Fill in the size of the virtual disk that you wish to create. Select 2000 (megabytes).

The size should be large enough to hold the guest operating system and all of the software that you intend to install in the virtual machine, with room for data and growth. There is no way to increase this number later, although you can install additional virtual disks if you run out of space on this one. You will typically need about 500MB of actual free space on the file system containing the virtual disk to install Windows 98 and popular applications such as Microsoft Office inside the virtual machine.

4. Enable the CD-ROM drive.



Select CD-ROM Enabled. Type in the path to the CD-ROM device, for example, `/dev/cdrom`.

You will need to use your CD-ROM drive when you install the guest operating system.

If you wish, you can disable access to the CD-ROM drive later using the Devices menu or from the Devices tab in the VMware Tools inside your running virtual machine.

5. Enable the floppy disk drive.



Select the Floppy Enabled option and choose the device that corresponds to your physical floppy drive, for example, `/dev/fd0`.

You may need to use the floppy drive while you are installing your guest operating system. If you wish, you can disable access to the floppy disk drive later using the Devices menu or from the Devices tab in the VMware Tools inside your running virtual machine.

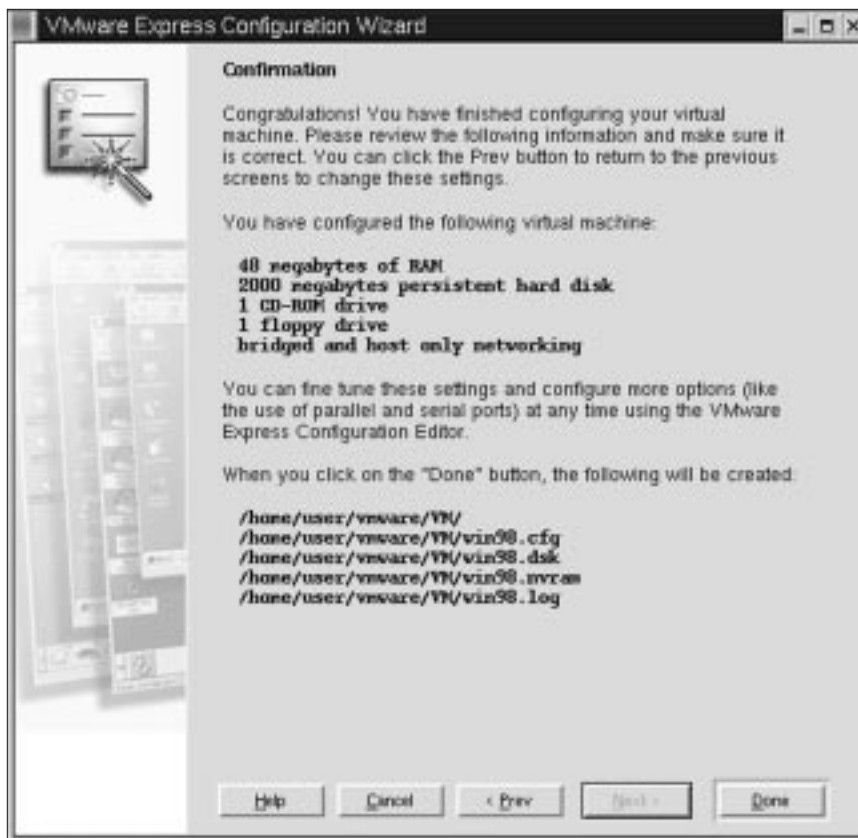
6. Configure the networking capabilities of the virtual machine.



Selecting Bridged and Host-Only Networking will enable your virtual machine to use both an existing Ethernet connection on your host computer and also a virtual network limited to the host and the virtual machines running on the host.

For more details about VMware Express networking options, see the tech note on Networking in this guide.

Note: The VMware Samba server can give your guest operating system access to files on your host computer. For details, see the tech note Using Samba for File Sharing in this guide.



7. Review and finish the configuration.

This final screen presents all the options you have selected. Review it for accuracy and click the Done button to complete the virtual machine configuration.

INSTALL A GUEST OPERATING SYSTEM

With VMware Express, you can run Windows 98 and Windows 95 guest operating systems. If you want to run other guest operating systems – including Windows NT, Windows 2000, Linux, and FreeBSD – you should upgrade to VMware Workstation. Select Help > VMware Workstation Upgrade offer!

Windows 98 Installation Guidelines and Known Problems

Windows 98 can be installed in a virtual machine using the standard Windows 98 CD.

Note: Some Microsoft Windows 98 OEM disks included with new computers are customized for those computers and include device drivers and other utilities specific to the hardware system. Even if you can install this Windows 98 operating system on your actual computer, you may not be able to install it in a VMware Express virtual machine. You may need to purchase a new copy of Windows to install in a virtual machine.

The instructions below are for the simplest case of one virtual IDE hard drive and one virtual IDE CD-ROM drive. If you have configured the virtual machine with more than one IDE hard drive, you should also `fdisk` and `format` these drives before installing Windows 98. If you have configured the virtual machine with more than one virtual hard drive or one virtual CD-ROM, you may need to use different device letters than those in the instructions below. Before installing the operating system, be sure that you have already created a new virtual machine and configured it using the VMware Express Configuration Wizard.

While you are installing the guest operating system, you can click anywhere inside the VMware Express window to give the virtual machine control of your mouse and keyboard. If you want the virtual machine to release the mouse and keyboard so you can access your Linux desktop again, press Ctrl-Alt-Esc.

Windows 98 Installation Steps

1. Use the VMware Express Configuration Editor to verify the virtual machine's devices are set up as you expect before starting the installation. For example, if you would like the Windows 98 setup program to install a sound driver, be sure that sound is enabled in the virtual machine's configuration. VMware also recommends that you disable the screen saver on the host system before starting the installation process.
2. Insert the Windows 98 CD in the CD-ROM drive.
3. Power on the virtual machine to start installing Windows 98.
4. Choose to boot from CD-ROM, then select Start Windows 98 Setup from CD-ROM. The setup program will run `fdisk` and reboot.
5. Choose to boot from CD-ROM, then select Start Windows 98 Setup from CD-ROM. The setup program will continue installing Windows 98.
6. Follow the Windows 98 installation steps as you would for a real PC.

Installing VMware Tools

After Windows has been installed, skip ahead to install the VMware Tools, as described in this guide.

Enabling Sound After Installing Windows 98

If sound was disabled during the Windows 98 installation, it can be enabled after the operating system has been installed. To set up the virtual machine to play sound, see the tech note on VMware Express and sound in this guide.

Enabling Networking After Installing Windows 98

If networking was disabled during the Windows 98 installation, it can be enabled after the operating system has been installed. To set up networking for a virtual machine, follow the instructions below.

1. Shut down Windows 98 and power off the virtual machine.
2. From the main program window, select Configuration Editor from the Settings menu and open the Ethernet Adapters panel.
3. Select a network connection type for the virtual machine and click the Install button.
4. Save the updated configuration and power on the virtual machine.
5. When Windows 98 reboots, it will automatically detect an AMD PCNET Family Ethernet Adapter (PCI-ISA) and prompt for the Windows 98 CD-ROM to install drivers. The default Ethernet adapter settings should work fine and do not need to be changed.

6. Use the Network icon in the Control Panel to view or change network settings. For example, you may want to add the TCP/IP protocol since Windows 98 does not install it by default.

Known Issues

1. After Windows 98 has been installed, you may notice COM5 and COM6 devices exist within the Windows Device Manager. These devices do not actually exist and are not consuming IRQ or other resources. You may remove them using the Windows device manager if you like.
2. Support for *EMM386.EXE* and other memory managers is currently limited. If you initially boot using a customized non-standard MS-DOS or Windows 98 boot diskette, be sure that *EMM386.EXE* (or other memory managers) are not being loaded. *HIMEM.SYS* and *RAMDRIVE.SYS* can be loaded and used without problems.

Windows 95 Installation Guidelines and Known Problems

Windows 95 can be installed in a virtual machine using a standard Windows 95 boot diskette and CD-ROM.

Note: Some Microsoft Windows 95 OEM disks included with new computers are customized for those computers and include device drivers and other utilities specific to the hardware system. Even if you can install this Windows 95 operating system on your actual computer, you may not be able to install it within a VMware Express virtual machine. You may need to purchase a new copy of Windows to install within a virtual machine.

Note: Some Windows 95 distributions include instructions that do not include the steps to `fdisk` and `format` a C: drive. You must `fdisk` and `format` the VMware Express virtual IDE hard disk drives before running Windows 95 setup.

The instructions below are for the simplest case of one virtual IDE hard drive and one virtual IDE CD-ROM drive. If you have configured the virtual machine with more than one IDE hard drive, you should also `fdisk` and `format` these drives before installing Windows 95. If you have configured the virtual machine with more than one virtual hard drive or one virtual CD-ROM, you may need to use different device letters than those in the instructions below.

Before installing the operating system, be sure that you have already created a new virtual machine and configured it using the VMware Express Configuration Wizard.

While you are installing the guest operating system, you can click anywhere inside the VMware Express window to give the virtual machine control of your mouse and keyboard. If you want the virtual machine to release the mouse and keyboard so you can access your Linux desktop again, press Ctrl-Alt-Esc.

Windows 95 Installation Steps

1. Use the VMware Express Configuration Editor to verify the virtual machine's devices are set up as you expect before starting the installation. For example, if you would like the Windows 95 Setup program to install a sound driver, be sure that sound is enabled in the virtual machine's configuration. VMware also recommends that you disable the screen saver on the host system before starting the installation process.
2. Insert the Windows 95 CD-ROM Setup Boot Disk in floppy drive A: and insert the Windows 95 CD in the CD-ROM drive.
3. Power on the virtual machine.

4. After the virtual machine boots, if you are presented with a choice of CD-ROM drivers, select the first IDE driver option available (even if your computer has a SCSI CD-ROM drive).
5. Partition the virtual disk. Type:
`FDISK`
and answer the questions.
Note: If you create a primary partition that is smaller than the size of the hard disk, be sure the partition is marked Active.
6. Reboot Windows 95. If the cursor is not already within the VMware Express window, click in the window, then press Ctrl-Alt-Del. If prompted on reboot to select a CD-ROM driver, select the first IDE CD-ROM driver from the list.
7. Format the C: drive with
`FORMAT C: /S`
8. Now start the Windows 95 installation. Type
`D:\WIN95\SETUP /IS`
Note: An intermittent problem can occur during Windows 95 installations in a virtual machine. Shortly after the Windows 95 setup program is started, scandisk runs to completion, and when the Windows 95 setup program should start its graphical user interface, the virtual machine returns to an MS-DOS prompt. VMware recommends you reboot the computer and rerun Windows 95 setup. You will not need to fdisk or format the drive again.
9. If the virtual machine's Ethernet adapter is enabled, you will have to add an Ethernet driver manually because Windows 95 will not detect it during the Analyzing Computer phase (even if you selected the network adapter detection option). Do the following to enable networking:
 - a. Continue with the Windows 95 installation, until you get to the screen titled Windows 95 Setup Wizard/Setup Options. Change the default setting from Typical to Custom and click Next to continue.
 - b. From the screen titled Network Configuration (which appears after the Analyzing Computer phase), click Add, select the Adapter component, select Advanced Micro Devices from the manufacturer window and AMD PCNET Family Ethernet Adapter (PCI&ISA) from the network adapter window.
 - c. If you need TCP/IP networking, add it from the Network Configuration screen (Windows 95 Setup does not enable TCP/IP by default).
If you don't do this, the first phase of the Windows 95 installation will not copy some of the files it will need later, and the entire installation will fail.
10. Finish the Windows 95 installation.
11. VMware Express virtual disks support DMA transfers for better performance. The feature can be enabled after Windows 95 has been successfully installed. To enable the feature, right-click My Computer and select Properties. From the System Properties dialog box, click the Device Manager tab, double-click the Disk Drives device category, double-click the GENERIC IDE DISK TYPE01 device, click the Settings tab and enable the DMA check box.

Installing VMware Tools

After Windows has been installed, skip ahead to install the VMware Tools, as described in this guide.

Enabling Sound After Installing Windows 95

If sound was disabled during the Windows 95 installation, it can be enabled after the operating system has been installed. To set up the virtual machine to play sound, see the tech note on VMware Express and sound in this guide.

Enabling Networking After Installing Windows 95

If networking was disabled in VMware Express at the time you installed Windows 95, it can be enabled after the operating system has been installed. To set up networking for a virtual machine, follow the instructions below.

1. Shut down Windows 95 and power off the virtual machine.
2. From the main VMware Express window, select Configuration Editor from the Settings menu and open the Ethernet Adapters panel.
3. Select a network Connection Type for the virtual machine and click the Install button.
4. Save the updated configuration and power on the virtual machine.
5. When Windows 95 reboots, it will automatically detect an AMD PCNET Family Ethernet Adapter (PCI&ISA) and prompt for the Windows 95 CD-ROM to install drivers. The default Ethernet adapter settings should work fine and do not need to be changed.
6. Double-click the Network icon in the Control Panel to view or change network settings. For example, you may want to add the TCP/IP protocol since Windows 95 does not install it by default.

INSTALL THE VMWARE TOOLS IN YOUR GUEST OPERATING SYSTEM

It is very important that you install VMware Tools in the guest operating system. Although VMware Express will run a guest operating system without VMware Tools, the graphics environment within the virtual machine will be limited to VGA mode graphics (640x480, 16 color).

With the VMware Tools SVGA driver installed, VMware Express supports up to 32-bit displays and high display resolution, with significantly faster overall graphics performance. Other tools in the package make it more convenient to use your virtual machine.

Installation files for VMware Tools for Windows are built into VMware Express (**Settings > VMware Tools Install**). VMware Tools for Windows supports Windows 95 and Windows 98 guest operating systems.

Install VMware Tools for Windows 98 and Windows 95

1. Power on the virtual machine. The following steps all take place inside the virtual machine, not on the host computer.
2. Prepare your virtual machine to install the VMware Tools. This will reconfigure the first floppy drive in your virtual machine.
Choose Settings > VMware Tools Install.
If you decide not to proceed with the installation of VMware Tools, you may cancel the operation.
Choose Settings > Cancel VMware Tools Install.
3. Double-click the My Computer icon on your desktop.

4. Double-click the A: drive icon.
5. Double-click *VMwareTools.exe* and follow the instructions.

Instructions for configuring the video driver will open automatically in Notepad at the end of the installation process. If the Notepad window is hidden, bring it to the front by clicking the Notepad button on the Windows taskbar.

Configuring the Video Driver on Windows 98

The detailed steps that follow are for a Windows 98 guest operating system. See the next section for details on the Windows 95 installation.

1. When you click the Finish button after installing VMware Tools, the Display Settings window opens.
2. Click the Advanced button. A dialog entitled Standard Display Adapter (VGA) Properties appears.
3. Click the Adapter tab.
4. Click the Change button. This will start the Update Device Driver Wizard. Click Next.
5. The Wizard presents you with two options. Choose the option to "Display a list of all drivers in a specific location..." Click Next.
6. Click the Have Disk button. This brings up the Install From Disk dialog.
7. Enter the following path, and click OK:
A:\win9x
8. Select VMware SVGA(FIFO) display adapter and click OK.
9. Answer Yes to the on-screen question, then click Next to install the driver. After the driver is installed, click Finish.
10. Click Close from the SVGA Properties dialog, then click Close from the Display Setting dialog.
11. The VMware Tools background application will be launched automatically when you reboot your virtual machine.



12. After restarting the Windows 98 virtual machine, open the device manager and verify that the display adapter is VMware SVGA(FIFO).
13. You should notice the presence of a Standard PCI Graphics Adapter too.

Configuring the Video Driver on Windows 95

The detailed steps that follow are for a Windows 95 guest operating system. See the previous section for details on the Windows 98 installation.

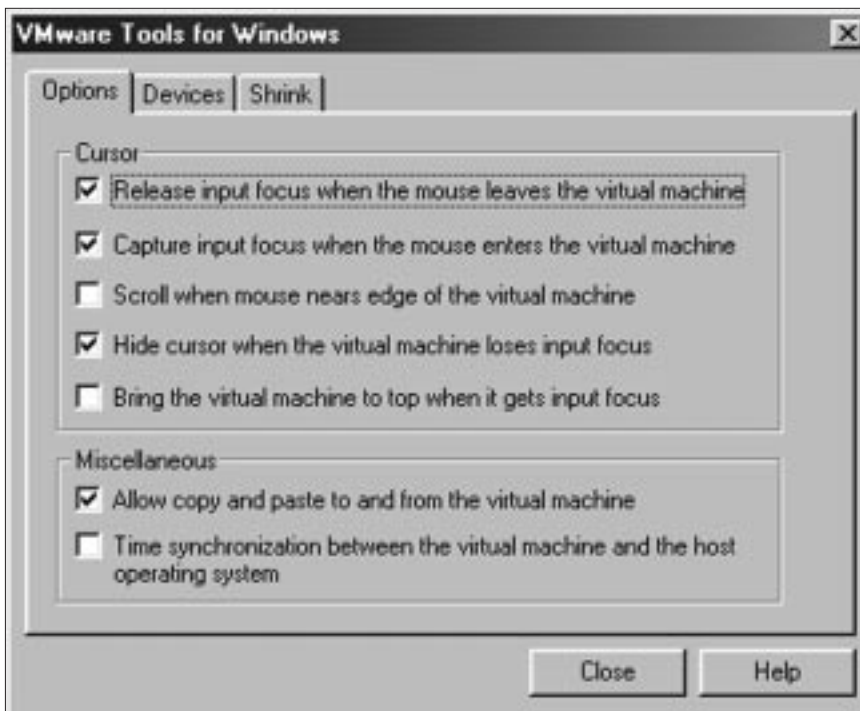
1. When you click the Finish button after installing VMware Tools, the Display Settings window opens.
2. Click the Advanced Properties button. The Advanced Display Properties dialog will appear.
3. Click the Change button. This will bring up the Select Device dialog.
4. Click the Have Disk button. The Install From Disk dialog will appear.
5. Enter the following path:
A:\win9x
6. Click OK to install the driver.
7. Click Close from the Advanced Display Properties dialog, then click Close from the Display Setting dialog.
8. Click Yes to restart Windows 95 and start using the new video driver.

9. After restarting the Windows 95 virtual machine, open the device manager and verify that the display adapter is VMware SVGA (FIFO).
10. You should notice the presence of a Standard PCI Graphics Adapter too.

Configuring VMware Tools for Windows 98 and Windows 95



1. Right-click the VMware Tools icon in the system tray, then click Main window...
(Or double-click the VMware Tools icon in the system tray.)



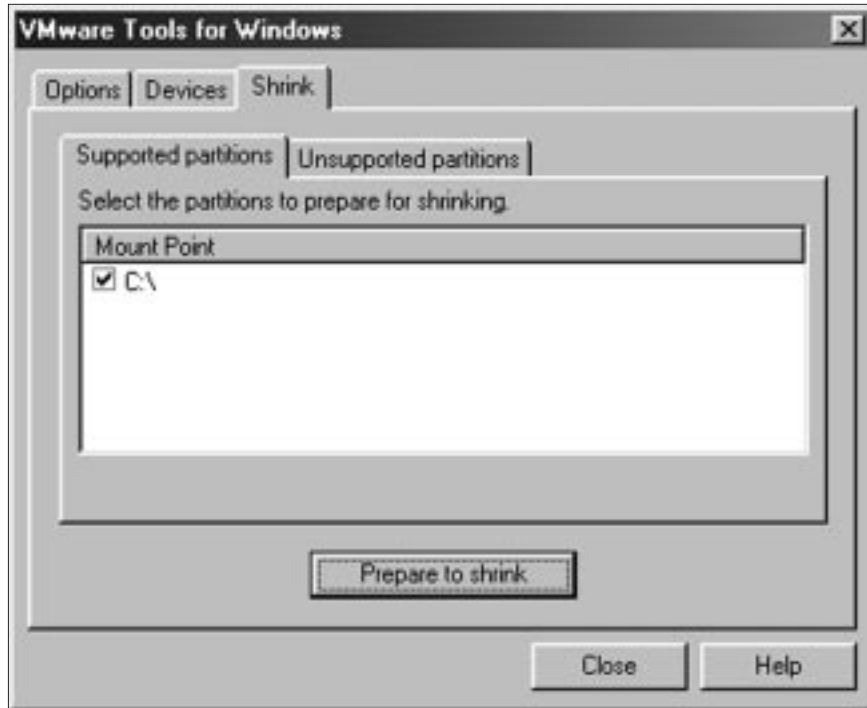
2. The VMware Toolbox cursor options are:

- Release input focus when the mouse leaves the virtual machine
- Capture input focus when the mouse enters the virtual machine
- Scroll when mouse nears edge of the virtual machine
- Hide Cursor when the virtual machine loses input focus
- Bring the virtual machine to top when it gets input focus

The VMware Tools Miscellaneous Options are:

- Allow copy and paste to and from the virtual machine
- Time synchronization between the virtual machine and the host operating system

3. The Devices tab of the VMware Toolbox options allows you to enable or disable removable devices. (You can also set these options by right-clicking the VMware Tools icon in the system tray, then clicking Devices, or navigate to them from the Devices menu of the VMware Express application.)



4. The Shrink tab gives you access to the settings you need if you wish to reclaim unused space in a virtual disk.

2

Running VMware Express

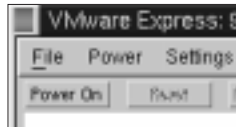
Running VMware Express

Now that you have installed a guest operating system and the VMware Tools, how do you run your virtual machine? This section gives you the highlights of the most common tasks.

For purposes of illustration, this guide assumes Windows 98 is the guest operating system. Some commands used in the illustrations may be different for Windows 95.

Think of your VMware Express virtual machine as a separate computer that runs in a window on your computer's desktop.

Instead of using physical buttons to turn this computer on and off, you use buttons at the top of the VMware Express window.



When virtual machine is powered off

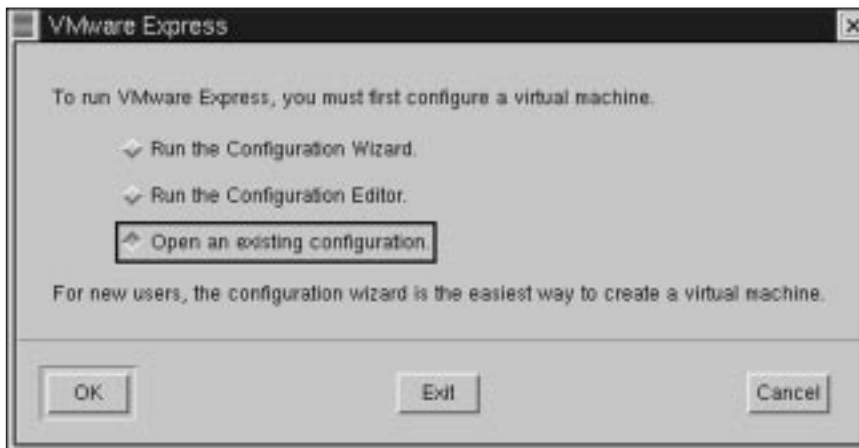


When virtual machine is powered on

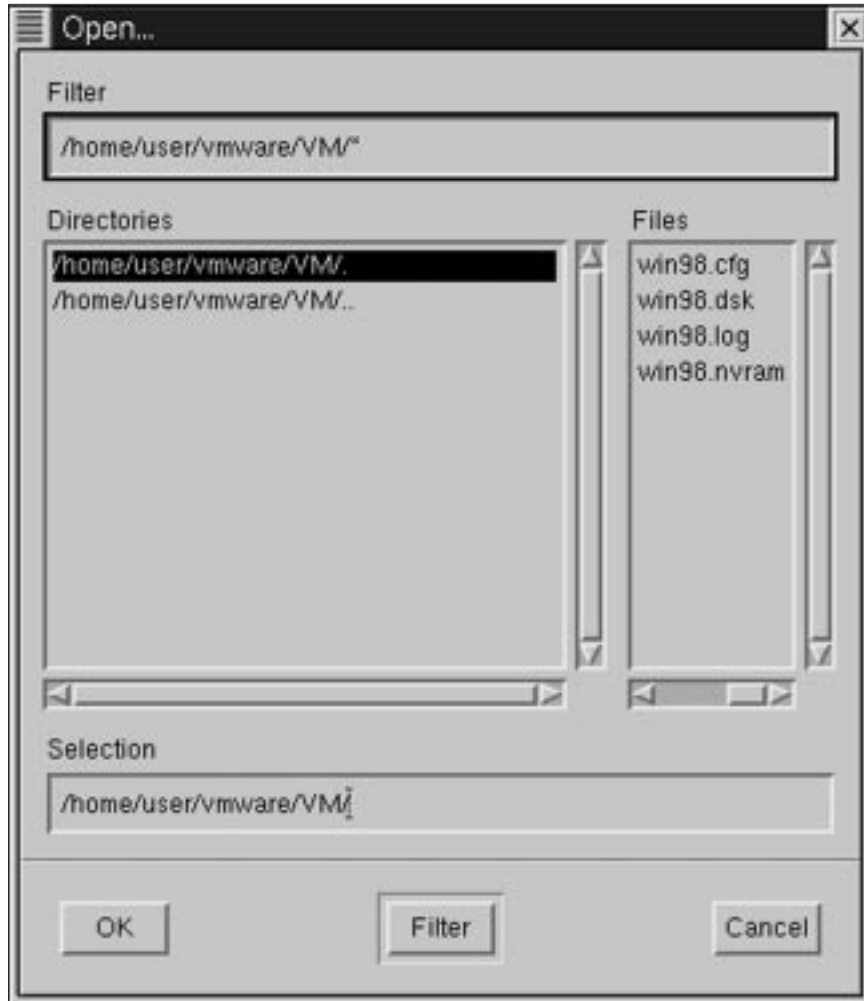
The power button will be labeled Power On or Power Off, depending on whether your virtual computer is running or not.

Starting a Virtual Machine

1. Open a terminal, type `vmware` and press Enter.



2. Select the "Open an existing configuration" radio button, then click OK.



3. Browse to your virtual machine's directory. Highlight the *win98.cfg* file, then click OK.
4. Click the Power On button to start the virtual machine.
5. Click anywhere inside the VMware Express window to give the virtual machine control of your mouse and keyboard.
If you want the virtual machine to release the mouse and keyboard, press Ctrl-Alt-Esc.
6. If you need to log on to a network, type in your name and password just as you would on a regular computer.

Using a Virtual Machine



When VMware Tools for Windows 98 and Windows 95 are running, the VMware Tools icon appears in the system tray

Using the Full Screen

If you want your VMware Express virtual machine's display to fill the screen – so you no longer see the borders of the VMware Express window – click the Full Screen button on the tool bar. To get out of full-screen mode – to show your virtual machine inside a VMware Express window again – press the Ctrl-Alt-Esc keys at the same time.

If you are using the Enlightenment window manager on your host, VMware also recommends that you disable the screen saver on the host system before going into full screen mode.

Installing New Software Inside the Virtual Machine

Installing new software in a VMware Express virtual machine is just like installing it on a regular computer.

1. Be sure you have started the virtual machine and, if necessary, logged on. Check the Devices tab in VMware Tools to be sure the virtual machine has access to the CD-ROM and floppy drives.
2. Insert the installation CD-ROM or floppy disk into the proper drive. If you are installing from a CD-ROM, the installation program may start automatically.
3. If the installation program does not start automatically, click the Windows Start button, go to Settings > Control Panel, then double-click Add/Remove Programs and click the Install button. Follow the instructions on screen and in the user manual for your new software.

Cutting and pasting

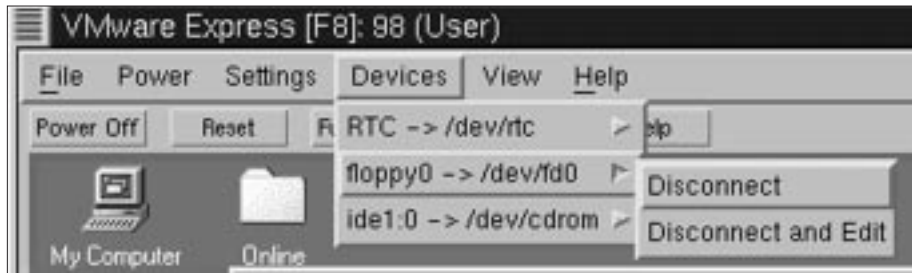
Be sure you have installed and started the VMware Tools in your virtual machine.



In Windows, you will see a VMware Tools icon in the system tray when the VMware Tools are running. When the VMware Tools are running, you can copy and paste between applications in the virtual machine and the host computer.

Disconnecting and reconnecting removable devices

Sometimes you may need to disconnect a removable device from your virtual machine. For example, you may need to let your host computer use the floppy disk drive or the CD-ROM drive.

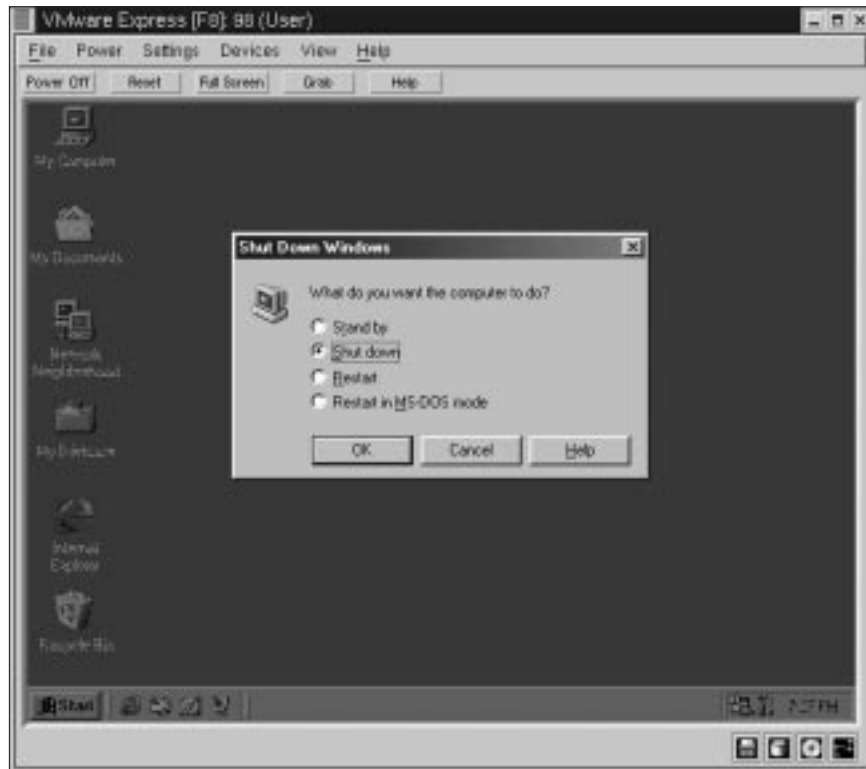


While your virtual machine is running, you may use the Devices menu to disconnect and reconnect removable devices.

To change the default settings – whether the device is connected when you first start your virtual machine – use the Configuration Editor (Settings > Configuration Editor) when the virtual machine is powered off.

Shutting Down a Virtual Machine

1. Select Shut Down from the Start menu of the guest operating system (inside the virtual machine).



2. Select the Shut Down radio button, then click OK.
3. After the guest operating system shuts down, it is safe to power off the virtual machine and exit the VMware Express application. Click the Power Off button, then select File > Exit.

3

Technical Reference Notes

Technical Reference Notes

CONFIGURATION WIZARD

Starting the Configuration Wizard

When VMware Express is started, the startup screen has three options: Run the Configuration Wizard, run the Configuration Editor, or open an existing configuration. The default selection is the Configuration Wizard: clicking the OK button starts the Configuration Wizard. The Configuration Wizard can also be started from the File menu (select File > Wizard).

Running the Configuration Wizard

The Configuration Wizard will present you with a series of screens that are navigated using the Next and Prev buttons at the bottom. At each screen, follow the instructions, then click the Next button to proceed to the next screen. Each screen will ask you a question. You will either have to select an option or fill in some information.

There is also a Finish button, which is initially dimmed. When there is enough information for the Configuration Wizard to finish the configuration, this button displays. Click the Finish button to have the Configuration Wizard fill in all of the remaining options with default values. Clicking Finish is the fastest way of configuring your virtual machine.

Clicking the Help button will open a pop-up window with context-sensitive help.

Your Virtual Machine Directory

VMware Express stores your virtual disk file and other files associated with your virtual machine together in one directory. Each virtual machine should have its own directory. The default location is the directory `~UserHome/vmware/VM` or `/home/UserHome/vmware/VM` where `UserHome` is the currently logged in user's name.

If you have set up more than one virtual machine, the files for each will be stored in the directory you specified for it in the Configuration Wizard.

Virtual machine performance may suffer if your virtual hard disk is on an NFS mounted file system. You should be sure that the virtual machine's directory is on a local file system.

Selecting the Size of the Virtual Disk (for new virtual disks)

Fill in the size of the virtual disk that you wish to create. The size should be large enough to hold the guest operating system and all of the software that you intend to install in the virtual machine, with room for data and growth. There is no way to increase this number later, although you can install additional virtual disks if you run out of space on this one.

The file that holds the virtual disk is not created at the maximum size of the virtual disk, but at a smaller size. This file grows as the virtual machine writes to the virtual disk.

Enabling the CD-ROM Drive

Select whether or not to allow the virtual machine to access the CD-ROM drive. If you wish to allow the virtual machine to access the CD-ROM device, the path to that device must be specified. This path is set to `/dev/cdrom` by default.

Note that most operating systems will require the use of a CD-ROM during installation.

Even if the virtual machine has CD-ROM access enabled, access to the CD-ROM device can be disabled during the operation of the virtual machine using the Devices menu.

Enabling the Floppy Disk Drive

Select whether or not to allow the virtual machine to access the floppy disk drive. If you wish to allow the virtual machine to access the floppy disk device, the path to that device must be specified. This path is set to `/dev/fd0` by default.

Note that some operating systems may require the use of a floppy drive during installation.

Even if the virtual machine has floppy disk access enabled, access to the floppy disk device can be disabled during the operation of the virtual machine using the Devices menu.

Configuring the Networking Capabilities of the Virtual Machine

The virtual machine can be configured to operate in a stand-alone mode, or it can be networked to the host machine, or it can be bridged to the real network (assuming the host is on a network). This screen lets you select the option that applies to this virtual machine.

The No Networking option configures the virtual machine to be a stand-alone machine. In this case, the virtual machine has no networking support, like a PC with no network card.

The Bridged Networking option configures the virtual machine to have a network adapter, and this network adapter is connected to the host network card through a bridge. The bridge forwards packets from the host's network interface to the virtual machine and forwards packets from the virtual machine to the network interface of the host. This allows the virtual machine to appear like a real machine to other machines on the network. If this option is selected, the virtual machine needs to be assigned an IP address, just like a real machine. DHCP can be used to do this automatically.

The Host-only Networking option configures the virtual machine to have a network, but the virtual machine is visible only to the host machine on which the virtual machine is running, and not to other machines on the network. This is useful for sharing files between the virtual machine and the host machine.

The tech note titled Networking provides more details about VMware Express networking options.

Congratulations

This screen displays the configuration settings that you have selected, or that have been selected for you by default. If you want to change any of these settings, the Prev button will take you to the earlier screens, where you can make your changes.

Clicking the Done button saves the configuration and returns you to the main program window. To start the virtual machine you just configured, click the Power On button.

The configuration settings can be viewed and modified using the Configuration Editor, in the Settings menu (Settings > Configuration Editor).

Note: Before you can run your new virtual machine, you must install a guest operating system. This guide includes instructions for installing Windows 98 and Windows 95 as guest operating systems. If you start up a new virtual machine that has no guest operating system installed and you do not have a bootable CD-ROM or floppy disk in the virtual machine, it will display an error message that says, "Operating System not Found."

CONFIGURATION EDITOR

A virtual machine configuration is kept in a text file. VMware recommends that you create this file using the Configuration Wizard. You can modify configuration settings using the Configuration Editor.

1. Launch the VMware Express program.
vmware
 2. Select Open an Existing Configuration, click OK, then browse to your virtual machine's configuration file and open it.
 3. Open the Configuration Editor (Settings > Configuration Editor).
 4. Make any changes you want to, as described in this section, then click Save to save the configuration and close the Configuration Editor.
- One IDE drive (P-M) is created by default. To create another disk drive, follow these steps.
 1. Click the + next to IDE Drives.
 2. Click the name of a drive that is shown as Not Installed.
 3. Choose Device Type.
 4. Enter the name of the disk to be created in the File Name field (the disk image will be saved in a file in the directory from which you are running).
Enter the disk size (or use the default).
Note: The specified size is the maximum disk capacity. The space taken by the file will usually be less, particularly before anything is placed on the disk.
 5. Click Create.
 6. Click Install.
Note: You may also use this section of the Configuration Editor to modify the settings for a disk that is already configured in your virtual machine.
 - One IDE CD-ROM drive (S-M) is created by default. To create another CD-ROM drive, follow these steps.
 1. Click the + next to IDE Drives.
 2. Click the name of a drive that is shown as Not Installed.
 3. Choose Device Type CD-ROM.
 4. Enter `/dev/cdrom` or the path to the CD-ROM in the Name field.
 5. Click Install.
Note: You may also use this section of the Configuration Editor to modify the settings for a CD-ROM drive that is already configured in your virtual machine.
 - One floppy drive (A:) is installed by default, using `/dev/fd0`. To change the path or add another floppy, follow these steps.
 1. Click the + next to Floppy Drives.
 2. Click Not Installed to add a drive or click the entry for the device you want to modify.
 3. Enter `/dev/fd1` or the path to your floppy device.
 4. Click Install.
 - Add a virtual machine network adapter.
 1. Click the + next to Ethernet Adapters.
 2. Click Not Installed.

3. Leave the Connection Type as Bridged.
(If you are not connected to a network with an Ethernet card, use the Host-only option or choose not to configure the Ethernet adapter.)

4. Click Install.

Note: You may also use this section of the Configuration Editor to modify the settings for a network adapter that is already configured in your virtual machine. The tech note titled Networking provides more details about the networking options.

- Add or modify a serial port.
 1. Click the + next to Serial Ports.
 2. Click an entry that shows Not Installed to add a port or click the entry for the port you want to modify.
 3. Specify the path your host machine is using to the device.

Note: This is not the place to configure a serial mouse. You can find those settings under the Mouse item.
- Add or modify a parallel port.
 1. Click the + next to Parallel Ports.
 2. Click an entry that shows Not Installed to add a port or click the entry for the port you want to modify.
 3. Specify the path your host machine is using to the device.
- Change mouse to a serial mouse (or other).

Click Autodetect and change the setting to the mouse you have.
- Change default memory settings (32MB).

Use the slider.
- Configure the miscellaneous options.

You can use the Misc. section of the Configuration Editor to set other parameters for your virtual machine.

Require SHIFT in hot key sequences

Select this box to change hot key combinations from CTL-ALT-key to CTL-ALT-SHIFT-key. This is useful if you want to prevent certain key combinations (for instance, CTL-ALT-DEL) from being intercepted by VMware Express instead of being sent to the guest operating system.

Power on when program starts

Select this box if you want the virtual machine to automatically power on when VMware Express is launched. If you choose this option, you will not have an opportunity to modify configuration options prior to booting the virtual machine.

Switch to full screen at every power on

Select this box if you want the virtual machine to switch immediately to full screen mode when the virtual machine is powered on. The virtual machine will enter full screen mode when you click the Power On button or if you have selected the option to power on when the program starts.

Exit at power off

Select this box if you want to automatically close the VMware Express application when you power off the virtual machine or suspend it to disk. When this option is selected, power off is equivalent to clicking Power Off then File > Exit.

Find best resolution in full screen mode

This option is selected by default. When selected, VMware Express will choose the best resolution for your virtual machine when it enters full screen mode. If you do not want VMware Express to find the best resolution for your virtual machine screen, unselect this option.

Logging level

VMware Express always logs important events in a log file, so that if the program crashes, or some other critical event occurs, information is available to help VMware technical support understand the problem, find workarounds, and fix it in a later product release. Log files are normally written to the directory that contains the virtual machine configuration file.

In many cases, however, the logged information is not sufficient. An error message may ask you to run with the logging level set to Debug and try to repeat the problem. This enables additional logging that can make it easier, or possible, to fix the problem.

Enabling debugging information makes the log file grow faster and also turns on a large number of internal consistency checks that can slow down execution. For this reason, unless you are trying to reproduce a problem, it is best to run with the level set to Normal.

USING VMWARE TOOLS TO SHRINK A VIRTUAL DISK

You can physically reclaim space in virtual disks using the shrink functionality provided in the VMware Tools for Windows. This operation requires free disk space equal to the size of the virtual disk being shrunk.

To shrink partitions of a virtual disk:

1. Maximize the VMware Tools
2. Select the Shrink tab
3. Consult the VMware Tools Help > Shrink help... for detailed information on shrinking virtual disks

MEMORY USAGE

VMware Express allows users to set the memory size of each virtual machine and the amount of physical host memory reserved for virtual machines. By adjusting the memory size of the virtual machine, users can affect both virtual machine and overall system performance. In this note we describe how VMware Express uses the memory configuration parameters to properly manage virtual machines and reserved memory.

Virtual Machine Memory Size

You can set the size of the virtual machine's physical memory via the Configuration Edit or (Settings > Configuration Editor > Memory). The minimum size of the memory for the virtual machine should be set based on the recommendations of the operating system provider.

The Configuration Wizard sets what we believe are reasonable defaults for the memory size of a virtual machine based on the type of the guest operating system. The actual size that should be given to a virtual machine depends on a few parameters.

- What kinds of applications are to be run in the virtual machine
- What applications are going to be running on the host at the same time as the virtual machine

Linux does not behave well when it runs low on free memory. For this reason users should not run virtual machines whose memory requirements exceed that of the host and other applications. To help guard against virtual machines causing the host to thrash, VMware Express enforces a limit on the total amount of memory that may be consumed by a virtual machine. The memory used by the currently running virtual machine cannot exceed the amount of physical memory on the host minus some memory that must be kept available for the host.

Some memory must be kept available on the host to ensure the host will be able to operate properly while a virtual machine is running. The amount of memory reserved for the host depends on the host and the size of the host's memory.

NETWORKING

Overview

Each virtual machine can have its own independent network configuration. There are three choices for configuring networking:

- No networking
- Host-only networking
- Bridged networking

No networking simply means a virtual machine is run in isolation; it will not be able to communicate with the host operating system or any other virtual machine running on the host. This option is useful if you desire complete isolation for testing or security purposes. To set up your virtual machine in this way, simply do not install a network interface adapter when configuring the virtual machine.

If you have set up a virtual machine with networking and decide you want to remove it, use the Configuration Editor (Settings > Configuration Editor), click the + sign beside Ethernet Adapters, select the adapter you wish to remove, then click Remove. Click Save to save the changes and close the Configuration Editor.

Host-only networking means a virtual machine can communicate with the host operating system and any other virtual machines set up to use host-only networking, but the virtual machine cannot communicate with any systems off the host machine without the use of a proxy server.

If you chose to install Samba when you installed VMware Express – or if you already had Samba configured appropriately on your host – the guest operating system can share files with the host using the facilities of the host-only network.

Host-only networking is most useful when the host is itself isolated or when you want to isolate your virtual machines from systems outside the host computer. This configuration is analogous to the way corporations often connect their internal networks to the Internet with a firewall and proxy services. To set up a virtual machine in this way you need to install a network interface adapter and mark it as "hostOnly." Once the guest operating system is installed you may then need to do some additional configuration that is described below.

Bridged networking means a virtual machine runs on a virtual network that is "bridged" to an existing physical network. This permits a virtual machine to appear as a full-fledged host on an existing physical network.

A bridged virtual machine may transparently use any of the services available on the network that it is bridged to: printers, file servers, gateways, etc. Likewise, when a virtual machine is bridged, any physical host – or other virtual machine configured as bridged – can use resources on that virtual machine. This is the most commonly used networking configuration. To manually configure bridged networking you need to install a network interface adapter and mark it as "bridged." Once the guest operating system is installed, you may then need to do some additional configuration work that is described below.

What You Will See on the Host

VMware Express networking support is done on the host machine through a virtual network device driver that implements two network interfaces: `vmnet0` and `vmnet1`. Each interface is associated with a virtual Ethernet hub through which any number of virtual machines and the host may communicate. By convention `vmnet0` is used for bridged networking and `vmnet1` is used for host-only networking. In addition to the network interfaces there are two applications: `vmnet-bridge` and `vmnet-dhcpd`. The `vmnet-bridge` application is used by the bridged networking support to effect transparent communication between `vmnet0` and another network interface, typically `eth0`. `vmnet-dhcpd` is an optional process that runs only when host-only networking is configured; it implements the DHCP protocol for virtual machines running on `vmnet1`.

What You Will See on the Guest Operating System

Network support on the guest operating system appears through the virtual Ethernet adapter(s) that are configured for the virtual machine. Each device appears to the operating system as an AMD PCNET PCI adapter. Most operating systems will recognize this virtual hardware and automatically configure use of the appropriate device driver. The main issue in completing network configuration in the guest operating system is assigning a network address for the virtual machine.

More Details about Host-Only Networking

Setting Up Host-Only Networking On The Guest Operating System

Host-only networking means a virtual machine can communicate with the host operating system and any other virtual machines set up to use host-only networking, but the virtual machine cannot communicate with any systems off the host machine without the use of a proxy server. This is done by creating a private virtual network that the host and all host-only configured virtual machines reside on. Typically all the parties on this private network use the TCP/IP protocol suite, although there is no requirement for this.

Regardless of the communication protocols used, each virtual machine and the host must be assigned addresses on the private network. This can be done "statically" (that is, by consulting a fixed database) or "dynamically" using protocols such as the Dynamic Host Configuration Protocol (DHCP). When host-only networking is enabled at the time VMware Express is installed, a custom DHCP server application is set up to run on the host machine. This server implements the DHCP protocol only for virtual machines running on the host-only network associated with the virtual network interface `vmnet1`. Guest operating systems that are set up to use DHCP at boot time to obtain an IP address will then work without any additional configuration (except for setting up names, as described below). Guest operating systems that do not use DHCP to obtain an IP address must be set up with a static IP address.

Selecting IP Addresses For Virtual Machines On A Host-Only Network

You have two choices for setting up IP addresses for virtual machines on a host-only network: dynamic assignment using DHCP or static assignment. Using DHCP to assign IP addresses is simpler and more automatic than statically assigning them. Most Windows operating systems, for example, come preconfigured to use DHCP at boot time so they will be functional the first time they are booted, without additional configuration. If, however, you want your virtual machines to communicate using names instead of IP addresses, then you need to set up a naming convention, a name server on the host machine, or both. In this case it may be simpler just to use static IP addresses.

VMware recommends that if you have virtual machines you intend to use frequently or for extended periods of time, you assign them static IP addresses or configure the host-only DHCP server to always assign the same IP address to the virtual machine. For virtual machines that you do not expect to keep for long, use DHCP and let it allocate an IP address.

Note that for each host-only network, the available IP addresses are split up using the following conventions. (VMware Express always uses a Class C address for host-only networks.)

Range	Address Use	Example
<net>.1	host machine	192.168.0.1
<net>.2-<net>.127	static addresses	192.168.0.1-192.168.0.127
<net>.128-<net>.254	DHCP-assigned	192.168.0.128-192.169.0.254
<net>.255	broadcasting	192.168.0.255

(where <net> is the network number assigned to your host-only network.)

Avoiding IP Packet Leakage in a Host-Only Network

Each host-only network is intended to be confined to the host machine on which it is set up. That is, no packets sent by virtual machines on this network should "leak out" to a physical network attached to the host. Packet-leakage can only occur if a machine actively forwards packets. Note that this can be true of the host machine **or** any virtual machine running on the host-only network.

Systems that support the TCP/IP protocols are usually capable of forwarding IP packets they receive but which are not addressed to them. By default, however, these systems come with IP packet forwarding disabled. If you find packets leaking out of a host-only network, check if forwarding has mistakenly been enabled on the host machine, and if it is enabled, disable it. For Linux systems this is done by writing a 0 to the special file `/proc/sys/net/ipv4/ip_forward`. For example, type the following command:

```
echo 0 >/proc/sys/net/ipv4/ip_forward
```

(note that this must be done as the super-user). For other systems there is a system configuration option that can be set through a control panel, at compile time, or possibly at boot time. Consult your system documentation.

If the host has multiple network adapters, then it is likely intentionally configured to do IP forwarding and you do not want to disable it. In this case the only way to avoid packet-leakage is to enable a "packet filtering" facility and specify that packets from the host-only network should not be sent off-machine. An explanation of how to do this is beyond the scope of this document; consult your system documentation.

Finally, be aware that virtual machines may leak packets as well. For example, if you use Dial-Up Networking support on a virtual machine, then if packet forwarding is enabled, host-only network traffic may leak out through the dial-up connection.

Controlling Routing Information for a Host-Only Network

A host-only network is a full-fledged network. It has a network interface associated with it (vmnet1) that is marked "up" at the time the host operating system is booted.

Consequently, routing server processes that operate on the host operating system, such as routed and gated, will automatically discover it and propagate information on how to reach it unless you explicitly configure them not to. If either of these programs is being run only to receive routing information, then the easiest solution is to run them with a -q option so that they do not supply routing information, only receive it. If, however, they are running because they are to supply routing information, then you need to configure them so they do not advertise routes to the host-only network.

Unfortunately, the version of routed that comes with many distributions of Linux has no support for specifying that an interface should not be advertised. Consult the routed(8) manual page for your system in case you have a more contemporary version of the software.

For gated, configuration is involved. You need to explicitly exclude the vmnet1 interface from any protocol activity.

Using Samba for File Sharing on a Host-Only Network

VMware Express for Linux can automatically install and configure a Samba server to act as a file server for Microsoft Windows 95 and Windows 98 guest operating systems.

For details, read the tech note Using Samba for File Sharing.

Other Potential Issues with Host-Only Networking

The following are common questions and issues that may arise when configuring a host-only network.

Q: DHCP on the host machine does not work after I install VMware Express.

A: If you were running the DHCP server program dhcpd on your machine before installing VMware Express, then it probably was configured to respond to DHCP requests from clients on any network interface present on the machine. When host-only networking is configured, an additional network interface, vmnet1, is marked "up" and available for use, and dhcpd may notice this. In this case some dhcpd implementations abort if their configuration files do not include a "subnet" specification for the interface – even if dhcpd is not to respond to messages that arrive through the interface. The best solution to this problem is to add a line to the dhcpd configuration file of the form:

```
subnet <net>.0 netmask 255.255.255.0 { }
```

(where <net> is the network number assigned to your host-only network; for example, 192.168.0). This informs dhcpd about the host-only network and tells it explicitly not to respond to any DHCP requests it sees coming from it.

An alternative solution is to explicitly state the set of network interfaces that you want dhcpd to listen to each time you start the program. For example if your machine has one Ethernet interface eth0, then each time you start dhcpd you would list it on the command line:

```
dhcpd eth0
```

rather than have it probe for all available network interfaces.

If the above solutions do not work for your dhcp server program, then it likely is old. You can try upgrading to a more current version such the Version 2 DHCP software available from the ISC (see <http://www.isc.org>).

Q: Is there any way to use DHCP and Dynamic Domain Name Service (DDNS) on a host-only network?

A: DHCP can be used to hand out IP addresses as well as other information, such as the identity of a host running a name server and the nearest router/gateway. But it does not currently provide a means to dynamically establish a relationship between the IP address it assigns and a client's name (that is, to update a DNS server using DDNS). This facility is scheduled to be part of the Version 3 DHCP server available from the Internet Software Consortium (ISC). When that is available we will update our software to use that server.

In the meantime, if you want to use names to communicate with other virtual machines you will need to either edit the DHCP configuration file for vmnet1 (*/etc/vmware/vmnet1.conf*) or use IP addresses that are statically bound to a host name. Editing the DHCP server configuration file requires information that is best obtained directly from the DHCP server documentation; consult the UNIX manual pages `dhcpcd(8)` and `dhcpcd.conf(8)`.

More Details about Bridged Networking

Setting Up Bridged Networking On The Guest Operating System

Bridged networking means a virtual machine appears just like any other host on the physical network. You need to configure operating system support for the virtual Ethernet adapter, then either assign a fixed network address or enable use of DHCP for dynamic address assignment.

Assigning a network address is done according to local conventions – if your site runs DHCP, then you may choose to enable DHCP use, otherwise you will need to consult a network administrator to obtain a network address. Be aware that if the host machine is set up to boot multiple operating systems and you run one or more of them in virtual machines, then you will need to configure each operating system with a unique network address. (Many people assign all systems the same address since they assume only one will be running at a time!)

Changing the MAC Address of a Virtual Machine

When a virtual machine is powered on, VMware Express automatically assigns it a MAC address. The software guarantees that virtual machines will be assigned unique MAC addresses within a given host system. However, the software does not guarantee that a given virtual machine will be assigned the same MAC address every time it is powered on. In addition, VMware Express does its best, but cannot guarantee, to automatically assign unique MAC addresses for virtual machines running across multiple host systems.

If you want to guarantee that the same MAC address is assigned to a given virtual machine every time, or want to guarantee a unique MAC address for each virtual machine within a networked environment, you can assign it manually instead of allowing VMware Express to assign it automatically. It is possible to manually assign the same, unique MAC address to any virtual machine by adding the following line to its configuration file:

```
ethernet0.address = 00:50:56:XX:YY:ZZ
```

where XX is a valid hex number between 00h and 3Fh, and YY and ZZ are valid hex numbers between 00h and FFh. VMware Express virtual machines do not support arbitrary MAC addresses, hence the above format must be used.

Note: As long as you choose XX:YY:ZZ so it is unique among your hard-coded addresses (where XX is a valid hex number between 00h and 3Fh, and YY and ZZ are valid hex numbers between 00h and FFh), conflicts between the automatically assigned MAC addresses and the manually assigned ones should never occur.

USING SAMBA FOR FILE SHARING

VMware Express includes a Samba server that is automatically configured to act as a file server for Microsoft Windows 95 and Windows 98 guest operating systems. You can simply drag and drop their files between different environments without needing to manually configure Samba on your system.

The lightly modified Samba server installed by VMware Express runs over the VMware Express virtual Ethernet, and the Samba traffic between different operating systems is isolated from actual local area networks.

The source code diffs for the changes, based on Samba 2.0.6, are available from the VMware Web site. A download link is at http://www.vmware.com/support/reference/linux/samba_2_linux.html.

VMware hopes these changes will be integrated in the next release of Samba.

Adding User Names and Passwords to the VMware Samba Password File

You may add user names and passwords to the VMware Samba password file at any time from a terminal window on your Linux host computer.

1. Log in to the root account.

```
su
```

2. Run the VMware Samba password command.

```
vmware-smbpasswd vmnet1 -a <username>
```

where *<username>* is the user name you want to add.

Follow the instructions on the screen.

Note: *vmware-smbpasswd* is based on the standard Samba password program. If you are familiar with the options used in *smbpasswd*, you may use any of them in *vmware-smbpasswd*.

3. Log out of the root account.

```
exit
```

If you receive an error message that says

Unknown virtual interface "vmnet1"

this indicates your machine is not using the VMware Samba server.

If your installation of VMware Express does not include the VMware Samba server and you want to set it up, log in to the root account on your host computer (*su*), then run *vmware-config.pl* from a terminal on your host computer. When the configuration script asks *Do you want this script to automatically configure your system to allow your virtual machines to access the host file system?* Answer *Yes*.

SOUND

VMware Express provides a virtual audio device compatible with the Creative Technology Sound Blaster® 16 and supports sound in Windows 95 and Windows 98 guest operating systems. The VMware Express sound device is disabled by default and must be enabled in the VMware Express Configuration Editor. Sound support is currently limited to PCM (Pulse Code Modulation) output (that is, any application that produces sound without using MIDI).

Configuring Sound with VMware Express

1. Configure sound on the Linux host operating system. Refer to the documentation for your particular Linux. You may need to install additional software packages on your system to support sound. VMware cannot provide support assistance in configuring sound on your host operating system. Please contact your host operating system support provider or PC manufacturer for help.
2. Enable sound within the virtual machine. The sound virtual device is not installed in the virtual machine by default. In the VMware Express Configuration Editor, open the Sound Adapter panel and click the Install button. Save the configuration and power on the virtual machine.
3. Configure the guest operating system to use the VMware Express virtual sound device. This device is compatible with a Creative Technology Sound Blaster 16.
4. If you have never installed a Sound Blaster 16 Card in this Windows system previously, you will need a Windows 95 or Windows 98 installation CD-ROM.
 - a. Launch Add New Hardware from the Windows Control Panel.
 - b. Click Next.
 - c. Select Yes for "Do you want Windows to search for new hardware?"
 - d. Click Next.
 - e. Click Next again.
 - f. Windows should run the autodetection and say it is ready to finish.
 - g. If prompted to do so, insert the Windows CD-ROM into the drive and click OK.
 - h. Click Finish.
5. If you have problems with Windows autodetection, add the device manually.
 - a. Launch Add New Hardware from the Windows Control Panel.
 - b. Click Next.
 - c. Select No for "Do you want Windows to search for new hardware?"
 - d. Click Next.
 - e. Select "Sound, video and games controllers."
 - f. Click Next.
 - g. Select "Creative Labs Sound Blaster 16 or AWE-32."
 - h. Click Next.
 - i. Click Finish.

Known VMware Express Sound Limitations

- Sound support is limited to Sound Blaster compatible PCM (Pulse Code Modulation) output. This includes the ability to play .wav, .au and Real Audio formats.
- MIDI sound is not supported.
- Game ports/joysticks are not currently supported.
- Sound does not work well with several games, especially fast, interactive games.

PARALLEL PORT BEHAVIOR

VMware Express supports two types of virtual parallel port devices: unidirectional ports (SPP) and a partial emulation of bidirectional PS/2-style ports. Unidirectional ports are supported in all Linux host versions. Bidirectional ports are supported in Linux kernel versions 2.2.5 or later.

VMware Express requires that the parallel port "PC-style hardware" option (CONFIG_PARPORT_PC) be built and loaded as a kernel module (that is, it must be set to "m"). VMware Express is unable to use bidirectional parallel port devices if CONFIG_PARPORT_PC is built directly (compiled) into the kernel. This limitation exists because CONFIG_PARPORT_PC does not correctly export its symbols.

Unidirectional Ports

Unidirectional ports are supported for backward compatibility. They are used typically to connect to printers or to send the printer output to a file. The speed is usually adequate for printing text, but expect long delays when printing images.

The pathnames of the host devices for unidirectional ports are typically `/dev/lp0`, `/dev/lp1`, etc.

Bidirectional Ports

Bidirectional ports are used by a variety of devices (printers, scanners, dongles, disk drives).

Currently, VMware Express provides only partial emulation of PS/2 hardware. Specifically, interrupts requested by a device connected to the physical port are not passed to the virtual machine. Also, the guest operating system cannot use DMA (direct memory access) to send data to or from the port. This may be resolved in a future release of VMware Express.

For this reason, and for the time being, not all devices that attach to the parallel port are guaranteed to work correctly. Below is a partial list of devices, which we will update as we gain further information. If you try out a device that's not in the list, we would like to hear about it.

Bidirectional emulation is slower than native access but faster than unidirectional emulation, so this is the recommended mode, when possible, even when the device is unidirectional (as with printers).

The pathnames of the host devices for bidirectional ports are usually `/dev/parport0`, `/dev/parport16`, `/dev/parport32`, etc. The VMware Express installer creates these devices if they do not exist. They may be also created by hand using `mknod`. For example, to create the second `parport` (`parport16`), type the following command:

```
mknod /dev/parport16 c 99 16
```

Default Configuration

Parallel ports by default are bidirectional on Linux hosts 2.2 or later. They are unidirectional otherwise. Their default base addresses are, in order, `0x3bc`, `0x378` and `0x278`. None of the ports have an assigned IRQ or DMA channel. The ports are not present by default.

Installation on Guest Operating Systems

On Windows 9x, when a port is changed from unidirectional to bidirectional or vice versa, it is necessary to remove the device driver for that port (double-click the System icon in the Control Panel) and add a new one. Adding a new driver is also required when a new port is added. In both cases use the Add New Hardware icon in the Control Panel and let Windows detect the new device(s). Manually selecting the devices from a list may result in an incorrect configuration.

Troubleshooting

If an error message is displayed at power on stating the parallel port on the host does not have an ECR (Extended Control Register), it is possible the hardware supports it but it has been disabled in the BIOS. In this case, reboot your host, enter the BIOS configuration editor (typically by holding down the Delete key during early execution of the BIOS), find the parallel port field, and enable ECP mode (or other combination of modes that include ECP). Most modern computers should support ECP mode.

Devices Known to Work	
Adobe dongle	Windows 95 guest
RIO MP3 player	Windows 95 guest
UMAX Astra 1220 P scanner	Windows 95 guest
Hewlett-Packard LaserJet 5MP printer	Windows 9x guests
Canon Bubble Jet BJ-200e printer	Windows 9x guests
Iomega ZIP drive	Requires recent drivers (see note below).

Devices That Probably Work	
Dongles	Most dongles are likely to work.
Printers	Most printers are likely to work.
HP Deskjet 722C	Reported by customer.
Epson 750 printer in bidirectional mode	Reported by customer.
CARDport Swift Smart Media Digital Image Reader/Writer from Chase Advanced Technologies	Reported by customer.
Logitech Scanman Color 2000 (parallel port hand scanner)	Reported by customer.
Creative Labs WebCam II (parport version)	Reported by customer.

Special Notes for the Iomega Zip Drive

On Windows 9x, use of older drivers for the Iomega Zip drive may cause the guest operating system to lock up intermittently at boot time or during installation of the guest operating system. The newest Iomega drivers work reliably in our tests. They are available at <http://www.iomega.com/software/index.html> (or use this direct link to the downloadable file: <http://apps.iomega.com/servlet/dataprocess/driveraccess?database=steerdown&ID=100000212>).

VMWARE EXPRESS KEYBOARD MAPPING

This document addresses these issues (and some others too):

- My (language-specific) keyboard is not supported by VMware Express.
- Some of the keys on my keyboard don't work right in the virtual machine.
- My keyboard works fine when I run a virtual machine locally, but not when I run the same virtual machine with a remote X server.

Quick Answers

- If your keyboard works correctly with a local X server, and you just want the same behavior with a remote X server (which is also an XFree86 server running on a PC), just add the line `xkeymap.usekeycodeMapIfXFree86 = true` to the virtual machine configuration file or `~/vmware/config` (on the host machine, where you run the virtual machine, not on the machine with the X server).
- If you are using an XFree86-based server that VMware Express doesn't recognize as an XFree server, use this instead:

```
xkeymap.usekeycodeMap = true
```

The Complete Story

Unfortunately, keyboard support for the PC (virtual or otherwise) is a complex affair. To do it justice, we have to start with some (greatly simplified and not strictly correct) background information.

Pressing a key on the PC keyboard generates a scan code based roughly on the position of the key. For example, the Z key on a German keyboard generates the same code as the Y key on an English keyboard, because they are the same key. Most keys have one-byte scan codes, other keys (with one exception) have two-byte scan codes with prefix 0xe0. Internally, VMware Express uses a simplified version of the PC scan code that is a single 9-bit numeric value, called v-scan code. V-scan codes are written as a three-digit hexadecimal number. The first digit is 0 or 1. For example, the left-hand control key has a one-byte scan code (0x1d); its v-scan code is 0x01d. The right-hand control key scan code is two bytes (0xe0, 0x1d); its v-scan code is 0x11d.

An X server uses a two-level encoding of keys. An X key code is a one-byte value. The assignment of key codes to keys depends on the X server implementation and the physical keyboard. As a result, an X application normally cannot use key codes directly. Instead, the key codes are mapped into keysyms that have names like "space," "escape," "x," "2." The mapping can be controlled by an X application via `XChangeKeyboardMapping()` or by the program `xmodmap`. Also, `xev` is a handy tool that shows the key codes and keysyms for the keys typed into its window.

To recap, a key code corresponds roughly to a physical key, and a keysym corresponds to the symbol on the key top. For example, with an XFree86 server running on a PC, the Z key on the German keyboard has the same key code as the Y key on an English keyboard. The German Z keysym, however, is the same as the English Z keysym, and different from the Y keysym.

For an XFree86 server on a PC, there is a one-to-one mapping from X key codes to PC scan codes (or v-scan codes, which is what we really use). VMware Express takes advantage of this fact. When it is using an XFree86 server on the local host (therefore must be on a PC), then it uses the built-in mapping from X key codes to v-scan codes. This mapping is keyboard independent, and should be correct for most (if not all) languages. In other cases (not an XFree86 server or not a local server), VMware Express must map keysyms to v-scan codes, using a set of keyboard-specific tables.

Key code mapping is simple, automatic, and foolproof. (Keysym mapping is more complex and described later.) However, because the program cannot tell whether a remote server is running on a PC, it errs on the safe side and uses key code mapping only with local X servers. This is often too conservative and undesirable. Luckily, this and other key code-mapping-related behavior can be controlled by configuration settings:

- `xkeymap.usekey codeMapIfXFree86 = true`
Use key code mapping if using an XFree86 server, even if it is remote.
- `xkeymap.usekey codeMap = true`
Always use key code mapping regardless of server type.
- `xkeymap.nokey codeMap = true`
Never use key code mapping.
- `xkeymap.key code.<code> = <v-scan code>`
If using key code mapping, map key code `<code>` to `<v-scan code>`. `<code>` must be a decimal number. `<v-scan code>` should be a C-syntax hexadecimal number (for example, `0x001`).

The easiest way to find the X key code for a key is to run `xev` or `xmodmap -pk`. For v-scan codes, try the (incomplete) table at the end of this document. The keysym mapping tables described below are also helpful.

Use this feature to make small modifications to the mapping. For example, do this to swap left control and caps lock:

```
xkeymap.key code.64 = 0x01d # X Caps_Lock -> VM left ctrl
xkeymap.key code.37 = 0x03a # X Control_L -> VM caps lock
```

These configuration lines can be added to the individual virtual machine configuration, to your personal VMware Express configuration (`~/vmware/config`), or even to the host-wide (`/etc/vmware/config`) or installation-wide (usually `/usr/local/lib/vmware/config`) configuration.

When key code mapping cannot be used (or is disabled), VMware Express maps keysyms to v-scan codes. This is done using one of the tables in the `xkeymap` directory in the VMware Express installation (usually `/usr/local/lib/vmware`). Which table to use depends on the keyboard layout. The normal distribution includes tables for PC keyboards for the United States and a number of European countries and languages. And for most of these, there are both the 101-key (or 102-key) and the 104-key (or 105-key) variants.

VMware Express automatically determines which table to use, by examining the current X `keymap`. However, its heuristics may sometimes fail. In addition, each mapping is fixed and may not be completely right for any given keyboard and X key code-to-keysym mapping. For example, a user may have swapped control and caps lock using `xmodmap`. This means the keys will be swapped in the virtual machine when using a remote server (keysym mapping) but unswapped when using a local server (key code mapping).

Therefore, keysym mapping is necessarily imperfect. To make up for this defect, most of the behavior can be changed with configuration settings:

- `xkeymap.language = <keyboard-type>`
Use this if VMware Express has a table in `xkeymap` for your keyboard but can't detect it.
`<keyboard-type>` must be one of the tables in the `xkeymap` directory. (See above for location.) However, the failure to detect the keyboard probably means the table isn't completely correct for you.
- `xkeymap.keysym.<sym> = <v-scan code>`
If using keysym mapping, map keysym `<sym>` to `<v-scan code>`. `<sym>` must be an X keysym name. `<v-scan code>` should be a C-syntax hexadecimal number (for example, `0x001`).

The easiest way to find the keysym name for a key is to run `xev` or `xmodmap -pk`. The X header file `/usr/X11R6/include/X11/keysymdef.h` has a complete list of keysyms. (The name of a keysym is the same as its C constant without the `XK_` prefix.) For v-scan codes, try the (incomplete) table at the end of this document. The `xkeymap` tables themselves are also helpful. Use this feature to fix small errors in an existing mapping.

- `xkeymap.fileName = <file-path>`
Use the keysym mapping table in `<file-path>`.

A table is a sequence of configuration lines of the form

```
<sym> = <v-scan code>
```

where `<sym>` is an X keysym name, and `<v-scan code>` should be a C-syntax hexadecimal number (for example, `0x001`). (See `xkeymap.keysym` above for how to find the keysyms and v-scan codes for your keyboard.)

Compiling a complete keysym mapping is hard. It is best to start with an existing table and make small changes.

V-scan Code Table

These are the v-scan codes for the 104-key U.S. keyboard:

Symbol	Shifted symbol	Location	v-scan code
Esc			0x001
1	!		0x002
2	@		0x003
3	#		0x004
4	\$		0x005
5	%		0x006
6	^		0x007
7	&		0x008
8	*		0x009
9)		0x00a
0	(0x00b
-	_		0x00c
=	+		0x00d
Backspace			0x00e
Tab			0x00f
Q			0x010
W			0x011
E			0x012
R			0x013
T			0x014
Y			0x015

U			0x016
I			0x017
O			0x018
P			0x019
[{		0x01a
]	}		0x01b
Enter			0x01c
Ctrl		(left)	0x01d
A			0x01e
S			0x01f
D			0x020
F			0x021
G			0x022
H			0x023
J			0x024
K			0x025
L			0x026
;	:		0x027
'	"		0x028
`	~		0x029
Shift		(left)	0x02a
\			0x02b
Z			0x02c
X			0x02d
C			0x02e
V			0x02f
B			0x030
N			0x031
M			0x032
,	<		0x033
.	>		0x034
/	?		0x035
Shift		(right)	0x036
*		(numeric pad)	0x037
Alt		(left)	0x038
Space bar			0x039

Caps Lock			0x03a
F1			0x03b
F2			0x03c
F3			0x03d
F4			0x03e
F5			0x03f
F6			0x040
F7			0x041
F8			0x042
F9			0x043
F10			0x044
Num Lock		(numeric pad)	0x045
Scroll Lock			0x046
Home	7	(numeric pad)	0x047
Up arrow	8	(numeric pad)	0x048
PgUp	9	(numeric pad)	0x049
-		(numeric pad)	0x04a
Left arrow	4	(numeric pad)	0x04b
5		(numeric pad)	0x04c
Right arrow	6	(numeric pad)	0x04d
+		(numeric pad)	0x04e
End	1	(numeric pad)	0x04f
Down arrow	2	(numeric pad)	0x050
PgDn	3	(numeric pad)	0x051
Ins	0	(numeric pad)	0x052
Del		(numeric pad)	0x053
F11			0x057
F12			0x058
Break	Pause		0x100
Enter		(numeric pad)	0x11c
Ctrl		(right)	0x11d
/		(numeric pad)	0x135
SysRq	Print Scrn		0x137
Alt		(right)	0x138
Home		(function pad)	0x147
Up arrow		(function pad)	0x148

Page Up		(function pad)	0x149
Left arrow		(function pad)	0x14b
Right arrow		(function pad)	0x14d
End		(function pad)	0x14f
Down arrow		(function pad)	0x150
Page Down		(function pad)	0x151
Insert		(function pad)	0x152
Delete		(function pad)	0x153
Windows		(left)	0x15b
Windows		(right)	0x15c
Menu			0x15d

The 84-key keyboard has a Sys Req on the numeric pad:

Symbol	Shifted symbol	Location	v-scan code
Sys Req		(numeric pad)	0x054

Keyboards outside the U.S. usually have an extra key (often < > or < > |) next to the left shift key:

Symbol	Shifted symbol	Location	v-scan code
<	>		0x056

Glossary

Glossary

Bridged networking

A type of network connection between a virtual machine and the rest of the world. Under bridged networking, a virtual machine appears as an additional computer on the same physical Ethernet network as the host.

See also Host-only Networking.

Configuration

See Virtual machine configuration.

Configuration Editor

A point-and-click editor to view and modify the configuration of a virtual machine. It may be launched from the Settings menu.

See also Configuration Wizard.

Configuration Wizard

A point-and-click interface for convenient, easy creation of a virtual machine configuration. It is launched automatically when VMware Express is started without specifying a configuration file. It can also be launched from the VMware Express File menu. It prompts the user for information, suggesting default values in most cases. At the end it creates files that define the virtual machine, including a virtual machine configuration file and (optionally) a virtual disk or raw disk file.

See also Configuration Editor.

Guest operating system

A Windows 95 or Windows 98 operating system that runs inside a virtual machine.

See also Host operating system.

Host-only networking

A type of network connection between a virtual machine and the host. Under host-only networking, a virtual machine is connected to the host on a private network, which normally is not visible outside the host. Multiple virtual machines configured with host-only networking on the same host are on the same network.

See also Bridged networking.

Host machine

A real, physical computer (as opposed to a virtual machine).

Host operating system

An operating system that runs on the host machine.

See also Guest operating system.

Virtual disk

A virtual disk is a file on the host file system that appears as a physical disk drive to a guest operating system. This file can be on the host machine as well as on a remote file system. When you configure a virtual machine with a virtual disk, you can install a new operating system onto the disk file without the need to repartition a physical disk or reboot the host. VMware Express virtual disk devices can also be mapped to partitions on the host machine.

Virtual machine

A virtualized x86 PC environment on which a guest operating system and associated application software can run. Multiple virtual machines can operate on the same host machine concurrently.

Virtual machine configuration

The specification of what virtual devices (disks, memory size, etc.) are present in a virtual machine, and how they are mapped to host files and devices.

Virtual machine configuration file

A file containing a virtual machine configuration. It is created by the Configuration Wizard or the Configuration Editor. It is used by VMware Express to identify and run a specific virtual machine.