

VMware Workstation v. 3.1 & 3.2 for Windows
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Introduction

If you've ever wanted to clone your computer in order to run multiple operating systems simultaneously or combine all your old computers into a single box, then VMware has a solution for you. VMware Workstation creates a virtual computer (or virtual machine, VM) inside your physical computer (or physical machine, PM). The PM continues to run its operating system, called the host operating system (host OS), and its applications while one or more VMs run their guest OSes and applications. The VMs run concurrently within the PM, so you have multiple computers at your fingertips all inside a single box.

VMware is not the only solution to this kind of problem, of course. A single computer can be equipped with removable disk drives, like the new computer at TCS headquarters. Disadvantages include the expense of multiple drives, difficulty in transferring data between drives, and inability of OSes to run simultaneously. Alternatively, you can partition a single disk and install multiple OSes. This is cheaper and facilitates data transfer, but adds risk as some OSes recklessly clobber foreign partitions upon installation. Furthermore, many computers ship with preinstalled OSes which include diagnostic or suspend-to-disk partitions that limit the flexibility of this method.

VMware does have downsides. It borrows hard drive space from the host OS, requires networking for file transfer, and can't supply an ISA bus for legacy hardware. Worse, not all guest OSes are supported. On the other hand, virtual disks can be formatted with wild abandon and VMs run simultaneously, making it perfect for certain applications.

According to the marketing literature, VMware is not intended for casual users. However, you don't need to be head of technical support or cross platform software development to put it to good use. I had four applications in mind for this product:

- 1) Installing Linux on a laptop to run some high end speech analysis software.
- 2) Running the same Apache web server, Python, and sendmail that my internet service provider uses so as to better debug web sites. (Telnet access is not provided.)
- 3) Replacing outdated computers with VMs that run older Windows software unsupported by XP.
- 4) Porting software applications to Linux.

This review focuses on the first application.

Packaging

The box I received was printed v. 3.0, but stickers indicated that it contained v. 3.1. Version 3.2 was released during this review in the form of a free download. The product is clearly undergoing changes, albeit minor ones, which seem to involve support for Windows XP. The box contained one user's manual of 400 pages updated for v. 3.1 and one CD along with a quick reference card, registration number, and information about other VMware products.

The CD envelope refers to an end user license agreement which is not included in hardcopy, but is available online or on the CD itself. If you read the CD version, you discover that the software is not returnable after the envelope has been opened. By that time it's too late. That's my only issue with the packaging.

Documentation

A PDF version of the manual is included on CD and the software provides access to very complete, compiled HTML help files. The manual is exceptionally literate with complete sentences down to the lists of contents that precede each chapter. It serves for both the Windows and Linux host OSes and describes installation of a multitude of guest OSes that will not all be relevant, so you need only read every other page at most. Do read about the guest OSes you intend to use because it contains important information concerning video card support, for example.

The manual includes many helpful screen shots. Typos are nearly absent, but note that the newsgroup `vmware.guest.windows-nt` is printed incorrectly. A welcome addition would be a table of variables and values used in the ini files containing settings for the guest OSes. Not all can be manipulated with the graphical interface.

Installation

Installation of VMware itself is extremely simple. I double clicked under Windows XP since autorun doesn't work, and this was the hardest part. With v. 3.1 I was notified that some software had "not passed Windows Logo testing to verify its compatibility with Windows XP." This was fixed with v. 3.2. I was a disappointed when the firewall asked if I should "allow VMware driver installer to access the internet." The manual does not mention this.

Virtual Machines

The first step after installation is building a VM by collecting and configuring various hardware components. VMware jump starts you by suggesting a configuration appropriate for a selected guest OS. It recommends a particular amount of memory, for example. Values can be changed later and thankfully don't involve tearing the computer apart. Here is what you have to choose from:

Memory. VMware recommends minimum and maximum values based on the guest OS and amount of memory in the PM, respectively. You can test how a guest OS or its applications function in a low memory environment by reducing the value.

Virtual disk. Both IDE and SCSI disk drives are supported, regardless of the PM's interface. Disk data is stored in files managed by the host OS using multiple, sequential files for large disks. The files can be copied or archived without a backup program for the guest OS. Virtual disks run in persistent, undoable, and non-persistent modes. Undoable changes can be discarded when the VM is powered down. If the decision is postponed until a subsequent power up, new changes can be appended to the old. Undoable mode can prevent trashing of the guest OS. Reconfigure it in some reckless way, shut it down, reset the VM, and determine whether the OS still runs. If not, power down the VM and discard the changes. Non-persistent mode is useful for tutorials where the guest OS should boot to the same state for each class. A VM can also be granted direct access to a physical drive, but check the manual for important details.

DVD/CD-ROM. Either a physical DVD/CD-ROM drive or an ISO image can be used. It should be possible to download Linux and use the ISO images to install it without burning a CD. VMware Tools (described later) installs this way. DVD viewing with a guest OS is not supported.

Floppy drive. Again, either a physical drive or a floppy image can be used. Image data is probably ordered by side, track, and then sector, but this isn't documented. No tool is provided to create anything other than a blank image, but `diskcopy` or `dd` can be used to copy a diskette to an image. Documentation is unclear about which floppy formats are supported. The BIOS running in the VM lists 360KB, 1.2MB, 720KB, 1.44MB, and 2.88MB formats, but a blank floppy image is 1.44MB without fail.

Network. Four networking options are provided: bridged, network address translation (NAT), host-only, and custom. Networking allows for data transfer between host and guest OSes. No special drag and drop mechanism is provided, although one can cut and paste text or use the serial or parallel ports for data transfer.

Serial port. The VM can access a physical port or connect to a file (output only) or a named pipe. Options to tee the data and send it to both the physical port and a file or to record incoming data are not available but might be useful.

Parallel port. Connection is made to a physical port or file. You can copy a file from DOS to the host OS with `"copy filename.ext prn:"`.

Generic SCSI device. The VM can access the PM's SCSI devices if the guest OS supports a BusLogic SCSI adapter. No other virtual adapters are

provided. A guest OS could make backups to a physical tape drive or control a scanner using the SCSI interface.

USB controller. If the PM has USB ports, the VM can be granted access to them.

Sound adapter. VMware provides a virtual adapter that is almost compatible with a Sound Blaster 16 or AWE-32. Only pulse code modulated (PCM) output is supported; neither MIDI nor FM synthesis functions. Programs that probe for these capabilities may in my experience not recognize the adapter. Joysticks and game ports are likewise unsupported. The Sound Blaster is interfaced to the sound adapter in the PM.

A keyboard and mouse are installed by default and without options.

You may have noticed the video card absent from the list. No configuration options exist for video; a standard card is installed by default. Unless further steps are taken, the card provides VGA resolution of 640 by 480 in 16 colors. This is adequate for installation of supported guest OSes, although not always without difficulty, which is the primary reason for the manual pages detailing installation for each guest. After rudimentary installation under VGA resolution or in text mode, the VMware Tools package must be installed. This provides X server settings for Linux and device drivers for Windows that enable higher resolutions and better performance. It also allows tricks like seamless movement of the mouse cursor between guest and host OS windows.

Guest Operating Systems

After configuring a VM, it's time to power it up. The VMware user interface provides buttons and menus for powering off, powering on, suspending, and resetting the virtual machine and well as switching to full screen mode, capturing screen shots, etc. Icons show drive and network activity while the machine runs much like the LEDs of a PM. On power up you see the same screens that a PM displays when starting. Phoenix BIOS 4.0 runs and you can press F2 to change settings and specify, for example, a different boot device order. Until an operating system is installed, however, nothing much happens.

In putting VMware through its paces I installed eight different operating systems. Installation didn't always succeed initially, but I attribute that mainly to my own mistakes or to immature Linux distributions rather than to VMware. Once a guest OS was installed, performance was not always satisfactory. In particular, the sound adapter and keyboard had problems which I do attribute to VMware. Here are the ones I tried:

Red Hat Linux 7.2. Remember to configure a sound adapter first because it is not part of the standard VM for Linux. The low resolution graphical installation worked although it was slowed by the virtual video card, and

VMware recommends text mode installation. I installed VMware Tools and soon had high resolution graphics. The page for tool installation soon became the most consulted manual page, and I wish it appeared in the VMware dialog. The Sound Blaster was recognized during installation, but sound quality was terrible, consisting mostly of crackles and jerky starts and stops. The manual details editing of a configuration file on the host to improve sound performance, and this helped some, but not enough. In the process of fiddling with the Linux configuration I messed up the sound settings and achieved silence. The program that normally configures sound, `sndconfig`, probes for the MIDI interface. This fails and one must instead edit `modules.conf` by hand. The utility of the undoable disk mode quickly became apparent. Sound has been restored to the extent that it works and the speech analysis software has also been installed. Being able to install it on a laptop (and moreover to debug that installation) has already justified using VMware to me.

Caldera OpenLinux 2.3. The VMware manual assumes installation from a standard distribution CD. For Caldera and SuSE Linux 6.4 and 7.0 my CD was from a nonstandard magazine distribution and not all instructions applied. Most explain how to avoid graphical installation and later configure the X server because of the unusual video card implementation. With Caldera the low resolution installation succeeded; with others I had to dig through documentation to configure graphical logon and things not supported by older text mode installers. Caldera had a problem installing to a SCSI drive, but worked on IDE. Sound worked better and played for a second before pausing; networking worked better in NAT mode than bridged. Otherwise I noticed only one complaint about a failed low level parallel port configuration.

SuSE Linux 6.3, 6.4, 7.0. Graphical installation failed with v. 6.3 (but did not for others) and text mode was substituted. LILO did not run from the SCSI drive for 6.3, but did with others, and IDE was used instead. At one point v. 6.4 displayed in 320 by 240 pixel mode showing only part of the screen. The manual hints of this possibility. VMware Tools fixed the problem. Each system worked with bridged networking, but my notes say that 6.3 and 7.0 were not happy with the sound adapter.

Windows 95. Installation proved challenging, but only because of an aging CD and a long lost serial number. Instructions say that the first CD-ROM driver on the boot diskette works, but it didn't, and the second had to be substituted. Windows 95 boot diskettes were often customized, so generalization is difficult. The troubleshooting guide suggests downloading a known good driver from the Mitsumi site, but including it on the VMware CD would be better. As an experiment I allocated more memory to this VM than was physically available. Although VMware complained, it seemed to work. Sound performed well under Windows 95.

Windows ME. To install ME, I had to upgrade from 95. I simply made a backup copy the disk for 95 and proceeded without concern for backing out of

a failed ME installation. Unfortunately, the 95 disk provided insufficient capacity for ME. VMware can't make drives larger, although it can defragment virtual drives or shrink them by reclaiming unused space. To solve the problem, I added a D: drive and transferred files until enough space was available on C:. Sound performance was shaky even under light loads while windows were repositioned, for example.

DOS 5.0. DOS installed fine with a couple xcopy commands. I didn't configure sound, but did play some old Q-BASIC programs. The manual mentions that dosidle.exe can be downloaded to improve performance. Finding it on CD would be preferable. I created a massive 4GB drive for DOS and found that the file consumed only 8MB of the host drive. VMware does not allocate space for unused sectors. Since virtual disk size cannot be increased, a good strategy is to create large drives like this. They can have either a single partition that is slowly consumed or multiple partitions from which space is borrowed as needed by a (re)partitioning program.

In general VMware installation worked for all OSes listed. The virtual video adapter is a hassle and would be the first thing I'd change for the general customer. An adapter should be emulated, no matter how slowly, that allows for standard installation at resolutions that VMware Tools support. The tools would still provide optimization. For my particular application, sound adapter performance is insufficient. I will install the speech analysis software on an office computer and use the VM on the laptop at home or away, but not for serious work.

I put each guest OS to work and found responsiveness very good on a 1GHz machine. The ability to suspend a VM to disk is wonderful for slow-booting Linux and the snapshot showing the suspended screen's contents is an outstanding idea. Network connections were often flaky, however, with complaints about unreachable DHCP servers. The long route from the VM through several drivers, the software firewall (often the kink), hub, DSL modem, Qwest, and finally ISP seems fragile. Some OSes were more successful than others at connecting. The host OS complained periodically, so the problem was probably not VMware. The X server configuration provided by VMware, potentially limited by Linux, provides only TrueColor mode; PseudoColor and DirectColor are unavailable. If you need dynamic colormaps, note the limitation.

When I finally graduated from mouse to keyboard input, random keystrokes appeared double. Typing a long command line was aggravating and entering a password for Linux was nearly impossible. Luckily, v. 3.2 soon appeared.

Technical support

The updated version fixes the problem with Windows Logo testing. The VMware Tools installation program now produces warnings from perl regarding uninitialized variables, but runs fine otherwise. The update claims to fix the keyboard problem, but not for me, so I contacted technical support.

Support is provided over the web. I was required to open an account and supply an email address and password. The 30-day complementary support period began with my request. Email confirmation was sent immediately including a support request number. Three hours later a real person wrote requesting details which I provided. Unfortunately, 10 days have passed with no word from VMware.

Informal support is available from the news server news.vmware.com. I inquired there about experiences with sound adapter performance, but received no replies.

Recommendation

Comments expressed in the newsgroups indicate that people either love or hate VMware based on whether or not their specific OS or application runs. I rate the product a B+. Without the sound problems it would receive an A- and improved video support would earn it an A. The keyboard problem is likely temporary. Had I concentrated on another of my four potential applications, the grade might have differed. Please take advantage of the free download (only ~20MB) and 30-day trial period to make sure your OS and applications run. I've had more fun playing with imaginary computers the past few weeks than I could have imagined.

Company/Product information

Vendor: VMware, Inc.
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Tel: 1-877-4VMWARE
URL: <http://www.vmware.com>
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Product: VMware Workstation v. 3.2 for Windows
Cost: free 30 day trial version from <http://www.vmware.com>
\$299.00 download version from <http://www.vmware.com>
\$329.00 boxed version from VMware, Inc.
\$307.99 boxed version from <http://www.programmersparadise.com>

System requirements

Processor: Intel Celeron, Pentium II, III, 4 or
AMD K6-2, K6-III, Athlon, Duron
266 MHz minimum, 400 MHz or more recommended
Memory: 128 MB minimum, 256 MB or more recommended
Disk space: 20 MB plus space for guest OSes
Host OS: Windows XP Professional or Home
Windows 2000 Professional, Server, or Advanced Server
Windows NT Workstation or Server 4.0 with SP3 or higher

Differing lists of supported guest OSes appear on the box, in the manual, and on the web site. The information changes quickly so that even the summary below is not to be trusted. Several versions of Linux appear in the category “may work” and others in “may not work” which also includes BeOS and OS/2 which do not work. Check the web for details before purchasing either VMware or the guest OS.

Guest OS: Any host OS shown above
Windows ME, 98, 98 SE, 95, WfW, 3.1
Windows .NET Web, Standard, and Enterprise Server beta 3
MS-DOS 6
Red Hat, SuSE, Mandrake, Caldera, Corel, and Turbo Linux
Free BSD
Solaris
NetWare Server

Test system

HP Pavilion Notebook

Processor: AMD Mobile Athlon 4
1GHz
Memory: 256MB
Disk space: 10 GB free
Sound: ESS Allegro PCI Audio
Host OS: Windows XP Home Edition
Guest OS: Windows 95, ME
MS-DOS 5.0
Caldera OpenLinux 2.3
Red Hat Linux 7.2
SuSE Linux 6.3, 6.4, 7.0

Biography

Keith Alcock has written software for many of the guest operating systems that VMware supports on its virtual machine including DOS, Windows, and Unix, as well as software for the Smalltalk and Java virtual machines. He can often be found at the Developer’s SIG meetings.