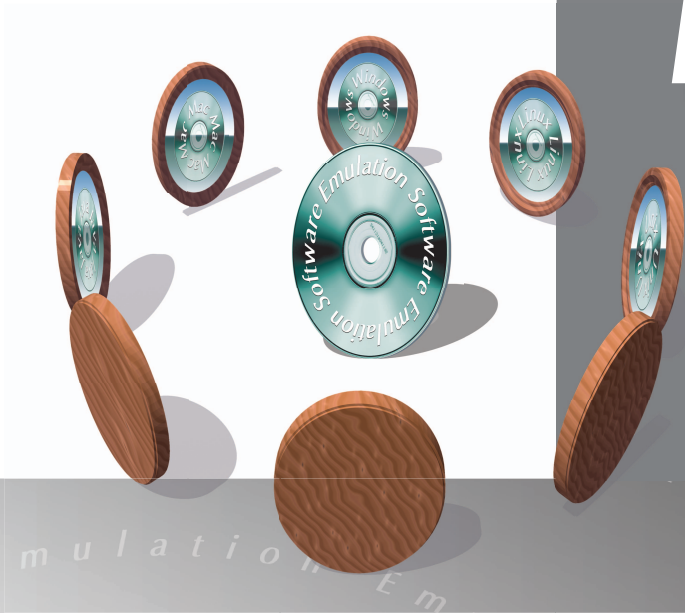# Almost as good as being there

Virtual machines gained popularity as a way to emulate Windows on Mac OS or Linux. Nowadays they're finding uses in testing, software development, server virtualisation, legacy applications, and many more. We look at the two most popular packages.

By Steven Turvey

Microsoft boosts server efforts

Microsoft is acquiring some assets of Connectix, including an unreleased server program and software that permits Windows to run on a Macintosh. Connectix is best known for its Virtual PC software, but has been trying to recast itself as a maker of server virtualisation software, which lets a single machine perform like several independent machines running their own operating systems.

The two companies had been in talks for many months, says Kurt Schmucker, vice president of Mac products for Connectix.

The future for Connectix, and for the products that Microsoft did not acquire, is somewhat unclear. For the next six months, the company's main focus will be the "graceful transition" of the virtualisation products to Microsoft, although Schmucker says the company will still support and sell its other products, such as RAMDoubler.

"After six months, we don't know yet," says Schmucker.

Connectix has been focusing on its development of the virtualisation products over the past year, Schmucker says, adding that the bulk of the company's current revenue comes from its Virtual PC for the Mac software.

"Connectix will continue to exist after the post-acquisition phase," says Jim Hebert, general manager of Microsoft's enterprise server business. "Connectix has been around for a long time and has had a variety of successes in a number of marketplaces. They're really creative guys. I expect they'll do something interesting."

VMware, Connectix's main rival in the server virtualisation arena, has the early lead with a product that has been on the market for several years. VMware is profitable and plans to offer a new product next quarter that enables two-processor virtual machines instead of just single-processor models.

Microsoft is important to VMware, says Chief Executive Diane Greene. Microsoft is VMware's biggest customer, and other customers most frequently run Windows in conjunction with VMware, she says.

Dividing servers into several independent "partitions," each with its own copy of an operating system, was pioneered with mainframes and now is common on Unix servers. Intel servers running Windows are beginning to catch up.

Partitioning is useful for consolidating several lower-end machines onto a single larger machine, a cost-saving measure. It's also good for responding to spikes in processing demands because a partition under a heavy load can quickly be assigned more computing resources than a comparatively idle one. If Microsoft incorporates Connectix's virtualisation technology into Windows, the software could profit from these abilities.

As recently as the past few months, Microsoft executives said the company wasn't focused on partitioning. Rather, the company's plan involves using a single operating system on each server but placing limits on how much of a computer's resources, such as memory, a specific application can use.

One analyst praised the purchase and pointed out some wide-reaching implications.

"I think it's a great move for Microsoft," IDC analyst Al Gillen says. He notes that Microsoft had been "noticeably absent" in the virtualisation arena. "I would think this is the start of a bigger effort in this space for Microsoft," he says.

Gillen says that, surprisingly, Microsoft would continue to offer non-Windows support provided by the Connectix technology.

"Microsoft told me that they would continue to have as a feature the ability to host a Linux guest operating system running on your Windows server," he says. "A lot of Linux proponents would not approve of that,

Virtual machines are certainly not going to be everyone's cup of tea. In fact, if you don't need to run multiple operating systems or are not a techno freak then you should probably skip ahead to the next article.

So who will typically want to use virtual machine (VM) software? For instance, a software developer in the early stages of the development may wish to test the code on some basic operating system setups, say Windows 98SE, ME, 2000, and XP. Now you could try and set up a few PCs with multiple boot options but it's a bit of a pain waiting for the system to reboot and start up the new OS each time you want to test a slice of code. With several virtual machines running on a single host PC you can simply move back and forth amongst the various OSes with the quick and simple click of a mouse.

You may not even be a developer, it could simply be that you like to use applications and tools that are only available under specific operating systems. Some may run under Windows, while others may only be available under Linux. Or you may have upgraded to Windows 2000 or XP only to find that a vital business application will only run under Windows 95 or DOS.

With either of the following applications, Connectix Virtual PC or VMware Workstation, you can have a host PC running either Windows or Linux with the other less frequently used OS running in a virtual machine window.

And, the good news is that both virtual machine applications are surprisingly fast and generally robust. Indeed, both vendors appear to have approached the problem from the same basic specifications; the similarities in features and functionality far outweigh the differences.

Our host PC used in the testing was a Dell Optiplex GX240 with a 1.7GHz Pentium 4 processor, 512MB of DDR memory, and a 32MB ATI Rage 128 Ultra graphics card running Windows XP Professional.

PROS AND CONS

It was interesting that while both applications were similar there are some quite significant advantages and disadvantages with each. In general VMware was the fastest in our benchmarks under Windows 2000 running in a VM, but the performance advantage in general was not that great. In terms of disk performance, Virtual PC was actually faster, but VMware had the edge in graphics and business application performance. In both cases we had configured the foreground VMs for maximum performance, but it appears that VMware's code is slightly more efficient or that it allocates a little more CPU time to the VM than Virtual PC.

Virtual PC on the other hand was the more robust

but a lot of people who are not biased in that respect would not be opposed to using that for some workloads."

Gillen says that support is important as Microsoft seeks to extend its corporate reach. "This is really a heterogeneous play," he says. "You could put NetWare on [a Windows server], you could put OS/2 on it."

The Connectix server software supports Linux partitions, but VMware places a high priority on Linux support. "Our belief is that although our customers predominantly are using our software to run multiple instances of Windows, they really do care about having the choice what operating system to run," Greene says.

Initially, Microsoft plans to target the Connectix server technology at its large installed base of Windows NT 4 customers. The company estimated that about 35 percent of Windows customers still use Windows NT 4, making them the leading candidates to move first to Windows Server 2003, which Microsoft plans to launch on April 24.

Microsoft is so concerned about the large number of customers using Windows NT 4 Server that the company in January extended security and hot-fix support through the end of 2004.

In the interim, Microsoft wants to make moving to Windows Server 2003 as easy as possible for those customers still using seven-year-old NT 4. Initially, the company plans to offer the Connectix technology for partitioning servers running the newer software to support applications from the older one.

"We're going to be able to offer our NT 4 installed-base customers an incremental set of migration tools that make it very straightforward to move an NT 4 application stack over to a modern operating system like Windows Server 2003 on a new piece of hardware," Hebert says.

"What this does," he adds, "is make it possible to partition a single processor into multiple subprocessors—ie, you share a single processor with multiple NT 4 application stacks."

For now, Microsoft will focus more on server consolidation than more-traditional partitioning schemes used on Unix servers and mainframes. But Hebert did not discuss future plans for the Connectix technology.

"As these older machines reach the end of their life . . . there is a place for them to go that doesn't require much effort on the part of IT organisation to keep them up and running," Hebert says.

An enterprise business moving an NT 4 application to Windows Server 2003 might use only 5 percent of the processing power. Consolidation of multiple application stacks would make better use of the hardware, Hebert says.

The consolidation process using the virtual machine technology offers customers other advantages, such as continuing to use existing applications but on a newer operating system with better security.

Still, running the consolidated applications has some drawbacks. "This (technology) is really most useful for applications that are low-throughput and are not generally thought of as critical-response-time applications but are still important for many enterprises to run their businesses," Hebert says.

Microsoft expects the server product to be available for downloading in the middle of the year and to officially ship by the end of the year. Connectix has been beta-testing Virtual Server, and before the Microsoft deal had expected the final version to ship in the first quarter.

"There's pricing in place for the (existing) Connectix products, and I don't believe we have any plans to change those," Hebert says. "I don't think we've priced the server product," adding that the price would likely be "modest".

—Ian Fried, Joe Wilcox, and Stephen Shankland

of the two applications. Everything ran first time every time without the need to tweak or reload. VMware on the other hand refused to install Winbench99 V2.0 at all, and we had to resort to the previous V1.2 and then upgrade. We also had problems with the audio and COM port configurations in VMware, whereas Virtual PC's audio and COM ports were up and running from the word go. The only feature we would have liked to see in Virtual PC was the provision for USB ports straight out of the box. Another advantage we feel Virtual PC has over VMware is the consistent emulation of known hardware standards. The graphics emulation for example is the S3 Trio 32/64 and the audio is Sound Blaster 16 or AWE 32. This should make it a lot easier to install operating systems not supported by the vendor as you can simply select a known driver rather than try and get something to run with VMware's proprietary graphics driver, for example.

So in the end we feel Virtual PC is the best bet: it's solid, reliable, and—while not quite as fast as VMware—is certainly no slouch either.

CONNECTIX VIRTUAL PC FOR WINDOWS V5

We have in the past used earlier versions of Virtual PC at the Lab and, to be blunt, while we could appreciate the difficulty of creating a seamless virtual PC application, we were less than impressed with the end result in terms of usability, particularly stability.

We were pleasantly surprised to find that Connectix has addressed the stability issue exceedingly well in this latest incarnation.

And even more impressive is the ease and simplicity with which you setup your virtual PC environment. If you can install a basic Windows app from the box, then you are going to be able to install Virtual PC. The configuration is also a doddle.

The first time you run Virtual PC (VPC) it prompts you with a series of simple questions such as what OS are you going to install; this helps the application

	Host PC	Virtual PC
Graphics card	32MB ATI Rage 128 Ultra	S3 Trio32/64
Sound card	Intel 82801BA AC'97	Sound Blaster 16 or AWE32 or compatible
Network Card	3Com 3C920	Intel 21140 based PCI
USB	Intel 82801BA USB Host Controller	Not Supported
Ports	COM1, COM2, LPT1	COM1, COM2, LPT1

are you going to install; this helps the application suggest basic virtual memory settings. The user can increase or decrease the memory allocations on various Virtual PCs if they are running several to balance the performance of each VPC. You can also choose to purchase a ready-made disk image for your operating system (unfortunately we did not receive one in time for testing). In this instance a Ghost image is simply loaded into the virtual disk and once you reboot that VPC, the OS is up and running.

We did it the old fashioned way and simply installed Windows 2000 from CD on one VPC and SuSE Linux on the other VPC. The virtual system that is emulated by the software is not particularly sophisticated as you can see from the table below, but it is certainly sufficient for most business applications. Do not expect to run your digital editing suite or Unreal 2 game from the VPC, it simply does not have that much emulated sophistication or grunt, which we will get to later.

Once you have created one or more VPCs, they are effectively controlled from the small Virtual PC window. From here you can launch the relevant VPCs, shut them down, tweak their individual settings, or create a new VPC.

We found the sound emulation worked fine—although we did not rigorously test it to ensure Sound Blaster compatibility, it worked satisfactorily in any of the business applications we ran. And, once we had configured our LAN settings correctly on the VPC, we had full access to the network. There were two options for the LAN, Shared Networking with Network Address Translation or Virtual Switch. The application notes recommend Shared is the easiest to configure and should suit most users. However, to run server software or run networking protocols other than IP over Ethernet, Virtual Switch must be used. Although the latter is more difficult to configure according to the manual, we found it simple and straightforward.

Cutting and pasting between host PC and VPC is supported as is dragging and dropping, and folder sharing. One rather neat feature is you can not only gracefully close down a VPC and its OS, you can brutally pull the plug, which results in a disk scan on its reboot. You can also suspend the VPC, save its state to disk, and then restart where you left off.

The CD and floppy drive can be manually ''captured'' or ''released'' by the VPC, however if you insert a self booting CD it will boot up on whichever window currently has the focus.

Most of the functionality just described is available from the VPC's drop down menu at the top of the window. There is also an additional VPC toolbar at the bottom of the window that indicates the status of the virtual hard drive, CD, floppy, shared folders if there are any, and virtual LAN. However, if the VPC display is configured for full screen, the menu and tool bars are no longer available. Virtual PC Preferences such as CPU load sharing between front and background VPCs are also set from here.

The VPCs can be configured so they can be remote controlled by another PC as long as this PC is running the VPC client.

Running apps on the VPC was a breeze; quite frankly we were surprised at how robust the VPC was. Business Winstone and all its applications ran without a hitch and any business apps we threw at it ran smoothy. Admittedly the VPC is generally slower than the host PC, as you can see from the graphs, and you can expect your average business app to run around half as fast as it would on the client. But, on our 1.7GHz PC, the VPC and apps managed to keep up with most tasks we tried.

VMWARE V3.2

Installing VMware is exceptionally easy and even the configuration of the application should not pose a problem to the average PC user. When setting up each virtual machine, the user is prompted with a series of simple questions and generally VMware suggests a setting for the item in question based on the OS being installed and the host PC's specifications. In general, you can simply go with the suggestions and your VMs will run fine.

The default partition size is 4GB and the user can alter the memory allocation to the VM if they wish
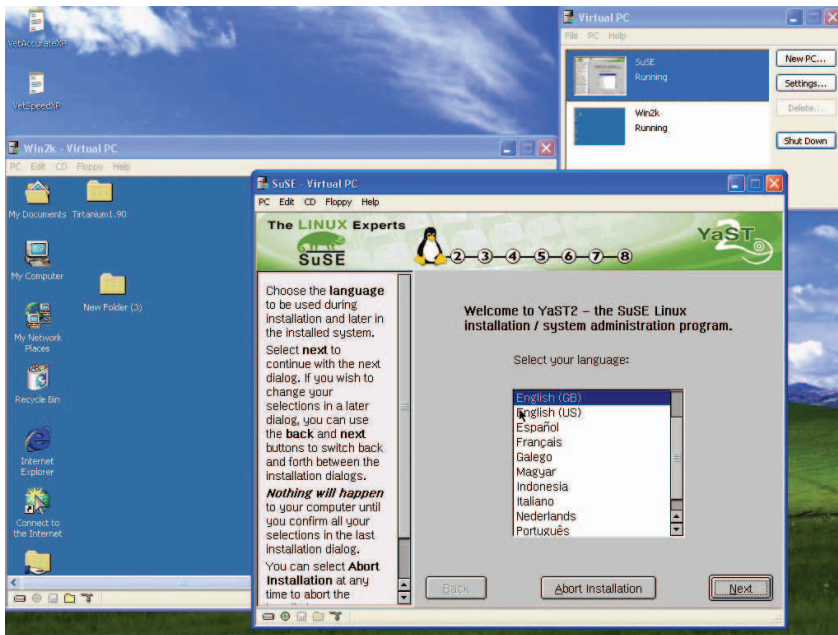
Virtual PC.

	Host PC	VMware
Graphics card	32MB ATI Rage 128 Ultra	VMware SVGA II
Sound card	Intel 82801BA AC'97	Legacy Audio Driver (Sound Blaster 16)
Network Card	3Com 3C920	AMD PCNET Family PCI
USB	Intel 82801BA USB Host Controller	Intel 82371AB/EB
Ports	COM1, COM2, LPT1	COM1, COM2, LPT1
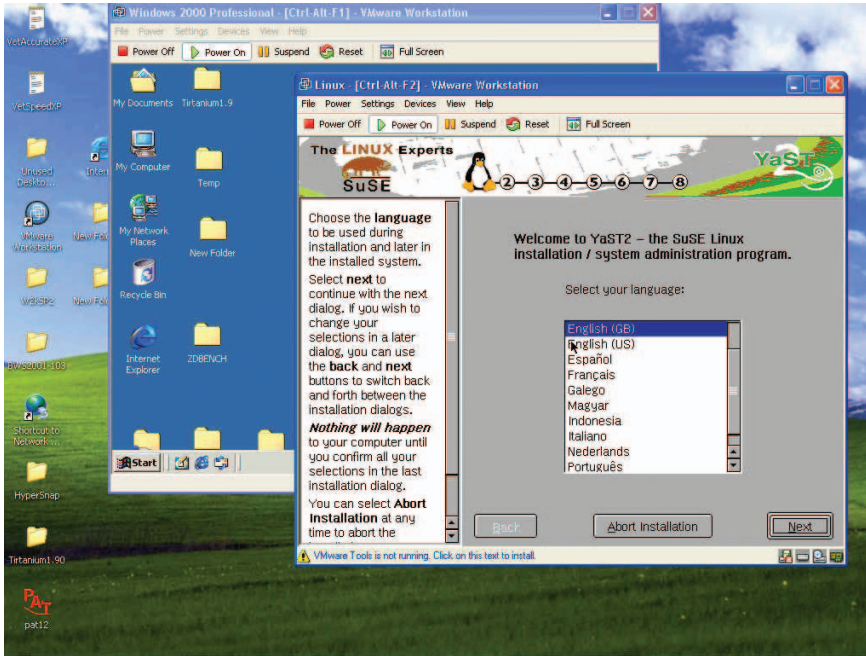
VMWare.

to increase or decrease the general performance. Operating systems can be purchased from VMware as disk images that can be simply copied over to the newly created partition, or you can chose to "bake your own" as we did. As with Virtual PC, we tested VMware on Windows XP host with Windows 2000 and SuSE Linux VMs.

You will notice from the table that VMware has its own proprietary display driver. When you first install your OS, Windows 2000 for example, you are presented with the 640 x 480 16-colour display. After the OS is installed you then install the VMware "tools" which amongst other things install the proprietary display driver. This could be a bit of a trap if VMware does not support the OS you are attempting to install. And, although the audio drivers are Sound Blaster 16 compatible, they are not recognised by the Device Manager as such, and so may also be a problem with unsupported OSes. We feel it would have been far safer to simply emulate a known hardware standard transparently, particularly in the case of the video drivers.

There was also a minor problem with our system in that the COM ports did not install correctly and Device Manager claimed there were not enough free resources. The audio driver also refused to function correctly. It was nice to see that the USB ports were supported.

VMware provides four methods of connecting to your LAN: bridged connection (which we used), Network Address Translation which shares the host's IP address, a private shared network that treats the host as a separate physical PC, and a custom virtual network. We had no problem configuring the VM using the bridged option and connections to the LAN were seamless and quite fast.

The toolbar has four buttons for power on and off, Suspend, Reset, and full screen. Through the menus you can access the configuration editor, preferences, manage virtual networks, disconnect drives and USB devices, and configure the Local and Global priority of VM. In the latter case, rather than use the terms foreground and background, VMware uses "grabbed" and "ungrabbed". The four indicators along the status bar display drive and network activity.

Running our suite of benchmarks and apps was for the most part clear sailing, although we could not load

Test results

	Virtual PC	VMWare
Business Winstone 2001	51.5%	56.2%
WinBench 99 Business Graphics	14.9%	16.6%
WinBench 99 High-End Graphics	23%	34.8%
CD WinBench 99	37.3%	76.3%
Hard disk	67.8%	62.7%

Test scores represent the benchmark performance of the virtual machine as a percentage of the performance of the host.
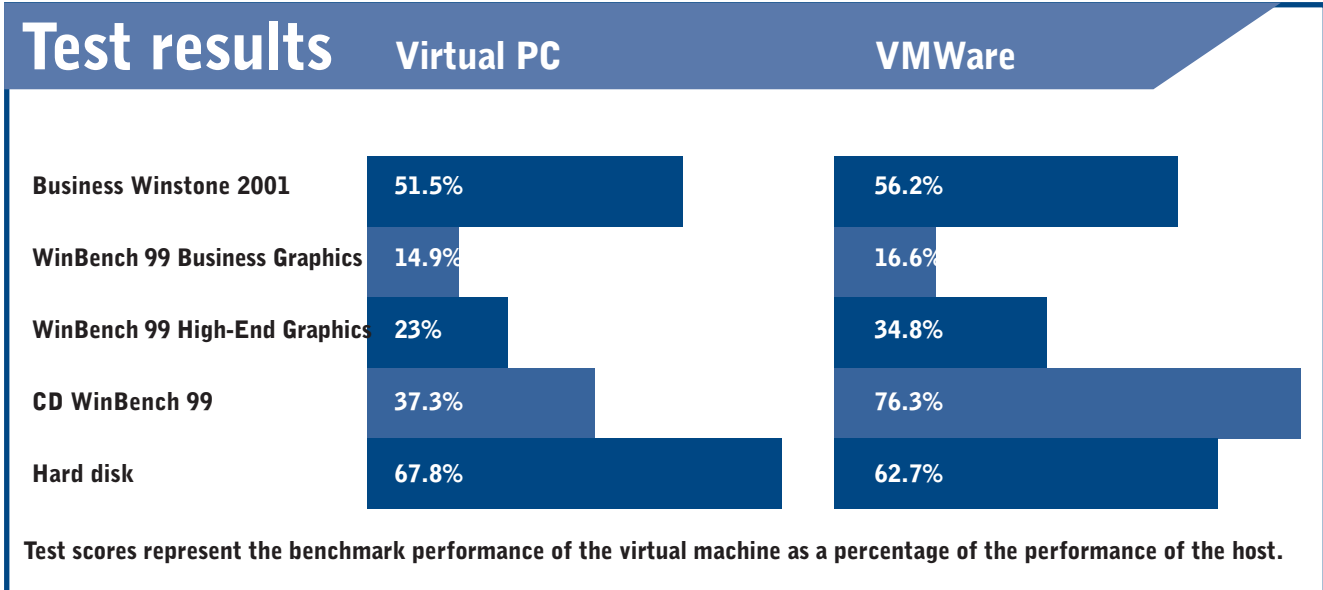
Product   Connectix Virtual PC For Windows V5

Price $491.23; OS packs $408.73 for Windows 98, Me & XP Home, $535.38 for Windows 2000 & XP Professional

Vendor   FirmwareDesign

Phone   1300 369 951

Web   www.connectix.com

Interoperability ✚✚✚✚½
Runs on most Windows x86 platforms, OS/2 and Mac.

Futureproofing ⌛⌛⌛½
Standard, albeit modest, hardware component emulation should support future OS versions without custom vendor provided drivers.

ROI ⑤⑤⑤⑤
Modestly priced, particularly if you install your own guest OS from scratch.

Service 🔧🔧½
7-day replacement warranty, free Web support; telephone and e-mail support charged at $49.50 per incident or $99 for a three-incident pack. (Updates and patches are free from the Web site.)

Rating ★★★★

Minimum system requirements
- Athlon, Duron, Celeron, Pentium II, Pentium III, or Pentium 4 processor; 400MHz minimum (600MHz recommended).
- Windows XP Home, Windows XP Professional, Windows ME, Windows 2000 Professional, or Windows NT 4.0 SP6.
- CD-ROM required for installation.
- RAM: depends on host OS but the guest OS requirements range from 32MB for DOS, 128MB for Windows 2000 and XP Pro; server implementations obviously require more.
- Hard disk space: depends on host but the guest OS requirements range from 50MB for DOS, 2GB for Windows 2000 and XP Pro; server implementations obviously require more.

Product   VMware V3.2

Price   Boxed CD $585, downloaded $510

Vendor   Microway

Phone   1300 553 313

Web   www.vmware.com

Interoperability ✚✚✚
Runs on most Linux and Windows x86 platforms but not OS/2 or Mac.

Futureproofing ⌛⌛⌛½
Proprietary drivers for some emulated hardware subsystems could prove to be a problem if an OS needs to be installed that is not directly supported by VMware.

ROI ⑤⑤⑤½
A little more expensive than Virtual PC but still reasonably priced.

Service 🔧🔧🔧½
Free Web, e-mail, and telephone 9-5 Mon-Fri if purchased locally; phone support $165 per incident if downloaded. Premium packages are available.

Rating ★★★½

Minimum system requirements
- 266MHz or faster processor (400MHz or faster recommended), single or multiprocessor Intel Celeron, Pentium II, III, 4; AMD K6-2, K6-III, Athlon, Duron.
- Windows XP Home, Windows XP Professional, Windows ME, Windows 2000 Professional, Windows NT 4.0 with Service Pack 6a, Windows Server 2003; Mandrake, Red Hat, SuSE, TurboLinux, or Caldera Linux.
- RAM: Depends on host and guest OS requirements but the minimum is 128MB and recommended is 256MB.
- Disk Drives: 20MB free disk space required for VMware basic installation and 1GB free disk space recommended for guest OS.

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version 2 of Winbench99 (the installation procedure would simply crash; we overcame this by installing an earlier version and then upgrading it). All the applications in Business Winstone 2001 ran without a hitch but we could not get the sound emulation to work correctly. We found cutting and pasting between the VM and host only worked with text, and not files or folders. We were disappointed we could not simply drag and drop files and folders between VM and host. Cursor behaviour was at times annoying and certainly not as smooth in a VM as Virtual PC for example. Also when a CD was ejected or loaded there was a significantly long period of time when the cursor simply froze and was not atvailable.

Performance on the other hand was very good and in the common business applications we ran VMware on average managed 56 percent of the host PC's performance. ∎

Microsoft Corp. has recently acquired the Connectix Virtual PC products and technology, and has announced that it will continue developing and supporting the products as part of their product portfolio.