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Running server systems in virtual environments is a popular approach, but the technology offers benefits to desktop users. In this article, we investigate some virtual desktop alternatives.

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Virtualization technologies offer a simple approach to testing new configurations or launching programs designed for different operating systems. Most commercial virtualization products make it easy for newcomers to install and use the software.

These virtualization alternatives support guest systems running in an isolated environment on the host machine. The guest can be installed from ISO images or installation CDs or DVDs, which are mounted on the virtual machine.

When it comes to supported guest systems, the choices range from any flavor of Windows (from Windows 3.11 to Vista), through Linux systems with kernel 2.4 and 2.6, to more exotic creatures, such as various BSD derivatives, Sun Solaris, or OS/2.

I decided to try out some desktop virtualization alternatives. I tested four typical desktop virtualization solutions, using the latest versions available at the time of the test. In some cases, newer versions have appeared since the test date. For instance, we tested the Innotek VirtualBox 1.3.99 beta, and version 1.4 has subsequently found its way to market. The release version of VMware Worksta-

tion 6.0 has also appeared since we tested the beta, and VMware Server has climbed from 1.0.2 to 1.0.3.



Figure 1: Parallels' approach to organizing controls is unconventional but not impractical.



Figure 2: Parallels supports simultaneous launching and viewing of virtual machines.

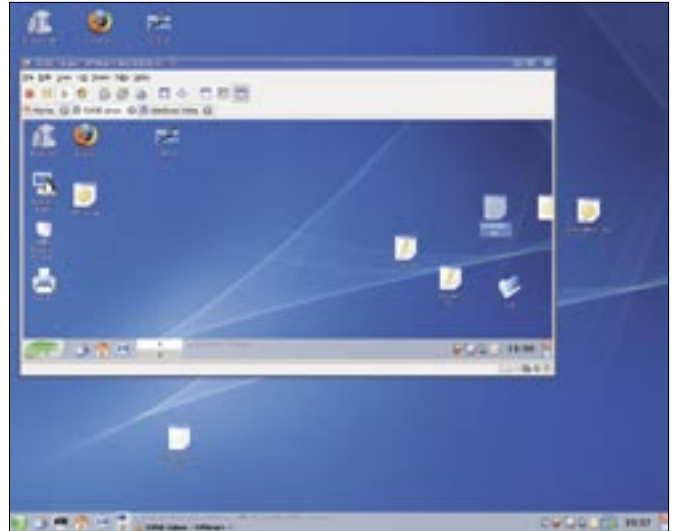


Figure 3: VMware Workstation automatically adjusts the guest display resolution and supports drag and drop.

VirtualBox and VMware Server are free, and Parallels Workstation 2.2 will set you back US\$ 49.99. The final version of VMware Workstation costs US\$ 189, although the beta we used in our test was free. Parallels offers a 14-day trial version. The machine in our lab has a 64-bit CPU (AMD 3200) and 1GB of RAM. The host system is OpenSUSE 10.2. I decided to install Windows Vista Business Edition and OpenSUSE 10.2 as guest systems.

One focus of the test was the exchange of data between the guest and host systems, which matters if you want to transfer the files created on the guest system. The test looked into how well various approaches worked, from shared folders, via mounting physical partitions, to the use of drag and drop to copy files between the guest and host.

The test candidates came with their own kernel modules, which are compiled and integrated during the installation process. I had to install the GCC compiler, along with the required kernel sources and headers, before installing the virtualization software or Guest Add-ons for Linux. OpenSUSE version 10.2 or later disables USBFS support in the kernel for security reasons. Because all of the virtualization test candidates, apart from VMware 6.0 beta, base USB support on USBFS, USB did not work. If you use a distro that includes USBFS support, this will not be an issue.

Parallels Workstation 2.2

Parallels claims to provide virtualization made easy [1], and the Parallels Work-

station is in line with the claim. The full version costs US\$ 49.99. For our lab, I downloaded the fully functional, 14-day trial version [2]; the vendor offers RPM and DEB packages as well as a tarball.

Controls

The GUI is attractive and clear. The top half of the main window (Figure 1) shows the settings for the virtual machines running on the host. The buttons below this are used to configure or create a new virtual machine. Parallels places the control unit for starting, stopping, or resetting the virtual machine on the right side of the window. The system lacks an overview of all installed machines in the main window or in tabs.

Guests

Parallels offers wizard-based guest configuration, which prompts for data such as the RAM and hard disk size, as well as the guest system to use. Guest add-ons provide drivers to boost the performance of the virtual machine and extend its functionality. Parallels only has add-on support for Windows guest systems. The program does not have a drag and drop function for exchanging files between the VM and the host. Parallels has a copy and paste function, but it was awkward. A snapshot function for saving the system status is missing.

The "acceleration level" is a function for guest system performance optimization. Parallels lets you disable the function, but this makes little sense: Disabling the turbo slows the guest system

to the point that it is almost impossible to use. The number of guest systems you launch at the same time, each running in a separate window (Figure 2), only affects the performance of the host system.

File Transfer

Parallels has a convenient tool for shared folder management, but relies on you to install guest add-ons and is thus not available on Linux. This also applies to Vista, but for other reasons.

Parallels does not support mounting of physical partitions. This restricts the options for exchanging files between guest and host systems to network services, such as a Samba server, or mass media attached to a USB port, which is not available on the SUSE Linux 10.2 host. The software autodetects USB devices attached to the host on other host operating systems.

Because Parallels only supports USB 1.0, it takes quite a while to transfer data from the virtual machine to a USB device. Although I installed the guest add-ons, Parallels took about eight minutes to transfer a 100MB file to an attached USB memory stick on Windows Vista.

Conclusions

Parallels is average. The other virtualization solutions in this test provide at least the same functionality and were free of charge in the case of VMware Server and VirtualBox. Parallels has simple installation and controls, but lacks a snapshot function. Parallels offers comprehensive documentation as a PDF download [3].

Parallels: Plus and Minus

- + Simple installation and controls
- + Very good documentation
- Lacks a snapshot function
- No guest addons for Linux

VMware Workstation 6.0

VMware [4] offers the current version 6 of VM Workstation, which costs around US\$ 189. We tested the beta version, which was available for free download.

Controls

VMware offers a tarball with installer and an RPM package. The next step is

to launch *vmware-config.pl* at the command line to configure the software. Users must answer some tricky questions, such as the kind of network support they will be using. Read the manual [5] before you start the install.

The GUI is fairly clear, and users should have no trouble finding critical functions. Although VMware has a plethora of settings, they are so well organized that users should have no trouble finding their way around.

Guests

Just like Parallels, VMware launches a wizard to help you set up guest systems. Because the wizard only helps you de-

fine a couple of key parameters, it is a good idea to click *Edit virtual machine settings* to fine-tune each guest. I had no trouble installing Vista, but a display error on OpenSUSE 10.2 prevented me from completing the configuration. Calling the X configurator, *sax2*, at the command line soon had this issue resolved.

VMware provides guest addons for Vista and Linux. Enabling addons provides advanced functions on the guest system, such as automatic mouse pointer switchover between the guest and host system, and automatic customization of the display resolution on the guest system to reflect the VM window size (Figure 3). VMware is the only can-

Table 1: Virtualization Solutions Compared

Vendor	Parallels <i>www.parallels.com</i>	Innotek <i>www.innotek.de</i>	VMware <i>www.vmware.com</i>	VMware <i>www.vmware.com</i>
Product	Desktop for Linux 2.2	VirtualBox 1.3.99 beta	Workstation 6.0 beta	Server 1.0.2
Price	US\$ 49.99	Free	US\$ 189 (final version)	Free
License	Commercial	Commercial/GPL	Commercial	Commercial
Hardware Support				
SCSI support	–	–	✓	✓
Sound card	✓	✓	✓	✓
USB	USB 1.0	USB 1.0	USB 2.0	USB 1.0
Disk Management				
ISO images	✓	✓	✓	✓
CD/DVD burner support	–	–	–	–
Hard Disk space consolidation	–	✓	✓	✓
Snapshots	–	Several	Several	✓
Snapshots of running system	–	✓	✓	✓
Restore on running system	–	–	✓	✓
Miscellaneous				
Autofit guest/window	✓ ¹	✓ ¹	✓	✓ ³
Automatic mouse detection	✓ ¹	✓	✓	✓
Guest addons	✓ ¹	✓	✓	✓
Multiple VMs simultaneously	✓	✓	✓	✓
VMs in different windows	✓	✓	–	–
Remote control	–	✓	✓	✓
Boot Time (seconds)				
OpenSUSE 10.2	90	77	65	110
Windows Vista	110	65	70	60
Performance*	∅	+	++	++
Controls				
Installation	++	∅	+	+
User Help	++	++	+	+
Data Exchange				
Shared folders	✓ ²	✓ ³	✓	–
Physical disk space on guest	–	–	✓ ⁴	✓ ⁴
Copy and paste	✓ ¹	✓ ³	✓	✓
Drag and drop	–	–	✓	–
Ranking				
Price/performance ratio	–	+	+	+
Installation and controls	++	+	+	+
Feature scope	–	∅	++	∅
Position:	4	2	1	3

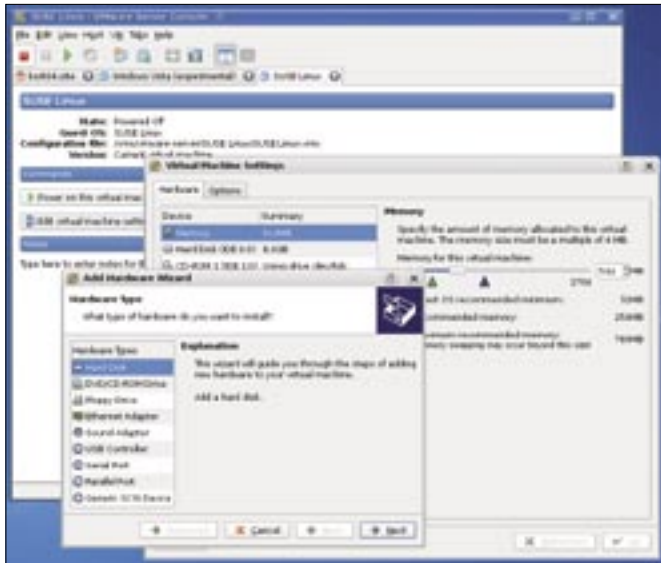


Figure 4: The VMware Server version looks exactly like the Workstation version, although its technical capabilities are not in the same league.

didate to support this functionality on Linux.

Boot times of 70 seconds for Vista and 75 seconds for OpenSUSE 10.2 made the software the fastest performer. My subjective impression was that neither the guest nor the host suffered from performance hits.

Data Exchange

VMware Workstation offers a copy and paste function and drag and drop for files between the host and guest. No matter what guest operating system you use, you can drag the required file out of a guest directory and drop it onto the host desktop, or vice versa. VMware Workstation was also the only test candidate to support the USB 2.0 protocol. It took about 10 seconds to transfer a 100MB test file. The current version also

supports multihead operations over multiple screens.

Conclusions

Both VMware Workstation's performance and interoperability between the host and guest are very impressive throughout. The only niggle I had was the price of US\$ 189 for the final release.

VMware Workstation: Plus and Minus

- + USB 2.0 support
- + Snapshot Manager
- + Very powerful
- + Drag and drop
- Expensive

VMware Server 1.0.2

VMware [4] provides the server version free of charge [6]. Despite the suggestion of a server emphasis in the

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Symbols and Notes in Table 1

Subjective impression (VMware license prohibits benchmarks):
++ = very good, + = good, Ø = average, – = satisfactory

¹ Only Windows guests including Vista

² Only Windows guests excluding Vista

³ Did not work in test

⁴ Restricted use in test

name, VMware Server performs very well on home PCs. The license restrictions, such as grid computing and leasing or selling services that run on the server, are unlikely to worry a private user. Just like the Workstation version, VMware Server is available both as a tarball and installer package and as an RPM. You need to register to use the software; in exchange for your registration, VMware sends you a serial number.

Controls

When you launch VMware Server, the first thing you see is the Connection Manager, which you can use to start and manage the software locally or remotely. The manager also allows you to mount CD/DVD drives on the host and remote client on the virtual machine. My first impression was that the Server and Workstation GUIs and configuration windows are identical (Figure 4).

A couple of visual differences, such as the *Host* menu entry, which opens the Connection Manager, betrays the Server version. The underlying technology is a completely different matter: The Server feels very much like a narrow-track version of the Workstation. For example, the Server version lacks USB 2.0 and shared folder support. The snapshot function is restricted to a single restore point. On the other hand, the software has additional functions, such as command-line controls, although desktop users will probably not miss them.

Guests

Installation of OpenSUSE 10.2 and Vista were trouble free. The software has guest addons for both operating systems. On Vista, you have no alternative but to install the addons because the network connection will not work otherwise.

Data Transfer

VMware Server gives users very little in the line of options for transferring files between the host and the guest. Although both the VMware Server and Workstation versions let you mount host disks and partitions on the guest system, the exchange of data is unreliable. The lack of USB support in our lab environment prevented me from testing the USB workaround. The Server version lacks the drag and drop function offered by the workstation. As workarounds, you

could use network services such as ftp, http, or SMB to exchange data.

Conclusions

The free VMware Server is definitely an option for desktop use. Although the feature set isn't nearly as extensive as that of the Workstation version, VMware Server is very much on a par with other products in our lab.

VMware Server: Plus and Minus

- + Free
- + Clear-cut controls
- No shared folders
- Only one snapshot supported

VirtualBox

As a newcomer to the virtualization market, Innotek [7] introduced its VirtualBox [8] virtualization solution as a free download in January of this year. Both private and commercial use of the software, which is released under a closed source license, are free. I tested version 1.3.99; Version 1.4 is now available.

In addition to the version I tested, Innotek also offers a GPL'd variant of VirtualBox; however, this other version does not have the full feature set of the version I tested and thus lacks support for USB, shared folders, and RDP-based remote access.

Controls

RPM and DEB packages, as well as a binary installer, are available for VirtualBox. After setting up the software, the next step is to add user accounts to the *vboxusers* group.

Users who do not belong to the *vboxusers* group see an error message when they launch a virtual machine – just one indication of how quirky VirtualBox turned out to be in our lab. Luckily, the software comes with an information-packed manual located in */opt/VirtualBox-1.3.99*.

The developers put a lot of effort into designing the GUI. No other test candi-

VirtualBox: Plus and Minus

- + Free
- + Snapshot management
- + Excellent disk management
- Quirky configuration

date has such clear configuration windows, the best example of this being the Virtual Disk Image Manager (Figure 5), which you can use to manage virtual disks, ISO images, and floppy images for all guest systems.

The snapshot management function, which supports any number of backup images, also gives users a clear overview of the critical information.

The VirtualBox software provides command-line tools and a separate front-end, both of which allows users to control the software independently of the current operating system. The GUI provides a slide control for setting the virtual graphics memory (a maximum of 128MB).

Guests

I had no trouble installing the guest systems; however, network interface drivers for Windows Vista were missing, and installing the guest addons did nothing to change this. I had to consult the manual to find out the download location [9] and how to integrate the drivers. To allow users access to guest systems over the network, VirtualBox supports RDP-based access, which opens up access to remote controllers such as Krd; USB-over-RDP adds the option of giving the guest system access to USB devices on remote computers.

Besides its own formats, VirtualBox also supports virtual disks in VMware format. I was unable to launch a system

INFO

- [1] Parallels: <http://www.parallels.com>
- [2] Parallels download: <http://www.parallels.com/en/download/workstation/>
- [3] Documentation for Parallels: <http://www.parallels.com/en/support/documentation/>
- [4] VMware: <http://vmware.com/>
- [5] VMware Workstation 6 beta: <http://www.vmware.com/products/beta/ws/>
- [6] VMware Server: <http://www.vmware.com/products/server/>
- [7] Innotek: <http://innotek.de/>
- [8] VirtualBox: <http://virtualbox.org/>
- [9] Network interface drivers for Vista: http://www.amd.com/us-en/ConnectivitySolutions/ProductInformation/0,,50_2330_6629_2452%5E2454%5E2486,00.htm

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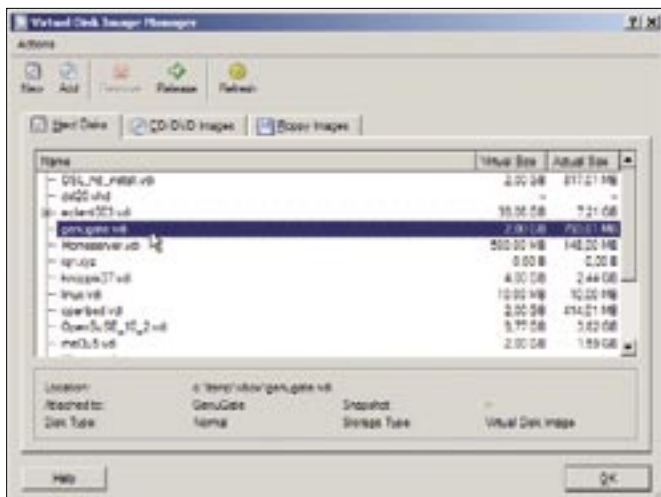


Figure 5: The award for the best-designed solution for virtual disk management goes to VirtualBox with its Virtual Disk Image Manager.

created on VMware, which restricts the virtual disk function to shared data partitions.

Data Exchange

Although VirtualBox offers shared folder support, I was not able to integrate the shared folders feature for Vista in a way that allowed me to view the folders in the File Explorer. I was able to access the folders at the command line. Also, the copy and paste function between the guest and the host, which the software theoretically supports, failed to deliver. Because the software could not mount host partitions and USB support did not work in my test environment, my data exchange options were generic network services – just like VMware Server.

Conclusions

VirtualBox is on the right track, but it is still a long way from challenging VMware Workstation. This said, VirtualBox is on a par with VMware Server and even slightly ahead in some areas, such as snapshot management.

And the Winner Is

The clear winner in this test is VMware Workstation 6.0 beta. The software is defini-

tive in many respects, and competitors often have trouble keeping up with the pace. One example of this is the perfect copy and paste and drag and drop functions, along with USB 2.0 support for a faster exchange of data via USB sticks. VMware asks you to pay for this quality: The final version will cost around US\$ 190.

Joint second place in the test goes to VMware Server and VirtualBox in a tight finish. Although VMware Server scores with its subjectively better performance, VirtualBox counters the attack with intelligent disk management and a Snapshot Manager.

Parallels brings up the tail of the field: For US\$ 50, the software has less to offer than its free competitors by VMware and Innotek. What disappointed me was the dismal data exchange performance of the candidates, with the exception of VMware 6.0. Some candidates failed to support shared folders, USB, and mounting of physical partitions in a satisfactory way; in some cases, the features failed to work entirely.

All of the candidates offer well-designed and intuitive GUIs, along with comprehensive documentation. ■



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