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Virtualizing with VirtualBox

PIGGYBACK

Many popular virtualization tools are either too expensive or too complicated. If you're looking for another option, try the no-cost and user-friendly VirtualBox. **BY THOMAS LEICHTENSTERN**

Virtualization is gaining popularity as a technique for testing software and simplifying system administration. A virtualization tool simulates an autonomous machine that is independent of the host system.

Unfortunately, many virtualization programs are either expensive, like the market leader VMware [1], or difficult to use, like Xen. Alternative programs such as Qemu often fail to offer adequate performance in production environments.

Innotek [2] recently stepped up to fill the gap with its GPL'd virtualization program, VirtualBox [3]. (See the box titled "License Issues.") Innotek describes VirtualBox as a no-cost, user-friendly tool that supports a large variety of guest and host systems.

VirtualBox guests can include any popular Linux distribution, BSD, OS/2, or any Windows operating system (including Vista). Host systems include Windows XP and Linux distribution kernel 2.4 or later, but only 32-bit platforms so far. (A 64-bit version is apparently in the works.) We decided to test the latest VirtualBox release, version 1.3.6, to see whether the program meets the ambitious goals of its developers.

Features

In contrast to VMware Workstation, VirtualBox does not manage virtual machines as tabs within a window; instead, it displays the guest systems in multiple independent windows (Figure 1). Like VMware, VirtualBox treats the virtual systems as independent instances.

VirtualBox emulates a computer with an Intel 440FX chipset ("Natoma"), an AMD 79C973 (PCnet-II) network card, an Intel AC97 sound card, and a standard VGA adapter with configurable graphics memory of up to 32MB. The developers plan to integrate a virtual Intel gigabit NIC.

A slider allows you to set the memory size for the virtual machine to the maximum physical RAM size. Because the virtual machines run as regular processes on the host system, the host system's scheduler is responsible for allocating CPU cycles. VirtualBox does not have central process management for the virtual machines as of this writing, but the plan is to add this feature by mid-year. Native support for VMware images is planned for some time this spring.

Just like VMware, VirtualBox also has a Snapshot Manager that let users freeze and restore a system status at any time.

You'll also find an **RDP** server that you can enable individually for any guest system to support graphics mode access over networks.

Installation

The download page at the VirtualBox homepage [3] has packages with the binaries for Debian (3.1 and 4.0) and Ubuntu (6.06 LTS and 6.10). Users with other distributions can use the generic installation script, (*.run*), which also includes the binaries.

Because VirtualBox requires a kernel module, you need the kernel source code and headers, along with *make* and GCC. VirtualBox builds the module from the sources, unless you happen to have a suitable module available. The software also needs version 3.3.5 or newer of the Qt libraries, as well as the SDL 1.2.7 multimedia library or newer.

Debian and Ubuntu users can set up VirtualBox by entering *sudo dpkg -i VirtualBox* < *Version* > *.deb*, replacing *Version* with the version that matches the distribution on your machine (for example, *Ubuntu_Edgy_i386* for Ubuntu 6.10). Users with any other distribution will need to launch the generic installation script as root by entering *sudo bash VirtualBox_1.3.6_Linux_x86.run install*.

The setup routine sets up a group called *vboxusers*; on Ubuntu and Debian systems you need to manually add any users who will be working with VirtualBox (*usermod -G vboxusers -a* < *users* >). On systems like SUSE or Mandriva use the command *usermod -A vboxusers* < *users* > . Please note that users who are logged in need to log off and back on to apply the new group membership.

The installation script automatically creates an entry for starting the *vboxdrv* service in */etc/init.d*, removing the need to start the service when you boot the host machine. You can control the service with the */etc./init.d/vboxdrv* init script, telling it to *start*, *stop*, or *restart*.

GLOSSARY

RDP: Remote Desktop Protocol. A Microsoft protocol that provides terminal services between two computers, wherein one machine acts as a server and creates screen output for the other system.

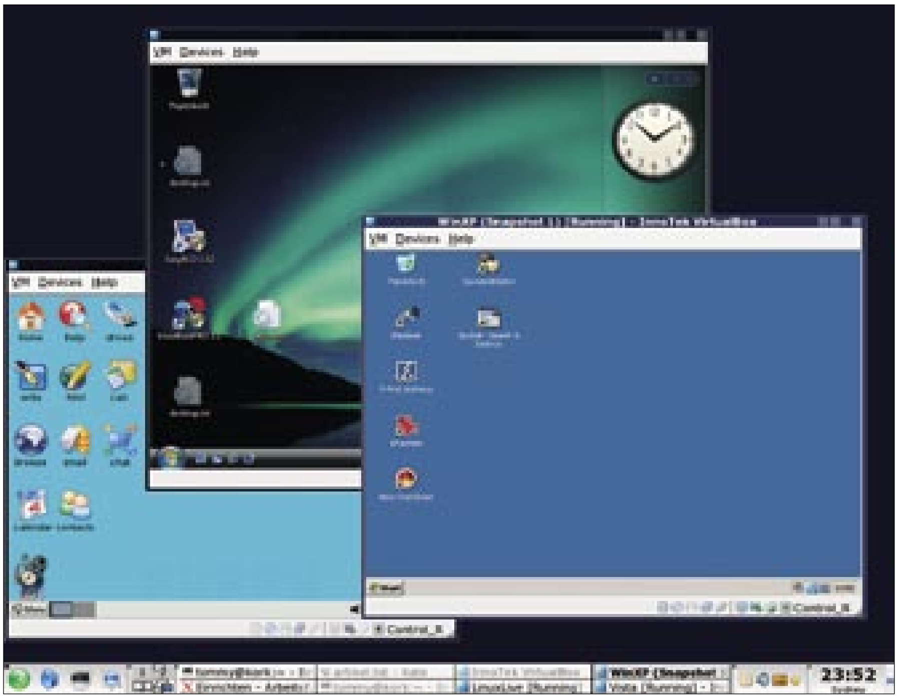


Figure 1: VirtualBox opens virtual machines as independent instances in separate windows, which lets users run different operating systems at the same time.

USB support in VirtualBox relies on the Usbfs virtual filesystem. Because SUSE 10.2 has removed support for Usbfs from the kernel for security reasons, users of this distribution need either to install a different kernel or do without USB support in virtual systems such as VirtualBox (and VMware).

Users with other distributions will need to modify the mount options in */etc/fstab* to make sure the software has the necessary access privileges for Usbfs. Open */etc/fstab* as root and look for the entry that mounts Usbfs, such as:

```
usbfs /proc/bus/usb ➥
usbfs noauto 0 0
```

Add the following line to this entry:

```
usbfs /proc/bus/usb usbfs ➥
devgid=GID_for_group_➥
vboxusers,devmode=➥
664,noauto 0 0
```

Typing *mount usbfs* mounts the filesystem with the modified settings from */etc/fstab*:

```
# mount
[...]
usbfs on ➥
/proc/bus/usb type usbfs ➥
(rw,devgid=1000,devmode=664)
```

If you're running SUSE Linux 10.0, which ignores the instructions for the USB filesystem in */etc/fstab*, you need to remount Usbfs by running a small script at boot time:

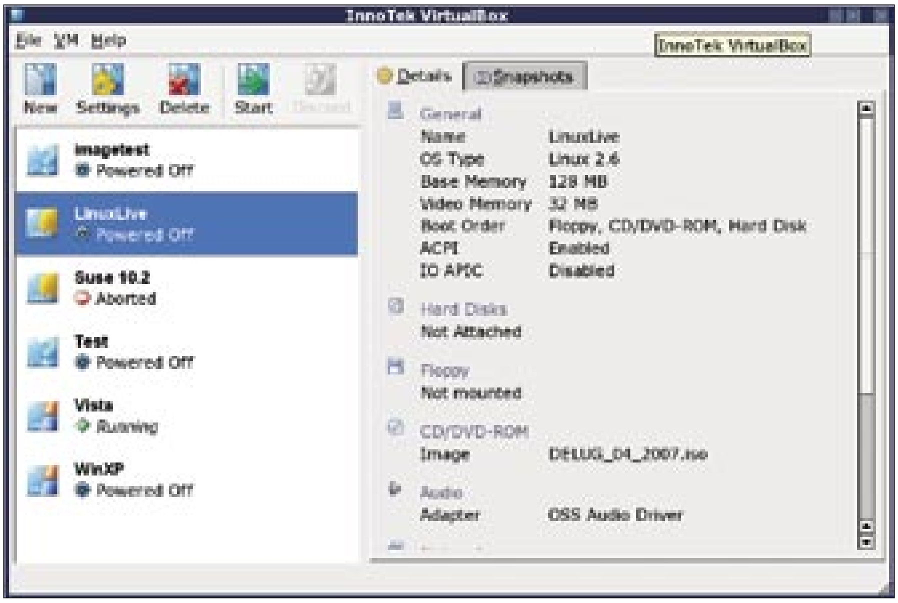
```
#!/bin/bash
/bin/umount usbfs
/bin/mount usbfs
exit 0
```

License Issues

Innotek offers two flavors of VirtualBox: the Open Source Edition (OSE), with GPL'd source code, and the closed source binary version, which is released under the name "VirtualBox Personal Use and Evaluation License." Innotek allows you to use this variant for personal and academic purposes free of charge; all other uses are subject to a license fee after a "reasonable" evaluation period of "a couple of weeks." The advantage of the non-free variant is that it offers value-added features such as shared folders and support for USB, RDP, and iSCSI.

PDF Manual

The installation folder */opt/Virtualbox-1.3.4* has a comprehensive, PDF-formatted instruction manual with detailed descriptions of functions and settings.



imagetest
Powered Off
LinuxLive
Powered Off
Suse 10.2
Aborted
Test
Powered Off
Vista
Running
WinXP
Powered Off

General
Name LinuxLive
OS Type Linux 2.6
Base Memory 128 MB
Video Memory 32 MB
Boot Order Floppy, CD/DVD-ROM, Hard Disk
ACPI Enabled
IO APIC Disabled

Hard Disks
Not Attached

Floppy
Not mounted

CD/DVD-ROM
Image DELUG_04_2007.iso

Audio
Adapter OSS Audio Driver

Figure 2: The VirtualBox GUI is neat and uncluttered.

Store the script as *usbfsstart.sh* in */etc/init.d/* and add a symbolic link to the required runlevel directory (typically */etc/init.d/rc5.d*):

```
ln -s /etc/init.d/↩
usbfsstart.sh ↩
S100usbfsstart
```

Settings

To launch the VirtualBox GUI (Figure 2), you can either select *System* | *InnoTek VirtualBox* in the *K* menu or enter *Virtualbox &* at the command line; you do not need root privileges.

Global settings, such as *Default Folders* for images and snapshots or *Hostkey* for quitting the virtual machine (the right Ctrl key by default) are available in the *File* | *Global Settings* menu.

GLOSSARY

ALSA: Advanced Linux Sound Architecture. Sound architecture for Linux systems with audio and MIDI functionality. ALSA replaced OSS as the standard with kernel 2.6. OSS programs use an emulation and are still supported.

OSS: Open Sound System. Portable sound card driver system for Unix-style systems. Because of restricted functionality and proprietary origins, OSS was replaced by ALSA in kernel 2.6.

iSCSI: Internet Small Computer System Interface. An approach to transmitting SCSI data over networks in TCP/IP packets.

To create a new virtual machine (VM), just click the *New* button. This launches the *Virtual Machine Wizard*, with which you can set parameters such as the VM name, the disk space and memory allocation, and the guest operating system.

Because VirtualBox does not check free space on the physical partition when creating dynamic disks, you need to make sure that the reserved space is physically available.

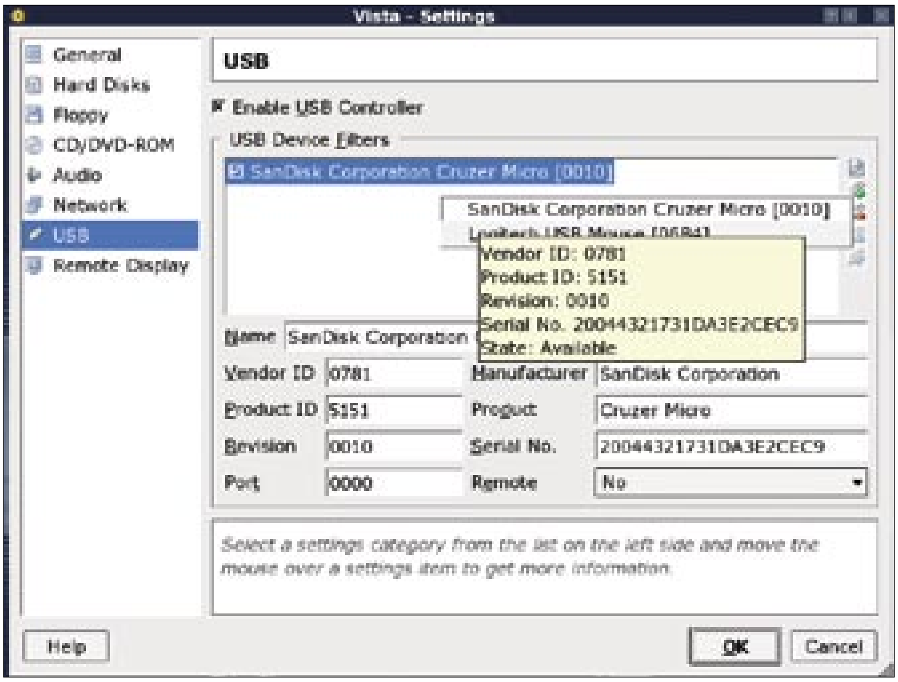
If not, your disk could just run out of space, causing the VM to crash without a word of warning.

A similar warning applies to creating snapshots: VirtualBox does not store snapshots in the directory for the matching virtual hard disk; instead, it puts them in in the global default path for images (your home directory), unless you change the setting for the VM in *General* | *Advanced*, *Snapshot Folder*.

When you set up main memory, you also need to be careful because the software for each VM will use its memory allocation exclusively. If you launch multiple VMs that together need more memory than the host system actually has, one or multiple VMs might crash, and processes on the host system could even terminate.

Clicking on *Finish* tells the *Virtual Machine Wizard* to add the new VM with the specified basic parameters to the list of defined VMs (Figure 2, left). On the right side of the window, you will see more settings for the VM in the *Details* tab. You can enable additional functions such as audio support (your options are **ALSA** and **OSS**), the graphics memory size (configurable up to 32MB), or RDP shares.

The software has a very elegant approach to USB device management (Figure 3). To list all the USB devices plugged into the machine, along with their manufacturer and product string descriptors, just click the *Add from* icon in the right-hand taskbar.



☒ Enable USB Controller

USB Device Filters

☑ SanDisk Corporation Cruzer Micro [0010]

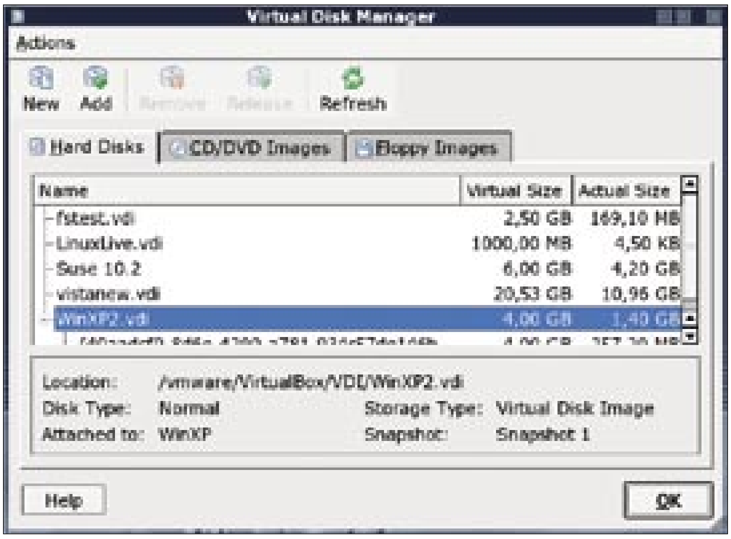
SanDisk Corporation Cruzer Micro [0010]
Logitech USB Mouse [06B4]

Vendor ID: 0781
Product ID: 5151
Revision: 0010
Serial No. 20044321731DA3E2CEC9
State: Available

Name SanDisk Corporation
Vendor ID 0781 Manufacturer SanDisk Corporation
Product ID 5151 Product Cruzer Micro
Revision 0010 Serial No. 20044321731DA3E2CEC9
Port 0000 Remote No

Select a settings category from the list on the left side and move the mouse over a settings item to get more information.

Figure 3: VirtualBox displays the names of the host system's USB devices and lets you use them on the guest machine.



Name	Virtual Size	Actual Size
fstest.vdi	2,50 GB	169,10 MB
LinuxLive.vdi	1000,00 MB	4,50 KB
Suse 10.2	6,00 GB	4,20 GB
vistanew.vdi	20,53 GB	10,96 GB
WinXP2.vdi	4,00 GB	1,40 GB

Location: /vmware/VirtualBox/VDI/WinXP2.vdi
Disk Type: Normal
Storage Type: Virtual Disk Image
Attached to: WinXP
Snapshot: Snapshot 1

Figure 5: The Virtual Disk Manager supports management of disks and disk images used by VirtualBox.

To use the required device on the VM, you then click it. The *Remote* pull-down lets users specify whether or not to share the device for remote use (via USB over RDP). If you enable this option, you can plug in the device, say a USB stick, to the remote computer in an RDP session and access the device via the guest machine.

In our lab, USB support caused a couple of strange side effects. In one case, the USB mouse on the host system failed after launching a VM. In another case, the guest system refused to cooperate with USB sticks that the operating system normally detected without any trouble.

Operations and Functions

In contrast to VMware, virtual machines on VirtualBox do not have a separate BIOS: instead, you need to use the configuration interface for some settings, such as the disk boot order. At the bottom edge of the VM window, a collection of icons shows the status of the active devices, as well as network and drive access status. A right-click on a CD or USB icon pops up a context menu that lets you mount or disable drives or devices on the fly.

Guest desktop auto-resizing changes the resolution of the guest desktop to match the size of the display window (Figure 4). The green arrow in the desktop icon of the task bar tells you whether this function is active, and right-clicking enables or disables the function.

To use this function, you need to install the guest add-ins. To mount the image with these tools as a CD on the guest system, you can click on *Devices | Install Guest Addins…* Clicking *VBoxGuestAdditions.exe* as a privileged user or calling *VBoxGuestAdditions.run* as root installs the add-ins.

For Linux VMs, you additionally need to set up the sources and kernel headers. The add-ins also enable automatic mouse cursor switching between the VMs and the host system desktop. VirtualBox does not support drag and drop copying between the host and guest systems.

The VirtualBox GUI front-end is simply a convenient means for controlling the text-based back-end of the virtualization tool. Some settings, such as setting up shared folders for all VMs, are only available at the command line.

Figure 4: The auto-resize function automatically changes the guest desktop size to match the window size.

Entering *VBoxManage* without any parameters lists the available commands. To set up a share, type *VBoxManage sharedfolder add Guestname -name sharename -path path/to/local/directory*. Again, you will need the guest add-ins for this.

Virtual Disks

VirtualBox manages disks independently of the VMs via the *Virtual Disk Manager* (Figure 5), which you can access via the *File* menu in the main window. The program displays virtual disks in the *Hard Disks* tab, no matter which directory they reside in physically.

To use disks in VMs other than those they are assigned to, click the *Release* button. The disk then appears in the disk selection drop-down menu of the other VMs. To create a new, independent disk that is then available to any VM, you can click the *New* button. The *CD/DVD Images* tab lists the ISO images that you have mounted on a VM some time in the past.

Conclusions

Apart from a couple of minor bugs, VirtualBox creates a favorable impression and provides good performance. The only major point of criticism was unreliable USB support, but to make up for this, VirtualBox has an excellent management solution for virtual disks and CD ROM images. RDP and **iSCSI** support and the USB-over-RDP function are abilities that competitors lack.

The developers promise far-reaching enhancements for the next version. In addition to process control and an import function for VMware images, the changes will include a graphical front-end for managing virtual shares. Considering that a VMware license for home use costs US$ 189, the free VirtualBox is a good choice in many situations. ■

INFO

[1] VMware: *http://vmware.com*

[2] Innotek: *http://innotek.de*

[3] VirtualBox: *http://virtualbox.org*