

*by Ken Baker*

# S Q UEE Z E

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Managing NetWare on a Virtualized Machine  
Part 3 of 4

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ighlights of a Blockbuster—  
Novell Open Enterprise Server 2

Over the past year or so you've no doubt heard many of the benefits of Xen virtualization provided in SUSE Linux Enterprise Server 10, such as server consolidation, workload isolation and even disaster recovery through dynamic server migration. These benefits are of great interest to Novell customers—and reason for many of them to make the move to Linux. But there is one virtualization benefit that has received only nominal attention: the ability to run NetWare in a virtualized environment and thus preserve NetWare-specific applications or skill sets on which your business can depend. You may want to leverage your NetWare-dependent applications while you gradually migrate to Linux. Or maybe you want to continue running NetWare while taking advantage of the latest and greatest hardware. Either way, you can use the virtualization capabilities inherent in the SUSE Linux Enterprise Server 10 kernel of Novell Open Enterprise Server 2 to achieve your objectives.

## > Enhanced for Virtualization

In Novell Open Enterprise Server 2, you have the choice to deploy NetWare 6.5 SP7 on either a physical machine or in a virtual machine using Xen virtualization. The NetWare 6.5 operating system has been enhanced to recognize when it is running in a virtualized environment. This is known as paravirtualization.

With paravirtualization, the NetWare operating system runs inside a virtual machine as a virtualized guest operating system on top of the virtual machine monitor, also known as the Xen hypervisor. The virtual machine monitor is a software layer developed and maintained by the Xen open source community. The virtual machine monitor runs between the server hardware and the SUSE Linux operating system kernel and has the responsibility to allocate resources to the virtualized guest operating systems. It presents them with virtual machines that act like the guest servers' native architectures.

While a fully virtualized operating system has to “trap” information from the executing instruction stream, a paravirtualized

Figure 1 Virtualized NetWare utilizes virtual drivers, eliminating the need to worry about physical drivers.

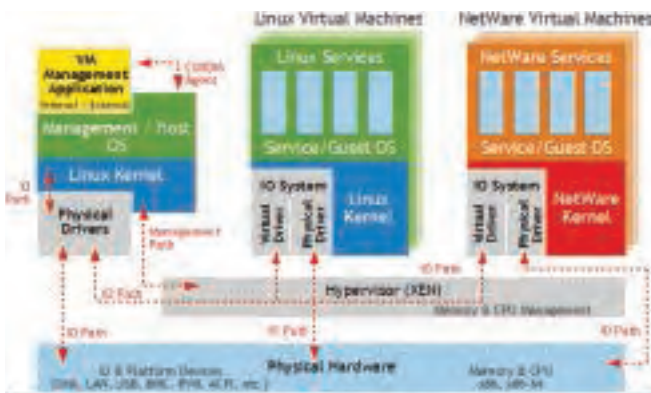


Figure 2 Virtualization allows you to move multiple physical NetWare servers into guest virtual machines for server consolidation on a single physical box.



## From a management standpoint, NetWare administrators manage NetWare in a virtual machine much the same way they manage NetWare on a physical machine.

operating system doesn't require this and provides performance gains as a result. In addition, with paravirtualization, the virtualized platform doesn't have to emulate the actual hardware platform. This leads to additional efficiencies in circumstances such as accessing page tables that control memory.

Finally, a paravirtualized operating system communicates using a set of virtualized, rather than physical, drivers. Since the host OS takes care of the physical driver requirements, it presents a significant benefit to NetWare customers who want to take advantage of the latest advances in hardware technologies, but haven't found the necessary driver support. Because NetWare can run as a paravirtualized guest OS that loads virtual drivers, it no longer needs to worry about physical drivers. Given that the host OS is Linux, which has vast and ever-growing driver support, paravirtualized NetWare automatically inherits that entire driver base.

However, even though your NetWare virtual machines automatically load virtual drivers, you still have the option to load physical drivers. (SEE FIGURE 1.) Utilizing physical drivers lets your virtual machine interact directly with the physical hardware. One reason for doing this might be to gain a little extra performance from your network card; however, a more likely reason is to allow direct interaction with a tape backup device to reduce I/O overhead. But be aware that using physical drivers could impact some virtualization operations such as migrating a virtual machine from one physical server to another.

### > NetWare as You Know and Love It

Even though NetWare has been enhanced to recognize that it's running as a virtual server, it is still basically the same reliable NetWare you're used to. It's simply operating in a new environment that presents opportunities and capabilities you didn't have before.

In fact, paravirtualized NetWare utilizes the exact same binary code that runs on bare metal machines with just a few exceptions. The first exception is the loader file. Physical NetWare utilizes NWLOADER.SYS while virtual NetWare uses XNLOADER.SYS, which basically just tells the server that it's running in a virtual environment. The only other binary difference is in the drivers that are loaded. In a virtual NetWare environment you'll typically load virtual drivers that interact with Xen rather than discrete drivers that interact with actual physical components. These virtual drivers are primarily comprised in the files XENBLK.CAD, XENNET.CAD and XENMPPSM.

Also, according to Novell engineering, more than 95 percent of the NLMs in NetWare required no changes to run on a NetWare virtual machine. When changes were needed, it was typically because the NLMs contained privileged or sensitive CPU instructions, accessed hardware directly or expected to run at ring zero.

Such was the case with the SERVER.EXE file, which required the most changes. But this also means you shouldn't have problems running your third-party NLMs, unless they fall into one of the above categories. With regard to backup and antivirus NLMs, Novell is working closely with those vendors to ensure that their solutions will run without problems in a virtual environment.

From a management standpoint, NetWare administrators manage NetWare in a virtual machine much the same way they manage NetWare on a physical machine. Management tools such as ConsoleOne, iManager and Novell Remote Manager all work the same. But now you have even more ways to manage your NetWare server. In addition to traditional NetWare management tools, you inherit the ability to take advantage of Linux management utilities and console commands, because the virtual machine is running in a Linux environment. (See *NetWare Commands & Linux Counterparts*.)

### > Getting the Most Out of Your Hardware

One of the major benefits of running NetWare as a virtual machine in Novell Open Enterprise Server 2 is that it allows you to fully utilize your existing hardware investments. Unlike some virtualization solutions, it doesn't require you to deploy it on servers with chipsets specifically enabled for virtualization. In fact, if your current NetWare servers have fairly low CPU utilization, you might even be able to host multiple NetWare virtual machines on one of your existing servers. Thus enabling you to take advantage of the benefits of server consolidation.

But running NetWare as a virtual machine does provide you the

## NetWare Commands & Linux Counterparts

Since virtualized NetWare runs hosted in a Linux environment, it's helpful to be familiar with some of the standard Linux commands. Novell partner BrainStorm, Inc. provides an *Administrator's Command Reference for Novell Open Enterprise Server* that shows common NetWare commands and their Linux counterparts. The following are a few examples of these command mappings:

- **CLS** for NetWare and **clear** for Linux: clear the console screen and move the console prompt to the top of the screen.
- **DSRepair** for NetWare and **ndsrepair** for Linux: maintain and repair the database of an eDirectory tree.
- **VIEW** for NetWare and **cat** for Linux: view a file from the NetWare server console.

The complete command reference can be found at [BrainStorminc.com/oes](http://BrainStorminc.com/oes).

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added option of moving up to even higher performing hardware if desired. This enhances your ability to do server consolidation, and take better advantage of 64-bit processors. By running NetWare as a virtual machine in Novell Open Enterprise Server 2, you are no longer 32-bit bound. You can take full advantage of the extra processing power, added memory capabilities, and improved heat and energy savings offered by 64-bit dual-core and multi-core processors.

In addition to preserving all of your trusted NetWare services on today's high-end hardware platforms, server consolidation is one of the main reasons for employing virtualized NetWare. With NetWare virtual machines in a Novell Open Enterprise Server environment, you could consolidate three or more physical NetWare servers into guest virtual machines that run on a single physical box. (SEE FIGURE 2.) You can also host Linux virtual machines on that same hardware. This ability to host both Linux and NetWare as virtual machines on a single box can also facilitate migration efforts from NetWare to Linux by allowing you to preserve access to any NetWare-dependent applications and services while you transition your IT environment and skill sets to Linux. To help you with your consolidation efforts, you can also leverage the Open Enterprise Server Migration

Tools that ship with the product and the Novell Open Enterprise Server Migration Web site at [novell.com/oesmigrate](http://novell.com/oesmigrate).

**> Deployment Considerations**

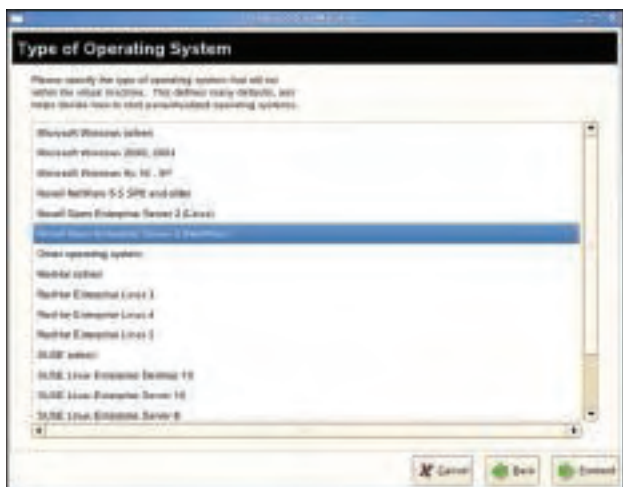
Before you deploy NetWare as a virtual machine, consider your storage options. Will you use a SAN or NAS, or will you use storage local to the physical server hardware? Be aware that if you use local storage, it will prevent you from doing an on-the-fly migration of a virtual machine from one physical server to another.

Also, if you're hosting multiple virtual machines on the same physical server, pay attention to their various workload types. If you overload your physical server with multiple virtual machines with the same type of workload, you could run out of CPU, memory or I/O bandwidth. For example, if all of your virtual machines perform disk-intensive operations, they could use up the entire bandwidth of your disk array.

**> Installing Virtualized NetWare**

As stated, your NetWare virtual machine will run as a guest on top of a Novell Open Enterprise Server 2 Linux server. Your virtual machine

**Figure 3** *Create Virtual Machines* is one of three installation methods in YaST for creating a NetWare virtual machine.



**Figure 4** *Using a response file during the installation of a NetWare virtual machine* can be useful when you need to create multiple NetWare virtual machines.



host server will be SUSE Linux Enterprise Server 10 SP1 also running on top of your Novell Open Enterprise Server 2 Linux server. So the first thing you need to do is install a Novell Open Enterprise Server 2 Linux server onto your hardware box, placing it in a new eDirectory tree. The physical server will need to have at least 512 MB of RAM for the VM host server and 512 MB of RAM for the NetWare virtual machine; however, for better performance, consider using a server with 2GB of RAM or more.

Next you'll need to install and configure SUSE Linux Enterprise Server 10 SP1 as your virtual machine host server. Specify Open Enterprise Server 2 as an add-on product and select the Virtualized NetWare Host Server server role within the Open Enterprise Server 2 installation options. Because you'll want to optimize the host server to manage your virtual machines, configure it without any Open Enterprise Server services. Install on an Open Enterprise Server virtual guest OS or a physical NetWare installation.

In keeping with the desire not to run additional services on your host server, during the install, deselect Print Server from the Primary Functions menu option. And don't run eDirectory on your host server. Instead, add your host server to the existing directory tree during the installation.

After you finish the host server installation and configuration and the system reboots, do the following to finalize your host server configuration:

1. Log in as root and change the default boot loader to the Xen kernel.
2. Reboot the system.
3. Configure NTP on the host server.
4. Disable the Alt-Escape desktop shortcut, if using GNOME.

After your host server is up and running, create a virtual machine for NetWare using one of three installation methods—each with an icon in YaST. The Virtual Machine Manager option launches a program called `virt-manager`. To create your NetWare virtual machine using `virt-manager`, click Virtual Machine Manager in YaST and select New. This launches a program called `vm-install` that guides you through the creation of your NetWare virtual machine. Using `virt-manager` is advantageous because it provides a vm-specific console and doesn't allow most keyboard commands to be intercepted by the Linux desktop. In other words, most of the common NetWare keyboard commands you're used to will work as they always have.

The second option in YaST is Create Virtual Machines, which launches the `vm-install` program directly. (SEE FIGURE 3.) You can choose to do a new install, a migration or an upgrade. The available methods include new, create factory image, configure factory image and upgrade (either manual or scripted). All of these options are provided using the Virtual Machine Manager option described above (which launches the `vm-install` program as part of its process). One advantage of using the Create Virtual Machines option directly is that you can run `vm-install` in pure text or GUI mode, while `virt-manager` requires a GUI; however, by launching `vm-install` with this icon, you bypass `virt-manager` and won't have NetWare keyboard control. This is the reason for the instruction to disable certain shortcuts in the GNOME desktop.

The last installation option, which is particularly useful if you're creating multiple NetWare virtual machines, is to use the Response File Generator to enable unattended installations. A response file is created in YaST by selecting Open Enterprise Server from the menu and then selecting the Create NetWare Silent Install option. On the Select Install Type page, leave the install type set to Virtual and click Next. The Response File Generator will then prompt you for information about the NetWare server you want to create as a virtual machine. Simply answer the questions the same way you would if you were doing a physical NetWare installation. If you already have a response file for NetWare 6.5, this can also be used to generate a virtual NetWare server.

If you decide to use a response file, you can initiate the install by clicking Virtual Machine

Manager in YaST, selecting Find from the Operating System Installation menu option and then browse to the location of the response file you created. (SEE FIGURE 4.) After you open and apply it, it will create the virtual machine and install your virtual NetWare server. If a required parameter is missing in the response file, you'll be prompted to enter the desired values during the installation. If you did not specify a response file, you'll need to enter all of the installation information just as if you were doing a physical NetWare installation. For complete details on installing NetWare virtual machines, refer to the online documentation for Open Enterprise Server 2 at [novell.com/documentation/oes2](http://novell.com/documentation/oes2).

Once your virtual machines are created, you can manage them using the Virtual Machine Manager utility, which allows you to do things such as add, view, start, shut down and terminate virtual machines. You can also manage your virtual machines from a terminal using `xm` commands. (See *Virtual Machine Commands*.)

#### > More to Come

The ability to preserve your NetWare services in a paravirtualized NetWare virtual machine is only one of the many benefits provided by Novell Open Enterprise Server 2. In addition to virtualization, you've already read about Domain Services for Windows and Dynamic Storage Technology in earlier segments of this *Novell Connection* magazine series on the top features of Novell Open Enterprise Server 2. Watch for the final segment in next month's online version when we cover how Novell Open Enterprise Server helps you finalize your transition to Linux. **N**

## Virtual Machine Commands

The following are virtual management commands that can be executed from a terminal when logged in as root.

- `xm help`: view a list of subcommands available for the `xm` command.
- `xm list`: view a list of all running virtual machines.
- `xm create /etc/xen/vm/vm_name`: start and view a virtual machine. A paravirtualized virtual machine starts but does not display. A fully virtualized virtual machine starts and displays according to the settings in the virtual machine configuration file.
- `xm create /etc/xen/vm/vm_name -c`: start and view a paravirtualized virtual machine.
- `xm console vm_name`: view the console of an already-running paravirtualized virtual machine.
- `xm mem-set vm_name MB_Memory`: change the memory available to a paravirtualized virtual machine.
- `xm shutdown vm_name`: perform a normal shutdown of a paravirtualized virtual machine's operating system.
- `xm destroy vm_name`: terminate a virtual machine immediately. This basically emulates turning off the power to a physical machine and is (just like the power button) a last resort and could cause other problems. Be aware that this command might cause file system corruption.