

By Debra Littlejohn Shinder, MCSE, MVP, and Rick Vanover

*Virtualization* has been a major buzzword in the IT world for a few years. Now the buzz is getting bigger, with the release of Windows Server 2008 and the impending integration of the Hyper-V virtualization component (formerly called Viridian), expected this summer. Of course, Microsoft already has Virtual Server and Virtual PC, as well as stiff competition on the virtualization front from VMWare and Citrix/XenSource.

With all these options, taking the plunge into virtualization can be a big and confusing step. Here are a few things you should know about virtualization and virtualization software before you start to plan a deployment.

## 1 Virtualization is a broad term with many meanings

Virtualization software can be used for a number of purposes. Server consolidation (running multiple logical servers on a single physical machine) is a popular way to save money on hardware costs and make backup and administration easier, and that's what we're primarily focused on in this article. However, other uses include:

- **Desktop virtualization**, for running client operating systems in a VM for training purposes or for support of legacy software or hardware.
- **Virtual testing environments**, which provide a cost-effective way to test new software, patches, etc., before rolling them out on your production network.
- **Presentation virtualization**, by which you can run an application in one location and control it from another, with processing being done on a server and only graphics and end-user I/O handled at the client end.
- **Application virtualization**, which separates the application configuration layer from the operating system so that applications can be run on client machines without being installed.
- **Storage virtualization**, whereby a SAN solution is used to provide storage for virtual servers, rather than depending on the hard disks in the physical server.

## 2 Not all VM software is created equal

An array of virtualization programs are available, and the one(s) you need depends on exactly what you need to do. You might want to run a virtual machine on top of your desktop operating system, running a different OS, either to try out a new OS or because you have some applications that won't run in one of the operating systems.

For example, if you're using Windows XP as your desktop OS, you could install Vista in a VM to get to know its features. Or if you're running Vista but you have an application you occasionally need to use that isn't compatible with it, you could run XP in a VM with that application installed. For simple uses like this, a low-cost or free VM program, such as VMWare Workstation or Microsoft's Virtual PC, will work fine.

On the other hand, if you need to consolidate several servers and thus need maximum scalability and security, along with sophisticated management features, you should use a more robust VM solution, such as VMWare's ESX Servers, Microsoft's Virtual Server or (when it's available) the Hyper-V role in Windows Server 2008. For relatively simple server virtualization scenarios, you can use the free VMWare Server.

### 3 Check licensing requirements first!

As far as licensing is concerned, most software vendors consider a VM to be no different from a physical computer. In other words, you'll still need a software license for every instance of the operating system or application you install, whether on a separate physical machine or in a VM on the same machine.

There may also be restrictions in the EULA of either the guest or host OS regarding virtualization. For example, when Windows Vista was released, the licensing agreements for the Home Basic and Home Premium versions prohibited running those operating systems in VMs, but Microsoft has since changed those licensing terms in response to customer input.

Windows Server 2008's EULA provides for a certain number of virtual images that can be run on the OS, depending on the edition. This ranges from none on Web edition to one on Standard, four on Enterprise, and an unlimited number on Datacenter and Itanium editions.

### 4 Be sure your applications are supported

Another issue that needs to be addressed up front is whether the application vendor will support running its software in a virtual machine. Because VMs use emulated generic hardware and don't provide access to the real hardware, applications running in VMs may not be able to utilize the full power of the installed video card, for example, or may not be able to connect to some of the peripherals connected to the host OS.

### 5 Virtualization goes beyond Windows

There are many virtualization technologies and some of them run on operating systems other than Windows. You can also run non-Windows guest operating systems in a VM on a Windows host machine. VMWare can run on Linux, and Microsoft previously made a version of Virtual PC for Macintosh (but did not port it to the Intel-based Macs). Parallels Desktop provides support for running Windows VMs on Mac OS X. Parallels Workstation supports many versions of Windows and Linux as both host and guest. Parallels Virtuozzo is a server virtualization option available in both Linux and Windows versions. Other virtualization solutions include:

- **Xen** (now owned by Citrix), which is one of the most popular hypervisor solutions for Linux.
- **Q**, an open source program based on the QEMU open source emulation software, for running Windows or Linux on a Mac.
- **Open VZ**, for creating virtual servers in the Linux environment.

### 6 Virtualization can increase security

Isolating server roles in separate virtual machines instead of running many server applications on the same operating system instance can provide added security. You can also set up a VM to create an isolated environment (a "sandbox"), where you can run applications that might pose a security risk.

Virtual machines are also commonly used for creating "honeypots" or "honeynets." These are systems or entire networks set up to emulate a production environment with the intention of attracting attackers (and at the same time, diverting them away from the real production resources).

## 7 Virtualization can increase availability and aid in disaster recovery

Backing up virtual machine images and restoring them is much easier and faster than traditional disaster recovery methods that require reinstalling the operating system and applications and then restoring data. The VM can be restored to the same physical machine or to a different one in case of hardware failure. Less downtime means higher availability and greater worker productivity.

## 8 VMs need more resources

It may seem obvious, but the more virtual machines you want to run simultaneously, the more hardware resources you'll need on that machine. Each running VM and its guest OS and applications will use RAM and processor cycles, so you'll need large amounts of memory and one or more fast processors to be able to allocate the proper resources to each VM.

To run multiple resource-hungry servers on one machine, you'll need a machine with hardware that's capable of supporting multiple processors and large amounts of RAM and you must be running a host OS that can handle these.

## 9 64 bits are better than 32

For server virtualization, consider deploying a 64-bit host operating system. 64-bit processors support a larger memory address space, and Windows 64-bit operating systems support much larger amounts of RAM (and in some cases, more processors) than their 32-bit counterparts. If you plan to use Windows Server 2008's Hyper-V role for virtualization, you have no choice. It will be available only in the x64 versions of the OS.

## 10 Many resources are available for planning your virtualization deployment

Virtualization is a huge topic, and this article is only meant to provide an overview of your options. Luckily, there are many resources on the Web that can help you understand virtualization concepts and provide more information about specific virtualization products. The following list should get you started:

- [General virtualization information and news](#)
- [Application virtualization](#)
- [Presentation virtualization](#)
- [Server virtualization \(server consolidation\)](#)
- [Desktop virtualization](#)
- [Microsoft Virtual PC](#)
- [Microsoft Virtual Server](#)
- [Microsoft Hyper-V](#)
- [Windows 2008 Virtualization and Consolidation](#)
- [VMWare](#)
- [Xen](#)
- [Parallels](#)

## 11 Virtualization is more than just VMware

Sure VMWare is the current leader, but it has company in the server virtualization space as well as desktop virtualization. The newest player is Citrix XenServer. The [XenServer Enterprise](#) platform is quickly gaining features and management offerings rivaling those of VMware Virtual Infrastructure 3 (VI3), based on ESX 3.5 and Virtual Center 2.5. The [Hyper-V virtualization](#) hypervisor is also going to be a player when Windows Server 2008 is released. Hyper-V will provide a similar offering to VI3 from the Microsoft perspective. The Hyper-V virtualization platform on Windows will also offer some desktop virtualization options that supplement the server virtualization platform.

## 12 Storage and networking will be your biggest pain points

Planning a server virtualization implementation of any scale will require a lot of planning in the areas of storage and networking. In a server virtualization strategy, the migration from local storage to shared centralized storage takes adequate sizing and planning. Further, administrators will be challenged to rethink the provisioning of virtual servers. For example, in using VMware ESX virtual server environments, the virtual hard disk size is allocated entirely when the virtual machine is created. Therefore, if a Windows virtual server has 50 GB assigned to the virtual hard drive in the virtual machine inventory yet uses only 15 GB on the virtual file system, the other 35 GB will be claimed by this system on the storage available to ESX.

For larger implementations, the virtualization administrator is not in charge of the storage. Many storage administrators will identify the base requirement, add a small amount (maybe 10% to 15%), and if more is needed later, add it as required. This is an inconvenient shift for most administrators but an efficient use of the storage on the central storage systems. Storage area network (SAN) systems, such as the IBM SAN Volume Controller and EMC ControlCenter SAN Manager, are expensive, and storage administrators are challenged to use these resources in the most efficient manner possible.

Networking virtual environments poses another set of issues. When considering a virtualized server environment, management strategies are adapted to reflect additional connectivity requirements, high availability, and virtual switching. Planning the adequate cabling requirements, virtual LAN (VLAN) assignments, and redundancy is a step that in my experience could always use another pass to ensure all connectivity requirements will be met in a redundant fashion.

## 13 Don't underestimate the value of the free tools

Free virtualization products, like [VMware Server](#), [Citrix XenServer Express](#), and [Microsoft Virtual Server 2005](#), provide a great way to get exposure to virtualized environments for basic testing and performance benchmarking. Another popular technique is to use free tools for remote systems that can't be run centrally. Having a single physical server with a free virtualization product running a small number of virtual machines is a solid strategy for situations where a robust virtualization solution would be impractical.

The free products generally lack the management tools that accompany the full enterprise suites; however, tools can be purchased to provide additional management options for the free products. For example, consider [Virtual Center for VMware Server](#) to manage the free virtualization engine.

## 14 Management tools are key

Basic virtualization technology, in my opinion, is becoming a commodity that will eventually be more dependant on hardware resources than on virtualization hypervisor technology. The management tools will be the driving forces in virtualization technology decisions. The packages that offer the most options in storage and networking management, machine migration, high availability, and efficiency configuration options will be factors that decide what packages will be used.

## 15 The operating system may go away

Virtualization platforms may not even have an operating system in the foreseeable future; in fact, this is already here. [VMware's ESX 3i](#) offers the same functionality as the fully installed ESX 3 but within a 32-MB footprint. It will soon be available as an integrated option within server systems. This will reduce risks of the installed operating system providing any security issues and will channel all configuration of the host system to the management package.

## 16 Virtual appliances rock!

Virtual appliances (VAs) make up a new space that has emerged as virtualization has become more popular. The VA model is simply a purpose-built virtual machine that provides a canned set of functionality from the start. VAs are available to provide DHCP roles, provide chargeback to virtual environments, act as Wiki servers for intranets, and to fulfill many other purposes. [VMware's Virtual Appliance Marketplace](#) will have some company, as current VAs are adding support for Citrix XenServer and other virtualization platforms.

Many virtual machines are available for free with open source applications and free operating systems. The VA model can be a big aid in bringing specific functionality to your infrastructure without additional licensing or hardware costs. Many VAs also work on the free virtualization products, so you don't tie up expensive hardware resources on your enterprise virtualization system, should you wish to conserve availability.

## 17 Virtualization can benefit the desktop

Do you have a large number of like-configured desktops? If so, you may want to consider a desktop virtualization solution. These solutions allow administrators to have a new level of granular control of the installed inventory, permitted hardware accessibility, and network connectivity. Desktop virtualization also makes reversion back to the base image a snap. No longer will a trip up to re-image and re-personalize a system be required.

Some of the desktop virtualization packages also manage storage very efficiently. Imagine providing a virtual desktop to 1,000 computers, but instead of hosting an image of the base install for all of those computers, the virtualization package manages only the change in storage. For most situations, that will be simply the profile and current usage data. And in this situation, the backend storage requirement for 1,000 virtualized desktops is very small, considering the number of systems being hosted.

## 18 Take advantage of application virtualization

Application virtualization isn't new to you if you've used products like Citrix MetaFrame and Presentation Server before. But additional technologies are now available that virtualize applications outside of the simple presentation mode. The key difference between application virtualization and other virtualization strategies is that the encapsulated application is all done on the client, from the processing standpoint. There's no background server providing the processor resources for the virtualized application. However, policies define what applications are to be run on the clients; the package for the application is provided to the client, and that environment is virtualized locally. In this fashion, there is no central collection of hardware resources to deliver the application.

## 19 Beware of virtual machine sprawl

The growing popularity of virtualization may introduce a new phenomenon -- virtual machine sprawl. In a way, this is accelerated by the wonderful tools available to help organizations migrate to virtual environments. Physical-to-virtual (P2V) conversion tools allow administrators to take servers to the virtual environment easily, and it may become tempting to omit the decision process of what systems need to go and what need to stay. The other half of this situation is that if we are challenged to review carefully what physical systems need improvements in their operating system environment before migrating to the virtual environment, the tasks may never be completed.

## 20 Many things will require rethinking

Depending on the scale of your virtualization implementation, some elements of your infrastructure will need to be revisited. Topics such as backup and restore, storage management, network connectivity, and the server build process will all need addressing before moving to the virtual world. All hassles aside, it is clearly a positive direction for many situations to utilize hardware efficiently, meet disaster recovery requirements, save on server hardware, and increase the level of central management.



Debra Littlejohn Shinder is a technology consultant, trainer and writer who has authored a number of books on computer operating systems, networking, and security. These include *Scene of the Cybercrime: Computer Forensics Handbook*, published by Syngress, and *Computer Networking Essentials*, published by Cisco Press. She is co-author, with her husband, Dr. Thomas Shinder, of *Troubleshooting Windows 2000 TCP/IP*, the best-selling *Configuring ISA Server 2000*, and *ISA Server and Beyond*.

Rick Vanover works for Safelite Auto Glass (Belron US) in Columbus, OH. There, he is part of a team of IT professionals providing central Windows-based server administration. Previously, he worked for Dematic Corp (formerly Siemens L&A, Siemens Dematic, Rapistan) deploying custom software solutions to the material handling industry using a mix of current hardware and software products. You can reach Rick at [b4real@usa.net](mailto:b4real@usa.net).

