



Hyper-V: What you need to know before getting started

Server virtualization continued to gain popularity in 2008, and Microsoft is looking to shift the market in its favor. But will the release of Hyper-V for Windows Server 2008 really make the kind of impact the company is looking for? In this E-Guide, brought to you by SearchWindowsServer.com and Dell, learn more about how Microsoft Hyper-V fits into the server virtualization landscape, with insight on exactly what Hyper-V has to offer, details on key features, and analysis of how the Microsoft technology stacks up against the competition.

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Can Microsoft really make an impact with Hyper-V?

Danielle Ruest and Nelson Ruest, Contributors

VMware has been working hard for the past ten years to develop the x86 virtualization market, and the company has done a good job of it. Today, VMware's virtualization portfolio includes ten different virtualization tools and a plethora of management utilities that tackle anything—from resource load balancing to workflow automation for virtual machine (VM) requests. This effort has granted them a well-deserved 80% of the current marketplace for server virtualization.

Now, with the release of the Hyper-V role for Windows Server 2008, Microsoft obviously wants its own share of the market. This is the first time Microsoft has had a hardware-based virtual machine engine. Previously, the company had released two software-based virtualization products—Virtual PC and Virtual Server. Both were derived from the technology Microsoft acquired from Connectix Corp., the original makers of Virtual PC. Connectix first made its name when it began producing software that allowed Macintosh users to run Windows software on their PCs by emulating Windows on top of the Mac OS.

Software virtualization tools require an underlying operating system to run. In the cases of Virtual PC and Virtual Server, the underlying OS is Windows XP, Vista, Windows Server 2003 or 2008. In the case of VMware's software virtualization offerings, the underlying OS can be several different versions of Windows, Linux or even the Macintosh OS.

Hardware virtualization products, commonly called hypervisors, run directly on the hardware and do not require an operating system. In the case of VMware's ESXi hypervisor, this is pretty clear since the hypervisor is only 132 MB in size and is installed directly on the hardware or, even better, integrated to the server you purchase from the likes of Dell, HP, Fujitsu and others.

Operating system requirements are less clear with Microsoft's Hyper-V, since Hyper-V is a role within Windows Server 2008 and therefore requires an installation of the OS before you can enable it. However, much of the Hyper-V code is similar to that of Citrix XenServer—which is also a hardware virtualization tool—only this time it's built upon the Xen extensions to Linux. It's important to note that XenServer also requires some Linux code to run.

Unlike VMware's similar offerings, the two Microsoft software virtualization tools will only run x86 or 32-bit virtual machines. In the case of VMware, all of its virtualization products, both hardware and software, will run x86 and x64 virtual machines so long as you install them on a machine using an x64 processor. Microsoft's Hyper-V, however, will only install on an x64 machine and will support select x86 and x64 VMs (see Table 1 on following page).



Table 1: VMware versus Microsoft Hypervisor Guest OS Support

Metric	VMware	Microsoft
Guest OS Support	Microsoft Windows 3.1/3.11/95/98/Me/NT/2000/ 2003/2008/XP/Vista x86 or x64 MS-DOS 6.x Red Hat Enterprise Linux 2.1/3/4/5 Red Hat Advanced Server 2.1 Red Hat Linux 7.2/7.3/8.0/9.0 SUSE Linux Enterprise Server 8/9/10 SUSE Linux 8.2/9.0/9.1/9.2/9.3 FreeBSD 4.9/4.10/4.11/5.0 TurboLinux 7.0, Enterprise Server/Workstation 8 Novell Linux Desktop 9 Sun Java Desktop System 2 NetWare 6.5/6.0/5.1 Solaris 9/10 for x86	Microsoft Windows 2000/2003/2008/XP Pro/Vista x86 and x64 SUSE Enterprise Linux Server 10 SP1
64-bit Guest Support	Most x64 OSes	Windows 64-bit OSes

Note that Table 1 outlines the guest operating systems that are supported by both vendors on their hypervisors. While Microsoft does not support products like Windows NT on Hyper-V, this does not mean you cannot run the OS inside a virtual machine on this hypervisor. It only means that if you do, Microsoft will not support the operation on Hyper-V. There is no loss there since Microsoft stopped support for Windows NT in 2004.

A virtual machine is a virtual machine, and if you can build it, chances are very good it will run on top of pretty much any hypervisor that recognizes the format of the virtual disks that make up the machine. Performance may not be great, but running a machine as a VM is so much better than running a machine on a physical box that you may be better off anyway.

Microsoft's Hyper-V is a version 1 product and, as many have already pointed out, it lacks several features available in other hypervisors. However, the very fact that it is built on and included in Windows Server 2008 will likely make it a popular choice. It won't be because of the price, however, because at \$28 per box, Hyper-V is still more expensive than the free VMware ESXi installable edition. No, it will be popular because people are familiar with Windows Server and will want to take advantage of its complete features set.

Hyper-V can be installed on either the full installation or the Server Core installation of Windows Server 2008. Most small organizations will probably run it on the full installation since that's what they are familiar with, but we would recommend they use Server Core.



Server Core is a minimalist installation of Windows that was designed with Hyper-V in mind. It does not include Internet Explorer, Windows Contacts or Windows Media Player components, and because of this, it does not require updates as frequently as the full installation. In addition, because it is a minimalist version of Windows Server 2008, it doesn't require as much overhead as the full installation, which frees up more resources for the virtual machines you would run on top of it.

Will Hyper-V have an impact? There is no doubt that it will. Will it displace VMware ESXi? Only time will tell. Right now, Hyper-V is in its infancy and needs to mature significantly before it can play the same role in the data center that VMware does today.

Just what does Microsoft Hyper-V have to offer?

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In a bid to compete against VMware, Microsoft recently released Windows Server 2008 Hyper-V, its flagship virtualization engine or hypervisor. Still, as a version 1 product, many in the industry have claimed that Hyper-V is lacking in comparison to VMware in certain key areas:

- **VMotion**—A technology that moves virtual machines from host to host while they deliver services to end users without service interruption. In this iteration, Hyper-V does not support live migration of virtual machines.
- **Distributed Resource Scheduling (DRS)**—A tool that uses policy-based resource allocation to support VMs. If a VM requires additional resources to run because of a peak in demand (and the host it is currently running on cannot provide them), DRS will automatically locate an appropriate host in the resource pool and move the VM using live migration. While it is possible to monitor VMs running on Hyper-V to determine if they have appropriate resources, you cannot move them to another host unless they are first shut down. There is nothing very dynamic about such a move.
- **Special RAM management features**—VMware offers features such as:
 - the ability to share in-RAM components between VMs
 - allocating RAM in a minimum/maximum configuration
 - memory over-commitment
 - allocating more RAM to a VM than is available on a host and memory ballooning
 - recovering unused memory from running VMs to allocate elsewhere

Hyper-V does not offer any such features, as memory that is allocated to a VM is dedicated to that VM from that point on.

So just what does Microsoft Hyper-V offer? While Hyper-V is not another VMware ESX Server (at least not yet), it is still a very powerful hypervisor that is built on top of the Windows Server 2008 code. This means you can install and run Hyper-V on a multitude of devices and server configurations—many more in fact than you can choose for

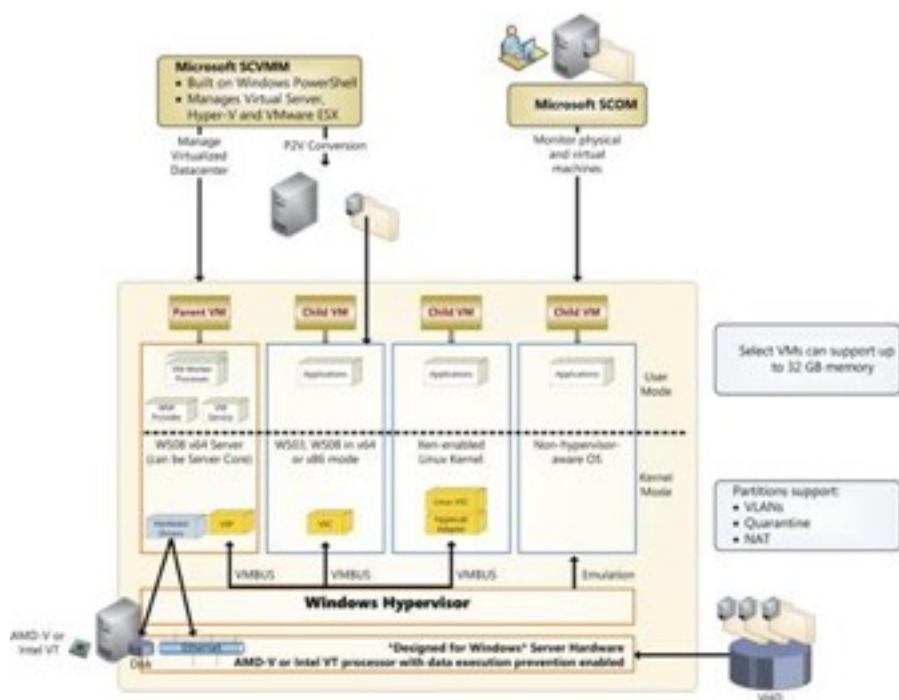


VMware. Hyper-V also has support for mixed virtual machine environments, letting you run different types of 32- or 64-bit operating systems simultaneously (Windows and Linux).

Host servers running Hyper-V can include up to 16 processor cores and support for virtual machines running on up to four processor cores, depending on the guest operating system. Hyper-V includes a new virtual switch that provides extensive emulation of network interface cards. Through this switch, you can configure VMs to run Windows network load balancing or failover clustering, which lets you create highly available virtual machine configurations.

Hyper-V has a new hardware-sharing architecture that provides access and utilization of core resources (disk, networking and video) using a virtual service provider/virtual service client (VSP/VSC) architecture (see Figure 1). This means that virtual machines in Hyper-V do not rely on Hyper-V for the drivers for virtual hardware. Instead, virtual machines run their own drivers directly through Hyper-V integration components. This removes a potential single point of failure in host server configurations.

Figure 1



While Hyper-V does not support live migration, it does support quick migration, which can migrate a running VM from one system to another with minimal downtime through Windows Server and System Center management tools. Basically, the VM is paused on one server and restarted on another. Hyper-V can also create virtual machine snapshots, which act as point in time captures that let you restore a VM to a previous state. It can take up to 512 snapshots for each VM without service interruption.

Hyper-V systems are scalable, letting you run several VMs within a given host. Hyper-V hosts run exclusively on x64, taking advantage of the additional memory capabilities inherent in this platform. In addition, Hyper-V is extensible through Windows Management Instrumentation (WMI) or its application programming interface (API), which can allow independent software vendors to build custom tools or utilities that extend the capabilities of Hyper-V.

Microsoft's virtualization engine can be installed on either the full or Server Core installation of Windows Server 2008, but Server Core is highly recommended since it requires fewer resources and would therefore take less away from the VMs it hosts. In addition, because it is an integral part of Windows, Hyper-V is an appealing hypervisor if only for the familiar ground it puts IT professionals on.

Yes, it's true: This first iteration is not as powerful as other hypervisors, but that will not significantly influence Hyper-V's adoption. It is a true hypervisor that is built on one of the most powerful server operating systems of all time. Watch it grow and look for substantially improved feature sets in future iterations.

How does Microsoft Hyper-V rate?

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The making (or unmaking) of a hypervisor has everything to do with the tools that support its operation in your data center. VMware, for example, has been in the hypervisor (or x86 virtualization) market for the past 10 years. This has given the company the opportunity to create an abundance of tools all centered around virtual machine (VM) and host server management. These tools include not only the management of virtual machines in production environments, but also in lab and staging environments, which are essential to ensure that only stable and certified solutions are delivered into your production network.

With Microsoft releasing its very first hypervisor this year—Windows Server Hyper-V—some might think that its arsenal of management tools would be meager, but that is not the case. Microsoft has been in the management space for Windows networks for several years with its System Center line of products and has been able to easily adapt existing tools to the management of virtual machines. After all, virtual machines are easier and simpler to manage in a lot of ways, and Microsoft has been able to enter the hypervisor fray with a series of tools that directly address some of the most common needs in VM management.

When it came to management of operations not traditionally supported by common tools, Microsoft was able to deliver utilities with new functionality that address those needs. Virtual machine creation and administration is a good example of that. Microsoft delivered System Center Virtual Machine Manager (VMM), a tool centered around virtual machine creation, protection and manipulation. In fact, Microsoft is set to release a second version of VMM that will include additional improvements such as management of Hyper-V or VMware host servers.

Table 1 outlines the different functions required for administering virtual machines. It also lists the various tools available from both VMware and Microsoft in support of each function.



Table 1. VMware and Microsoft Management tools for VM environments

Feature	VMware	Microsoft
VM/Host Management	VirtualCenter	Hyper-V Console System Center Virtual Machine Manager
VM Provisioning	Lifecycle Manager	SC Virtual Machine Manager
Live VM Migration	VMotion	Quick Migration
LAN High Availability: VMs	High Availability	Failover Clustering
LAN High Availability: Storage	Storage VMotion plus third-party	Windows Server Simple SAN plus third-party
Backup	Consolidated Backup plus third-party	Windows Server Backup Volume Shadow Copy Service (VSS) writer SC Data Protection Manager
VM Placement Management	Distributed Resource Scheduler	SC Operations Manager SC Virtual Machine Manager
Policy-based Resource Allocation	Distributed Resource Scheduler	SC Operations Manager
Security	VMsafe plus third-party	Windows Server Integration plus third-party
Patching and Updates	Update Manager	Windows Server Update Services SC Configuration Manager
Host Power Management	Distributed Power Management	SC Operations Manager at host level
WAN BCM	Site Recovery Manager	Failover Clustering, Geoclusters
Physical to Virtual (P2V) Conversion	Converter	SC VMM
Single VM Staging for Testing or Development	Lab Manager	SCVMM Self-service Web Portal
Testing or Development		
Entire VM Environment for Testing or Development	Lab Manager	Third-party or custom scripts
Lab Environment Graduation Management	Stage Manager	Third-party or custom scripts

As you can see from the table, Microsoft and VMware are almost neck and neck in terms of management tool availability. VMware has a different approach, however: Each new tool integrates into the core VMware management environment, namely VirtualCenter. This way, administrators only need to use one single tool to manage the data center.

As for Microsoft, all System Center tools rely on a single interface, so operators running System Center Operations Manager or Virtual Machine Manager will need little retraining as far as accessing the tool is concerned. However, other tools, such as the Hyper-V console, do not use the same interface and in some cases even uses different language than System Center. For example, an image of the state of a virtual machine at a specific point in time is called a snapshot in Hyper-V, while it's dubbed a checkpoint in Virtual Machine Manager.

These simple details aside, Microsoft has made a major inroad in terms of virtual machine and hypervisor management, and the company continues to offer new tools in support of the move toward virtualization. Hyper-V may be a version 1 product, but its management is not. IT pros should consider this when making the choice of which hypervisor to go with. Also, keep in mind that management tools that only manage a single hypervisor are dead-end tools; the future is clearly leading us toward heterogeneous hypervisor management.



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[What is Microsoft Hyper-V?](#)

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