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Hyper-V™ vs. vSphere™: Understanding the differences

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Hyper-V™ vs. vSphere™: Understanding the differences

For years, there has been a feature battle between VMware vSphere™ and Microsoft Hyper-V™. In general, vSphere has won the feature battle, although Hyper-V is certainly no slouch; the product can hold its own – and does hold its own for many organizations that have made the decision that it's the right solution for their needs.

vSphere administrators may not have the opportunity or desire to really put Hyper-V through its paces, particularly given vSphere's technical superiority. Although that superiority remains largely in place today, the feature gap will ultimately shrink and Hyper-V will become a "good enough" solution for more and more organizations.

In order to help vSphere administrators make the knowledge leap between the two platforms, this paper will outline the differences between the currently shipping products from both VMware® and Microsoft®: vSphere 5 and Hyper-V 2008 R2 with SP1. In this paper, you will be introduced to key features in the products and be exposed to the feature deltas that may exist.

Product level overview

Both VMware and Microsoft offer their products in multiple editions depending on the needs of the customer and both companies provide a free edition of their respective hypervisor tools for customers that do not have advanced needs.

Product licensing and editions comparison

Description	Standard	vSphere Enterprise	Ent. Plus	Hyper-V Data Center
Processor entitlement	per CPU	per CPU	per CPU	per CPU
vRAM entitlement	32 GB	64 GB	96 GB	n/a
vCPU entitlement	8-way	8-way	32-way	n/a

Supported guest operating systems

In breadth of operating system support, VMware's vSphere is the clear winner, although Microsoft has made steady strides in Hyper-V. For many, however, Hyper-V's support for the world's most common operating systems is enough.

Hyper-V supports all Microsoft operating systems – both client and server – since Windows 2000. For full support, the latest operating system service pack is required. In addition to supporting Windows operating systems, Hyper-V supports:

- CentOS 5.2-5.7 and CentOS 6.0 and 6.1
- Red Hat Enterprise Linux 5.2 – 5.7, 6.0 and 6.1
- SUSE Linux Enterprise Server 11 with Service Pack 1
- SUSE Linux Enterprise Server 10 with Service Pack 4

VMware, on the other hand, provides a much more comprehensive level of support for guest operating systems. The company supports Microsoft products all the way back to MS DOS 6.22 and Windows 3.1. On the Linux front, VMware supports products from just about every distribution out there, including CentOS, Mandrake, Novell and Red Hat, among others. In addition to supporting most Linux variants, vSphere also provides support for Max OS X 10.7 and other versions of OS X Server, FreeBSD, OS/2 Warp, Netware and Solaris. For a complete list of supported operating systems, refer to VMware's Guest Operating System Installation Guide.

Scalability comparison on a per edition basis

vSphere and Hyper-V differ significantly on their ability to scale to serve large organizations with vSphere generally winning in a side-by-side comparison. Of course, this doesn't mean that all is lost for Hyper-V; Hyper-V's limits prove to be more than adequate for many organizations. The chart below details the scalability differences in the various editions of the two company's products.

	vSphere5			Hyper-V		
Feature	**Standard**	**Enterprise**	**Ent. Plus**	**Standard**	**Enterprise**	**DC**
Max host processors	160	160	160	4	8	64
Max virtual SMP (guest)	8	8	32	4	4	4
Max host RAM (GB)	2048	2048	2048	32	2048	2048
Max RAM per VM	255	255	255	64	64	64
Failover nodes	32	32	32		16	16
Memory overcommit/dynamic mem.	✓	✓	✓	✓	✓	✓
Transparent page sharing	✓	✓	✓			
Live workload migration		✓	✓		✓	✓
Live storage migration		✓	✓			
Max guests per host	512	512	512	384	384	384
Distributed Resource Scheduler		✓	✓			
Distributed switch			✓			
Virtual instance rights (Windows)	0	0	0	1	4	Unlimited
Hypervisor licensing model	per proc	per proc	per proc	per host	per host	per proc

Sources: Configuration Maximums (VMware), Requirements and Limits for Virtual Machines and Hyper-V in Windows Server 2008 R2, Windows Server 2008 R2 Editions Comparison

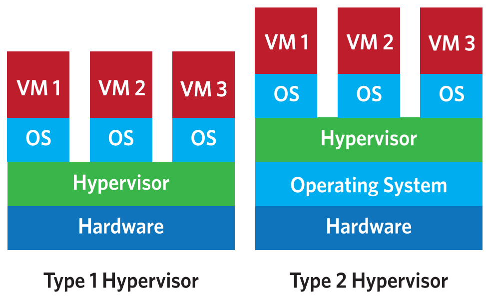
Technical features comparison

At present, vSphere 5 certainly holds a considerable lead in features and performance over currently shipping versions of Hyper-V, which, as of this writing, is Hyper-V 2008 R2 SP1. Although the gaps exist, it's important for administrators to understand the particular differences in order to choose the solution that best meets business needs and budgets.

Architecture and hypervisor footprint differences

Perhaps some of the most obvious differences between VMware and Hyper-V lie in the product architecture and footprint. Whereas a VMware vSphere Hypervisor installation requires only 144 MB of disk space, a Hyper-V installation requires a minimum of 3 GB for a Server Core installation and around 10 GB or so when a full Windows installation is selected.

The primary reason for this significant space difference lies in the underpinnings of the two hypervisor solutions. Hyper-V relies on the installation of the general purpose Windows Server 2008 R2 operating system while vSphere does not have such weight attached to it.



On the architecture front, Hyper-V is often mistaken for what's known as a Type 2 hypervisor when, in reality, both it and vSphere are Type 1 hypervisors. With a Type 1 hypervisor, often referred to as a "bare metal" hypervisor, the virtualization software sits directly atop the hardware, managing access to said hardware. With Type 2 hypervisors, such as Virtual PC and VMware Workstation, the hypervisor is installed inside a host operating system and the hypervisor software simply operates like any other host-based program.

When the Hyper-V role is enabled on a Windows Server 2008 R2 machine, the existing Windows instance becomes a virtualized root partition.

From an architecture standpoint, Hyper-V's reliance on and support of Windows as its base means that Hyper-V can be used on a much wider variety of hardware than vSphere, which is pretty restrictive when it comes to hardware. The Windows hardware compatibility list (HCL) provides much broader hardware support than vSphere's relatively narrow list of supported hardware.

If you dig a little deeper into the technical details, you will also find that the Hyper-V architecture is based on what's called a microkernelized hypervisor while vSphere is monolithic in nature. This microkernelized design lends flexibility and security to the hypervisor model by isolating the virtual machines from one another with little shared code, such as drivers. Under Hyper-V, more synthetic drivers are used, which can boost overall service performance. vSphere's architecture revolves around a more monolithic core which includes many shared drivers as well as the virtualization stack.

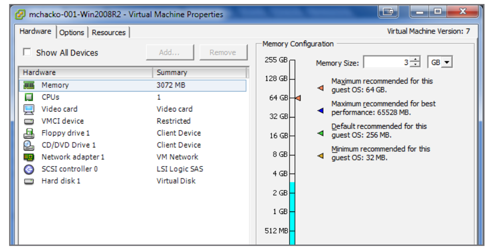
Frankly, the kernel type – microkernelized vs. monolithic – probably won't play much of a part in a hypervisor decision at present, but understanding that both vSphere and Hyper-V both leverage bare metal capabilities is critical, particularly since Hyper-V's implementation model is fraught with confusion.

CPU contention management

Regardless of the system running, the operating system always has to schedule CPU resources appropriate to the current assignment. As the system becomes charged with the support of additional disparate workloads, however, the issue of CPU contention – that is, the ability for the system to respond to processing requests – becomes an issue. However, resource contention is generally not a major issue at the low end of the virtualization spectrum. It begins to come into play as systems are pushed to their limits, which forces the operating system to more carefully dole out increasingly scarce resources.

vSphere CPU scheduling controls

Both vSphere and Hyper-V include manual methods for adjusting CPU scheduling between virtual machines. There are three settings for each virtual machine in vSphere that can be adjusted:

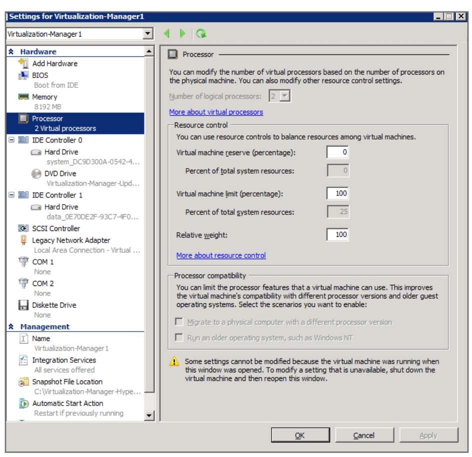


- **Shares**. Shares are used to dictate the relative performance of a virtual machine. If a virtual machine has a share value that is half of another, it's entitled to only half the CPU resources.
- **Reservation**. A reservation is a guarantee that a virtual machine will receive at least the resources that are specified in MHz.
- **Limit.** The value specified here limits the ability of the virtual machine to consume unlimited resources. This is useful in situations in which an individual virtual machine is consuming too much.

vSphere has a powerful CPU scheduling mechanism in place that ensures that virtual machines receive attention from the system. VMware has produced a white paper that goes into great technical depth for how this scheduling is achieved.

Hyper-V CPU scheduling controls

Hyper-V works to address CPU contention issues in a couple of different ways. First, each virtual machine has manual CPU settings that the administrator can adjust to meet business needs.



- **Virtual machine reserve (percentage)**. Allows the reservation of a portion of the server's total processing resources for this virtual machine. Consider this scenario: This virtual machine is running a mission-critical workload. There must always be CPU resources available to serve this VM's workload. By default, a virtual machine is guaranteed/reserved 0% of the host's resources. An administrator can set this to a non-zero value to reserve resources.
- **Virtual machine limit (percentage)**. On the flip side, an administrator can also limit how much of a host's processing resources can be consumed by a single virtual machine. This setting is useful for instances in which a virtual machine might be attempting to consume too many resources.
- **Relative weight.** If the two settings above are a bit too exacting, an administrator can take a different approach to determine how much processing power should be consumed by the virtual machine. The relative weight option allows the weighting of this virtual machine against others. By default, every virtual machine gets a weight of 100. If a VM should have lower priority, provide a lower number.

Shared memory/memory management differences

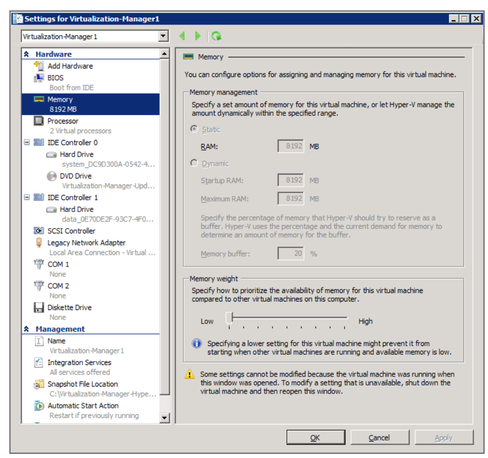
An area in which vSphere currently handily trumps Hyper-V is in the area of memory management. The two sections below provide you with technical details about how each solution implements advanced memory management techniques. Hint: If memory management is your key technical driver, stop reading now and stick with vSphere.

VMware memory management techniques

VMware has perfected some powerful techniques by which RAM can be managed and optimized on a vSphere host in order to provide additional scalability on a per-host basis and to keep a host operating a peak levels.

- **VMware Oversubscription/Overcommit.** VMware allows administrators to assign more aggregate RAM to virtual machines than is actually physically available in the server. This works because VMware actively monitors all virtual machines and can take RAM from virtual machines that aren't using their full allocation and assign that RAM to virtual machines that need it. Accomplished through a mechanism called the Idle Memory Tax, VMware progressively "taxes" virtual machines based on the amount of idle RAM they have.
- **Transparent Page Sharing.** When there is idle CPU time, vSphere looks for pages located across virtual machines that can be matched with one another and shared. This is basically a deduplication method applied to RAM rather than storage. For organizations that tend to use the same operating system for many virtual machines, the memory impact can be substantial.
- **Guest Ballooning.** When a particular virtual machine needs to increase its memory usage, it can request memory from other virtual machines. When VMware Tools is installed inside a virtual machine, along with everything else is a memory balloon process. The guest operating system can swap processes out to help free up memory that is then assigned to the balloon. When other VMs request memory, it can be lent via this balloon.
- **Memory compression.** Memory compression is a technique that is used to prevent the hypervisor from needing to swap memory pages to disk when RAM becomes limited. Memory compression attempts to fit multiple pages of RAM into a smaller number of pages in order to postpone for as long as possible the need for the hypervisor to swap to disk. Disk swapping is expensive in terms of performance.

Hyper-V Dynamic Memory



Whereas VMware has a number of different techniques by which to manage and optimize RAM, Hyper-V eschews the multi-pronged approach in favor of a single method known as Dynamic Memory, which was introduced in Windows Server 2008 R2 SP1. Dynamic Memory relies primarily on a process similar to the Guest Ballooning feature described previously.

Included in the Hyper-V Integration Services that are installed inside a virtual machine is a driver called the Dynamic Memory Virtual Service Consumer (DM VSC). The DM VSC is responsible for monitoring the memory usage of the guest operating and tracking guest RAM needs. This information is reported to the host, which is responsible for deciding whether to give or take RAM from the virtual machine for other purposes.

It's easy to see how this feature could reduce a virtual machine's memory to dangerous levels, leaving it unable to respond to a sudden environmental change that creates the need for more memory. To prevent this situation, Hyper-V provides a (default) buffer of 20% of unused memory.

Hyper-V exposes the Dynamic Memory configuration options as a part of the virtual machine settings. An administrator provides both startup and maximum RAM variables along with the desired memory buffer. The administrator also has the opportunity to provide a memory weight value to the virtual machine, which allows the administrator to ensure that mission critical virtual machines are serviced before less critical needs.

Dynamic Memory in Hyper-V is much more exposed to the administrator than RAM management options in VMware. Although the solution doesn't provide the same "overcommit" capability as VMware, it does allow the administrator to attempt to increase virtual machine density through advanced RAM management.

Virtual machine storage capabilities compared

Storage is another critical shared resource in a virtual environment. Only with the right kind of storage can the hypervisor products achieve their true potential. However, even before the issue of advanced features as they relate to storage can be discussed, administrators must understand the storage capabilities and limitations that exist in both vSphere and Hyper-V.

Storage types

The chart below outlines the storage types that are supported by each product.

Technology	Description	vSphere	Hyper-V
DAS	Directly attached storage	✓	✓
NAS	Network attached storage	✓	
FC	Fibre Channel	✓	✓
iSCSI	Internet SCSI	✓	✓
FCoE	Fibre Channel over Ethernet	✓	

As you can see, your storage choices are a bit more limited with Hyper-V.

Thin provisioning

Thin provisioning is a method by which administrators can have the best of both worlds when it comes to storage. No one wants to allocate too little disk space for mission critical services. On the other hand, no one wants to waste expensive shared disk space on a SAN, either. Thin provisioning makes it possible for administrators to allocate the space they believe they may ultimately need for a service without actually having to dedicate the space right now.

Thin provisioning is supported in both Hyper-V and vSphere.

Linked image support

Thin provisioning is one method by which disk space can be conserved in a virtual environment. Another way to achieve disk capacity savings is to simply link images to one another. For example, suppose you're running fifty Windows Server 2008 R2 virtual machines. All fifty of these machines use the same base disk image, so why now just create the image once and then point another forty-nine virtual machines at the base image?

This is an area in which Microsoft is actually ahead of VMware in most scenarios. Although VMware provides a feature known as "linked clones" in VMware View and vCloud Director, vSphere does not yet provide this capability natively.

Hyper-V provides a feature that Microsoft calls Differencing Disks, but with a caveat. A differencing disk – called a child disk – is a virtual hard disk that is linked to a master image – called a parent disk – and that stores and isolates any changes that are made to that master image on a per-VM basis.

Through the use of this feature, administrators can create a master base image and simply link other virtual machines to this image and save a lot of disk space.

But, as mentioned, there is a caveat: Microsoft does not recommend that the differencing disks feature be used in a production environment as it can create unexpected out-of-disk-space issues that can negatively affect availability.

vSphere VMFS vs. Microsoft VHD

One of VMware's claims to fame has been VMFS (Virtual Machine File System), the incredibly powerful and scalable file system that enables much of VMware's feature set. VMFS delivers a number of features and capabilities that are not found in Microsoft's competing VHD (Virtual Hard Disk) format.

In a cluster environment, VMFS truly shines. VMFS allows the hot add and removal of hosts to and from the cluster without the need to interrupt other running workloads. Currently, shipping Hyper-V solutions do not have this dynamic flexibility.

Microsoft does provide Cluster Shared Volume (CSV) support in Hyper-V, but the implementation of this feature is far more complicated than VMware's clustering implementation.

Both VMware and Microsoft allow administrators to make direct use of disks through respective pass-through techniques. For vSphere, this feature is known as Raw Device Mapping (RDM). In the Hyper-V world, these are known as "Pass-Through Disks". In this area, there isn't much difference. Pass-through techniques can be used to improve overall performance.

On the storage management front, vSphere is still light years ahead of Microsoft in providing native features to the environment. Here are some features that are available in vSphere, but missing from Hyper-V:

- **Centralized management of datastores.** A single location in which all data stores can be managed in order to provide more visibility into the environment.
- **Storage Management Initiative Specification (SMI-S) support.** Standardized monitoring of storage.
- **Caching.** Improves performance.
- **Storage DRS.** A way to automatically place VMs to load balance Storage IO demands.

Power management

One of the great promises of virtualization is the possibility of reducing costs by combining workloads onto fewer physical machines, which also reduces the amount of electricity consumed in aggregate. That's just the first possibility, though. With advanced workload migration techniques, virtualization offers the possibility for optimizing running workloads by consolidating them onto as few hosts as possible and moving the remaining hosts into a power-save mode. In this way, organizations can make further gains in virtualization-related cost savings.

VMware Distributed Power Management (DPM)

Although there is some question in the VMware community about the actual rewards that can be reaped from DPM, it works exactly as described above and, theoretically, has the potential to reduce power usage. DPM automates the process of energy conservation, leaving the administrator free to focus elsewhere. When power requirements dictate, hosts are brought online to service the burgeoning workload and taken offline when needs lessen.

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Hyper-V

At present, Hyper-V has no native virtualization-based opportunities to automate power management. Hosts *can* take advantage of some existing Windows features, such as the ability to park a processor core and slightly reduce power consumption, but this is almost negligible in terms of power savings.

Virtual network features comparison

One major change that was wrought with the rise of virtualization was the need for previously disparate IT teams to work more closely than ever before. Nowhere is this truer than when it comes to networking. With virtualization on the rise, the systems and networking teams need to collaborate and cooperate much more than was necessary in the past. Each hypervisor brings with it different capabilities, as described below.

Networking features

Both Hyper-V and vSphere provide full support for foundational networking elements including VLAN support and support for jumbo frames, which can boost iSCSI storage performance. Both also provide full support for the emerging IPv6 standard as well as for bandwidth, and reliability-enhancing NIC teaming features, although Hyper-V relies on NIC vendors for this capability; it's not provided at the virtual switch level (in software) as it is in vSphere.

Further, both products provide support for different types of offloading, which can reduce host processor usage and increase potential consolidation rations.

vSphere

- **TCP Segmentation Offload.** The process of encapsulating data packets into Ethernet-sized frames requires some processor overhead. With TCP Segmentation Offload, the host TCP/IP stack can submit frames of up to 64 KB in size to the NIC at which point the NIC then repackages these frames into sizes that fit inside the network's maximum transmission unit (MTU) size.
- **NetQueue.** Enables the system to process multiple network receive requests simultaneously across multiple CPUs.
- **iSCSI.** iSCSI traffic results in a "double hit" from a CPU overhead perspective. First, the SCSI commands needs to be encapsulated and then this traffic itself needs to be encapsulated so that it can go out on the network. By offloading iSCSI encapsulation, a system can avoid much of this necessary overhead.

Hyper-V

- **Chimney (TCP offload).** Offloads to the NIC significant portions of the CPU workload normally associated with TCP/IP functionality.
- **Large Send Offload (LSO).** Like vSphere's TCP Segmentation Offload, LSO provides Hyper-V hosts with the ability to submit larger frames – in this case up to 256KB in size – to the network adapter for further processing, thus alleviating the host of that task.
- **Virtual Machine Queue (VMQ).** Takes precedence over the use of Chimney when both are available. Similar to NetQueue. Creates multiple virtual network queues for each virtual machine. Network packets destined for these virtual machines are then sent directly to the VM, reducing some overhead.

It's easy to see that these features may have different names, but they provide similar functionality.

In addition to the elements described above, vSphere boasts an additional networking feature: The Distributed Virtual Switch is a virtual device that spans multiple vSphere hosts and moves networking management to the cluster level as opposed to managing it at the host level. The Distributed Virtual Switch also enables third party vSwitch integration into vSphere.

Virtual machine mobility and availability

The process of abstracting a running workload from the underlying hardware presents some unique opportunities to shift data and workloads to different hardware platforms. Both VMware and Microsoft provide methods for data and workload migration, but the implementations vary in significant ways.

Workload migration

A critical availability and maintenance tool, workload migration between hosts, has long been enjoyed by VMware shops (vMotion™) and has come more recently to the Microsoft world through a feature the company calls "Live Migration". Workload migration is one area in which VMware shows its maturity. Although Hyper-V provides what many consider to be a "good enough" solution to the problem, VMware remains significantly in the lead in this space in currently shipping versions of respective products.

VMware vMotion

vMotion was an incredible introduction to the world of virtualization and revolutionized the way that administrators interacted with active workloads. No longer were services relegated to the original host upon which they were deployed. Now, workloads could be shifted between physical hosts in almost real-time with the end user having no awareness that the activity was taking place.

Although workload transfers via vMotion are initiated with just a few clicks of the mouse, the behind-the-scenes process is quite complex, the technical details being beyond the scope of this paper. Although complex, VMware has continued to innovate in this space and has expanded vMotion's already strong feature set with new capabilities that make this technology even more useful and applicable to more use cases.

In vSphere 5, VMware added two major features to workload migration:

- **Use multiple network adapters for vMotion.** Allows the VMkernel to transparently load balance vMotion traffic among multiple network interfaces to a point of saturation – even on 10 Gb networks – in order to improve the speed of the transfer.
- **Metro vMotion.** vMotion has traditionally required that network adapters have a round-trip latency of not more than 5 ms. With vSphere 5, this is increased to 10 ms, making it a suitable solution even in WAN scenarios.

Microsoft Live Migration

Microsoft Live Migration is the name of Hyper-V's workload migration tool. In currently shipping versions of Hyper-V, Live Migration is sort of a "vMotion Lite" but once the next release of Hyper-V is released, the feature gap will shrink. Hyper-V 3.0 is briefly discussed later in this paper.

Live Migration in Hyper-V is not nearly as intuitive as it is under vSphere. In order to operate, the administrator must first configure Microsoft Failover Clustering on all physical hosts that will use live migration. In addition, the cluster should be configured with a dedicated network interface card and virtual network for the live migration traffic.

Although the underlying mechanics are similar – machines are added to a cluster and there should be a NIC dedicated to the purpose, it's much easier to create clusters under vSphere. That said, once the Microsoft cluster is established, the Live Migration feature provides much of the same capability as vMotion.

Storage migration comparison

Hardware abstraction applies to both the compute and storage layers of the computing model. This is particularly useful as it provides organizations the freedom to choose among many different storage options and simply migrate workloads between storage manufacturers or performance tiers. Storage migration features add heretofore unheard of levels of simplicity in the otherwise challenging process of upgrading to new storage hardware and keeping virtual machines running at performance tiers appropriate to their function.

VMware Storage vMotion

Storage vMotion provides administrators with a zero downtime storage migration solution that boasts complete transaction integrity. With storage vMotion, virtual machine storage can be migrated in a number of different ways:

- **Thick to thin.** Migrate virtual disk files from thickly provisioned to thin and back again.
- **Raw Device Mapping disk (RDM) to VMDK.** Convert an RDM-based disk to a VMDK.
- **Across protocols.** Migrate NFS-based storage to an iSCSI array or Fibre Channel array and vice versa.

VMware's storage vMotion technique is a no downtime affair meaning that it is fully transparent to the end user.

Recently, VMware added a storage capability to the Distributed Resource Scheduler (DRS), which introduced Storage DRS (SDRS). SDRS automates the leveling and availability of storage resources on an ongoing basis, leaving the administrator to simply create availability and balancing rules and then focusing on more value-add activities.

Microsoft Quick Storage Migration

Microsoft's storage-shifting technology relies in Microsoft's Background Intelligent Transfer Service (BITS) to migrate live workloads from one storage medium to another, whether that's simply between storage locations or whether that's between storage devices using different storage technologies.

The main disadvantage of Quick Storage Migration lies in the fact that it's not fully transparent to the end user. At the end of the migration process, the VM is placed into save-state for up to one minute while the process finalizes the migration of the virtual machine's memory state and differencing disks.

Availability capabilities

Both VMware and Microsoft include high availability capabilities in their products, but they do so to varying degrees. In this area, VMware is currently ahead of the game by providing scalability and features not yet matched in the Hyper-V product. However, Hyper-V provides enough workload availability features as to be relevant in this area.

There are two different scenarios to consider in the availability spectrum. First, there is individual workload availability. What happens when a server or a workload fails? Second, what happens when an entire data center fails? Both are touched upon in this section.

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vSphere availability mechanisms

On the workload front, vSphere includes the following availability capabilities:

- **VMware High Availability (HA)**. The HA feature monitors virtual machines to detect operating system and hardware failures. When a failure occurs, the virtual machines are restarted on other hosts in the resource pool without the administrator needing to be involved. HA is not fully transparent to the user; the VM needs to be restarted in order for the service to resume operation.
- **Fault Tolerance (FT).** FT picks up where HA leaves off by providing continuous protection for individual virtual machines that suffer a failure of their host. FT does not protect against application level faults. To work its magic, FT creates a second shadow virtual machine that runs in lockstep with the first. If the original virtual machine's host fails, this shadow virtual machine can assume the workload. The use of FT carries some severe limitations, such as restricting to one the number of vCPUs allowed in the virtual machine.

A plain vSphere implementation doesn't have any host-based site resiliency. However, with the additional of Site Recovery Manager (SRM), an add-on, this capability can be added.

As of vSphere 5, a VMware cluster can include up to 32 nodes with no defined upper limit on the number of virtual machines that can be included in the cluster.

Hyper-V availability mechanisms

Hyper-V provides only a high availability capability. At present, an easily implemented solution such as VMware FT is not available, so individual workload protection is not as robust as it can be under vSphere.

Hyper-V's high availability capability is achieved by virtue of a Hyper-V host server's inclusion in a Microsoft Cluster Server-based cluster (MSCS). This is an existing Windows Server availability mechanism that can be leveraged by Hyper-V. Although MSCS does, in fact, provide high availability, the implementation carries quite a bit of complexity—much more than a like-sized VMware cluster. That said, whereas VMware requires the purchase of an additional component to achieve true host-based site failover capability, Hyper-V inherits this capability from Windows Server 2008 R2 in a feature that is known as a stretched cluster. A Windows Server 2008 R2 Data Center license also includes MS Site Recovery.

A Hyper-V cluster can include up to 16 hosts and 1,000 virtual machines.

What's coming in Hyper-V 3.0

When Windows 8 is released, Microsoft will also be releasing a major new version of Hyper-V. Hyper-V 3.0 brings with it many enhancements that will start to close the gaps between it and vSphere. Among the new features:

- A new virtual disk format (VHDX). Although this new disk format is usable with newer versions of Windows only, it extends Microsoft's virtual disk format and allows it to support virtual disks up to 16TB in size.
- Storage and network resource pools. These resource pools allows you to group and abstract storage and network resources.
- Virtual Fibre Channel adapter. Hyper-V 3.0's new virtual Fibre Channel adapter allows a virtual machine to access directly Fibre Channel SANs. This capability means that an individual virtual machine will be able to boot from a SAN.
- Support for more than 4 virtual processors. This is one of Hyper-V's biggest weaknesses when it comes to pure scale as compared to VMware.
- Hardware Acceleration. So far, two features are added: Virtual Machine Queue and IPsec offload.
- Bandwidth Management. Specify minimums and maximums for virtual machine bandwidth utilization.
- Virtual Switch Extensions. So far, there appear to be two filters added: NDIS Capture LightWeight Filter and WFP vSwitch Layers LightWeight Filter.
- Multiple Concurrent Live Migration. Enables an administrator to initiate multiple simultaneous workload migrations between hosts.
- Storage Live Migration with a twist. Hyper-V 3.0 will allow administrators to move virtual machines from any storage to any storage; storage doesn't have to be a completely shared medium. Want to migrate a VM to a thumb drive? Go ahead! Further, Storage Live Migration in Hyper-V 3.0 eliminates the short period of downtime that was associated with this service in previous versions of the product.

Obviously, these are just some of the big features coming to Hyper-V 3.0.

Hypervisor Management

Both VMware and Microsoft, in addition to their base hypervisor products, offer robust management toolsets designed to ease the administrative overhead for their products. However, in some instances, the additional management tool layer is required in order to unlock some of the advanced functionality that has been described in this paper. For example, in order to use VMware's Distributed Resource Scheduler to automatically migrate workloads between vSphere hosts, organizations must also acquire the company's vCenter management tool. For Hyper-V, the company's Virtual Machine Manager (VMM) tool is necessary for organizations that want to convert an existing physical server to a virtual machines (P2V).

That is, perhaps, among the biggest differences between VMware and Microsoft in the hypervisor wars. With VMware, it's all but a requirement that organizations that move beyond a single host buy the management product in order to use many features, although both products add a lot to their respective product's feature sets. With Hyper-V, a lot of functionality – clustering and workload migrations, for example – is provided by the underlying operating system, not the management tool.

This fact is certainly a point in Microsoft's favor. Beyond the basic functionality one would expect from a hypervisor, such as the aforementioned clustering and workload migration features, when one adds VMM, the following processes become possible:

- Fast provisioning of virtual machines.
- V2V conversion of VMware-based virtual machines to Hyper-V.
- Conversion of physical servers to virtual ones (P2V).
- Template-based virtual machine creation.
- Automatic placement of new virtual machines to aid in load balancing.
- Centralized management of multiple Hyper-V hosts.

Finally, deep performance monitoring, capacity planning, configuration management and chargeback are beyond the scope of the basic hypervisor management tools and require an additional solution.

Summary

Although the virtualization world will change a bit with the release of Hyper-V 3.0, the currently shipping version of Hyper-V still lags in the feature race when compared to vSphere 5. However, it's not always about features; many organizations will find that Hyper-V R2 SP1 has just enough meat on its bones to fulfill business goals. In order to understand whether or not Hyper-V can meet their needs, administrators need to know where the two products stand against one another. Hopefully, this paper has demonstrated the differences.

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About the Author

Scott Lowe brings with him close to twenty years of experience in the IT field, with particular interests in IT management, virtualization and storage.

Lowe is the author or author of three books and countless articles and blog posts. Since 2000, he has been a regular contributor to CBS Interactive's TechRepublic unit. Additionally, Lowe is a contributor to virtualizationadmin.com, SearchCIO-Midmarket.com and Wikibon. When not writing, he produces training videos for TrainSignal.

After spending 10 years as the CIO for a number of organizations, Mr. Lowe recently formed The 1610 Group, an IT strategy and management consultancy focused on assisting clients in discovering value in their IT investments. The 1610 Group operates at both the strategic level with C-level executives and at the tactical level assisting in the implementation of core technologies.

About SolarWinds

SolarWinds (NYSE: SWI) provides powerful and affordable IT management software to customers worldwide - from Fortune 500 enterprises to small businesses. The company works to put its users first and remove the obstacles that have become "status quo" in traditional enterprise software. SolarWinds products are downloadable, easy to use and maintain, and provide the power, scale, and flexibility needed to address users' management priorities. SolarWinds online user community, http://thwack.com, is a gathering-place where tens of thousands of IT pros solve problems, share technology, and participate in product development for all of the company's products. Learn more today at http://solarwinds.com.

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