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vSphere: New Features and Benefits

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Bill Ferguson, Global Knowledge Instructor, VCI, VCP, CCSI, MCT

Introduction

Virtualization of servers is one of the hottest topics in today's IT environment. The ability to consolidate many physical servers into one physical server using virtual machines has led to dramatic changes in regard to business continuity and disaster recovery strategies for small and large organizations alike. VMware has been a key leader in server virtualization for at least the last decade. In fact, most of the current Fortune 100 companies use VMware products as part of their network infrastructure.

One of the reasons that VMware continues to lead is that they haven't been content to "stand on their laurels" with their last product; instead they continue to stretch the technology, as well as the imagination, with their next product. vSphere, VMware's latest release, adds approximately 150 new features to its previous VI3 product! The purpose of this white paper is to highlight the most notable of these features and to discuss the benefits they offer your organization's IT infrastructure.

This paper is divided into three sections, based on three major types of improvements. First, we will discuss what's new in the overall vSphere product in regard to configuration maximums, installation, host profiles, and hot plug capability, as well as the concept of cloud computing. Second we will discuss the new features of the vCenter Server 4.0 and how they simplify management for you and reduce the complexity of working with large virtual environments. Finally, we will discuss the new business aspects of vSphere and the features included in each of the four editions of the product.

What's New in vSphere 4.0

It might be more appropriate to ask "what's not new" in vSphere 4.0! A completely new approach and a new list of acronyms are provided by cloud computing. New, and unbelievable, configuration maximums have been achieved. The installation of the host server has been simplified and can now be profiled. The capability on virtual machines to hot-add components that were once thought impossible has been achieved.

Cloud Computing

VMware has taken a completely new approach to virtualization by embracing the cloud computing concept and developing vSphere as an internal-private cloud (the datacenter) that can co-exist with external clouds provided by third-parties (such as Amazon, Nirvanix, and many others). Cloud computing serves businesses that need production-level performance and reliability, regardless of whether the resource is on or off their premises. A

huge ecosystem of technology and cloud service providers has emerged over the last few years and continues to expand.

vSphere promises to offer choice of provider, reliable technologies, and full application support for this new cloud computing environment. Users can leverage the Virtual Appliance Marketplace to deploy over 1000 applications to a cloud or to an on-premise environment. Also new to vSphere and cloud computing is the concept of a vApp, which is a logical “wrapper” that contains an application as well as all of the virtual machines and resources required to make it function, whether internal or external. Often, applications require more than one virtual machine to function properly (for example, a NAT client requires a NAT router), so the concept of the vApp adds a capability to manage an application at a new level while at the same time reducing the complexity involved.

New Configuration Maximums

I can't count the number of times that my VI3 students have said that they are beginning to consolidate servers but that some of the very high-powered servers have not even been considered because of the processor and memory limitations of VMs on VI3. It's interesting to me that the configuration maximums of 4 processors and 64GB of RAM per VM could be considered as a “limitation” but, in some cases, the physical servers that are being used for databases or other high-capacity jobs require more resources than those maximums allow. With vSphere, VMware has all but obliterated that particular objection to consolidating a physical server to a virtual one. Below are some of the new, and somewhat insane, configuration maximums for vSphere 4.0 VMs and ESX 4.0 hosts.

- 8 vCPUs per VM
- 255GB RAM per VM (Available Memory)
- 10 vNICs per VM
- 512 vCPUs per host
- 320 VMs simultaneously running on a host
- 64 physical CPUs per host
- 20 vCPUs per core
- 1TB physical RAM per host

New Installation Video

If you've ever installed ESX 3.5, then you know that some parts of that installation tend to be a little “cryptic” at best. The VMware Install and Configure classes that I teach begin on day one with a complete install of an ESX 3.5 operating system on a Dell PowerEdge host. I typically walk my students through the installation step by step before we begin, and I still end up walking around the room and confirming with the students that they are on the “right track” during the installation. The biggest danger during the installation is that choosing the wrong LUN on the SAN could result in destroying important data on a drive. This is what we refer to as an RGE, or resume generating event! In addition, the incorrect selection of a NIC that is not actually connected to the management network can result in a new “troubleshooting opportunity.”

To circumvent these issues and infuse you with more confidence while installing the software, VMware has provided a video depicting an installation of ESX 4.0 using the GUI installation. If “a picture is worth a thousand words,” then a video must be worth at least a thousand pictures! The video is included with the ESX 4.0 software, and you can also find it on the web. After watching the video, you can quickly relate the example installation to your own environment and make the appropriate choices. We also highly recommend that you coordinate with your SAN administrator to make sure that you don’t create an RGE.

New Host Profiles

The installation of the software on the host is just the beginning. Once that’s done, there are many decisions to make regarding networking, storage, and security and a multitude of configuration changes to make based on each decision. In many organizations, the decisions that affected one host are the same for all hosts; which means that all of the configuration changes tend to be the same as well. For this reason, VMware has developed a method of capturing a blueprint or template of a known and validated host configuration, including the networking, storage, and security settings, and then using it to simplify the setup of another host and to monitor compliance of all hosts. In addition, you can now make changes in one GUI location that will affect settings on multiple hosts!

Hot Plug Capability

You may have noticed with VI3 that the only component that you could add on a running virtual machine was an additional hard drive. That always made sense to me, and I have always explained that you certainly couldn’t add a new processor or more RAM to a running physical machine, so why should you expect to be able to add those components to a running virtual machine. Well, now I have to change my analogy because VMware has pulled off the once thought “impossible” yet again. With vSphere and ESX 4.0, it is now possible to add processors and RAM to a running virtual machine. It turns out that this is more of a benefit than some had imagined because most organizations limit the number of administrators who are authorized to restart a server and some organizations require a lengthy “political process” to make it happen. Of course, the operating system on the VM must also support the hot-add, and there are a few cases where a restart may be necessary to fully recognize the new resource level. The main thing is that VMware has made this available as an option to be used when it’s politically or operationally expedient.

What’s New in vCenter Server 4.0

VMware vCenter Server 4.0 is the simplest and most efficient way to manage vSphere. This is true whether you have 10 VMs or 1000s of VMs to manage. This is really no different than Virtual Center in VI3 except that vCenter takes it many steps further with the ability manage the newest features such as Linked Mode, Fault Tolerance for VMs, Enhanced Storage VMotion, Distributed Power Management (DPM), and vNetwork Distributed Switch. Next-generation applications such as VMware’s Orchestrator offer a powerful engine that simplifies management by enabling you to automate over 800 common tasks. These new features improve overall efficiency of management and energy efficiency as well.

Linked Mode

In my VI3 Install and Configure class, we begin by installing one ESX host. We then install Virtual Center 2.5 and add that host to the Virtual Center. Later, we add another host and manage the two hosts using one Virtual

Center server. Since Virtual Center 2.5 has a host limitation (about 200 hosts), I've often wondered if we could also install the individual Virtual Centers into another larger container and manage that container. This is what VMware Linked Mode offers. An organization that has many Virtual Center installations, whether because of capacity limitations or political reasons at the time they were created, can choose to "link" those Virtual Center installations together and manage them as a whole in regard to configuration, permissions, and reporting. This is only possible if all of the hosts are upgraded to ESX 4.0 and all of the Virtual Center 2.5 installations are upgraded to vCenter 4.0, but this can be done gradually while realizing more and more of the benefits over time.

Fault Tolerance for VMs

High Availability in Virtual Center 2.5 consists of a "fault tolerant" solution for ESX hosts along with experimental support for VM high availability. I use quotations on the words fault tolerant because Virtual Center 2.5 does not offer 100% fault tolerance for the VMs on an ESX host. Instead, it makes available the automatic restart of the VMs on another host if the host on which the VMs are running should fail. This means that the server VMs and the applications they are providing for your users will go down for a period of time if the host fails. In many cases, this is acceptable, but in some cases it is not acceptable.

vCenter 4.0 allows you to easily configure 100% fault tolerance for a VM. This is accomplished by the simple creation of a Secondary VM on a different ESX 4.0 host. This Secondary VM runs in "lockstep" with the Primary VM so that if the host on which the Primary VM resides should fail, the Secondary VM can immediately assume all of the responsibility of the Primary VM. Therefore, the end users will never know that the host has failed, because their server did not fail! This is extremely easy to configure and can be done regardless of the software that the VM is running.

Enhanced Storage VMotion

VMotion is the capability to move the state of your running VM from one host to another. Storage VMotion is the capability to move your running VMs files to a different datastore. VMotion is easy to configure with the GUI interfaces provided by Virtual Center 2.5. Storage VMotion, another story entirely, requires the use of the command line to configure. In fact, Storage VMotion is so different to configure on Virtual Center 2.5 that we don't even cover it in our Install and Configure course, but instead "push" it to the more advanced Deploy Secure and Analyze (DSA) course.

Enhanced Storage VMotion in vCenter 4.0 provides a GUI interface that makes moving the state and/or the database of a running VM just as easy as a mouse click. However, the already amazing technology behind it has been improved upon in regard to its speed, efficiency, and security. The capability to easily create a VM in one datastore, start it up, test it fully, then move it to another datastore (without the need to shut it down) gives you a new set of options in regard to the installation, testing, and deployment of new servers.

Distributed Power Management (DPM)

Distributed Power Management (DPM) is another feature of VMware that is experimental in Virtual Center 2.5, but fully supported in vCenter 4.0. DPM continuously optimizes power consumption in the datacenter by leveraging the tools of DRS and VMotion. DRS, as you may know, can be configured to monitor the resources on a host and decide whether to move a VM to another host to best utilize the resources available. This is made possible because the VM can be moved using VMotion and the end user will never lose his connection with

his server or realize that any move has taken place. DPM takes this one step further by working with DRS to consolidate workloads to as few hosts as possible to still meet the needs of the VMs on the hosts. The result is that some hosts end up with no VMs and can be automatically powered down for the time being until they are needed again. This allows organizations to cut power consumption and cooling costs, and increases the usable life of the physical equipment. This results in much greater efficiency in the datacenter and an overall savings to the organization.

vNetwork Distributed Switch

In previous versions of VMware, you create virtual switches on a single ESX host, and they only reside on that host. That means that you have to configure the networking of each host and then further configure how that host is connected to your overall network. In vCenter 4.0, the introduction of a vNetwork Distributed Switch that resides in the Datacenter (internal cloud) instead of the host allows you to configure your network as a whole instead of having to configure your ESX hosts individually. Another tremendous benefit of this feature is that it opens the door for third parties to develop switches that you can use as the distributed switch rather than a VMware component. One of the first of these types of virtual switches is the Cisco Nexus 1000v virtual switch. This is a virtual switch with all of the capabilities of a physical switch, such as port security, VLANs, etc., that you can manage from a command line interface (CLI) or through GUI tools. Many more of these types of virtual switches are sure to follow!

Orchestrator

Many tasks that you perform as a VMware administrator are repetitive in nature. In other words, to get the same result you make the same decisions each time. The decisions that you make are often dictated by your organization's structure, equipment, best practices, and so on. For this reason, you do have to make the decisions - at least once! Orchestrator allows you to capture workflows such as those associated with creating a VM, cloning a VM, etc., and "play them back" instead of going through all of the manual steps each time. This results in time savings to you as well as accuracy in regard to the configuration included in the workflows. You can automate over 800 tasks using Orchestrator. Many out-of-box workflows are already available, and you can build your own with a simple drag and drop interface.

New Business Aspects of vSphere 4.0

As usual, the details are in the "fine print." In order to get all of the "bells and whistles" that you need out of those that we've discussed, you have to secure the licenses for the proper edition of the software. There are four editions of vSphere, each with its own list of features and benefits. They are vSphere Standard, Advanced, Enterprise, and Enterprise Plus. These four editions and the main features they offer (or don't offer) are listed below. For a complete comparison you should check the website. http://www.vmware.com/products/vsphere/buy/editions_comparison.html

You should choose your edition and buy the appropriate licenses based on the features offered by each edition and your current and projected needs. The specific pricing of your licensing is a detail that you should discuss with your VMware representative. As always, you should check the Systems Compatibility Guide <http://www.vmware.com/resources/compatibility>, which is updated by VMware every Wednesday morning like "clockwork." Keep in mind that ESX 4.0 is a 64-bit operating system that requires a 64-bit host, but don't assume that a 64-bit host that you have been using for ESX 3.5 will work. Rather, you should check the guide carefully to make

sure that your host and all of its components are supported for vSphere 4.0. The beauty of VMware is that if you provide the supported physical hardware, then the virtual components will take care of themselves. This has never been truer than with the new ESX 4.0 and vSphere 4.0!

Feature	Standard	Advanced	Enterprise	Enterprise Plus
Host Profiles	NO	NO	NO	YES
vNetwork Distributed Sw.	NO	NO	NO	YES
DRS w/ DPM	NO	NO	YES	YES
vMotion	NO	YES	YES	YES
Enhanced Storage VMotion	NO	NO	YES	YES
Fault Tolerance for VMs	NO	YES	YES	YES
Hot Add for Proc. and RAM	NO	YES	YES	YES

Conclusion

To sum it up, VMware has made major improvements to the V13 suite of products and released a new and exciting offering called vSphere; which will be with us for some time to come. There are over 150 new features and they are "across the board," ranging from the overall product and its packaging to the management interfaces that you use to configure it. To obtain the features that you need, you just select the most appropriate edition of the software.

ESX 4.0 has a new installation video to make it easier for you to install a host correctly the first time and new host profiles to make it much easier for you to install similar hosts. The VMs created on vSphere 4.0 can be more powerful than ever before; with huge configuration maximums and the ability to hot-add not just drives but also RAM and even processors. vCenter has much of the same look and feel as Virtual Center 2.5, but allows you to manage new and innovative tools such as Linked Mode, FT for VMs, Enhanced Storage VMotion, DPM, and vNetwork Distributed Switch. Orchestrator allows you to take the tedium out of performing the same tasks over and over; instead, you can use your imagination to create the network that you need.

Your biggest decision is which edition of vSphere fits your organization best. Whether you choose the Standard, Advanced, Enterprise, or Enterprise Plus edition - you can be assured that you are purchasing a high-quality product. Therefore, your decision should be based on whether you will use the features offered by the each of the editions. If you take care to assure that your hardware is in the Systems Compatibility Guide, you will likely find that VMware has already done a lot of the preparation for you.

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About the Author

Bill Ferguson has been in the computer industry for over 20 years. Originally in technical sales and sales management with Sprint, he made his transition to Certified Technical Trainer in 1997. In addition to teaching for Global Knowledge, Bill writes and produces technical training videos, which include A+, Network+, Windows 2003 Management, Windows XP Management, Windows 2003 Security, Server+, and Interconnecting Cisco Network Devices, available on the web.

Bill has also authored several books, including the 70-298 Exam Cram 2 title (Designing Security for a Windows Server 2003 Network) for Que Publishing and he co-wrote the security related 70-297 and 70-299 Exam Cram 2 titles. Most recently, he wrote the Microsoft Certified Desktop Support Technician (MCDST) Study Guide for Sybex Inc., as well as their latest Network+ 2009 Objectives Review Guide book. His aspiration is as follows: "My job is to understand the material so well that I can make it easier for my students to learn than it was for me to learn."