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Upgrading to ESXi 5.1: Best Practices

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Bill Ferguson, VCI3, 4, 5

Introduction

If you are upgrading to ESXi 5.1, there are some important facts that you should consider first. Upgrading involves many stages and processes that must be performed in a specific order. Many of these processes are one-way and do not provide a "back button." If you do not use care and consideration in your upgrade plan, you could possibly lose important data and configuration, and potentially even lose contact with your servers. Understanding how to upgrade properly will ensure that you endure as little downtime as possible on each of your vSphere components.

This white paper covers several topics to consider when Upgrading to ESXi 5.1, including:

    Why are you upgrading?

    What are you upgrading?

    What should you do to get ready?

    What is the correct upgrade process?

    What should you do after the upgrade is complete?

This paper is not meant to be a complete guide; but it covers the most important topics and provides links to more detailed information on each key point.

Why Are You Upgrading?

If you are upgrading to vSphere 5.1, chances are good that it's because vSphere 5.1 has features and benefits that you don't have with your current version of VMware software. This paper is not long enough to even begin a discussion on all of the features and benefits that are available to you on vSphere 5.1 if it is installed properly. The bottom line is that you likely want to perform an installation or upgrade that will afford you the features and benefits that you want with as few headaches as possible.

What Are You Upgrading?

Whether you are upgrading from vSphere 4.x or vSphere 5.0, you need to understand the differences between what you have and what will be available after the upgrade. Of course, there are many new features and benefits available in vSphere 5.1 that were not part of earlier versions of vSphere; but you should also understand that

some of what you may have become accustomed to using has been changed in the later versions of vSphere. These changes may not be as dramatic if you are upgrading from vSphere 5.0 rather than from vSphere 4.x.

One of the biggest differences that you will notice if you are upgrading from vSphere 4.x to ESXi 5.x is that ESX is no longer available. This means that the service console, a modified version of Red Hat Linux software, is no longer used. The service console has long been used for a management tool as well as a development environment. The service console has been replaced by a management console that you connect to using a vmkernel port. Also, if you are concerned about where you will use your scripts, you have several options for development, including the vCLI, vSphere Management Assistant (VMA), and even a PowerShell-based PowerCLI. The end result is that you will have a smaller and more secure management platform and still have plenty of tools for development.

On the other hand, if you are upgrading from vSphere 5.0 to vSphere 5.1, then your biggest differences may seem small in comparison to upgrading from vSphere 4.x. This might be especially true if you have a relatively small network. Still, there are differences that you will have to consider in regard to user accounts and authentication and even with regard to setting a vCenter Administrator account. If this has piqued your interest, then keep reading!

What Should You Do to Get Ready?

Due to changes in the software architecture, not all of the configuration files, settings, and third-party tools are guaranteed to be migrated to ESXi 5.x. Because of this, VMware strongly recommends that you note all of your configuration modifications and customizations before performing the upgrade. As a best practice, you should backup any virtual machines (VMs) that are located on the local storage of your ESX/ESXi hosts.

In addition, when you are migrating to ESXi 5.1, you should ensure the following:

- Supported server platform. For a list of supported platforms, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility/search.php.

- Supported 64-bit CPU with at least two cores

- Support for LAHF and SAHF CPU instructions

- NX/XD bit enabled for the CPU in the BIOS

- To support 64-bit Guest OS on VMs, Intel VT-x, or AMD RVI must be enabled

- Minimum 2GB of physical RAM; 8GB is recommended

- One or more Gigabit or 10Gbps Ethernet controllers. For a complete list of supported controllers, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility/search.php.

- SCSI disk or local RAID LUN (with unpartitioned space)

- Supported disk controllers include basic SCSI controllers, Adaptec Ultra-160 or Ultra-320, LSI Logic Fusion-MPT, or most NCR/Symbios SCSI. Supported RAID controllers include Dell PERC, Adaptec RAID, LSI Logic MegaRAID, HP Smart Array, or IBM ServeRAID controllers. For a complete list of supported controllers, see the VMware Compatibility Guide at http://www.vmware.com/resources/compatibility/search.php.

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- SATA, SAS, and SCSI are supported. IDE is not supported for disk. To use a SATA CD-ROM device on the host as a VM drive, you must use IDE emulation mode.
- Unified Extensible Firmware Interface hosts can boot from CD-ROM drives or USB media. Network booting or provisioning with VMware Auto Deploy requires legacy BIOS firmware.

Since that's a long laundry list, you might need some help! One of the tools you can use to get ready is the **vCenter Host Agent Pre-Upgrade Checker**. You can run this tool from your vSphere Client to check whether the host is reachable, the disk space is sufficient, the network is functioning, the file system is intact, and required patches are applied. A successful check does not guarantee a successful upgrade, because the vCenter Host Agent Pre-Upgrade Checker only looks for known issues; but it's a good start, whether you are planning on upgrading the hosts individually or using vCenter Update Manager. The vCenter Host Agent Pre-Upgrade Checker does not "fix" anything; instead, you must resolve the issues that it finds and then run the tool again to verify that they are fixed.

To enhance the performance of your host, VMware recommends that you also consider the following:
- **CPU -** Faster processors and larger caches improve performance. More cores will also enhance performance, but a VM will only obtain a maximum processing power equivalent to one physical core for each vCPU, so faster cores can make faster VMs.
- **RAM -** The more the better! You can have up to 2TB of RAM if your host supports it. You should consider using a minimum of 8GB of RAM on each host, so as to take full advantage of the new features in ESXi 5.1 and vSphere 5.1.
- **Network -** Place the management network and the VM network on separate physical cards. Consider using a card dedicated to a specific VM when necessary for maximum network performance.
- **Disk -** Do not place your VM files on the same physical disk as that of the ESXi host. Use physical disks that are easily large enough to hold all of the VM files and templates that you use. You will have better performance and fewer headaches.

In addition to hardware and performance considerations, there are other significant changes that will affect your upgrade and your use of vSphere 5.1, especially if you have more than one vCenter. There is a new **Single Sign On** service that increases security and control by allowing the software components to communicate with each other through a secure token mechanism. Depending on the size and complexity of your installation, there may also be a changed setting for the vCenter Server Administrator(s) of your organization.

Single Sign On

When you upgrade to vCenter Server 5.1, the upgrade process will install vCenter Single Sign On first and then upgrade vCenter Server. **You cannot assume that the local user accounts and Active Directory (AD) accounts that were pre-populated by the earlier version of vCenter will continue to work.** If your vCenter is joined to an AD domain at the time that the Single Sign On software is installed, then that AD domain should be discovered and its identity added. If this does not occur, then you will need to logon to the vCenter Server through the vSphere Web Client and add the AD domain to Single Sign On. Also, before you begin the upgrade process, you should make sure that all of your vCenters and hosts have their clocks synchronized to a reliable NTP server. This will avoid certificate and AD errors caused by a lack of time synchronization.

For more information about these tasks, you should search for **pubs.vmware.com** and then for **vSphere 5.1 Security**.

Configuring a vCenter Administrator

It may seem unusual to be required to configure a vCenter Administrator as part of an upgrade but, because of the function of the Single Sign On authentication system, you should be ready for this issue. In vSphere versions prior to vSphere 5.1, vCenter Administrators are by default the users who belong to the local OS's administrators group. In contrast, when you install vCenter Server in vSphere 5.1, you must provide the default (initial) vCenter administrator user or group. In this way, you have greater control and do not inadvertently give administrative control of your vCenter machine to Domain Admins who have no VMware experience.

In a small installation with one vCenter server and Single Sign On within the same box, the default setting is to designate the group Administrators as the vCenter Server administrative user. The assumption is that it's the same person or group. For larger installations, where vCenter Single Sign On and vCenter Server are deployed on different hosts, you cannot preserve the same behavior as in vCenter 5.0. Instead you will need to assign the vCenter Server administrator role to a user or group from a registered identity source. This source could be a vCenter Single Sign On server, AD domain controller, or other OpenLDAP server. You can add multiple AD, or OpenLDAP domains to a single vCenter Server 5.1. For more information about these new features read the pdf on vSphere 5.1 Security by searching for **pubs.vmware.com** and then for **vSphere 5.1 Security**.

What Is the Correct Upgrade Process?

Going by the book, the upgrade process is precisely defined and should be followed in a specified order and manner whenever possible. In real life, other options and challenges always exist that might come into play in your organization. If you want to upgrade to vSphere 5.1 with the least possible headaches, you should perform the following steps in their precise order:

1. Upgrade vCenter
2. Upgrade vSphere Client
3. Upgrade vCenter Update Manager
4. Upgrade Hosts
5. Upgrade VMware Tools for VMs
6. Upgrade Virtual Machine Hardware

Now let's look at each of these steps a little closer and discuss some considerations and issues for each one.

Upgrading vCenter

VMware supports in-place upgrades to vSphere 5.1 on 64-bit systems from vCenter 4.x and vCenter Server 5.0. On average, you should expect your vCenter to be down for about 40 to 50 minutes. This includes reconnecting the database. During this time, your ESX/ESXi hosts and VMs will continue to function as normal. High Availability (HA) will still be functional if it is configured; but Distributed Resource Scheduler (DRS) will not function without vCenter.

Unlike earlier versions, vCenter Server 5.1 does not support directly migrating an existing vCenter Server to a new machine (physical or virtual) during an upgrade. In addition, if you are using Windows XP Professional x64 for your vCenter Server in 5.0, then you will need to choose a compatible server OS instead, because vSphere 5.1 does not support using Windows XP x64 as a vCenter Server.

As I mentioned before, you will have to make a decision in regard to your Single Sign On server when upgrading vCenter Server. There is a lot to be considered and known here, especially in a large organization. I would highly recommend that you search the latest links and forums regarding Single Sign On BEFORE you upgrade your vCenter! You can upgrade your vCenter in-place by installing the latest version from the vSphere Installation Manager (VIM) software package.

Upgrading vSphere Client

As part of the upgrade, you will install a new vSphere Client and a new vSphere Web Client. The difference is that in previous versions you were likely just installing the Web Client because it was there; but now you will actually begin to use it more. In fact, you will have to use it to take advantage of many of the new features that vSphere 5.1 offers, such as shared-nothing vMotion! You can upgrade both of these components in place using the VIM software package.

Upgrading vCenter Update Manager

While there are many ways to upgrade your hosts and VMs (interactive, scripted, and so on), the best method and the one with the fewest potential headaches is to use the vCenter Update Manager (VUM). The VUM for 5.1 can easily upgrade your 4.x and 5.0 ESXi hosts and even your 4.x ESX hosts! To take advantage of what VUM has to offer, you should upgrade VUM by installing the latest version from the VIM software package. VUM for vSphere 5.1 requires a 64-bit OS. If you are running an earlier version of VUM on a 32-bit platform, then you will have to do a new installation. After installing/upgrading VUM, you should also upgrade the VUM plug-in in your new vSphere Client. Again, I recommend that you read all of the latest release notes FIRST; such as the ones on the link below:

http://www.vmware.com/support/vsphere5/doc/vsphere-update-manager-51-release-notes.html

Upgrading Hosts

When you upgrade from ESX 4.x to ESXi 5.x, the upgrade process preserves as much of the ESX host configuration as possible. Because of the architectural differences between ESX 4.x and ESXi 5.x, many configuration files cannot be migrated. If a host contains customizations such as special VMware Infrastructure Bundles (VIBs) or drivers, this will further complicate the process. In addition, there are a significant number of firewall configuration changes and the firewall rulesets are replaced by new rulesets. Also, since the ESXi 5.x hosts will use more memory than the previous host, the Resource Pool settings might be sufficient for all VMs; especially if you are using all or close to all of the resources on the host. Additionally, network changes cannot be ignored, especially if you are upgrading from ESX 4.x to ESXi 5.x. In this case, the Service Console and Service Console port will be removed and replaced by a vmkernel port that is configured for Management. While it's possible to upgrade your hosts in many ways (esxcli commands, scripted, auto deploy, and so on) using VUM will give you the best chance of having a functional ESXi 5.x host when the upgrade is finished.

Finally, you haven't really successfully upgraded the hosts until they are reconnected to their respective managing vCenter Servers, and each host license is reapplied or upgraded. You should perform the following steps, after you have upgraded or migrated your hosts and **BEFORE** you upgrade your VMs.

- If vCenter Server manages the host, reconnect the host to the vCenter by right-clicking the host and selecting **Connect**.

- View the upgrade logs. You can use the vSphere Client to export the logs and view them for any anomalies that stand out. You don't have to understand all of the verbose information to see something that just doesn't seem proper, such as a storage error or an error affecting HA.

- Reapply the license or note the number of days that you still have in evaluation mode. You only have 60 days from the time you originally powered on the host. You can use the License Portal on the VMware page and your new vSphere Client to upgrade your license.

- Run the command **esxcli storage claimrule convert** on your vSphere CLI to convert any ESX 3.x-style /adv/Disk/MaskLUNs LUN masks to the claim rule format used with ESXi 5.1.

Upgrading VMware Tools for VMs

VMware Tools is a suite of utilities that you can install in the OS of a VM. VMware Tools enhances the performance of the VM and makes many of the ease-of-use features possible, such as shutting down VMs without first logging in. In addition, VMware tools provides improved memory control, improved mouse performance, and synchronization of the clock on the VM with that of the host. This is still just a subset of the benefits provided by VMware Tools. Suffice it to say that VMware Tools should be installed whenever possible on all VMs.

Once you have VUM installed and upgraded, you can use VUM to easily upgrade the VMware Tools to match the current version of your host and the VMs that are supported on that type of host. In this example, you are upgrading the VMware Tools on the VMs to support the Version 9 virtual hardware that you will be upgrading to and using on the Version 9 VMs that will be on the ESXi 5.1 host. Even though you are planning ahead for the next version of virtual hardware, you should always update the VMware Tools first and then the virtual hardware. With Windows and Linux operating systems, after you have upgraded the VMware Tools, you must reboot the system or at least re-load the network modules (in Linux). You should understand that Version 9 virtual hardware will only be compatible with ESXi 5.1 hosts. **If you don't plan to upgrade all of the hosts in a cluster, you might want to hold off on upgrading the VMs.**

Upgrading Virtual Machine Hardware

The final step that you can perform with VUM is upgrading the VM hardware to match the host. If you have decided that you want to upgrade the VMs, and have already upgraded the VMware Tools, then you can select this option in VUM, and the virtual hardware on the VMs will be upgraded. You should, of course, plan for some downtime of the VMs during the upgrade of the VM hardware as well as during the upgrade of the VMware Tools. Once you are upgraded to vSphere 5.1, you should be able to update your VMware Tools on most of your VMs without downtime; as that is one of the new features!

What Should You Do After You Upgrade?

You will have other upgrade concerns if you are using the vCenter Appliance, which cannot be upgraded with the VUM but must be reinstalled and reconnected to your database. In addition, you may need to manually

install or upgrade VMware Tools on Linux, Solaris, or Netware VMs. For more information about these additional upgrade steps, search for the pdf at **vSphere Upgrade 5.1 - Documentation**.

In addition, upgrade steps that you can take later on include upgrading your VMFS-3 datastores to VMFS-5 and upgrading your vSphere Distributed Switches. These are steps that do not have to be performed at the time of the initial upgrade but can be performed very quickly and easily once all your hosts are upgraded, the time is right, and there is a need for the new version. In fact, you may never elect to perform these upgrades on some of your datastores and switches.

The final thing that you should do is begin to enjoy the features and benefits available in your new vSphere 5.1 environment. To find all the latest information, simply search for **What's New in vSphere 5.1** and then follow the VMware links to pdfs and information pages. Don't forget to upgrade the remainder of your environment when the time is right to take advantage of the latest that VMware has to offer!

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> VMware vSphere: Install, Configure, Manage [V5.1]
>
> VMware vSphere: Optimize and Scale [V5.1]

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About the Author

Bill Ferguson, VCI3, 4, 5, MCT, MCSE, MCP+I, CCSI, CCNA, A+, Network+, Server+, Security+ has been in the computer industry for over 20 years. Bill runs his own company as an independent contractor in Birmingham, Alabama, teaching classes for many national training companies, including Global Knowledge. Additionally, Bill has written and produced many technical training videos including: A+, Network+, Windows 2000 Management, Windows XP Management, Windows 2000 Security, Server+, and Interconnecting Cisco Network Devices. He also wrote the 70-298 Exam Cram 2 (Designing Security for a Windows Server 2003 Network) for Que Publishing. In addition, he wrote the Microsoft Certified Desktop Support Technician (MCDST) Study Guide for Sybex Inc. and several Network+ titles. Most recently, he wrote The Official VCP5 Certification Guide (Pearson/VMware Press). Bill says, *"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; whether I'm teaching in person, online, or in print."*