
12

UPGRADING TO vSPHERE

If you have an existing VI3 environment, at some point you'll probably want to upgrade it to vSphere. Before jumping right into the upgrade process, though, there are many considerations and requirements that you should be aware of. Once you are aware of everything you need to know, you should then put together a plan for how you are going to proceed. Upgrading to vSphere is fairly straightforward, but there are many gotchas that can make the process more difficult. To avoid surprises during the upgrade, you should properly prepare and know all the steps so that your upgrade is trouble-free and uneventful. In this chapter, we will cover considerations and steps for upgrading your existing virtual environment to vSphere.

COMPATIBILITY CONSIDERATIONS

There are many things to consider when upgrading your VI3 environment to vSphere, such as hardware and software compatibility and upgrade methods. You should spend some time researching this to ensure that you have all your bases covered beforehand. Finding out after you upgrade that some of your management tools are not compatible with vSphere can make things very difficult. Upgrading is a much simpler process than downgrading, so make sure you consider everything before beginning your upgrade.

HARDWARE COMPATIBILITY

Your server and storage hardware may be supported in VI3, but don't assume that it's supported in vSphere. Check VMware's online Hardware Compatibility Guide to make sure all your hardware components are supported in vSphere. This includes servers, I/O adapters, and storage devices. You may be able to get away with using servers that are not listed in the guide, but it's critical that your I/O adapters and storage are listed. Refer to the Importance of the Hardware Compatibility Guide section in Chapter 11 for more information on this. The other consideration that you need to be aware of in regard to hardware is the requirement for 64-bit hardware. See the section Selecting Physical Host Hardware to Use with vSphere in Chapter 2 for more information on this.

You should also be aware that the following features in vSphere require very specific hardware.

- **Hardware iSCSI**—Very few hardware iSCSI initiators are supported, and most of them are based on the QLogic adapters. Be sure to check the Hardware Compatibility Guide before using one, because if it is not listed, vSphere will see it as a network adapter instead of a storage adapter.
- **Fault Tolerance (FT)**—This requires very specific CPU families from Intel and AMD. See VMware Knowledge Base article 1008027 (<http://kb.vmware.com/kb/1008027>) for a list of supported CPUs. You can read more about the FT feature in Chapter 10.
- **VMDirectPath**—This requires specific chipset technology from Intel and AMD that supports Intel VT-d or the AMD I/O Memory Management Unit (IOMMU). You can read more about VMDirectPath in Chapter 2. Intel VT-d has been available for some time, but AMD finally released IOMMU in the HP ProLiant G7 servers.

SOFTWARE AND DATABASE COMPATIBILITY

When upgrading vCenter Server you should be aware that the requirements have changed in vSphere and some older operating systems and databases are no longer supported. vCenter Server 4.0 no longer supports SQL Server 2000 and requires either SQL Server 2005 or 2008. Consequently, if your vCenter Server 2.5 is using a SQL Server 2000 database, it will complicate the upgrade process.

Migrating the database to SQL Server 2005, which is supported with both vCenter Server 2.5 and 4.0, is the easiest method. If you plan to use SQL Server

2008, though, because vCenter Server 2.5 does not support SQL Server 2008 you will have to shut down the vCenter Server, migrate the database to SQL Server 2008, change the ODBC data sources, and then install vCenter Server 4.0. If you are using the built-in MSDE database with vCenter Server 2.x, it will automatically be upgraded to SQL Server 2005 Express. Optionally, you can migrate it to another supported database format before upgrading.

In addition, beginning with vSphere 4.1, vCenter Server is only supported on a 64-bit Windows operating system. So, if you do not have a 64-bit Windows OS, you must use vSphere 4.0 instead. See Chapter 11 for more information on this. Also be sure to look at VMware's Compatibility Matrix (www.vmware.com/pdf/vsphere4/r40/vsp_compatibility_matrix.pdf) to learn more regarding compatibility of the various vSphere components.

THIRD-PARTY APPLICATION COMPATIBILITY

If you are using any third-party applications (e.g., backup, management) with vSphere, make sure you check to see if they are supported in vSphere. A newer version may be available that is supported in vSphere. Also, if you are using vendor-supplied hardware management agents running inside your ESX Service Console, check for a newer version of them that supports vSphere. Using older versions can cause hard crashes of your ESX server.

VMWARE PRODUCT COMPATIBILITY

When vSphere first came out many of the VMware companion products did not support it yet. Products such as Lab Manager, View, and SRM only worked with VI3 and required newer releases before they supported vSphere. Most of those products now support vSphere, but it's always best to check first, especially if you are using a newer version of vSphere, such as 4.1. VMware publishes a Software Compatibility Matrix (http://partner-web.vmware.com/comp_guide/docs/vsphere_Comp_Matrix.pdf) that you can use as a reference.

PLANNING AN UPGRADE

Careful planning will make your upgrade go much more smoothly; without a solid plan your upgrade could turn into a nightmare. There are several methods that you can use to upgrade your environment, and the one you use will depend

on several factors, such as acceptable downtime and disruption to the environment, how much extra capacity you have, and whether you are using new hardware. The upgrade to vSphere has three main phases that are done in sequential order, so you need to keep this in mind when planning your upgrade.

UPGRADE PHASES

There is a definite order to follow when upgrading your environment. Think of the upgrade process as a pyramid, with vCenter Server being at the top, ESX and ESXi hosts in the middle, and virtual machines (VMs) at the bottom, as shown in Figure 12.1.

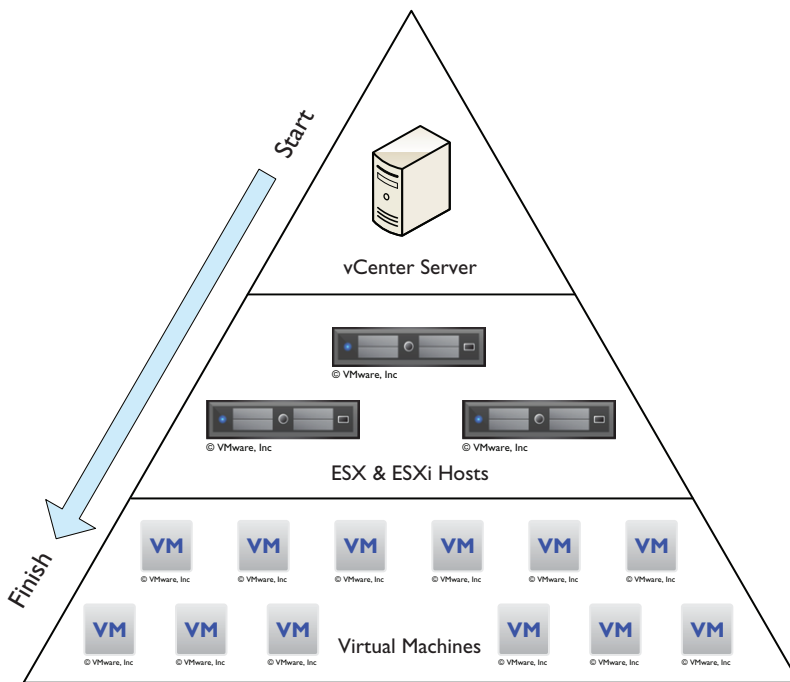


Figure 12.1 Upgrade order of a virtual environment, starting with vCenter Server

As a precursor, though, you should ensure that you identify and plan on any hardware upgrades that you may need to make to support vSphere. This could include memory upgrades, adding supported NICs and storage controllers, and upgrading hardware firmware levels. Additionally, you should plan to upgrade any third-party tools and agents at whatever point makes sense

depending on their backward-compatibility support. VI3 and vSphere are backward-compatible, but not forward-compatible. For example, a vSphere 4 vCenter Server can manage VI3 VMs, but a VI3 vCenter Server cannot manage vSphere 4 hosts. The same holds true with the client: The vSphere Client 4 can be used with the VI3 vCenter Server and host, but the VI3 Client cannot be used with vSphere 4. All of these compatibilities are listed in VMware's Compatibility Matrix (www.vmware.com/pdf/vsphere4/r40/vsp_compatibility_matrix.pdf). Here is more information on each upgrade phase.

- **Upgrade Phase 1, vCenter Server**—This is where you should start your upgrade, as vCenter Server is at the top of the compatibility pyramid. Once you upgrade your vCenter Server to vSphere, you must upgrade your VI3 Clients to the new vSphere Client. If you try to access a vSphere host or vCenter Server with a VI3 Client, you will be prompted that you must upgrade it first. Once you upgrade your vCenter Server, you can proceed with upgrading the rest of your environment.
- **Upgrade Phase 2, ESX and ESXi hosts**—You will most likely not be upgrading all your hosts at once, unless you have a small environment. vSphere hosts and VI3 hosts can coexist in the same cluster, and features such as VMotion and High Availability (HA) will still work. But although they can coexist, you should try to minimize the amount of time in which you have a mixed environment, because there are more risks of issues occurring due to differences between the versions.
- **Upgrade Phase 3, Virtual Machines**—Upgrading VMs consists of upgrading the virtual hardware from version 4 that is used in VI3 to version 7 that is used in vSphere. In addition, you should upgrade VMware Tools on each VM to whatever vSphere version you are running on your host. However, if you are running a mixed environment of hosts and there is a possibility of a VM moving from a vSphere host to a VI3 host due to a Distributed Resource Scheduler (DRS) or HA event, you should not upgrade the virtual hardware and VMware Tools to version 7. You should instead wait until all your hosts are upgraded to vSphere, because although a vSphere host can support either version, a VI3 host can support only the VI3 version of virtual hardware and VMware Tools.

UPGRADE METHODS

There are several ways you can upgrade your environment. Which one you use will depend on the following factors:

- **Downtime**—How much VM downtime you are willing to experience
- **Capacity**—Whether you have enough extra host capacity to move VMs around on hosts so that you can shut hosts down
- **Hardware**—Whether you are using new hardware for your vSphere hosts or reusing your current VI3 hardware

These factors will help determine whether you should do a fresh install or an in-place or migration upgrade when upgrading to vSphere.

Upgrade or Fresh Install

One decision you will have to make is whether to upgrade your existing hosts and vCenter Server or start fresh with a new installation. There are pros and cons to each method. For instance, a fresh install ensures that your hosts and vCenter Server are cleaner, with no residual files that you may have collected from the previous version. However, a fresh install requires that you reconfigure settings and other things that may have been wiped out. For ESX and ESXi hosts, you must reconfigure such things as your virtual networking, local user accounts, and DNS, time, security, and advanced settings. If you have any scripts or agents in the ESX Service Console, you must also reinstall them. Your VMFS datastores will not get overwritten unless you choose to do so, so all your VMs will remain intact once the host is upgraded. Optionally, if you have hosts with spare capacity, you can cold-migrate or VMotion the VMs to those hosts while you perform the upgrade. If you have simple virtual networks and are mostly using default settings on your hosts, a fresh install might make more sense.

For vCenter Server, if you perform a fresh install you will lose all the configuration settings that are unique to vCenter Server, such as clusters, DRS, HA, roles, and permissions, as well as all historical performance statistics for hosts and VMs. This information is stored in the vCenter Server database, which can get quite large over time. For this reason, many people like to start with a fresh database so that all the old data in the database does not carry over to the new server. As part of the upgrade, the vCenter Server database schema is modified and elements such as tables, views, and stored procedures are updated. Again, if your environment is smaller and you don't mind losing your old performance data and reconfiguring things, a fresh install might be the way to go.

The process for this is fairly straightforward. You just remove your hosts from vCenter Server, shut down vCenter Server and install a fresh copy with a fresh

database, and then add your hosts back into vCenter Server and reconfigure your settings. Optionally, you can also build a new vCenter Server and leave your existing vCenter Server in place, and then migrate hosts to it one by one.

The disadvantage of fresh installs is that you have more downtime and disruption in your virtual environment and you have to reconfigure all your settings. There are typically a lot more settings in vCenter Server than in ESX and ESXi, and many people do not want to lose their performance data, so many will do fresh installs for ESX and ESXi hosts but not for vCenter Server. If you've upgraded your hosts and vCenter Servers several times in the past, you might want to take advantage of fresh installs to get rid of all the crud that may have carried over each time and was never cleaned up. If you do choose to do a fresh install, make sure you document all your settings so that you know what to reconfigure afterward.

In-Place Upgrade or Migration Upgrade

There are two methods for upgrading hosts and vCenter Servers. You can choose to upgrade them in-place, or build a new environment and migrate your VMs to it. The decision here is highly dependent on whether you have extra hardware available, or if you have enough spare capacity on your hosts to hold your VMs while you shut down the hosts. If you run vCenter Server as a VM, you don't have to worry about extra hardware for that, but you'll need extra host hardware or enough spare capacity.

There are two ways to do a migration: with a new vCenter Server or using an existing vCenter Server. To migrate with a new vCenter Server, you set up a new vSphere environment with a new vCenter Server, and then configure clusters and other settings and move hosts from the old vCenter Server to the new one. You can do all of this while the host is running, without incurring any downtime for the VMs. To upgrade the hosts, you will need to move the VMs off of them or shut them down while you perform the upgrade. Here are some methods you can use to migrate to a new environment with a new vCenter Server. These methods all require shared storage that all hosts can access.

The following method moves 3.x hosts with VMs to vCenter Server 4.0.

1. Build a new vCenter Server 4.0.
2. Disable HA and DRS on the 2.x vCenter Server (unless you have plenty of spare capacity).
3. Configure clusters and settings on the new vCenter Server 4.0.

4. Disconnect a 3.x host from the vCenter Server 2.x.
5. Add the 3.x host to the new vCenter Server 4.0.
6. Continue the process until all 3.x hosts are moved to the new vCenter Server 4.0.
7. Shut down the 3.x hosts and upgrade them to vSphere 4.0. If you have enough capacity, you can do this as a rolling upgrade to reduce or eliminate VM downtime.

The following method moves 3.x hosts without VMs to vCenter Server 4.0.

1. Build a new vCenter Server 4.0.
2. Disable HA and DRS on the vCenter Server 2.x (unless you have plenty of spare capacity).
3. Configure clusters and settings on the new vCenter Server 4.0.
4. Move all VMs from the 3.x host to other hosts in the cluster and disconnect the 3.x host from the 2.x vCenter Server.
5. Rebuild the 3.x host with vSphere 4.0.
6. Add the new 4.0 host to the 4.0 vCenter Server.
7. Remove VMs from inventory (you don't need to shut them down) on 3.x hosts managed by the vCenter Server 2.x.
8. Add VMs to 4.0 hosts managed by the vCenter Server 4.0.
9. Repeat until all 3.x hosts have been upgraded.

These methods become easier if you have new or unused existing server hardware onto which you can install ESX or ESXi 4.0. You would then add the new hosts to the new vCenter Server 4.0 and just move the VMs to the new hosts without shutting down the 3.x hosts in the old environment. The other methods involve having only one environment with only one vCenter Server and are considered an in-place migration. These methods use a single vCenter Server that has been upgraded to vSphere 4.0.

The following method moves VMs to other hosts while upgrading.

1. Move VMs from a 3.x host to other 3.x hosts in the same cluster.
2. Shut down the vacated 3.x host and upgrade it to vSphere 4.0.
3. Power on the new 4.x host.
4. Move VMs from the 3.x host to the new 4.0 host.
5. Continue the process until all hosts are upgraded to vSphere 4.0.

The following method shuts down VMs on the hosts while upgrading.

1. Shut down the VMs on the 3.x host.
2. Shut down the 3.x host and upgrade it to vSphere 4.0.
3. Power on the new 4.0 host.
4. Continue the process until all the hosts are upgraded to vSphere 4.0.

To move VMs from one host to another while they are powered on, you can use the VMotion feature if the VMs are on shared storage. For VMs on local storage you can either shut them down and cold-migrate them, or use Storage VMotion (SVMotion) and VMotion together if you have shared storage to move them to other hosts. Using SVMotion to move VMs on local storage to other hosts is a multistep process, but it does avoid downtime. Here's how to do it.

1. Use SVMotion to move the VM from local storage on Host A to shared storage on Host A.
2. Use VMotion to move the VM from Host A to Host B on the same shared storage.
3. Use SVMotion to move the VM from shared storage on Host B to local storage on Host B (or keep it on shared storage).

Once you decide on a method that meets your requirements, you can begin the upgrade of your virtual environment to vSphere.

UPGRADE TECHNIQUES

Once you are ready to begin upgrading your environment, you should try to test the upgrade process first so that you are comfortable with it. If you have a dedicated test virtual environment, that is the perfect place to start. If not, and you have some extra hardware, try downloading an evaluation copy of VI3, installing it, and then upgrading it to vSphere. Even if you don't do this, you can install vCenter Server 2.x on a VM and practice upgrading it to vSphere. Otherwise, you might try the upgrade first on noncritical hosts that you can afford to have more downtime with in case you run into problems with the upgrade. Read the vSphere Upgrade Guide on VMware's website for the version that you are using; for 4.0 Update 1 the guide is located at http://vmware.com/pdf/vsphere4/r40_u1/vsp_40_u1_upgrade_guide.pdf. Pay very careful attention to the database steps when upgrading vCenter Server as this can be the trickiest part of the upgrade.

ROLLING BACK TO PREVIOUS VERSIONS

It is possible, but not easy, to roll back to previous versions once you have upgraded them. Therefore, before you upgrade a host, vCenter Server, or VM, be absolutely sure you are ready to do it.

Rolling Back vCenter Server

For vCenter Server, it is critical to back up the SQL database before you upgrade; otherwise, once you upgrade it, you cannot go back to the old database schema. Here are the steps for rolling back vCenter Server to a previous version.

1. Completely uninstall vCenter Server 4.0.
2. Restore the vCenter Server 2.x SQL database.
3. Install vCenter Server 2.x and tell it to use an existing database, and select your restored 2.x SQL database.
4. Reconfigure your license server with your 3.x license files.

Rolling Back ESX Hosts

Rolling back to a previous ESX version can be tricky, but it is possible. In most cases, it is easier to just reinstall ESX 3.x. Otherwise, if you want to roll back, here are the steps.

1. In the ESX Service Console, run the `/usr/sbin/rollback-to-esx3` command which reconfigures the bootloader to boot the previous ESX 3.x version. The `-f` parameter forces the rollback and suppresses the confirmation message. Once you run the command, you can no longer boot to ESX 4.0.
2. Reboot the host and it will boot to ESX 3.x.
3. Once the host boots to ESX 3.x, delete the ESX 4.0 Service Console VM folder (`esxconsole-<UUID>`) from the VMFS datastore.

Rolling Back ESXi Hosts

Rolling back to a previous ESXi version is much simpler because it is stored as a single image and ESXi always saves a copy of the previous version image whenever upgrading. Only one previous build is ever stored, and once you revert back to a previous version, it is irreversible; to go to a newer version you must reinstall it. The steps for reverting back to a previous ESXi version are as follows.

1. Reboot the ESXi 4.0 host.
2. When you see the page that displays the current boot build, press Shift-r to select the standby build.
3. Press Shift-y to confirm the selection, and press Enter.

Rolling Back VMs

For VMs, if you upgrade their virtual hardware from version 4 that is used by VI3 to version 7 that is used by vSphere, be aware that this is irreversible. If you snapshot the VM before upgrading it, it is possible to roll back if you revert to the snapshot. There is also a workaround to go back to version 4 using vCenter Converter, as outlined in the following steps.

1. Install vCenter Converter on a workstation and run it.
2. Run the Convert Machine Wizard. For the source, specify a VM type and a vCenter Server/host to connect to on which the VM is located.
3. For the destination type, select a VM and choose the same vCenter Server/host.
4. On the Host/Resource page, give the VM a different name and choose the VM hardware 4 version.
5. Once the process completes, power on the new VM, verify that it works, and then delete the original VM. Once you delete the original VM, rename the new VM to the original VM's name.

PRE-UPGRADE CHECKLIST

Before you upgrade any part of your virtual environment there is a pre-upgrade checklist that you should use to ensure that you are ready and have covered all your bases. VMware has published the complete checklist on its website (www.vmware.com/files/pdf/vsphere-migration-prerequisites-checklist.pdf), but here are some of the most important items.

Prerequisites:

- Be sure all your other VMware products and third-party products are compatible with the vSphere version that you are installing.
- Be sure all your server hardware, I/O devices, and storage devices are listed in the Hardware Compatibility Guide for the version of vSphere that you are installing.

vCenter Server:

- Ensure that the physical or virtual hardware for vCenter Server is sufficient. Although vCenter Server 2.x could get away with one CPU and 1GB of RAM, vCenter 4.0 requires two CPUs and at least 2GB of RAM (preferably 3GB) as the Tomcat service in vCenter Server 4.0 uses much more RAM than in 2.x.
- Ensure that your database is supported; MSDE, SQL Server 2000, and Oracle 9i are no longer supported in vCenter Server 4.0. Upgrade the database to a supported version before upgrading vCenter Server.
- For vCenter Server 4.0, make sure you use a 32-bit ODBC data source; for vCenter Server 4.1, you must use a 64-bit data source.
- If the database is 64-bit Oracle, make sure the default installation path of C:\Program Files(x86) is changed to remove the parentheses ().
- Ensure that for the Microsoft SQL database, the system DSN is using the SQL Native Client driver. You may have to manually install this.
- Ensure that the Oracle and Microsoft SQL databases have the appropriate permissions (MS SQL requires the db_owner privilege on the MSDB and vCenter database).
- Confirm that the vCenter Server system name is no more than 15 characters long.
- Ensure that ports 80, 443, 389, and 686 are not used by any existing application on the vCenter Server system and that there are no firewalls (including Windows firewalls) preventing these ports from/to the vCenter Server system.
- Ensure that you have taken a complete backup of vCenter Server, the vCenter database, templates in the vCenter repository, license files, and SSL certificate files before the install or upgrade.

ESX/ESXi hosts:

- Ensure that there is either a local VMFS or a shared VMFS volume with at least 10GB of free space to store the ESX 4 Service Console .vmdk file.
- Ensure that you have backed up your ESX host (service console files, .vmx files, custom scripts, host configuration files, and local VMFS filesystem).
- Ensure that you have backed up your ESXi host (using VI CLI and the vicfg-cfgbackup command).

- For ESX hosts, if you are using any hardware management agents inside the Service Console, make sure you upgrade to the latest version. Also ensure that any third-party agents, scripts, or software is upgraded to the latest version.

Virtual machines:

- Ensure that there are no suspend files for a VM in order to do the VM hardware upgrade.
- Ensure that the VM has a CD-ROM device configured in order for VMware Tools to mount the virtual ISO and install/upgrade VMware Tools.
- Ensure that it is okay to upgrade the VM hardware from version 4 to version 7. Once upgraded, you cannot revert back to an earlier VM format unless you have created a snapshot of the VM prior to the changes.
- Ensure that the VMs are backed up before upgrading them.

Licensing:

- Ensure that you have the necessary licenses for the required features of VMware vSphere. The evaluation license is valid for 60 days after you power on the ESX/ESXi host.
- Ensure that you have a backup copy of the existing VI3 License Server license files.

Once you are sure you meet all the necessary prerequisites, you're ready to begin upgrading your environment.

PHASE I: UPGRADING vCENTER SERVER

Before you upgrade vCenter Server, you need to make sure you have a good backup of the SQL database and that the SQL database you are using is supported by vCenter Server 4.0. Also make sure you have downloaded the vCenter Server installer and generated your license keys. Upgrading your vCenter Server does not require any host or VM downtime.

BACKING UP KEY FILES

In addition to a database backup, you should also back up the following key files in case you need to roll back to the previous version.

- Back up the SSL certificate folder under %ALLUSERSPROFILE%\Application Data\VMware\VMware VirtualCenter or %ALLUSERSPROFILE%\VMware\VMware VirtualCenter\.
- Back up the vpxd.cfg file which is located in %ALLUSERSPROFILE%\Application Data\VMware\VMware VirtualCenter or %ALLUSERSPROFILE%\VMware\VMware VirtualCenter\.
- Back up the license server .lic key file which is usually located in C:\Program Files\VMware\VMware License Server\Licenses.
- Make note of your ODBC DSN, username, and password.

AGENT PRE-UPGRADE CHECK TOOL

As part of the upgrade to vCenter Server, all of the hosts that are managed by it must have their vCenter Server agent (vpxa) that is running on them upgraded as well. It is fairly common to have this process fail on some hosts for various reasons, and as a result, they become disconnected from vCenter Server after the upgrade. When this happens you can manually get the agent to install, but the Agent Pre-upgrade Check tool is available that is designed to prevent the failure from happening. The tool checks each host for some of the usual things that cause the agent installation to fail. This includes making sure the host has sufficient disk space on the Service Console partitions, the host is reachable, the filesystem is intact, and any required patches are applied.

You can launch the tool from the vCenter Server installer; it is listed under Utility. Once you run the tool, it goes out to VMware's website and downloads any new updates that are available for it. When the wizard launches follow these steps to complete it.

1. At the Database Connect screen, choose your ODBC DSN to connect to, and enter a username and password for it as well as the credential type. If you are using the built-in database, you can select Use VirtualCenter credentials.
2. At the Select Mode screen, choose to scan all hosts or select custom mode to select the hosts; if you select custom mode, the next screen will let you choose the hosts.
3. At the Run Test screen, click the "Run precheck" button to begin checking the hosts. This will not cause any disruption to your hosts or to the VMs

running on them. Once the scan completes, click the Next button to see the results.

4. At the Pre-check screen, you will see your hosts listed as the results of the test. Click the links to see each host's individual report, or click the Run Report button for the full results.

If any of the hosts fail, read the results and resolve any issues with them. When you're finished, you're ready to upgrade vCenter Server.

RUNNING THE vCENTER SERVER INSTALLER

When you are ready to begin the upgrade, run the vCenter Server 4.0 installer by running the autorun.exe file on the install media. From the vSphere vCenter Server installer menu, choose the vCenter Server product installer and follow these steps.

1. At the Welcome screen, the installer will detect a previous vCenter Server version. Click Next to begin the upgrade.
2. At the License Agreement screen, accept the agreement and click Next.
3. At the Customer Information screen, enter your information and optionally enter a vCenter Server 4.0 license key. If you do not enter one, you can always enter one later, as it will use a 60-day evaluation key instead. Click Next to continue.
4. At the Database Options screen, the ODBC DSN that is already used by vCenter Server will be selected and you must provide a username/password if you are using SQL authentication; if you are using Windows authentication, you can leave this field blank. If you are using the built-in database, you can leave those fields blank also. Click Next to continue.
5. You may receive a message that some of the existing extensions (e.g., Update Manager, Converter) will not be compatible after the upgrade. You can upgrade them manually afterward using the vCenter Server product installer. Click OK to continue.
6. At the Database Upgrade screen, you have an option to upgrade the existing vCenter Server database. If you choose not to upgrade, you cannot continue, as the database upgrade is required. You also must check the box confirming that you have backed up your database and SSL certificates before you can continue. This screen is meant as a final warning to let you know your database will be upgraded, and if you do not have a backup, you cannot roll back to vCenter Server 2.x. Click Next to continue.

7. At the vCenter Server Service screen, either accept the default to use the built-in SYSTEM account or specify a user domain account instead. Click Next to continue.
8. At the Configure Ports screen, you have the option to change any of the default port numbers that are used by vCenter Server. It's recommended that you leave these at the defaults, unless you have changed the ports on your other servers because of a conflict. Be aware that if you are running another web server on the vCenter Server, such as Microsoft Internet Information Services (IIS), ports 80 and 443 will conflict with vCenter Server's built-in Tomcat web server. Click Next to continue.
9. At the Ready to Install screen, click the Install button to begin the upgrade. Your database will be upgraded as part of the vCenter Server installation. If you are upgrading from vCenter Server 2.5, the Database Upgrade Wizard runs in the background and requires no interaction. If you are upgrading from vCenter Server 2.0.x, the Database Upgrade Wizard appears and you must complete the wizard. If the Database Upgrade Wizard does display, you will have the option to keep the existing performance data, discard it, or keep only the last 12 months of it. If you keep the data, the upgrade will take quite a while if there is a lot of old performance data in the database.
10. The installer will run and will install and configure various components as well as upgrade the database. Once it completes, click Finish and the wizard will close. You will need to restart the system next.

POST-INSTALLATION STEPS

Once the vCenter Server restarts, you will need to connect to it using the vSphere Client. If you try to connect with the VI3 Client, you will get an error message stating that the required client support files need to be retrieved from the server and installed. You can run the vSphere Client installer by choosing the Run the Installer option; you can also download it and run it manually. In addition, you can access the vSphere Client installer from the vCenter Server install image or by accessing the vCenter Server with a web browser. When you run the vSphere Client installer you will also have the option to install the Host Update utility which you can use to upgrade hosts from VI3 to vSphere.

Once you install the vSphere Client and connect to the vCenter Server, the first thing you will want to do is set up the legacy licensing for your VI3 hosts. The hosts will be okay for 14 days if a licensing server is not available, but it is best to do this right away. If you did an in-place upgrade, you will not have to do

anything, as this is taken care of automatically, even if your license server is on another server. You should verify, though, that your VMware License Server service is running.

If you uninstalled vCenter Server or did a clean installation, you will need to configure the legacy licensing support. To do this select vCenter Server Settings under the Administration section and then select Licensing in the left pane. In the right pane, you can enter the IP address/host name of a new or existing VI3 licensing server and check the option to Reconfigure ESX 3 hosts. You can verify that the VI3 licenses are being read by selecting Licensing under the Administration section. All your VI3 licenses should be displayed in the Product view.

After the installation, if you are using an Oracle database, you should copy the Oracle JDBC Driver (ojdbc14.jar) to the <VMware vCenter Server>\tomcat\lib folder. For SQL Server databases, if you enabled bulk logging for the upgrade, disable it after the upgrade is complete.

Finally, you will want to upgrade your extensions to the new vSphere versions. To do this, run the vCenter Server 4.0 installer and select each extension. You can install the Update Manager, Converter, and Guided Consolidation extensions. When you run the installation, the installer will detect the old version of each extension and automatically upgrade it. After you upgrade the extensions, you must also upgrade the plug-in component in each vSphere Client instance by going to the Plug-in Manager and installing the new plug-ins.

PHASE 2: UPGRADING ESX AND ESXi

You have several options for upgrading your ESX and ESXi hosts to vSphere. The first option is to use the Update Manager plug-in that comes with vCenter Server. The second is to use the Host Update utility that installs with the vSphere Client that is normally used to patch/upgrade ESXi hosts. The Host Update utility is typically used to patch stand-alone hosts when vCenter Server is not being used, but in vSphere, it can now upgrade VI3 ESX hosts to vSphere as well. The final option is to simply burn the vSphere install ISO to a DVD, boot the host from it, and run through the installer.

Update Manager is much more robust than the Host Update utility, and you can orchestrate upgrades so that both hosts and VMs are updated. You can schedule upgrades via Update Manager, and automation and workflow are built

into it to make the process much easier. The Host Update utility provides an easy way to upgrade hosts from a remote location, without a CD, and with minimal down time. The utility upgrades the VMkernel and the service console on ESX hosts, and upgrades the image of ESXi hosts. It does not upgrade VMFS datastores, VM hardware, or VMware Tools, as Update Manager does.

USING THE HOST UPDATE UTILITY

The Host Update utility is an optional add-on when installing the vSphere Client. If you do not have it, you can simply reinstall the vSphere Client to install it.¹ Once you are ready to use it to upgrade your host, follow these steps.

1. Launch the Host Update utility and you will first be prompted that the utility needs to download patches from the VMware patch repository. Click No for this, as we are using the utility to upgrade hosts and not patch them.
2. From the top menu, select Host and then select Add Host and enter the IP address/host name of the host you wish to update. The host information will be displayed; note that patching is supported only for ESXi hosts and not for ESX hosts, but you can use the utility to upgrade ESX hosts.
3. You will need to put the host in maintenance mode before you can upgrade it, so shut down the VMs on the host or move them to other hosts before proceeding.
4. To begin the upgrade, click the Upgrade Host button and the Upgrade Wizard will launch.
5. At the Image Location screen, select the ISO or ZIP file of the ESX/ESXi 4.0 image that you wish to use to upgrade the host to, and click Next to continue.
6. The ISO will be validated. At the EULA screen, accept the licensing agreement and click Next to continue.
7. At the Host Credentials screen, enter the host user credentials (root) and click Next. If you have not placed the host in maintenance mode yet, you will be warned that you need to before proceeding. At the Host Compatibility Check screen, the host will be checked and any problems will be noted; if there are no problems, it will automatically go to the next screen.
8. At the Console OS Settings screen, select a datastore and size for the Service Console virtual disk file. You must choose either a local or a storage area network (SAN) datastore, as neither software iSCSI nor NFS datastores are

¹ Beginning with vSphere 4.1 the Host Update utility was dropped and the only update methods available are using Update Manager and the `vhostupdate/esxupdate` command line utilities.

supported for this. If you are using a SAN datastore, it cannot be shared with other hosts and it must be zoned to only that host. The minimum size for the virtual disk is 7.82GB; however, if you want to create additional partitions inside the Service Console per the recommendations in Chapter 11, you should increase this to at least 18GB. Once you select a datastore and size, click Next to continue.

9. At the Post-Upgrade Options screen, choose whether a rollback will be attempted in case the upgrade fails. In addition, you can choose to run a post-upgrade script and also select to roll back the upgrade if the script fails. Click Next to continue.
10. At the Ready to Complete screen, click Finish to begin the upgrade. The upgrade will proceed and the status will be displayed. First the ISO image will be copied to the host, and then the host will be shut down and restarted and the upgrade will begin. The new Service Console VM will be created and partitioned, and the packages will be installed inside it; then it will reboot again once it is complete.

When the host restarts you will get a message that the upgrade has succeeded. If the upgrade failed for whatever reason, you should restart the Host Update utility before trying again. You can also view the log located on the host in the `/var/log/vmware/vua.log` file. If the host shows Disconnected in vCenter Server afterward, right-click on it and select Connect. Finally, exit maintenance mode, and the upgrade will be complete and your host will be ready to use.

USING UPDATE MANAGER

Update Manager uses baselines that are created and then used to determine if a host is compliant with the specification of the baseline. If it is not, the host is remediated to bring it into compliance with the baseline. To upgrade hosts to vSphere with Update Manager, you need to first create a new upgrade baseline for vSphere 4.0. Once you create the baseline, you attach it to the host and then the upgrade begins. To create a new baseline, follow these steps.

1. Launch Update Manager from the vSphere Client, select the Baseline and Groups tab, and then select the Upgrade Baselines tab below it.
2. Click the Create link to create an Upgrade Baseline.
3. At the Baseline Name & Type screen, enter a name for the baseline and choose the Host Upgrade baseline type; click Next to continue.

4. At the Upgrade Version screen, select an upgrade ISO file to use for ESX hosts and an upgrade ZIP file to use for ESXi hosts. These files are available on the vSphere download page on VMware's website. Once you click Next, the files will be uploaded to the Update Manager server and imported.
5. At the COS VMDK Location screen, choose to automatically use a datastore which will use a local datastore, or manually choose a datastore instead. Click Next to continue.
6. At the Post-upgrade Options screen, choose whether a rollback will be attempted in case the upgrade fails. In addition, you can choose to run a post-upgrade script and select to roll back the upgrade if the script fails. Click Next to continue.
7. At the Ready to Complete screen, click Finish to create the baseline.

Now that you have a baseline created, you can attach it to your VI3 hosts to bring them into compliance with the baseline. When you attach the baseline to your hosts, your hosts will be evaluated, and if they are not in compliance with the baseline, they will be upgraded to bring them into compliance. Follow these steps to attach the baseline to a host.

1. In the Hosts and Clusters tab, select the VI3 host that you want to upgrade to vSphere, and in the right pane select the Update Manager tab.
2. Click the link to Attach the vSphere upgrade baseline to the host.
3. Once the baseline is attached, click the Remediate button to begin the process of upgrading the host to make it compliant.
4. The Remediation Wizard will launch; at the Remediation Selection screen, select the Upgrade baseline and click Next to continue.
5. At the EULA screen, accept the licensing agreement and click Next to continue.
6. At the ESX 4.0 Upgrade screen, you have the option to change the COS VMDK Location, Rollback on Failure, and Post-upgrade Script settings. These settings will display even if you are upgrading an ESXi host, in which case you can ignore them. Click Next to continue.
7. At the Host Remediation Options screen, choose to have the remediation occur immediately, or scheduled for a later time. In addition, you can specify failure options for when the host is placed in maintenance mode. If VMs cannot be powered off or VMotioned to other hosts, you can specify to retry, fail the task, power them off, or suspend them. Click Next to continue.

8. At the Ready to Complete screen, click Finish to begin the remediation. The host will automatically enter maintenance mode and restart, and the upgrade will begin.

Once the remediation completes, the host will show as compliant and will automatically exit maintenance mode. If the upgrade fails, you can check the logs to try to find out why. On ESXi hosts, you can use the vSphere Client to export the logs, which are located in `/esx3-installation/esx4-upgrade/` and `/var/log/vmware/`. For ESX hosts, the logs are located in `/esx4-upgrade/` and `/var/log/vmware/` on the host server.

POST-UPGRADE CONSIDERATIONS

Once you upgrade your hosts, there are some steps you may need to perform afterward to clean them up.

- If vCenter Server manages the host, you must reconnect the host to vCenter Server by right-clicking the host in the vCenter Server inventory and selecting Connect.
- When the upgrade is complete, ESX/ESXi is in evaluation mode. Evaluation mode lasts for 60 days. You must assign an upgraded license to your product within 60 days of the upgrade.
- After the ESX/ESXi upgrade, third-party agents are disabled but remain on the disk. To reenable them, you must reinstall them. You can use the `vihost-update` vSphere CLI command to install third-party extensions.
- For ESX hosts only, the web access service is disabled by default in vSphere as a security measure. If you want to enable it, follow these steps.
 1. Log in to the ESX Service Console.
 2. Type `service vmware-webAccess status` to check the status of the service.
 3. Type `service vmware-webAccess start` to start the service. The service will run only until the host is restarted.
 4. To have the service start each time the host boots, type `chkconfig --level 345 vmware-webAccess on`.
- Once you have determined the upgrade is stable, you can remove the ESX3 instance from the bootloader menu that displays when the host starts up. This removes the ability to roll back to ESX3 and deletes the ESX3 files from the `/boot` directory, deletes the ESX3 references from the `/etc/fstab`

directory, and deletes the `/usr/sbin/rollback-to-esx3` script. To remove ESX3 from the bootloader menu, follow these steps.

1. Log in to the ESX Service Console.
 2. Type `cleanup-esx3`; optionally, you can use the `-f` parameter to suppress the confirmation message.
 3. Reboot the host. The ESX3 option will be gone from the bootloader menu.
- Once you have upgraded all your VI3 hosts to vSphere, you can uninstall the VMware License Server application from the vCenter Server.

PHASE 3: UPGRADING VIRTUAL MACHINES

After you upgrade your hosts to vSphere, you need to upgrade your VMs as well. This includes upgrading the virtual hardware from version 4 that is used in VI3 to version 7 that is used in vSphere, and also upgrading VMware Tools to the latest version. However, if there is a possibility that the VMs will be migrated to a VI3 host due to a VMotion, HA, or DRS event, you should wait as the version 7 VM hardware is not supported on VI3 hosts. There are two ways you can upgrade both the virtual hardware and VMware Tools. You can use the vSphere Client and upgrade VMs one by one, or you can use Update Manager and update many VMs at once. You must first power off the VMs to upgrade their virtual hardware. VMware Tools upgrades can be done while the VM is powered on, but Windows VMs must be restarted afterward. The process for upgrading Windows VMs is as follows.

1. Power on the VM.
2. Upgrade VMware Tools.
3. Reboot the VM at the end of the VMware Tools upgrade.
4. Power off the VM.
5. Upgrade the virtual hardware.
6. Power on the VM. Windows detects new devices and prompts you to reboot the VM.
7. Reboot the VM to make the devices work properly.

UPGRADING VMWARE TOOLS

To upgrade VMware Tools on a VM using the vSphere Client, follow these steps.

1. Make sure the VMs are powered on, open the console for the VM, and log in to the guest OS.
2. Select the VM in the vSphere Client, right-click on it, and select Guest and then Install/Upgrade VMware Tools.
3. Choose either an Interactive or Automatic upgrade. The Interactive option allows you to select which components to install. The Automatic option will install VMware Tools without prompts and automatically restart the VM afterward.

To upgrade VMware Tools on multiple VMs at once, follow these steps.

1. Select a host in the left pane, and then select the Virtual Machine tab.
2. Hold the Ctrl key while clicking on multiple powered-on VMs.
3. Once you have selected them all, right-click and select Guest→Install/Upgrade VMware Tools.

To configure VMs to automatically upgrade VMware Tools when they boot, follow these steps.

1. Power off the VM.
2. Edit the settings of the VM.
3. On the Options tab, select VMware Tools in the left pane, and in the right pane under Advanced, put a checkmark by the “Check and upgrade Tools before each power-on” field.

The next time the VM is powered on it will install or upgrade VMware Tools automatically and restart if necessary.

UPGRADING VIRTUAL MACHINE HARDWARE

Upgrading virtual hardware from version 4 to version 7 is reversible if you take a VM backup or snapshot before performing the upgrade. If you do not take a snapshot before upgrading, you must use vCenter Converter to create a new VM with version 4 hardware. VMs must be powered off when their virtual hardware is upgraded. Also make sure you upgrade VMware Tools before upgrading virtual hardware. To upgrade the virtual hardware of a VM, follow these steps.

1. Power off the VM.
2. Select the VM in the vSphere Client, right-click on it, and select Upgrade Virtual Hardware.

3. Choose Yes at the confirmation message and the upgrade will proceed.
4. Power on the VM.
5. Log in to Windows. Restart once the new devices are detected.

To upgrade virtual hardware on multiple VMs at once, follow these steps.

1. Select a host in the left pane, and then select the Virtual Machine tab.
2. Hold the Ctrl key while clicking on multiple powered-off VMs.
3. Once you have selected them all, right-click and select Upgrade Virtual Hardware.

USING UPDATE MANAGER TO UPGRADE VMWARE TOOLS AND VIRTUAL HARDWARE

You can also use Update Manager to upgrade VMware Tools on VMs. Baselines have already been created for VMs to upgrade their VMware Tools and virtual hardware version to match the host, as shown in Figure 12.2.

Baseline Name	Content	Type	Component	Last Modified
VMware Tools Upgrade to Match Host	Details...	Dynamic	VM Tools	3/21/2010 3:55:10 PM
VM Hardware Upgrade to Match Host	Details...	Dynamic	VM Hardware	3/21/2010 3:55:10 PM
VA Upgrade to Latest	Details...	Dynamic	VA Upgrade	3/21/2010 3:55:10 PM
VA Upgrade to Latest Critical	Details...	Dynamic	VA Upgrade	3/21/2010 3:55:10 PM

Figure 12.2 Upgrading virtual hardware and VMware Tools using baselines

To upgrade VMs using Update Manager, just attach those baselines to the VMs and remediate them, and they will automatically be upgraded.

Once you upgrade your VM hardware, you can take advantage of the features in vSphere that require the new hardware. One new feature in particular that you may want to take advantage of is the new VMXNET3 virtual NIC (vNIC) type that offers more features and better performance than the VMXNET2 vNIC.

SUMMARY

Upgrading your virtual environment to vSphere is exciting, as you can finally start using the many new features that are available in vSphere. It is best to get some experience using vSphere before upgrading so that you are better prepared to use it. Read through the documentation, set up a test lab if you can, and look through the Upgrade Center web page (www.vmware.com/products/vsphere/upgrade-center/) on VMware's website. There are many great guides, tools, and videos that can help prepare you for your upgrade to vSphere. The more prepared and experienced you are beforehand the smoother your upgrade will be when you go to do it.

