VMware vSphere 5.5 Cookbook

A task-oriented guide with over 150 practical recipes to install, configure, and manage VMware vSphere components

Abhilash G B
In this package, you will find:

- The author biography
- A preview chapter from the book, Chapter 1 ‘Upgrading to vSphere 5.5’
- A synopsis of the book’s content
- More information on VMware vSphere 5.5 Cookbook

About the Author

Abhilash G B (@abhilashgb) is a virtualization specialist, author, designer, and a VMware vExpert (2014 and 2015) who specializes in the areas of data center virtualization and cloud computing.

He is a VMware Certified Advanced Professional in Data Center Administration (VCAP4-DCA and VCAP5-DCA). He also holds other VMware certifications, including VCP3, VCP4, VCP5-DCV, and VCP-Cloud. He has been in the IT industry for more than a decade and has been working on VMware products and technologies since the start of 2007.

Abhilash is also the author of two other well selling books: VMware vSphere 5.1 Cookbook and Disaster Recovery Using VMware vSphere Replication and vCenter Site Recovery Manager, both by Packt Publishing.

He is a passionate author willing to contribute more titles to the VMware community and an aspiring engineer keen to indulge in designing and creating great solutions.

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I would like to dedicate this book to my family. Without their patience and support, this book would not have been possible.

Thanks to Kenneth van Ditmarsch, Andy Grant, and Daniel Langenhan, the technical reviewers of this book, for their valuable input.

Special thanks to Harsha Bharwani (acquisition editor), Karthik Vedam (project coordinator), Athira Laji (content development editor), and Mrunmayee Patil and Shruti Rawool (technical editors) for their support during the course of writing this book.
VMware vSphere 5.5 Cookbook

With more and more data centers being virtualized using its technologies, VMware is still the undisputed leader in providing virtualization solutions ranging from server virtualization to storage and network virtualization. Despite the efforts from Citrix and Microsoft, VMware's vSphere product line is still the most feature-rich and futuristic in the virtualization industry. Knowing how to install and configure the latest vSphere components is important to give yourself a head start towards virtualization using VMware. This book covers the installation and upgrade of the vSphere environment and also the administration tasks that one would commonly need to handle when managing a VMware infrastructure.

*VMware vSphere 5.5 Cookbook* is a task-oriented, fast-paced, practical guide to installing and configuring vSphere 5.5 components. It will take you through all of the steps required to accomplish various configuration tasks with less reading. Most of the tasks are accompanied with relevant screenshots and flowcharts with the intention to provide visual guidance as well. The book concentrates more on the actual task rather than the theory around it, making it easier to understand what is really needed to achieve the task. However, most of the concepts have been well described to help you understand the background and working.

The main highlight of this book is the use of the vSphere 5.5 Web Client to accomplish most tasks. Although a few tasks cannot be accomplished using the new Web Client with the current vSphere version, VMware will be integrating them into the Web Client in its future product releases. The other highlights include chapters covering vSphere Host Profiles, vSphere Auto Deploy, ESXi Image Builder, and VMware Update Manager. This book also covers command-line methods for important tasks.

**What This Book Covers**

*Chapter 1, Upgrading to vSphere 5.5*, discusses the procedures involved in upgrading an existing vSphere infrastructure to vSphere 5.5. It covers upgrading the vCenter Server, the ESXi host, and the virtual machine tools and virtual machine hardware.

*Chapter 2, Performing a New Installation of vSphere 5.5*, walks you through the procedures involved in deploying a new vSphere 5.5 infrastructure. It covers the installation of ESXi, vCenter Server, and the deployment of the vCenter Server virtual appliance.

*Chapter 3, Using vSphere Host Profiles*, covers the use of Host Profiles to create, manage, and use ESXi host configuration templates.

*Chapter 4, Using ESXi Image Builder*, walks you through the process of creating, managing and applying image profiles to ESXi hosts.
Chapter 5, Using vSphere Auto Deploy, covers the procedures involved in forming an Auto Deploy infrastructure to enable faster provisioning of stateless or stateful ESXi hosts.

Chapter 6, Configuring vSphere Networking, explains how to set up and configure vSphere networking using vSphere Standard Switches and vSphere Distributed Switches. It covers advanced network configurations such as port mirroring, NetFlow, and the use of PVLANs.

Chapter 7, Creating and Managing VMFS Datastores, walks you through the process of creating and managing VMFS datastores. It also covers the use of datastore clusters and storage DRS.

Chapter 8, Managing iSCSI and NFS Datastores, covers the procedures involved in configuring and managing iSCSI and NSA storage on ESXi hosts.

Chapter 9, vSphere Storage Policies and Storage I/O Control, covers the use of storage policies to ensure that the VMs are placed in datastores categorized into different tiers and how to use storage I/O control to manage the I/O bandwidth between VMs running on them.

Chapter 10, Creating and Managing Virtual Machines, covers the procedures involved in creating and managing virtual machines in a vSphere infrastructure.

Chapter 11, Configuring vSphere HA, covers the configuration of high availability on ESXi clusters.

Chapter 12, Configuring vSphere DRS, DPM, and VMware EVC, covers the configuration of vSphere Distributed Resource Scheduler, Distributed Power Management, and VMware Enhanced vMotion Compatibility on an ESXi cluster.

Chapter 13, Upgrading and Patching Using vSphere Update Manager, covers the installation and configuration of vSphere Update Manager and the Update Manager Download Service (UMDS) to manage patching and upgrading of ESXi hosts.

Chapter 14, Using vSphere Management Assistant, covers the deployment and configuration of vMA 5.5 to run commands/scripts remotely on ESXi.

Chapter 15, Monitoring the Performance of a vSphere Environment, covers different methods to monitor the performance of ESXi and virtual machines in a vSphere infrastructure.
In this chapter, we will cover the following recipes:

- Downloading vCenter 5.5
- Carrying out pre-upgrade checks
- Upgrading the Single Sign-On (SSO) component
- Upgrading the vSphere Web Client
- Upgrading the vCenter Inventory Service
- Performing an upgrade of vCenter Server
- Upgrading ESXi to Version 5.5
- Upgrading vCenter Server Appliance (VCSA) to Version 5.5
- Upgrading VMware Tools
- Upgrading the virtual machine hardware
- Scheduling the virtual machine hardware upgrade
Introduction

At the time of writing this book, VMware vSphere 5.5 was the current major version of the core vSphere suite of products from VMware. The previous version was vSphere 5.1. The improvements and enhancements included in vSphere 5.5 make an upgrade worth it. The goal of this chapter is to help you understand and execute the process of upgrading your core vSphere infrastructure. The core includes your ESXi hypervisor, vCenter Server, and vCenter Server's components. The upgrade of the third-layer products that leverage the core vSphere infrastructure, such as vCloud Director and VMware View, are not covered in this chapter as they are beyond the scope and purpose of this book.

Before we begin, let me introduce you to the core infrastructure components that will be upgraded:

- **VMware vCenter Server**: The possibility of an upgrade or the need for a new build will depend on the current version of vCenter and the supported upgrade path
- **vCenter Single Sign-On**: This will be upgraded if the current version is 5.1; if not, it will be a new installation of this component
- **vCenter Inventory Service**: This will be upgraded if the current version is 5.1; if not, it will be a new installation of this component
- **vSphere Web Client**: This will be upgraded if the current version is 5.1; if not, it will be a new installation of this component
- **vSphere Update Manager**: This should be upgraded before the ESXi hosts, if you intend to use it to upgrade the hosts
- **vSphere Auto Deploy**: This is a requirement to upgrade vSphere Auto Deploy to the same version as vCenter Server
- **VMware ESXi**: This can either be upgraded by booting the server using the ISO image, by using vSphere Update Manager, or by updating the image profile if the existing servers are auto-deployed

**VMware vCenter Server**

vCenter Server is management software that helps manage and configure your virtual environment. It comes in two flavors, one being a standard Windows installation and the other in the form of a Linux-based virtual appliance. While the Windows-based installation of vCenter helps you segregate the components according to your needs, the Linux-based installation packages all the components into a single deployment package. While most large virtual environments use the Windows-based installation of vCenter, the vCenter Server Virtual Appliance finds its place in comparatively smaller environments. However, it is important to note that it now supports up to 100 ESXi hosts and 3000 virtual machines.
VMware vCenter Server Virtual Appliance

The VMware vCenter Appliance is a Linux appliance with all necessary modules and a built-in database. This appliance comes in handy when you want to deploy a vCenter instance without having to go through the installation procedure. As it is a Linux VM, you don't have to install a compatible Windows OS (VM / physical machine) and license it.

vCenter Single Sign-On

vCenter Single Sign-On (SSO) will be the first component to be upgraded or installed. It is an authentication service released with vSphere 5.1. With Version 5.5, it has been re-architected from the ground up to be simple to plan and deploy, and easier to manage.

It is an authentication gateway that takes authentication requests from various registered components and validates the credential pair against the identity sources added to the SSO server. All the other vSphere components are registered to the SSO server during their installation. At the time of writing this book, the following are the components that could register and leverage SSO 5.5's ability:

- VMware vCenter Server 5.5
- VMware vCenter Inventory Service 2.0
- VMware vCenter Orchestrator 5.1 and 5.5
- VMware vShield Manager 5.5
- VMware vCloud Director
- VMware vSphere Web Client 5.5
- VMware vSphere Data Protection
- VMware Log Browser
- vCAC 6.0

SSO supports authentication against the following identity sources:

- Active Directory
- Active Directory as an LDAP server
- Open LDAP
- Local OS
- Its local authentication domain: vsphere.local

Once authenticated, the SSO client is provided with a token for further exchanges. The advantage here is that the user or the administrator of the client service is not prompted for a credential pair (username/password) every time it needs to authenticate.
VMware has recoded SSO from scratch. It no longer uses an external database. It now has a single deployment mode. SSO 5.1 had three deployment modes, namely: Basic, High Availability, and Multisite. For the HA and Multisite modes, there was the concept of a primary node; only one primary node could exist in a particular SSO environment. You always had to plan and decide on the deployment mode before installing SSO, because, once deployed in a particular mode, changing to a different mode wasn't an easy job. This is however not the case with SSO 5.5, where we now have a single deployment mode and three placement methods:

- **First SSO server**: This is used when deploying the first SSO server at the site. This can either be done during the simple installation or by running the SSO installer separately on a different machine.

- **Additional SSO server**: This is used to spawn an additional SSO server at the same site. This additional instance will not be involved in any failover or load balancing with the first SSO server by default, but a third-party load balancer can be used achieve this.

- **Additional SSO server at a new site**: This is used to spawn an additional SSO server at a different (remote) site. The additional SSO servers deployed at the remote sites cannot be involved in a failover:

Here, **VMDir** (short for VM Directory) is SSO's LDAP-based internal directory used to store identity sources, SSO users, and policies. It is the source of truth for the vsphere.local domain.

**vCenter Inventory Service**

The vCenter inventory service is a read cache for use with the vSphere Web Client. It stores information pertaining to the vSphere Web Client inventory, thereby reducing the number of reads that need to hit the vCenter Server's database. It takes away some of the load handled by the vCenter Service (vpxd).
vSphere Web Client

Starting with vSphere 5.0, VMware introduced a web client component that can be used to manage vSphere environments. vSphere Web Client is an independent server component that is installed and then accessed via a web browser. It is independent because, unlike the older web client or the vSphere Client based on C#, you no longer have to connect the client to vCenter Server. It connects to its own server and this server component will let you add multiple vCenter Servers to its web-based GUI:

![Diagram of vSphere Web Client](image)

With vSphere 5.5, there are a few improvements with the web client in terms of performance, tagging, and so on.


Although I will be using vSphere Web Client for most of the tasks in the chapters, you could still use the vSphere Client to perform some of the same tasks. However, there are certain tasks that can only be done using the vSphere Client. For example, not all aspects of the VMware Update Manager plugin are available for use with the vSphere Web Client. Having said that, VMware will be moving all of the vSphere management GUIs to the web client in future versions of vSphere. So, it would be good to get accustomed to the vSphere Web Client interface now.

![Important Note](image)

Keep in mind, vSphere Web Client requires Flash to be installed for the GUI to work.
vSphere Update Manager

vSphere Update Manager automates the process of patching or upgrading ESXi hosts in an environment. It can also be used to upgrade the virtual machine hardware and VMware tools of the virtual machines. Update Manager does not have a standalone user interface. You will be required to download and install its plugin on the machine where you have vSphere Client installed. Even with the release of vSphere 5.5, not all of its functionalities are available via the vSphere Web Client. After a vCenter Server upgrade, the next component to upgrade will be Update Manager. This is done to facilitate upgrading the ESXi hosts. Read Chapter 13, *Upgrading and Patching Using vSphere Update Manager*, to understand the installation, configuration, and the use of the solution.

What is new with ESXi 5.5?

ESXi hypervisor is an abstraction layer that enables running of different virtual machines sharing the same physical hardware.

The vSphere 5.5 release is more scalable than before. The ESXi hypervisor now supports up to 4 TB of memory and 320 logical CPUs (pCPUs). It adds support for up to 16 NUMA nodes. The total supported vCPU count is now 4096.

Here is a table comparing scalability offered by vSphere 5.1 and 5.5:

<table>
<thead>
<tr>
<th>Feature</th>
<th>vSphere 5.1</th>
<th>vSphere 5.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical processors (pCPUs)</td>
<td>160</td>
<td>320</td>
</tr>
<tr>
<td>Memory</td>
<td>2 TB</td>
<td>4 TB</td>
</tr>
<tr>
<td>NUMA nodes</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>vCPUs</td>
<td>2048</td>
<td>4098</td>
</tr>
</tbody>
</table>


As the whitepaper introduces the components pretty neatly, we will not be doing the same in this book. This book will introduce you to the new changes in the respective chapters for vSphere 5.1 and 5.5.
The vSphere 5.5 upgrade path

Before you proceed with the upgrade, you need to understand the order in which the components should be upgraded. The rule-of-thumb is to upgrade vCenter Server prior to upgrading the ESXi server or any other solutions.

Here is the order of upgrade:

1. Verify all other solutions are compatible with the new vSphere version and also check HCL.
2. Upgrade the vCenter Server components to Version 5.5.
3. Upgrade Update Manager to Version 5.5.
4. Upgrade the ESXi host to Version 5.5.
5. Apply the vSphere licenses.
7. Upgrade the virtual machine hardware.
8. Upgrade the other solutions (such as Update Manager and Site Recovery Manager) to versions compatible with vSphere 5.5.

Downloading vCenter 5.5

The vCenter 5.5 installation bundle can be downloaded from the VMware downloads page for vSphere.

How to do it...

We can use the following steps to download vCenter 5.5:

2. Click on the Download Product hyperlink corresponding to VMware vSphere.
3. On the Download VMware vSphere webpage, locate VMware vCenter under needed license.
4. Click on the Go to Downloads URL corresponding to the vCenter entry to reach the web page titled Download VMware vCenter Server.
5. Download the vCenter Server ISO image.
Carrying out pre-upgrade checks

vCenter Server 5.5 is a 64-bit software and requires a 64-bit Windows operating system to be installed. It also requires a 64-bit ODBC DSN to be created in order to connect to the database. Note that, with this new release of vCenter, VMware has removed support for Windows 2003 operating systems.

Here is a list of supported operating systems vCenter 5.5 can be hosted on:

- Windows Server 2008 x64 Service Pack 2
- Windows Server 2008 x64 R2 Service Pack 1
- Windows Server 2008 x64 R2 Service Pack 2
- Windows Server 2012 x64

If your current vCenter Server is hosted on a Windows version not supported by vCenter 5.5, then the upgrade is not possible. You will have to perform a fresh install and point it to the existing database for a DB upgrade.

It is recommended that you check the VMware Compatibility Guide web page for changes in the supportability of your current software or hardware. The hardware components might sometimes need a firmware upgrade to work as expected when used with a newer release of vSphere. The VMware Compatibility Guide web page is available at www.vmware.com/go/hcl.

Running the installer to perform the upgrade is a pretty straightforward procedure. However, there are a few pre-upgrade checks that have to be performed to make sure that the upgrade can be done without any hassles.

How to do it...

The following are the pre-upgrade checks (details for each check are mentioned later):

1. Verify the software requirements for vCenter Server.
2. Check ESXi host compatibility with vCenter.
3. Run the vCenter Host Agent Pre-Upgrade Checker.
4. Check database compatibility.
5. Get a backup for the SSL certificates.
In the diagram, you see that the vCenter upgrade plan needs to be held off if the running version of ESXi will not be compatible with vCenter 5.5 after the vCenter upgrade. If the upgrade is performed disregarding this fact, then you will end up with an environment that is not compatible with vCenter. At this stage, you would need to validate different approaches to form a new vSphere 5.5 environment. One of them could be to upgrade both, the running vCenter and ESXi to a version that would make them supported candidates for an upgrade to vSphere 5.5. Another approach is to plan on forming a new vSphere 5.5 infrastructure by performing a fresh installation of all the components, though this would require virtual machine downtime.
Upgrading to vSphere 5.5

Checking ESXi host compatibility with vCenter
This is the most important check prior to initiating a vCenter upgrade. The rationale behind this check is to make sure that the ESXi hosts that you currently use to host your virtual machines can be managed by the new version of the vCenter that we are planning to upgrade to.

_vCenter Server 5.5 can be used to manage ESX/ESXi 4.x, ESXi 5.0.x, ESXi 5.1.x, and ESX 5.5._

VMware maintains a VMware Product Interoperability Matrixes web portal that can be used to determine when the new version of vCenter can manage the existing hosts.


Running the VMware vCenter Host Agent Pre-Upgrade Checker
The VMware vCenter Host Agent Pre-Upgrade Checker feature is run to generate a report showing issues detected on the ESX servers that would prevent a successful upgrade of the vCenter Host Agent software on the ESXi hosts:
Host Agent Upgrade Checker is installed as a separate tool. The installer can be initiated from the Welcome screen of the vCenter 5.5 Installation image (ISO) using the following steps:

1. Bring up the vCenter 5.5 Installation DVD’s welcome screen.
2. Click on the item Host Agent Pre-Upgrade Checker and click on Install.
3. Supply the fully-qualified domain name (FQDN) of the vCenter Server machine and the login credentials.
4. You will be presented with two scan options: Standard Mode and Custom Mode. Standard mode will scan all the ESXi hosts managed by the vCenter, whereas Custom mode will let you select the host to perform the scan on.
5. Run the pre-check by clicking on Run Pre-check, and click on Next once the check is complete.
6. On the next screen, check the reports generated.

**Checking database compatibility**
VMware supports the use of an Oracle or Microsoft SQL database server to host vCenter Server's database. During the installation of vCenter Server, the existing database is upgraded for use with the new version. For this to work, the database server should be compatible with the version of vCenter Server being installed—in this case, vCenter 5.5.

To check if the current database server is compatible with vCenter 5.5, you should use the Solution/database interoperability option at the VMware Product Interoperability Matrices web portal (http://partnerweb.vmware.com/comp_guide2/sim/interop_matrix.php).

**Backing up SSL certificates**
It is recommended you back up the existing certificates issued for vCenter Server. The certificate files are stored in the SSL directory. The site of the SSL directory varies, based on the Windows operating system the current vCenter is running on:

<table>
<thead>
<tr>
<th>Operating system</th>
<th>vCenter SSL folder path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 2003</td>
<td>%ALLUSERSPROFILE%\Application Data\VMware\VMware VirtualCenter\SSL</td>
</tr>
<tr>
<td>Windows 2008</td>
<td>%ALLUSERSPROFILE%\VmWare\VMware VirtualCenter\SSL</td>
</tr>
<tr>
<td>Windows 2012</td>
<td>%ALLUSERSPROFILE%\VmWare\VMware VirtualCenter\SSL</td>
</tr>
</tbody>
</table>
Upgrading to vSphere 5.5

The following screenshot shows the contents of the SSL folder:

![SSL Folder Contents]

<table>
<thead>
<tr>
<th>Name</th>
<th>Date Modified</th>
<th>Type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>rui</td>
<td>7/23/2011 8:49 PM</td>
<td>Security Certificate</td>
<td>2 KB</td>
</tr>
<tr>
<td>rui.key</td>
<td>7/23/2011 8:49 PM</td>
<td>KEY File</td>
<td>2 KB</td>
</tr>
<tr>
<td>rui</td>
<td>7/23/2011 8:49 PM</td>
<td>Personal Information</td>
<td>3 KB</td>
</tr>
</tbody>
</table>

**Enabling SSL certificate verification**

By enabling SSL certificate verification, vCenter Server will verify the validity of the SSL certificates of the ESX servers when establishing SSL connections with them. This step is required if you are upgrading from vCenter 4.1.x.

This can be enabled on the vCenter Server, by navigating to **Administration | vCenter Server Settings | SSL Settings** and selecting the **vCenter requires verified host SSL certificates** checkbox:

![SSL Settings]

When this option is selected, vCenter will verify the validity of the SSL certificates of the remote hosts when establishing SSL connections. This affects operations such as adding a host to vCenter Server, connecting to a VM, and making the VM devices remotely available.

Steps to verify host SSL certificates:
1. Compare the thumbprints for the hosts listed below with the thumbprints on the ESX host consoles.
2. For the host thumbprints that match, select the verified check boxes.

<table>
<thead>
<tr>
<th>Host</th>
<th>SHA1 thumbprint of certificate</th>
<th>Verified</th>
</tr>
</thead>
</table>
Upgrading the Single Sign-On component

To perform an upgrade of the Single Sign-On (SSO) server component, you will need the vCenter Installation DVD's ISO image mounted to the Windows virtual machine hosting the SSO server.

This section of the chapter only applies if you have an existing vCenter 5.1 environment, and the SSO server is segregated onto a different machine.

How to do it...

The following procedure will guide you through the steps required in upgrading the SSO server from Version 5.1 to 5.5:

1. When the vCenter installation DVD's welcome screen appears, select vCenter Single Sign-On under the Custom Install category and click on Install to start the setup:
Upgrading to vSphere 5.5

2. The first screen of the installation wizard workflow will indicate that it has detected an earlier version of SSO. Click on **Next** to continue:

3. Accept the **END USER LICENSE AGREEMENT** and click on **Next** to continue.

4. The installer will run a check on the prerequisites and display whether or not it has passed. Click on **Next** to continue:
5. The next screen will inform you that the installer will migrate the existing SSO data to the new version. It is just informational, click on Next to continue:

6. Select an upgrade mode. In this case, we have selected the option First existing vCenter Single Sign-On Server. Click on Next to continue:
7. Set a password for the administrator of the default SSO domain vsphere.local and click on Next to continue:

8. Specify the Site name and click on Next to continue. It is this part of the installation/upgrade that makes the SSO instance site-aware:
9. Change the destination install folder if necessary. In this case, we leave it unmodified. Click on **Next** to continue:

![Change destination folder dialog]

10. Review the summarized installation options and click on **Install** to initiate the installation process:

![vCenter Single Sign-On Information dialog]

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11. Once the installation is completed successfully, you will be presented with a wizard screen indicating that the installation has been completed. Click on **Finish** to exit the wizard workflow:

![vCenter Single Sign-On Setup](image)

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**Upgrading the vSphere Web Client**

The vSphere Web Client is the second component that should be upgraded when upgrading components individually. The Web Client is ideally installed on the same machine that you intend to install the vCenter Server Inventory Service on. The upgrade process for the Web Client is straightforward.
How to do it...

The following procedure will guide you through the steps required to upgrade the vSphere Web Client Server component:

1. Launch the installer for the vSphere Web Client from the vCenter Installation DVD:

2. Choose the language the installer should be presented with and click on **OK**.
3. The first screen of the installer wizard will indicate that it has detected the presence of an earlier version of the vSphere Web Client. Click on Next to continue:

4. Accept the VMWARE END USER LICENSE AGREEMENT and click on Next to continue.

5. Modify the default ports only if necessary. In this case, we are using the default setting. Click on Next to continue:
6. Supply the SSO administrator password so that the Web Client component can be registered as a client to the SSO server:
Upgrading to vSphere 5.5

7. You might be prompted to accept the SSO Lookup Service SSL certificate. Click on **Yes** to continue:

8. On the **Ready to Install** screen, click on **Install** to start the installation:
9. Once the installation is complete, click on **Finish** to exit the wizard. There will be an informational message suggesting that you wait for a few minutes before trying to access the Web Client for the first time. Click on **OK**:

![Image of vSphere Web Client Installation Complete]

**There's more...**

The following syntax and URL will help you to connect to the vSphere Web Client server:

- **Syntax:** `https://<IP address or FQDN of the server where vSphere Web Client is installed>/vsphere-client`
- **Example:** `https://192.168.193.50:9443/vsphere-client/`
Upgrading to vSphere 5.5

Upgrading the vCenter Inventory Service

The vCenter Inventory Service is the third and last component that should be upgraded before upgrading vCenter Server. Upgrading this component is performed using its installer for Version 5.5.

How to do it...

The following procedure will guide you through the steps required to upgrade the vCenter Inventory Service component:

1. Launch the installer for vCenter Inventory Service from the vCenter Installation DVD's welcome screen by selecting it and clicking on Install:

![VMware vCenter Installer](image)

2. Choose the language the installer should be presented with and click on OK.
3. The first screen of the installer wizard will indicate the presence of an earlier version of vCenter Inventory Service. Click on Next to continue:

4. Accept the VMWARE END USER LICENSE AGREEMENT and click on Next to continue.
5. Supply the FQDN of the machine on which the installer is being run. The installer is programmed to autofill this information, but in case it doesn't enter the FQDN manually. Click on **Next** to continue:

![Image of vCenter Inventory Service interface](image)

6. Modify the default ports only if necessary. In this case, we are leaving them unchanged. Click on **Next** to continue:
7. Specify the inventory size in terms of the number of ESXi hosts and virtual machines that will be added to the inventory. The inventory size dictates the JVM memory settings. Select one of the three options and click on **Next** to continue. If you choose to increase the size of the JVM, the virtual machine should be sized for the increase in memory usage as well:
8. Supply the SSO administrator password so that vCenter Inventory Service can be registered as a client to the SSO server. Then click on Next:

9. You might be prompted to accept the SSO Lookup Service certificate. Click on **Yes** to continue:
10. On the **Ready to Install** screen, click on **Install** to start the installation.

11. Once the installation is complete, click on **Finish** to exit the wizard.

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**Performing an upgrade of vCenter Server**

An upgrade of vCenter Server can be done either using the vCenter 5.5 Simple Installer or by initiating the vCenter Server’s installer separately (recommended). It can be performed only if the previous version of vCenter is on a supported 64-bit Windows operating system.

The following Windows operating systems are supported by VCenter:

- Windows Server 2008 x64 Service Pack 2
- Windows Server 2008 x64 R2 Service Pack 1
- Windows Server 2008 x64 R2 Service Pack 2
- Windows Server 2012 x64

Starting with vCenter 5.5, Windows 2003 is no longer supported.

Only the following releases, if installed on any of the preceding operating systems, are eligible for an in-place upgrade:

- vCenter Server 4.0 Update 4
- vCenter Server 4.1
- vCenter Server 5.0
- vCenter Server 5.1

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**How to do it...**

To perform an in-place upgrade of the current vCenter installation to Version 5.5, you will need to initiate the installer for vCenter Server. You can choose to either start a simple install or initiate the installer corresponding to vCenter Server separately. What you end up choosing will depend on your design.

Here are a few scenarios that you might encounter in your environment:

- vCenter Server 5.1 with SSO, Inventory Service, and Web Client in the same box
- vCenter Server 5.1 with SSO, Inventory Service, and Web Client server segregated onto different machines
- vCenter 5.0.x or vCenter 4.0.x (you want to segregate the SSO), Inventory Service, and Web Client installed on different machines when upgrading to vCenter 5.5
An upgrade using the Simple Installer is straightforward but harder to troubleshoot. I will familiarize you with the Simple Installer wizard screens in Chapter 2, Performing a New Installation of vSphere 5.5. As we have already covered the installation of vCenter Single Sign-On 5.5 and vCenter Inventory Service in this chapter, in this section we will use the vCenter 5.5 Installer.

The following procedure will guide you through the steps required to upgrade vCenter server to Version 5.5:

1. Back up the vCenter Server database.
2. Launch the vCenter Server installer from the vSphere Installation DVD’s Welcome Screen.
3. The first screen of the installer wizard will indicate the presence of an earlier version of vCenter Server on the same machine. Click on **Next** to continue.

4. Accept the **VMWARE END USER LICENSE AGREEMENT** and click on **Next** to continue.

5. Enter the **License Key** if you have it handy. If not just click on **Next** to install vCenter Server in evaluation mode (90 days) and enter the license key later:
6. The installer will auto-detect the DSN and the authentication. This might not be the case if you use SQL authentication or an Oracle DB. Click on Next to continue:

7. Choose to upgrade the vCenter Server database and check the box confirming that the SSO certificates are backed up. Click on Next to continue:
8. Choose the vCenter Agent Upgrade method (Automatic/Manual). In this case, we have chosen **Automatic**. Click on **Next** to continue:

![Image of vCenter Agent Upgrade screen]

9. Supply the service account credentials or choose to use the local account. In this case, we have chosen to use the local account by selecting the checkbox **Use Windows Local System Account**. Click on **Next** to continue:

![Image of vCenter Server Service screen]
10. Change the default ports only if necessary. We are leaving them unmodified for this example. On the same screen, you could also choose to increase the number of ephemeral ports for the vCenter instance. Make the decision and click on Next to continue:

11. Specify the **Inventory Size** in terms of the number of ESXi hosts and virtual machines that will be added to the inventory. The inventory size dictates the JVM memory requirement. Select one of the three options and click on Next to continue:
12. Supply the SSO administrator password so that vCenter Inventory Service can be registered as a client to the SSO server, then click Next:
13. You might be prompted to accept the SSO Lookup Service certificate. Click on **Yes** to continue:

14. Supply the vCenter Inventory Service URL. If the installer does not autopopulate this information, then it will have to be supplied manually. Click on **Next** to continue:

Syntax:

https://<FQDN or IP of vCenter Inventory Service Machine>:10433
15. Change the installation folder if necessary. In this case, we are using the default folder location.

16. Click on **Next** to continue:
17. On the **Ready to Install** screen, click on **Install** to start the installation:

18. Once the installation is complete, click on **Finish** to exit the wizard.

**Upgrading ESXi to Version 5.5**

Once you have vCenter Server upgraded to Version 5.5, the next step is to upgrade the ESXi hosts. The upgrade procedure will depend on the current deployment architecture. For instance, if all your ESXi hosts were deployed using the VMware Auto Deploy server, then you'll have to update the Image Profile sourcing the streamed image using a new off-line bundle. As Auto Deploy is covered in *Chapter 5, Using vSphere Auto Deploy*, in this chapter we will cover the upgrade of the ESXi host using the installation media.
Chapter 1

Getting ready

Before you begin any upgrade, it is very important to plan for it. So what would you need to do to perform an upgrade of ESXi? You would, of course, need the ISO image downloaded from VMware’s website, but you would also need a method to present the ISO to the physical machine so that it can boot from it. Most of the modern server equipments have a methodology to avoid the need to burn ISO to a physical DVD medium and then insert it in the DVD drive of the physical machine. If you are an administrator, you might already be aware of terms such as ILO (HP), DRAC (Dell), and KVM Manager (Cisco). These are web-based tools that will connect to an RAC on the server and enable remote access to the server’s console via the Web. Enough said on what is available out there; let’s make a list of what you need to begin the upgrade:

- The ESXi hypervisor DVD image downloaded from VMware’s website
- Access to the remote console of the server on which the upgrade will be performed

To download the DVD image, follow these instructions:

2. Click on the Download Product hyperlink corresponding to VMware vSphere.
3. On the Download VMware vSphere webpage, locate VMware ESXi 5.5 under the needed license category.
4. Click on the Go to Downloads URL corresponding to the ESXi entry to reach the web page titled Download VMware ESXi 5.5.
5. Download the ESXi ISO image, which includes VMware Tools.

How to do it...

The following procedure will guide you through the steps required to upgrade ESXi to Version 5.5:

1. Boot the machine using the ESXi Installation DVD.
2. Choose the ESXi-5.5.0 Standard Installer from the standard boot menu and hit Enter:
3. At the **Welcome to the VMware ESXi 5.5.0 Installation** screen, hit *Enter*:

![Welcome to the VMware ESXi 5.5.0 Installation](image)

4. Hit the function key (*F11*) to accept the EULA:

![End User License Agreement (EULA)](image)

5. Select the storage device that has the previous installation of ESXi and hit *F1* to view the disk details. In this case, it has detected an ESXi 5.1 installation. Next, hit *Enter*:
On hitting F1 you will be presented with the Disk Details. Don't make it a bullet though.

6. On the **ESXi and VMFS Found** screen, choose the option **Upgrade ESXi, preserve VMFS datastore**:
7. On the **Confirm Upgrade** screen, hit **F11** to start the upgrade:

![Confirm Upgrade Screen]

8. Once the upgrade is complete, hit **Enter** to reboot:

![Upgrade Complete Screen]

9. After a successful reboot, you will be at ESXi DCUI's welcome screen.

**Upgrading vCenter Server Appliance to Version 5.5**

If there are **vCenter Server Appliances (VCSAs)** managing subsets of your environment, then the upgrade of the appliance is necessary prior to upgrading the ESXi hosts managed by it. There is no concept of an in-place upgrade of a VCSA to a major version, meaning that the upgrade can’t really be directly applied to the appliance itself. A new appliance is deployed and the configuration is imported from the existing appliance.
You can download the latest available VCSA 5.5 appliance from VMware's download portal:

1. Go to the download page using the following URL (https://my.vmware.com/web/vmware/downloads).
2. Click on the Download Product hyperlink corresponding to VMware vSphere.
3. On the Download VMware vSphere webpage, locate VMware vCenter under the needed license category.
4. Click on the Go to Downloads URL corresponding to the vCenter entry to reach the web page titled Download VMware vCenter Server.
5. Download the vCenter Server Appliance ZIP bundle.

How to do it...

The following procedure will guide you through the steps required to upgrade the appliance to Version 5.5:

1. Create a snapshot on the source (old) VCSA.
2. Download and deploy the new VCSA 5.5 OVF.
3. After a successful first boot, you will be presented with the Welcome to VMware vCenter Server Appliance console screen. Make a note of the current access URL under the Quick Start Guide section of the welcome screen:
4. Use a browser to connect to the URL https://IPAddress:5480. In this case, it is https://192.168.70.204:5480.

5. Log in with the default credentials root/vmware.

6. After the login, you will be presented with the vCenter Server Setup wizard screen. Accept the license agreement and click on Next to proceed.

7. On the next screen (Configure Options), select the radio button Upgrade from previous version, and click on Next to continue:
8. The next screen will show you the pre-generated import key. Right-click on the key and copy it:

![Import Key Screen](image)

9. Go to the management interface of the existing VCSA, using its management URL `https://IPAddress:5480`, and navigate to the **Upgrade** tab.
10. Paste the copied import key into the **Upgrade key** area, and click on **Import key and stop vCenter Server**:

![Image of VMware vCenter Server Appliance](image)

11. Once the import is successful, you'll be informed and the **Upgrade key** text area will now have a new key generated by the existing VCSA. Select and copy the key:

![Image of VMware vCenter Server Appliance](image)
12. Go to the new appliance and paste the copied upgrade key into the source appliance key text area:
13. On the next screen, choose to replace the SSL certificates and click on **Next** to continue:

> It is recommended to replace the default self-signed certificates with CA-generated certificates.
14. On the next screen, specify a new password for the SSO administrator and click on Next:

15. The next screen will show a list of ESXi hosts managed by the existing VCSA. Click on Next to run the pre-upgrade checker.
16. Once the pre-upgrade check is complete, the next screen will seek confirmation on whether or not you have taken a snapshot of the existing (source) vCenter Server Appliance. Select the checkbox I confirm that I have made a backup/snapshot of the source vCenter Server Appliance and the external database, and click on Start to begin the upgrade:

![vCenter Server Setup](image)

17. The upgrade process will take a few minutes to complete. Once done, it should confirm the same and automatically reboot the appliance VM. At this point, you can click on Close to exit the setup wizard:
Once the reboot is complete, use the IP address of the source (old) VCSA to connect to the new appliance. This is possible because the new appliance has imported the entire configuration, including networking from the source appliance.

How it works...

Upgrading the appliance is not similar to the in-place upgrade that can be performed for a vCenter Server running on a Windows machine. The newly deployed appliance needs to be paired with an existing VCSA by exchanging SSL keys.

The destination (new) VCSA will have a pre-generated SSL key, which is used by the source (existing) VCSA to generate a new upgrade key. The source VCSA is powered off during the process of generating a new upgrade key.
The upgrade key is then supplied as a source key to the destination VCSA. The vCenter Startup wizard on the new VCSA will then fetch the configuration information from the existing VCSA over the network:

---

**Upgrading VMware Tools**

Once the hypervisor has been upgraded, you can start migrating virtual machines on the machine; but not everything has been upgraded to Version 5.5 yet. VMware Tools running inside the virtual machines can be upgraded as well to get the most out of the new hypervisor. The virtual machines, however, can continue to run with the older version of VMware Tools.

VMware Tools include the following:

- VMware device drivers for the virtual machine hardware
- The VMware Tools control panel
- A VMware balloon driver (memctl)
VMware Tools for all supported guest operating system types are packaged with ESXi. For Linux, they are also available as VMware Operating Specific Packages (OSPs) for download from the repository URL: http://packages.vmware.com/tools.

In this recipe, we will learn how to upgrade VMware Tools on virtual machines.

**Getting ready**

The virtual machine will require a reboot for the successful completion of the VMware Tools upgrade. So, plan for a scheduled downtime to perform this task on the production virtual machines. Also, take a snapshot of the virtual machine before the tools are upgraded.

**How to do it...**

The VMware Tools upgrade can be done using either vSphere Web Client or the vSphere Client on a powered-on virtual machine or even using the Upgrade Manager. In this section, we will be using vSphere Web Client to achieve the same.

Connect to vCenter Server using the vSphere Web Client:

1. Navigate to the **VMs and Templates Inventory** view.
2. Locate the VM and make sure it is powered on and running.
3. Right-click on the VM and navigate to **All vCenter Actions | Guest OS | Install VMware Tools**.
4. Choose the **Automatic Upgrade** option and then click on **Upgrade** to initiate the upgrade:

**How it works...**

The **Automatic Upgrade** option requires no user interaction. It will do the following:

- Automatically uninstall the older version of VMware Tools
- Install the new version from the ISO that gets mounted
- Reboot the **Guest Operating System (GOS)** to finish the tools upgrade

To verify that the tools upgrade has successfully completed, log-on to the guest operating system, right-click on the system tray icon for VMware Tools, and click on **About VMware Tools**, which should show you the VMware Tools version:
On selecting **About VMware Tools**, a dialog box showing the version number should come up:

For Linux machines, this verification can be done by running the following command demonstrated in the screenshot that follows later:

```bash
# vmware-toolbox-cmd -v
```

You can also check the virtual machine's tool version by navigating to **vCenter Servers | Clusters | Related Objects | Virtual Machines**. This will list all the virtual machines and their VMware Tool version status. The VMware Tools version status column is not enabled by default; you will have to enable it manually.
Upgrading the virtual machine hardware

Once VMware Tools has been upgraded, you can upgrade the virtual hardware for the virtual machines. The virtual hardware will determine the BIOS/EFI used, CPU and memory maximums for the virtual machine, and other features. Virtual hardware Version 10 was released with ESX 5.5. The new features of hardware Version 10 are covered in Chapter 10, Creating and Managing Virtual Machines.

In this recipe, I will discuss the steps required to upgrade the virtual machine hardware. Once you upgrade to the current virtual hardware version, you cannot downgrade it. If you have a multiversion ESX cluster, then make sure that the VM version (virtual hardware version) is at a level supported by all the participating hosts in the cluster. Also, for the upgrade to complete, the virtual machine requires a downtime.

Getting ready

Gracefully shut down the virtual machine on which you intend to perform the virtual machine hardware upgrade. If you cannot afford the downtime of the virtual machine at the moment, then you could choose to schedule an upgrade during the next restart.

How to do it...

The virtual hardware upgrade can be done either using vSphere Web Client or vSphere Client. I will show you how to perform the task using vSphere Web Client:

1. Connect to the vCenter Server using the Web Client.
2. Navigate to the VMs and Templates Inventory view.
3. Locate the VM and perform a graceful shutdown of the Guest Operating System (GOS) if you intend to perform the upgrade now.
4. Right-click on the VM and navigate to All vCenter Actions | Compatibility | Upgrade VM Compatibility...:
5. You will be prompted to confirm the operation. Click on Yes:

![Confirm VM Compatibility Upgrade]

6. In the Configure VM Compatibility dialog box, select the ESXi version you upgraded the server to and click on OK to finish reconfiguring the VM:

![Configure VM Compatibility]

**Scheduling the virtual machine hardware upgrade**

We cannot finish the virtual hardware upgrade while the virtual machine is powered on. Hence, we need to power off the virtual machine for an immediate upgrade. If you have a large number of virtual machines, then you can schedule the virtual hardware upgrade to happen during the next reboot of the virtual machine; for example, a reboot during the next patch cycle.
Upgrading to vSphere 5.5

Getting ready

Prepare a list of virtual machines you would like to perform the virtual machine hardware upgrade on.

How to do it...

The following procedure will walk you through the steps required to schedule a VM hardware upgrade:

1. Select the virtual machine(s) to perform the VM hardware upgrade on and navigate to Actions | All vCenter Actions | Compatibility | Schedule VM Compatibility Upgrade:
2. You will be prompted to confirm the scheduling operation. Click on Yes to confirm and bring up the Schedule VM Compatibility Upgrade window:

3. In the Schedule VM Compatibility Upgrade window, set the compatibility by selecting an ESXi version. In this case, as we have upgraded the ESXi hosts to Version 5.5, we have selected ESXi 5.5 and later:

4. Also, to make sure that the hardware upgrade is performed only after a graceful shutdown of the Guest Operating System (GOS), select the checkbox Only upgrade after normal guest OS shutdown and click on OK.
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