



Quick answers to common problems

Windows Server 2012 Hyper-V Cookbook

Over 50 simple but incredibly effective recipes for mastering the administration of Windows Server Hyper-V

Leandro Carvalho

[PACKT] enterprise 
PUBLISHING professional expertise distilled

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BIRMINGHAM - MUMBAI

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Acknowledgement

I still remember when my cousin Marcelo used to force me to read books when I was young. I wasn't very fond of reading in those days, and now here I am, releasing my own book. It's hard to believe that I could have achieved something that was such a distant dream for me before. So, I start by thanking you, Marcelo, for pointing me in the right direction and helping me to become who I am today.

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Working on this project was truly a challenge but was also really fun for me. The time it consumed was actually taken from the time I spend with my wife. Her support in everything I do is the most important thing I have and I must not forget to thank her for being by my side all the time. I also want to thank Leandro, whom I really admire as a professional, for letting me jump in on this project and making me believe in my skills.

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I would like to thank my wife, Daniele, and my kids, Matheus, Lucas, and Nicole, for their kind and full support and for understanding my long nights at the computer. I'd also like to thank the Microsoft Virtualization team in Redmond for their help and support, and Leandro Carvalho, for the invitation to participate in such a challenging project.

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I would like to thank my lovely son, Lukas, for letting me spend my time working on this project. You are the source of my inspiration and happiness.

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I want to thank my wife, Kerstin, and my kids, Ian and Ina, for their ongoing support, their understanding, and encouragement. Without you guys I could not have followed my passion.

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Table of Contents

Preface	1
Chapter 1: Installing and Managing Hyper-V in Full or Server Core Mode	5
Introduction	5
Verifying Hyper-V requirements	6
Enabling the Hyper-V role	9
Installing Windows Server 2012 and Microsoft Hyper-V Server 2012	12
Managing a Server Core installation using sconfig	16
Enabling and disabling the graphical interface in Hyper-V	19
Configuring post-installation settings	23
Chapter 2: Migrating and Upgrading Physical and Virtual Servers	29
Introduction	29
Performing an in-place upgrade from Windows Server 2008 R2 to Windows Server 2012	30
Exporting and importing virtual machines	34
Migrating virtual machines and updating their integration services	38
Converting VHD files to VHDX files	41
Migrating Virtual Machine storage using Storage Migration	44
Migrating virtual machines using Shared Nothing Live Migration	47
Converting physical computers to virtual machines	53
Chapter 3: Managing Disk and Network Settings	57
Introduction	57
Creating and adding virtual hard disks	58
Configuring IDE and SCSI controllers for virtual machines	63
Creating resource pools	65
Creating and managing virtual switches	69
Using advanced settings for virtual networks	75
Enabling and adding NIC teaming to a virtual machine	79
Configuring and adding Hyper-V Virtual Fibre Channel to virtual machines	83

Chapter 4: Saving Time and Cost with Hyper-V Automation	87
Introduction	87
Installing and running Hyper-V from a USB stick	88
Creating virtual machine templates	92
Learning and utilizing basic commands in PowerShell	95
Using small PowerShell commands for daily tasks	99
Enabling and working with remote connection and administration through PowerShell	105
Chapter 5: Hyper-V Best Practices, Tips, and Tricks	109
Introduction	109
Using the Hyper-V Best Practices Analyzer	110
Setting up dynamic memory for virtual machines	115
Enabling remote management for Hyper-V in workgroup environments	119
Installing and configuring an anti-virus on host and virtual machines	124
Chapter 6: Security and Delegation of Control	127
Introduction	127
Configuring Windows Update for Hyper-V	128
Configuring Cluster-Aware Updating for cluster nodes	133
Delegating control in Hyper-V	139
Configuring Port ACLs	144
Installing and configuring BitLocker for data protection	147
Configuring Hyper-V auditing	153
Chapter 7: Configuring High Availability in Hyper-V	159
Introduction	159
Installing and configuring an iSCSI Target server in Windows Server 2012	160
Installing and configuring the Windows Failover Clustering feature	167
Enabling Cluster Shared Volumes 2.0	175
Using Live Migration in a cluster environment	178
Configuring VM Priority for Clustered Virtual Machines	184
Chapter 8: Disaster Recovery for Hyper-V	187
Introduction	187
Backing up Hyper-V and virtual machines using Windows Server Backup	188
Restoring Hyper-V and virtual machines using Windows Server Backup	196
Configuring Hyper-V Replica between two Hyper-V hosts using HTTP authentication	203
Configuring Hyper-V Replica Broker for a Failover Cluster	213
Configuring Hyper-V Replica to use certificate-based authentication using an Enterprise CA	216
Using snapshots in virtual machines	225

Chapter 9: Monitoring, Tuning, and Troubleshooting Hyper-V	229
Introduction	229
Using real-time monitoring tools	230
Using Perfmon for logged monitoring	236
Using VM Monitoring	243
Monitoring Hyper-V Replica	250
Using Resource Metering	255
Tuning your Hyper-V server	258
Using Event Viewer for Hyper-V troubleshooting	261
Appendix: Hyper-V Architecture and Components	265
Understanding Hypervisors	266
Hyper-V architecture	267
Hyper-V architecture components	269
Differences between Hyper-V, Hyper-V Server, Hyper-V Client, and VMware	271
Index	277

Preface

Virtualization has proved that it can help organizations to reduce costs, and the Private Cloud has created a revolution in the way we manage and control our servers with centralization and elasticity. The new Windows Server 2012 Hyper-V release from Microsoft comes with a myriad of improvements in areas such as mobility, high availability, and elasticity, bringing everything you need to create, manage, and build the core components of a Microsoft Private Cloud for virtualized workloads.

Windows Server 2012 Hyper-V Cookbook is the perfect accompaniment for Hyper-V administrators looking to take advantage of all the exciting new features the release has to offer. Through practical recipes, you'll master Hyper-V deployment, migration, and management.

Windows Server 2012 Hyper-V Cookbook is an essential resource for any Hyper-V administrator looking to migrate, install, or manage their virtual machine efficiently.

With all the features of Windows Server 2012 Hyper-V covered, you will learn everything from installation to disaster recovery, security, high availability, configuration, automation, architecture, and monitoring, all in a practical recipe format. The book also includes new features such as Storage and Shared Nothing Live Migration, Hyper-V Replica and Network Virtualization, and much more.

With *Windows Server 2012 Hyper-V Cookbook* in hand, you'll be equipped to manage your private cloud with ease.

What this book covers

Chapter 1, Installing and Managing Hyper-V in Full or Server Core Mode, provides all the necessary information that you need to know before, during, and after the Hyper-V installation, to make sure that you can save time and solve any problems that you may face.

Chapter 2, Migrating and Upgrading Physical and Virtual Servers, covers tasks that will help you to have an easy and a successful upgrade to the new Windows and Hyper-V versions. You will see how to export and import virtual machines, convert VHD files to VHDX files, migrate virtual machine storage using Storage Migration, and so on.

Chapter 3, Managing Disk and Network Settings, covers recipes that will help you to manage disk and network settings efficiently.

Chapter 4, Saving Time and Cost with Hyper-V Automation, highlights the importance of PowerShell. This chapter will help you to learn and utilize basic commands in PowerShell and also to use them for daily tasks.

Chapter 5, Hyper-V Best Practices, Tips, and Tricks, will show you some best practices for Hyper-V and how they can easily be identified and implemented. By using best practices, you can enhance performance, increase security, and improve Hyper-V administration.

Chapter 6, Security and Delegation of Control, shows how to use configuration options such as access control using Authorization Manager and Simple Authorization, network protection with Port ACLs, and Hyper-V auditing, to enforce a safer environment for virtual and host computers.

Chapter 7, Configuring High Availability in Hyper-V, will show you how to create an iSCSI Target server for low-cost storage, how to prepare and configure a failover cluster for Hyper-V, **Cluster Shared Volumes (CSV)**, and other interesting things, to provide a high availability Hyper-V environment.

Chapter 8, Disaster Recovery for Hyper-V, will walk you through the most important process for setting up disaster recovery for your virtual machines running on Hyper-V.

Chapter 9, Monitoring, Tuning, and Troubleshooting Hyper-V, shows how to use the default tools in Windows Server 2012 to monitor physical and virtual servers, how to troubleshoot, and how to tune Hyper-V servers.

Appendix, Hyper-V Architecture and Components, includes well-explained topics with the most important Hyper-V architecture components compared with other versions.

What you need for this book

You should be comfortable with virtualization concepts and practices, and knowledge of previous versions of Windows Server would be an advantage.

Who this book is for

If you are an administrator who wants to master Microsoft Server Virtualization with Windows Server 2012 Hyper-V, this book is for you.

Conventions


In this book, you will find a number of styles of text that distinguish between different kinds of information. Here are some examples of these styles, and an explanation of their meaning.


Code words in text are shown as follows: "After its download, copy it to the chosen directory, then access it through the command prompt and run the command `coreinfo -v`."

Any command-line input or output is written as follows:

```
netsh interface ip set address "Local Area Connection" static
192.168.0.10 255.255.255.0 192.168.0.1 1
```

New terms and **important words** are shown in bold. Words that you see on the screen, in menus or dialog boxes for example, appear in the text like this: "To change the maximum number of simultaneous storage migrations, click on **Storage Migrations**".

 Warnings or important notes appear in a box like this.]

 Tips and tricks appear like this.]

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1

Installing and Managing Hyper-V in Full or Server Core Mode

In this chapter, we will cover the following topics:

- ▶ Verifying Hyper-V requirements
- ▶ Enabling the Hyper-V Role
- ▶ Installing Windows Server 2012 and Microsoft Hyper-V Server 2012
- ▶ Managing a Server Core installation using sconfig
- ▶ Enabling and disabling the graphical interface in Hyper-V
- ▶ Configuring post installation settings

Introduction

Microsoft has done a great job with Hyper-V. Since its first version in 2008, the enterprises noticed that it was a very good virtualization solution for a first release. The second version with Windows Server 2008 R2 brought a couple of new features that enable mobility such as **Live Migration** and **Dynamic Memory**. The third version in Windows Server 2012 goes beyond all expectations and brings all the components to allow IT administrators to have everything they need to build the base of their cloud. Almost everything in Hyper-V has been improved and it comes with lots of extraordinary features that will transform the way we manage and deploy our datacenters. All workloads can now be virtualized and new features deliver environments beyond virtualization as we know it. Hyper-V Replica, Shared Nothing Live Migration, Full PowerShell support, SMB 3.0, and new limits are some examples that makes Windows Server 2012 Hyper-V a key component with results like high availability, low cost, elasticity, reliability, and everything we need for our servers.

The Hyper-V journey starts with its installation. Even though the installation steps can be simple, it is crucial to take care of the server prerequisites and the post configuration tasks. It is also very important to verify all the hardware prerequisites, the installation, and the administration method that will be used to manage your server.

Having said that, Hyper-V installation should begin with one of the most important phases of virtual servers before even buying the server itself; it should begin with the planning phase. During this phase, you will identify the proper hardware configuration and all of the prerequisites based on your needs. By default, Hyper-V also needs some processor requirements and that's why these components must be present on every server that runs Hyper-V.

This chapter will provide all the information you need to know before, during, and after the Hyper-V installation to make sure that you can save time and solve any problems that you may face.

Verifying Hyper-V requirements

In order to install Hyper-V, you should make sure your server supports it by verifying the prerequisites. Failing with the Hyper-V requirements will result in an error while you install it.

Neither Windows nor Hyper-V offers a tool to verify the prerequisites, but the processor companies created tools such as **AMD-V System Compatibility Check** and **INTEL Processor Identification Utility**.

You will see in this recipe how to use them and also how to use the **Coreinfo** tool to facilitate the process.

Getting ready

To verify the prerequisites of your processor, you must download the Intel Processor Identification Utility. You can download it from the following link: http://downloadcenter.intel.com/Detail_Desc.aspx?ProductID=1881&DwnldID=7838&lang=eng&iid=dc_rss.

Based on the server processor, you can also download the AMD Virtualization Technology and Microsoft Hyper-V System Compatibility Check Utility from the following link: <http://support.amd.com/us/Pages/dynamicDetails.aspx?ListID=c5cd2c08-1432-4756-aafa-4d9dc646342f&ItemID=177&lang=us>.

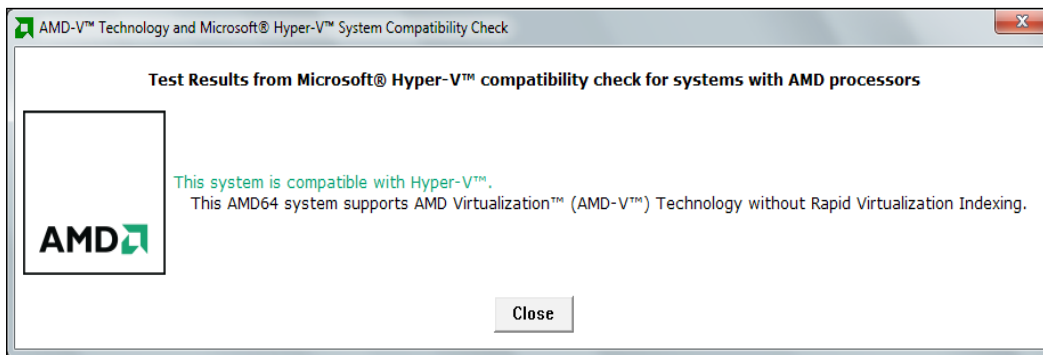
To identify the processor brand, open the **Directx Diagnostic Tool (dxdiag)** and check the processor information.

You also need to download the Coreinfo tool at <http://technet.microsoft.com/en-us/sysinternals/cc835722> to verify advanced processor support such as **Second-Level Address Translation (SLAT)** to install Hyper-V in Windows 8.

How to do it...

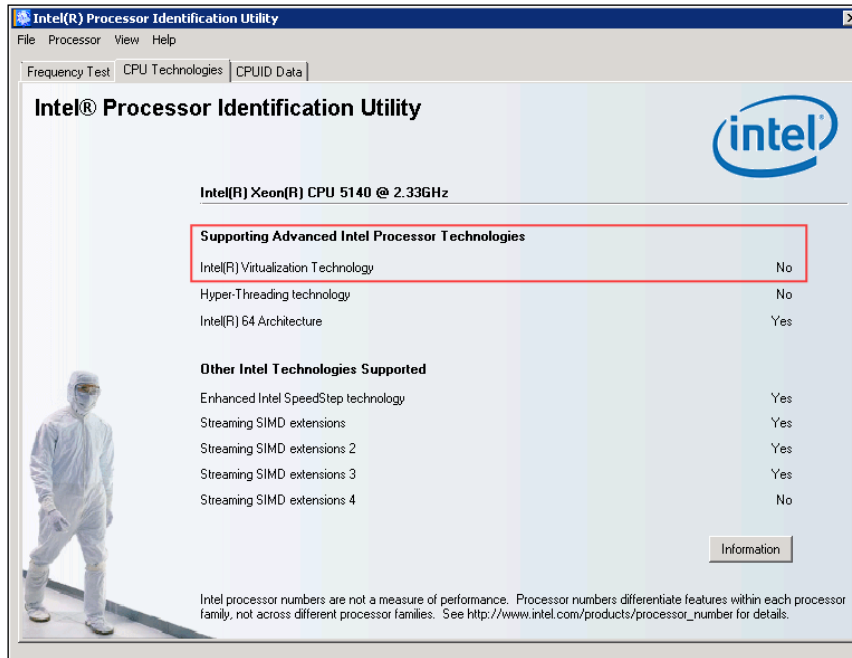
In the following steps, you will see how to verify if your computer meets the requirements to install Hyper-V on Windows Server 2012 and Windows 8.

1. After downloading and installing the necessary tools as explained in the *Getting ready* section, install the utility based on your processor.
2. For AMD processors, the AMD-V System Compatibility Check provides the results for AMD processors, if it supports Hyper-V, as shown in the following screenshot:

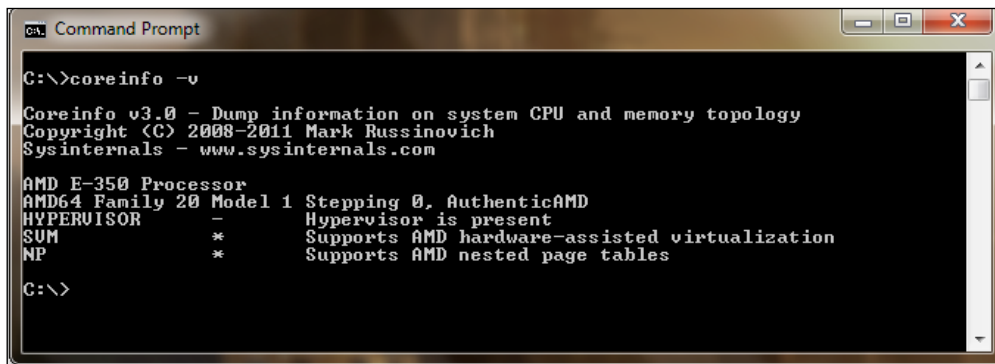


3. If you have an Intel processor, after the Intel Processor Identification Utility install, you will see three tabs once you run it.
4. Select the first tab named **Frequency Test** to show the highest frequency and speed that your processor can handle.
5. Select the second tab named **CPU Technologies** and check the results for the technologies supported by the processor model such as **Virtualization technology**, **Hyper-Threading** and other technologies.
6. Then, select the **CPUI Data** tab to see information such as the **Processor type**, **Family model**, **Cache sizes**, and **Data Execution Prevention (Execute Disable Bit)**.

7. For Intel processors, the result will be similar to the one shown in the following screenshot:



8. To verify whether the processor supports **Second-Level Address Translation (SLAT)** or not, use the free tool called **Coreinfo**.
9. After its download, copy it to the chosen directory, then access it through the command prompt and run the command `coreinfo -v`.
10. In the following screenshot, you can see an example of a computer running with an AMD processor, the SLAT support, the Hypervisor support, and it shows that the Hypervisor is not installed.



11. With these steps, you have identified whether the computer you want to install Hyper-V on has all its prerequisites.

How it works...

The mentioned tools simply verify the processor properties to show if it has the necessary features to install Hyper-V. One of these features is the **Hardware-assisted virtualization**. This functionality allows Hyper-V to run under privileged access through a special layer in the processor. In some cases, this feature must be enabled through the **Basic Input-Output System (BIOS)**.

These three tools also check whether the **Data Execution Prevention (DEP)** is present. Intel calls this feature **Intel XD bit (Execute Disable Bit)**, and for AMD it is **AMD NX bit (no execute bit)**. This feature must be also enabled through the BIOS.

There is a particular prerequisite called **Second Level Address Translation (SLAT)** that is shown only by the Coreinfo tool. SLAT is the only requirement that is optional for Windows Server, but necessary for Windows 8 installations. It provides better performance by reducing the CPU time and improving the memory usage in virtual environments. The -v switch used by Coreinfo shows whether the Hypervisor is enabled, whether it supports virtualization, and whether your processor supports SLAT. For the last one you will see an asterisk (*) at Intel **Nested Page (NP)** tables on the AMD processor and **Extended Page Tables (EPT)** for Intel processors.

Coreinfo and both AMD and Intel utilities extract details about the processor information provided by the BIOS. Sometimes for security reasons these features can be enabled manually. It is also common in some cases for it to be necessary to update the BIOS in order to manage these features.

See also

- ▶ *Appendix A, Hyper-V Architecture and Components*

Enabling the Hyper-V role

By default, Windows Server does not come with Hyper-V installed. In order to start using the virtual environment, Hyper-V needs to be enabled. Even with its straightforward steps, it is important to understand how it works after the setup and what has changed in Windows architecture.

Getting ready

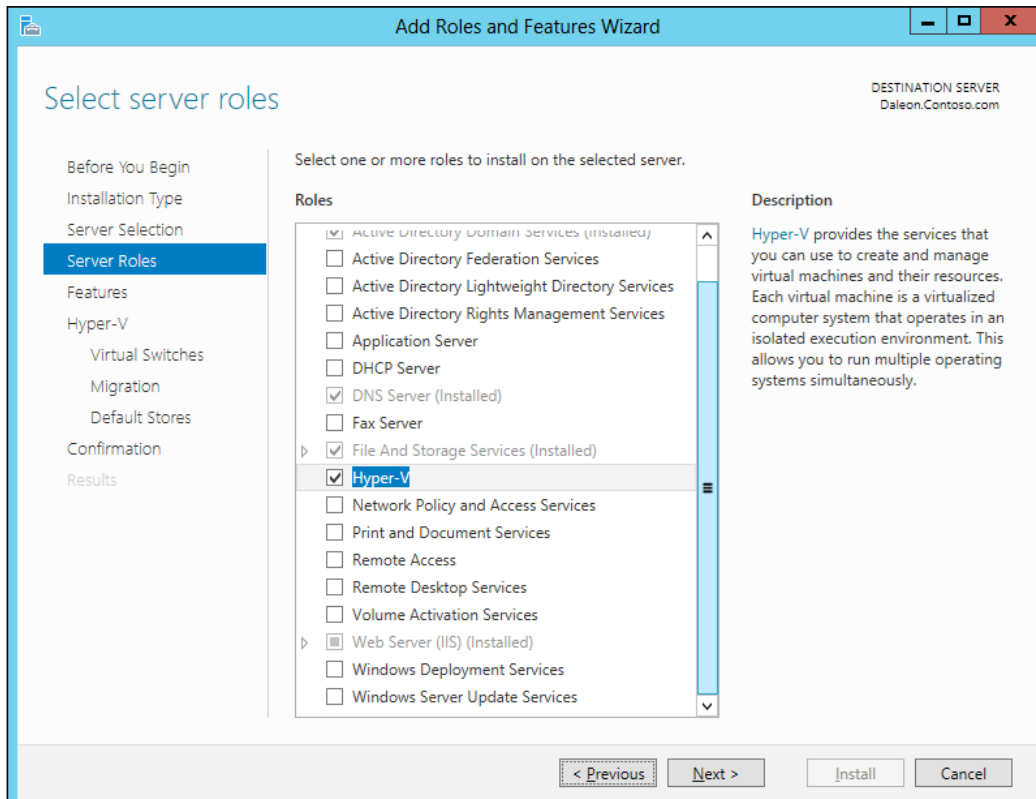
There are different methods to install Hyper-V. The most common one is through the graphical interface.

To get ready to enable Hyper-V you must be logged on with administrative privileges.

How to do it...

The following steps will demonstrate how to enable the Hyper-V Role for Windows Server and what is changed in the Windows architecture after its installation.

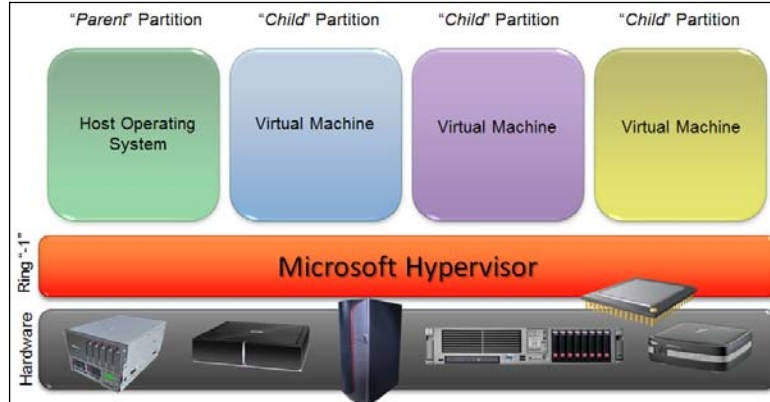
1. On the **Start Screen** select **Server Manager**.
2. In the Server Manager Dashboard, click on **Add roles and features**.
3. In the **Add Roles and Feature Wizard**, click on **Next** three times.
4. On the next screen, **Server Roles** page, select **Hyper-V**, as shown in the next screenshot, and click on **Next** three times.



5. In the **Virtual Switches** window, select the network adapter you want to use on Hyper-V. You can add, remove, and modify the virtual switches after the Hyper-V installation through **Hyper-V Manager**.
6. On the **Virtual Machine Migration** page, check the **Allow this server to send and receive live migration of virtual machines** option if you want to enable live migration requests, then click on **Next**.
7. In the last Hyper-V installation page called **Default Stores**, specify the default location for virtual disks and virtual machine configuration files, click on **Next** and then **Install** to start the installation process.
8. Reboot the server after the installation.

How it works...

The process that you have performed to install Hyper-V is quite simple, but it changes the processor architecture by creating a new privileged layer called **ring -1** that runs under the normal layers. The setup process, completed in the previous task, installs the Microsoft Hypervisor on this layer to make sure that Hyper-V has more privilege than Windows itself. Basically, the host operating system runs above the Hypervisor together and at the same level as the virtual machines. The host turns into a special virtual machine containing the virtualization stack, responsible to manage all the virtual machines from it. The following diagram illustrates Hyper-V being installed in the ring -1 and all the partitions running under it.



After the first reboot, the Windows boot (`winload.exe`) loads the driver (`hvboot.sys`) responsible to verify the processor that is running and if it supports virtualization. Then the Hypervisor image file is loaded. The host OS and the virtual machines are called **partitions**. Because they run at the same privileged access above the Hypervisor, the host OS is known as **parent partition** and the virtual machines are known as **child partitions**.

There's more...

For automation and fast installation, you can also enable Hyper-V using command lines. You can do that by using the command line `ocsetup`, `Servermanagercmd`, or Windows PowerShell.

Installing Hyper-V using Windows PowerShell

For a PowerShell installation, open Windows PowerShell and run the following command:

```
Add-WindowsFeature Hyper-V
```

See also

- ▶ The *Creating and managing virtual switches* recipe in *Chapter 3, Managing Disk and Network Settings*
- ▶ The *Hyper-V architecture components* recipe in *Appendix A*

Installing Windows Server 2012 and Microsoft Hyper-V Server 2012

After the prerequisites verification we are ready to install either Windows Server 2012 or Microsoft Hyper-V Server 2012. The basic installation is not so complicated and it's the same for both the products, but it takes time to be finished. It would be interesting to identify the needs of a server provisioning made by an automation task; in some companies it is common to have lots of physical and virtual machines being deployed, and automating the process could result in both cost and time saving.

In case you want to use the Windows Server 2012 installation, it offers two methods: Full Server and Server Core. The **Full Server** option provides a graphical interface to manage Hyper-V and Windows, including Hyper-V Manager, Server Manager, and all the other tools and services available on Windows. The problem with the Full Server option is that it comes with other components and services installed by default. That's why Windows Server 2008 introduced a new installation method called **Server Core** which is the default installation method in Windows Server 2012. This option does not come with the **Graphical User Interface (GUI)**; instead, it has a command line interface. With Server Core, we have more security and better performance in the host computer because only the core components of Windows are installed and features such as the Internet and Windows Explorer are not present.

As a result, the command line interface from Server Core and Hyper-V Server provide the following:

- ▶ Reduced maintenance and management
- ▶ Less risk of bugs and failures
- ▶ Less disk and memory requirements
- ▶ Less updates requirements
- ▶ More security

Both these described options are available on Windows Server, which means that a Windows Server License has to be purchased, although there is a free version of Hyper-V called **Hyper-V Server**. This is a version very similar to Windows Server Core installation, but it comes with Hyper-V only and contains all the features of Windows Server 2012 Hyper-V.

In this task, you will see how to install Hyper-V Server.

Getting ready

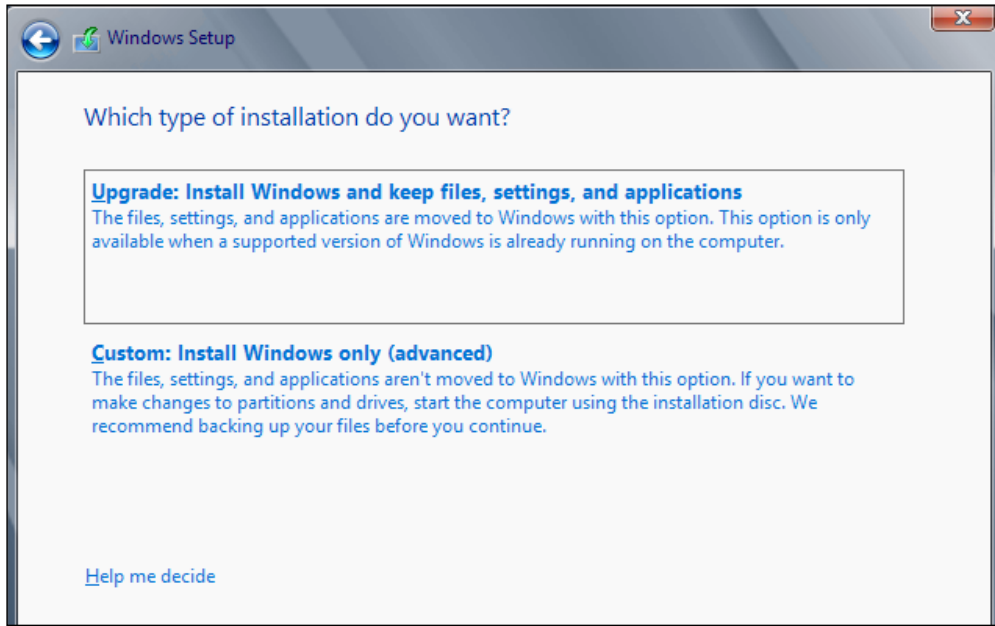
Before you start, make sure you have the correct media file or DVD with the Windows Server 2012 installation image.

How to do it...

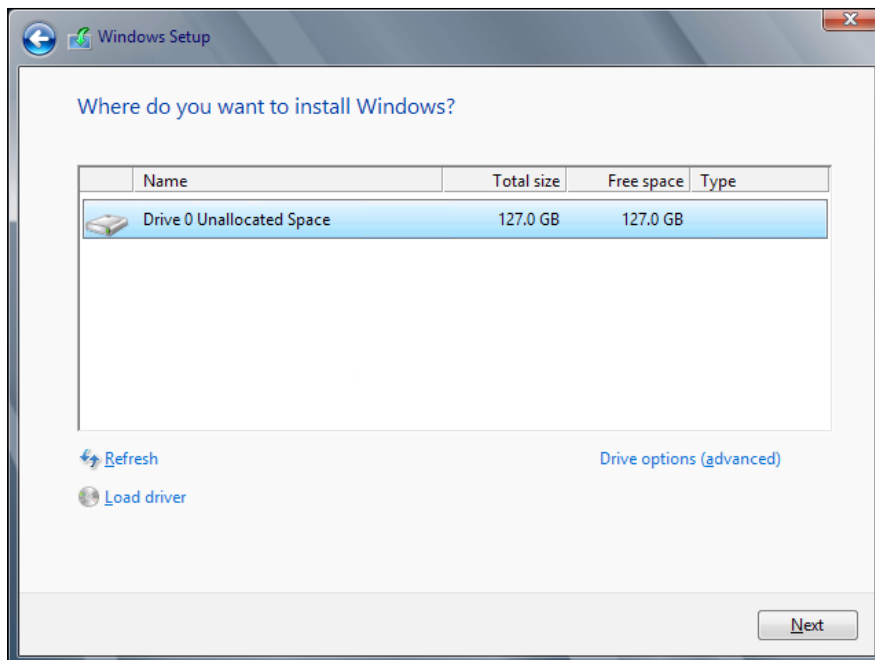
The following steps will walk you through the installation process of Windows Server 2012.

1. After the DVD boot process in the first screen, select your language, time and current format, keyboard or input method, and click on **Next**.
2. On the second screen, click on **Install now** and installation will automatically continue. If prompted, add the Windows **Product Key** and click on **Next** again.
3. Select the operating system to be installed and then click on **Next**.
4. In order to install Windows Server 2012, you will have to accept the license terms. Select the option **I accept the license terms** and click on **Next**.

- For a new installation, select the option **Custom: Install Windows only (Advanced)**, as shown in the following screenshot. The upgrade option for this version has been disabled.



- In the **Where do you want to install Windows** screen, select the hard drive you want to install Windows Server and click on **Next**. For advanced driver options click on **Drive options (advanced)**.
- If you have an external storage device or a hard drive that needs a driver to be loaded, click on **Load Driver**, as shown in the next image, and install the proper drivers. Click on **Next**.
- At this point, you need to wait for the installation to be completed. It can take from 10 to 30 minutes, based on your hardware.



9. When it finishes, you will see the login screen, asking you to provide the username and password. The default user is `Administrator` with a blank password. By default, Windows creates a blank administrator password. For the first login, the system prompts you to insert a password.

How it works...

The process to install Hyper-V Server and Windows is the same. The setup will install all the necessary components, but only to run Hyper-V without any other services (or applications, in case of Hyper-V Server). The first step made by the installation is to load the setup image file `boot.wim` and after the process above the setup applies the `install.wim` image file containing the OS image.

After the installation, you will be prompted to change the administrator password and the system will be ready to be used.

See also

- ▶ The *Managing a Server Core installation using sconfig* recipe in this chapter
- ▶ The *Enabling remote management for Hyper-V in workgroup environments* recipe in *Chapter 5, Hyper-V Best Practices, Tips, and Tricks*

Managing a Server Core installation using sconfig

You read in the previous recipe about all the benefits of Server Core such as performance, security and so on. But without the GUI, it's not easy to do the daily management and maintenance of Hyper-V. If you want to change the computer name or the IP address, the GUI is always the easiest to use. But on the other hand, the command line can bring a fast and an automated process.

That's why in Windows Server 2012, the Server Core version of Windows and Microsoft Hyper-V Server 2012 comes with the **Server Configuration (sconfig)**. This is a command line with a simple interface to reduce the time for doing the most common tasks in Windows. In the following screenshot, you can see an example of sconfig's first page:

```
C:\Windows\System32\cmd.exe - C:\Windows\system32\sconfig.cmd

=====
Server Configuration
=====

1) Domain/Workgroup:          Workgroup: WORKGROUP
2) Computer Name:            WIN-K4QCNH9C68L
3) Add Local Administrator    Enabled
4) Configure Remote Management Enabled
5) Windows Update Settings:  Manual
6) Download and Install Updates
7) Remote Desktop:           Disabled
8) Network Settings
9) Date and Time
10) Help improve the product with CEIP Not participating
11) Log Off User
12) Restart Server
13) Shut Down Server
14) Exit to Command Line

Enter number to select an option:
```

sconfig can do this via an intuitive numerical menu to facilitate the Windows configuration.