

Chapter 12

Networking with Windows Server 2008

In most organizations, Windows 7 will be a member of a domain, so it is important to know how to properly configure it in a domain environment.

In this chapter we discuss peer-to-peer networks and the advantages and disadvantages of this network model. We will also look at Windows Server 2008 domain-based networks using Active Directory and how to configure Windows 7 to work within the Windows Server 2008 domain environment.

Another technology that we will discuss is Windows Server 2008 Hyper-V, Microsoft's newest version of virtualization. Virtualization, one of the fastest-growing and hottest technologies to hit the market in the past few years, has started to make an impact due to its vast economic advantages. Virtualization gives an organization the ability to run multiple operating systems, called virtual machines, on a single machine. The ability to run multiple operating systems on a single machine can help an organization reduce their hardware costs and allow an organization to reduce their IT department overhead. We show you how to turn Windows 7 into a virtual machine that can run on Hyper-V or Microsoft Virtual PC.

In this chapter, you'll learn how to:

- ◆ Connect Windows 7 to the domain
- ◆ Configure Hyper-V
- ◆ Use Microsoft Virtual PC

Understanding Networking

The first thing that we have to discuss is Microsoft's network model types. Because this book is geared toward administrators, this might be a refresher for some, but many administrators do not do work on servers. So this chapter will be useful either way.

The way you design your network determines how you set up the rest of the computers and servers on your network. The choice you make here is going to be determined by many factors. The number of users on your network or the amount of money you can spend helps determine your network design. Microsoft uses two networking models: peer-to-peer networks and domain-based networks.

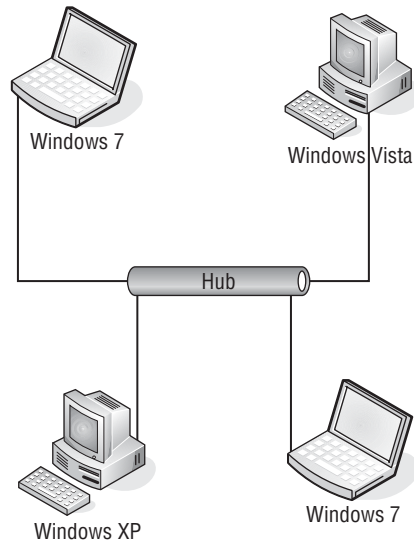
The Windows Peer-to-Peer Network Model

Let's begin with the peer-to-peer model. When you set up a Windows peer-to-peer network (also referred to as a workgroup network), it is important to understand that all computers on the network are equal. All of the peer-to-peer computers, also referred to as nodes, simultaneously act as both clients and servers.

This can be an advantage for small networks that have 10 or fewer users. It allows a small network to share resources without the need of a costly server. In addition, it enables a small company to have a network setup without hiring an internal IT department.

Peer-to-peer networks are no more than Windows XP, Windows Vista, and Windows 7 machines connected by a centralized connection like a router or hub, as shown in Figure 12.1.

FIGURE 12.1
The peer-to-peer model



WINDOWS NETWORKING

To learn more about Windows peer-to-peer networks, see *MCTS: Windows Server 2008 Network Infrastructure Configuration Study Guide: Exam 70-642*, by William Panek, Tyler Wentworth, and James Chellis (Sybex, 2008).

One of the biggest debates among IT professionals is when to use a peer-to-peer network. These types of networks have their place in the networking world. Most of you at home use this type of network. All computers connect using a small Internet router.

Well, it's the same for companies. You would use this network in a small environment with 10 or fewer users. This allows small organizations to share resources without the need of expensive equipment or server software.

But just like everything that is good, there is a downside to peer-to-peer networks. The biggest downside is manageability. Many new IT people like working on a small peer-to-peer network because of its size, but in fact a network with 10 users and 10 computers can be difficult to manage.

Because there is no server to centralize user accounts, each Microsoft Windows XP or Vista computer must have a user account and a password. So if you have 10 users with 10 computers and all 10 users must be able to access all 10 computers, you end up creating 100 accounts.

Another disadvantage to peer-to-peer networks is backups. Most IT departments do not back up individual user machines, and because there is no centralized server for data storage, data recoverability can be an issue.

So now that you have seen the advantages and disadvantages of a peer-to-peer network, let's discuss the pros and cons of a domain-based network.

Windows Server 2008 Active Directory Network

A domain-based network is a network that uses Microsoft's *Active Directory*. Active Directory is a single, distributed database that contains all the objects within your network. Some of these objects are user accounts, group accounts, and published objects (folders and printers).

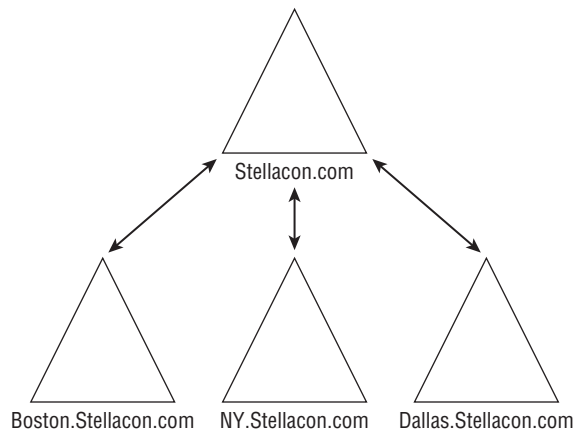
The first of many advantages to Active Directory is centralized management. As we just stated, the Active Directory database contains all the network information within a single, distributed data repository. Because these objects are all located in the same database, an administrator can easily manage the domain from one location.

Another major advantage to using Active Directory is domain security. An administrator has the advantage of creating a single username and password for all users within the domain. This password can be used to access all resources that an individual has the proper rights to access. An administrator can determine, based on job function or position, which files or folders a user can obtain. In our peer-to-peer example, you needed to create 100 accounts. Now with a domain, you need to create only 10 accounts.

An Active Directory structure is made up of one or more *domains*. A domain is a logical grouping of objects within your organization. For example, if we had the Stellacon.com domain, all users in that domain should be members of the Stellacon.com organization. The objects that are contained within a domain do not need to be in the same physical location. Domains can span the entire globe even though they are part of the same organization.

One of the advantages to using domains is the ability to have child domains. A child domain is a subdomain of another domain. You can build child domains based on physical locations, departments, and so forth. Figure 12.2 shows the hierarchy structure of Stellacon.com with its child domains (based on geographic location).

FIGURE 12.2
Domain structure



MICROSOFT DOMAINS

Microsoft domains are represented as triangles. It is important to remember that when looking at any Microsoft websites or white papers.

One of the benefits of creating child domains is scalability. Active Directory has the ability to store millions of objects within a single domain, but child domains give you the flexibility to design a structure layout that meets your organizational needs.

When setting up child domains, the parent and child domains already establish a *trust* relationship. *Trusts* allow users to be granted access to resources in a domain even when their accounts reside in a different domain. To make administration of trust relationships easier, Microsoft has made transitive two-way trusts the default relationship between domains. This means that, by default, all domains within the same forest automatically trust one another. As shown in Figure 12.2, Stellacon.com automatically trusts Boston.Stellacon.com, NY.Stellacon.com, and Dallas.Stellacon.com. This means that all child domains implicitly trust one another.

The last Active Directory advantage that we discuss is an extensible schema. The Active Directory schema is the attributes of the database. For example, when you create a new user using the Active Directory Users and Computers snap-in, the system asks you to fill in the user's first name, last name, username, password, and so forth. These fields are the attributes of Active Directory and that is the schema. An administrator has the ability to change or expand these fields based on organizational needs.



Real World Scenario

CHANGING THE SCHEMA

You may be asking yourself why an organization needs to change the schema. Many years ago, when I got out of the military and before I got into the computer industry, I used to cast toilets for American Standard. I made 50 toilets a day. When working for American Standard, I had an employee number of 343. All of my toilets used to get stamped 343 (so the company knew who made the product) on the bottom base of the toilet. My time card did not even have my name, just my number.

This would be an example of a field that would need to be added to your Active Directory schema. I would have an account in Active Directory with my name but there would need to be a field that showed my employee number. You might have to adjust your Active Directory schema based on your organizational requirements.

The major disadvantage to an Active Directory model is cost. When setting up an Active Directory domain, an organization needs a powerful enough machine to handle the Windows Server 2008 operating system. Also, most companies that decide to use a domain-based organization will require the IT personnel to manage and maintain the network infrastructure.

In the next section we look at some of the server terminology that we use in the remainder of this chapter.

Microsoft Networking Terms and Roles

The following are some networking terms and roles. You will be familiar with some of these terms, but it's always good to get a refresher.

Server A server is a machine that users connect to so that they can access resources located on that machine. These resources can be files, printers, applications, and so forth. Usually the type of server is dependent on the resource that the user needs. For example, a print server is a server that controls printers. A file server is a server that contains files. Application servers can run applications for the users. Sometimes you will hear a server referred to by the specific application that it may be running, such as "That's our SQL server" or "That's our Exchange server."

Domain Controller This server contains a replica of Active Directory. Active Directory is your database that contains all the objects in your network. A domain controller is a server that contains this database. Years ago (when we were using NT 3.51 and NT 4.0), we had to have a Primary Domain Controller (PDC) as well as Backup Domain Controllers (BDC), but that's not true today. All domain controllers are equal in a Windows Server 2008 network. Some domain controllers may contain extra roles, but they all have the same copy of Active Directory.

Member Server A member server is a server that is a member of a domain-based network, but it does not contain a copy of Active Directory. For example, it is recommended that Exchange be loaded on a member server instead of a domain controller. Both domain controllers and member servers can act as file, print, or application servers. It just depends on whether or not you need that server to have a replica of Active Directory.

Stand Alone Server A stand alone server is a server that is not a member of a domain. Many organizations might use this type of server for virtualization. For example, you load Windows Server 2008 with Microsoft's version of virtualization (Hyper-V) on a stand alone server. You can then create virtual machines that act as domain controllers to run the network.

Client Machine A client machine is a computer that normally is used for your end users in a company. The most common operating systems for a client machine are Windows XP, Windows Vista, and Windows 7.

DNS Server The *Domain Name Service (DNS)* server is a server that has the DNS service running on it. DNS is a name resolution service. DNS turns a host name into a TCP/IP address (forward lookup). DNS also has the ability to turn a TCP/IP address into a name (reverse lookup). When you install an operating system onto a computer, you assign that computer a hostname. The problem is that computers talk to each other using the TCP/IP protocol (example: 192.168.1.100). It would be difficult for most users to remember all the different TCP/IP addresses on a network. So normally you connect to a machine by using its hostname. DNS does the conversion of hostname to TCP/IP address for you.

The easiest way to understand how this works is to think of your phone number. If someone wants to call you and they don't have your telephone number, they call information. They give information your name and they get your phone number. Well, this is how a network works. DNS is information on your network. You give DNS a hostname and it returns a network telephone number (TCP/IP address). DNS is a requirement if you want to install Active Directory. You can install DNS before or during the Active Directory installation.

DHCP Server A *Dynamic Host Configuration Protocol (DHCP)* server is the server that runs the DHCP service. DHCP is the server on the network that assigns TCP/IP information to

your computers dynamically. Every computer needs three settings to operate properly (with the Internet and intranet): a TCP/IP number, a subnet mask, and a default gateway (router number). Your computers can get this minimum information two ways: manually (someone assigns the TCP/IP information) or dynamically (automatically installed). DHCP can assign more than just these three settings. DHCP can assign any TCP/IP configuration information (DNS server, WINS server, time servers, etc.).

In the previous section on DNS, we said that DNS was information on your network. Well, following this example, DHCP would be the phone company. DHCP is the component that assigns the telephone number (TCP/IP address).

Global Catalog The Global Catalog is a database of all Active Directory objects without all the attributes. The Global Catalog is a partial representation of the Active Directory objects. Think of the Global Catalog as an index. If you needed to look something up in this Windows 7 book, you would go to the index and find what page you need to turn to. You would not just randomly look through the book for the information. This is what the Global Catalog does on your Active Directory domain. When you need to find a resource in the domain (user, published printer, and so forth), you can search the Global Catalog to find its location.

Domain controllers need to use a Global Catalog to help with user authentication. Global Catalogs are a requirement on an Active Directory domain. All domain controllers can be Global Catalogs, but this is not always a good practice. Your network should have at least two Global Catalogs for redundancy, but too many can cause too much Global Catalog replication traffic.

ACTIVE DIRECTORY NETWORK

To learn more about Microsoft Active Directory networks, see *MCTS: Windows Server 2008 Active Directory Configuration Study Guide: Exam 70-640*, by William Panek and James Chellis (Sybex, 2008).

In the next section, we'll discuss the Windows Server 2008 operating system.

New Microsoft Windows 2008 Server Features

Microsoft Windows Server 2008 is the latest release of Microsoft's server operating systems. It is important to understand Windows Server 2008 and also how to install the operating system. There are many new and upgraded features in Windows Server 2008. In this section, we will show you the different versions of Microsoft Windows Server 2008 and some of the new features of Windows Server 2008.

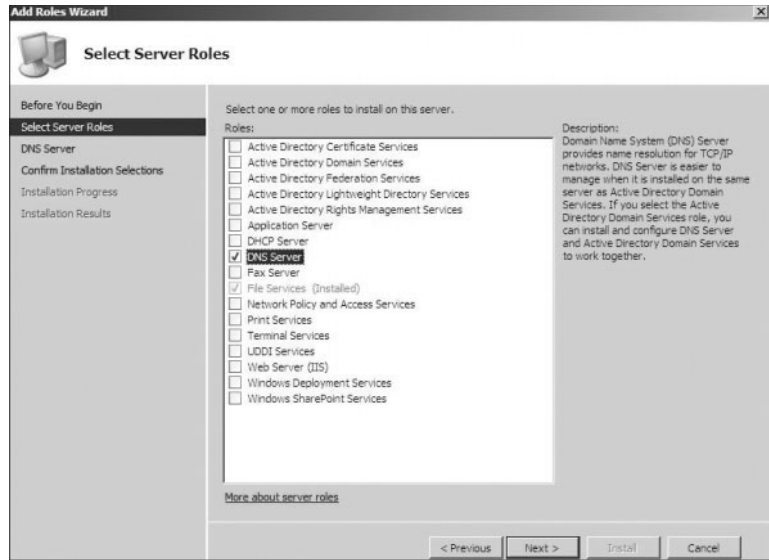
Hyper-V Hyper-V allows an organization to create and manage virtualized server environments. This is a new feature of Windows Server 2008 64-bit edition. We discuss Hyper-V in detail in the section "Understanding Virtualization," later in this chapter.

AD Rights Management Services (AD RMS) Active Directory Rights Management Service (AD RMS) is included with Windows Server 2008. AD RMS gives network users or administrators the ability to determine the access level (open, read, modify, and so forth) they would like to assign to other users in an organization. By using Microsoft Office 2003 Professional or Microsoft Office 2007, users can secure email messages, internal websites, and documents.

The advantage to AD RMS is that any user can secure confidential or critical company information. To use AD RMS, an AD RMS client is required. The AD RMS client is included with Windows Vista and Windows 7 by default.

Server Manager Windows Server 2008 has included a new single-source utility for installing, configuring, and managing roles on a server, as shown in Figure 12.3. *Server Manager* displays server status and system information, and also identifies problems with server roles.

FIGURE 12.3
Server Manager



Server Manager has replaced several features that had been included with Windows Server 2003. These replaced features include Manage Your Server, Configure Your Server, and Add or Remove Windows Components.

An issue that you face when deploying servers is the need to run the Security Configuration Wizard. Server Manager, by default, allows you to deploy servers without running the Security Configuration Wizard because Server Manager server roles are configured with Microsoft-recommended security settings.

Network Access Protection (NAP) Windows Server 2008 has a new security feature called Network Access Protection (NAP). You can use NAP to define network access, based on client requirements. The advantage of using NAP is that you can define this access at the granular level. NAP also gives you the ability to allow network access based on compliancy with corporate governance policies. Here's a list of some of the new features associated with NAP:

- ◆ Network layer protection
- ◆ DHCP enforcement
- ◆ VPN enforcement
- ◆ IPSec enforcement
- ◆ 802.1X enforcement
- ◆ Flexible host isolation

Read-Only Domain Controllers (RODC) Windows Server 2008 introduced a new type of secure domain controller called a *read-only domain controller (RODC)*. A read-only domain controller is a noneditable copy of Active Directory. This allows an organization to place a domain controller in an area or off-site location that does not have much physical security.

All domain controllers are equal. They all have the same version of Active Directory. This is also true with a read-only domain controller. Replication between domain controllers is bidirectional (replication happens both ways) except for the use of read-only domain controllers. Replication traffic between domain controllers and RODCs is unidirectional. Other domain controllers have the ability to talk to the RODC but the RODC does not have the ability to talk to other domain controllers.

An advantage to using an RODC in a nonsecure location is that an organization can give a normal user the right to administer and maintain the RODC. This user would not require domain administrator rights. They would be allowed to have the administrator role for the one RODC only. This concept is known as Administrator role separation.

Server Core Installation Another feature new to Microsoft servers is the Server Core installation, which allows you to install Windows Server 2008 with minimal options. Server Core is a low-maintenance version of Windows Server 2008 and has limited functionality.

Windows Server 2008 Server Core has no graphical user interface (GUI) utilities. All commands have to be issued through the use of a command prompt. If you have been in the industry long enough, think of UNIX or Cisco. You must know the command-line utilities to maintain the server. This is a great security feature.

Think of a normal server. If you want to add or modify a user, you go to Active Directory Users and Computers (domain based) or Computer Management for workstations or nondomain servers. Once in the application, you can do what's needed. The problem with this is that it is easy to do. If any user gets into your server room, it may be easy for them to do damage to your network. In a Server Core environment, just as we stated, there are no GUI snap-ins. If they don't know the command-line utilities, they can't make changes.

Server Core is an installation option that allows you to set up only limited server roles: DNS, DHCP, File Server, Active Directory, Media Services, and Hyper-V. For many organizations, this is going to be the way you set up Hyper-V, discussed in the "Understanding Virtualization" section of this chapter. This gives you extra security for your Hyper-V environment. By installing Server Core, you automatically create the following limitations:

- ◆ There is no Windows shell and limited GUI functionality (the Server Core interface is a command prompt).
- ◆ There is no managed code support in Server Core (all code must be native Windows API code).
- ◆ Microsoft Installer Package (MSI) support is limited to unattend mode only.

There are multiple editions of Windows Server 2008. Each edition has its specific uses. Table 12.1, taken from Microsoft's website at www.microsoft.com/windowsserver2008/en/us/r2-compare-roles.aspx, it shows the new and upgraded features included with Windows Server 2008 R2 (R2 is the latest release of Windows Server 2008) and which edition of Microsoft Windows Server 2008 R2 is required to use the new or upgraded features.

TABLE 12.1: Server Editions Comparison

SERVER ROLE	ENTERPRISE	DATACENTER	STANDARD	ITANIUM	WEB
Active Directory Certificate Services	X	X	X ¹		
Active Directory Domain Services	X	X	X		
Active Directory Federation Services	X	X			
Active Directory Lightweight Directory Services	X	X	X		
Active Directory Rights Management Services	X	X	X		
Application Server	X	X	X	X	
DHCP Server	X	X	X		
DNS Server	X	X	X		X
Fax Server	X	X	X		
File Services	X	X	X ²		
Hyper-V	X	X	X		
Network Policy and Access Services	X	X	X ³		
Print and Document Services	X	X	X		
Remote Desktop Services	X	X	X ⁴		
Web Services (IIS)	X	X	X	X	X
Windows Deployment Services	X	X	X		
Windows Server Update Services (WSUS)	X	X	X		

¹ Limited to creating Certificate Authorities — no other ADCS features (NDES, Online Responder Service). See ADCS role documentation on TechNet for more information.

² Limited to one standalone DFS root.

³ Limited to 250 RRAS connections, 50 IAS connections, and 2 IAS Server Groups.

⁴ Limited to 250 Remote Desktop Services connections.

In the next section, we look at the requirements that are needed to install Windows Server 2008.

Requirements for Windows Server 2008 Installation

Now that you have seen the benefits of Windows Server 2008, let's look at the requirements you need to install Windows Server 2008. If you are wondering why we are covering Windows Server 2008 requirements in a Windows 7 book, it's because Windows 7 will be installed on Windows Server 2008 domains.

This chapter walks you through the installation of Active Directory and then shows you how to add a Windows 7 machine to the domain. Because many readers have not switched to Windows Server 2008, it will help with the Active Directory installation.

Table 12.2, taken directly from Microsoft's website, it shows both the minimum and recommended requirements. I have been an IT manager and consultant for many years and from personal experience, I would only use the recommended requirements or higher.

TABLE 12.2: Microsoft Windows Server 2008 Installation Requirements

COMPONENT	REQUIREMENT
Processor	<ul style="list-style-type: none"> ◆ Minimum: 1 GHz (x86 processor) or 1.4 GHz (x64 processor) ◆ Recommended: 2 GHz or faster Note: An Intel Itanium 2 processor is required for Windows Server 2008 for Itanium-based systems.
Memory	<ul style="list-style-type: none"> ◆ Minimum: 512 MB of RAM ◆ Recommended: 2 GB of RAM or greater ◆ Maximum (32-bit systems): 4 GB (Standard) or 64 GB (Enterprise and Datacenter) ◆ Maximum (64-bit systems): 32 GB (Standard) or 2 TB (Enterprise, Datacenter, and Itanium-based systems)
Available disk space	<ul style="list-style-type: none"> ◆ Minimum: 32 GB ◆ Recommended: 40 GB or greater Note: Computers with more than 16 GB of RAM will require more disk space for paging, hibernation, and dump files.
Drive	DVD-ROM drive
Display and peripherals	<ul style="list-style-type: none"> ◆ Super VGA (800×600) or higher-resolution monitor ◆ Keyboard ◆ Microsoft mouse or compatible pointing device

The minimum requirements will allow the Windows Server 2008 operation system to install, but it will not be practical for any real-world situation. To make sure the requirements have not changed, visit Microsoft's website at www.microsoft.com/windowsserver2008/en/us/system-requirements.aspx.

One nice feature that Microsoft gives you is that if anyone is interested in evaluating Windows Server 2008, you can do so for no cost. When evaluating Windows Server 2008, the installation does not require a product activation or product key. Any Microsoft Windows Server product can be installed without activating the software for 60 days.

But let's say at the end of the 60 days you still need more time to finish your evaluation. You may reset your evaluation three more times (60 days each). This will allow you to evaluate the product for up to 240 days. At the end of the 240 days, the Windows Server 2008 product will need to be uninstalled or a valid product key and activation will be required.

Installing Windows Server 2008

Now that we have seen the benefits, editions, and requirements of Windows Server 2008, let's go ahead and install the product.

INSTALLING WINDOWS SERVER 2008

If you have already installed Windows Server 2008, you can skip the following steps. Just make sure that Windows Server 2008 64-bit version was the version installed. Hyper-V (discussed in the "Understanding Microsoft's Hyper-V Technology" section later in this chapter) must be run on a 64-bit version of Server 2008. If you have a 32-bit version of Windows Server 2008, complete the steps with a 64-bit Windows Server 2008 R2 version.

Perform the following steps to walk through installing Windows Server 2008 Enterprise Edition. If you do not have Windows Server 2008 Enterprise, download a trial version at Microsoft's website: www.microsoft.com/downloads.

1. Insert the Windows Server 2008 64-bit edition CD into the CD-ROM drive and reboot the machine. Make sure the computer can boot off the CD-ROM drive.
2. A window shows that files are loading onto the machine. After this screen finishes, another screen appears that asks you to specify your Language, Time, and Keyboard settings. Choose the settings that fit your system (normally just left at the defaults for US residents). Click Next.
3. At the Install Windows screen, click the Install Now arrow.
4. The next screen asks which version of Windows Server 2008 you would like to install. The choices you see might not be the same as the graphic (depending on the CD you have). Choose Windows Server 2008 Enterprise (Full Installation) and click Next. If you do not have Enterprise Edition, choose Standard (Full Installation).
5. At the License Terms screen, after reading the license select the I Accept The License Terms check box and click Next.
6. At the Which Type Of Installation Do You Want? screen, choose Custom (Advanced).
7. When the Where Do You Want To Install Windows? screen appears, choose the hard drive where you would like to install the operating system. Click Next.
8. The Installing Windows screen appears that shows the status of your install. Reboot after the install completes.

9. After you reboot, the system asks you to change the Administrator password at first login. Click OK and then enter and reenter the password **P@ssw0rd**. Click the arrow to the right of the password boxes.
10. When the Password Has Been Changed screen appears, click OK.

Now that you have installed the 64-bit version of Windows Server 2008 Enterprise Edition, perform the following steps to install Active Directory. Do not follow these steps if you are on a live network.

Perform the following steps in a test environment:

1. To install Active Directory, start the Active Directory Installation Wizard by clicking Start and typing **dcpromo** in the **Start Search box**. Press the Enter key.
2. When the Welcome screen appears, select Use Advanced Mode Installation and then click Next.
3. At the Operating System Compatibility screen, click Next.
4. The Choose A Deployment Configuration screen appears. Choose the second option, Create A New Domain In A New Forest. Then click Next.
5. The Name The Forest Root screen appears and asks you to enter the Full DNS name of your domain. For example, you can type **mycompany.com**. Enter your domain DNS name and click Next (use **mycompany.com** if you do not have a domain name).
6. After the DNS name is verified, a NetBIOS name box will appear with your default NetBIOS name (example: mycompany). A NetBIOS name can be up to 15 characters. To make it easier to remember and type the name, you should limit yourself to the English alphabet characters and numbers. Leave the default and click Next.
7. The Set Forest Function Level screen appears. Use the pull-down menu and choose Windows Server 2003 or Windows Server 2008 and click Next.
8. The Additional options screen appears next. Make sure DNS is checked (DNS is a requirement for Active Directory). Click Next.
9. A TCP/IP Static IP screen may appear. If it doesn't, go on to the next step. If the box does appear, choose the first option, Yes, and then make sure you configure a static IP address for your computer.
10. At the Database And Log Folders screen, you specify the file system locations for the Active Directory database and log file.
11. Accept the defaults and click Next.
12. At the Directory Services Restore Mode Administrator Password screen, provide a Directory Services Restore Mode Administrator password. This password is used to restore Active Directory in the event of its loss or corruption. This password does not have to correspond with passwords set for any other account. For now, make the password **P@ssw0rd**.
13. After you confirm the password, click Next.
14. The Active Directory Installation Wizard presents a summary of the installation options you've selected. Click Next to begin the Active Directory installation process. As Active

Directory is installing, you'll see a small window containing a graphic of a book that is being written to.

15. After you install Active Directory, you are prompted to reboot the system. After the reboot, you can access the administrative tools that are related to the configuration and management of Active Directory.

After the Active Directory database is installed, you need to verify the installation by clicking Start > Administrative Tools > Active Directory Users And Computers. If Active directory opens properly, then you completed the Active Directory installation correctly.

Perform the following steps to create a new user account in Active Directory:

1. From the Windows Server 2008 machine, click Start > Administrative Tools > Active Directory Users And Computers.
2. Expand the domain and right-click the Users OU. Choose New > User.
3. Create a new user using your information. You will log on as this user in the next section.

In the next section, we show you how to add a Windows 7 machine to the Active Directory domain.

Adding Windows 7 to the Domain Environment

In a corporate environment, the client machines (Windows XP, Windows Vista, and Windows 7) will be connected to the domain environment. There are two ways to connect the Windows 7 machine to the domain. You can connect the Windows 7 machine to the domain from the Windows 7 operating system or from Active Directory.

It does not matter which way you choose to connect the machine to the domain. We usually connect the Windows 7 machine through the Windows operating system, but either way does the same task.

Having the Windows 7 machine on the domain offers many benefits to administration, such as the following:

- ◆ You can deploy Group Policy Objects (GPOs) from one location instead of Local Group Policy Objects (LGPOs) on each machine (see Chapter 9, "Managing Security").
- ◆ Users can back up their data to a server. This way, the nightly backups cover user information. Most Windows 7 machines will *not* be backed up separately.
- ◆ You can manage users and groups from one central location (Active Directory) instead of on each Windows 7 machine.
- ◆ You can manage security to resources on servers instead of resources on each Windows 7 machine.

Perform the following steps to connect a Windows 7 machine to a Windows Server 2008 domain:

1. On the Windows 7 machine, click Start and then right-click Computer. Choose Properties from the context menu.
2. In the Computer Name, Domain, And Workgroup section, click the Change Settings link.
3. Click the Change button next to the To Rename This Computer Or Change Its Domain Or Workgroup section.

- In the Member Of section, click the Domain radio button and type the name of the Windows Server 2008 domain previously created, as shown in Figure 12.4.

FIGURE 12.4
Changing a workgroup machine to a domain



- A Credentials dialog box appears that asks for the administrator's username and password. Enter the Administrator's username and password and then click OK.
- A dialog box stating that you are part of the domain appears. Click OK and reboot the machine.
- From the Windows 7 machine, log onto the domain with your username and password.

You also have the ability to create the computer account in the Active Directory Users and Computers MMC snap-in.

Perform the following steps to add the Windows 7 machine to the domain from the Active Directory snap-in:

- From the Windows Server 2008 machine, click Start > Administrative Tools > Active Directory Users And Computers.
- Expand the domain and right-click the Computers OU. Choose New > Computer.
- In the Computer Name field, type the name of the Windows 7 computer. Click OK.
- Double-click the new Windows 7 computer in the right-hand window to open its properties.
- Take a look at the different tabs and then click the Cancel button.

In the next section, we look at one of the most exciting technologies to hit the market in a long time: virtualization.

Understanding Virtualization

Server virtualization gives an organization the ability to run multiple operating systems, called virtual machines, on a single machine. The ability to run multiple operating systems on a single machine will help an organization reduce their hardware costs and allow an organization to reduce their IT department overhead.

Many organizations have started to move their servers over to virtualized servers. But you do not need to just use virtualization for your servers. You can also use virtualization for client operating systems like Windows 7. In this section, we look at the two of the most common ways to use Microsoft products to virtually set up Windows 7. We also examine Microsoft's Virtual PC and Hyper-V. Microsoft has just released a new version of virtualization, called Hyper-V, with the Windows Server 2008 operating system and that's where we'll start.

Understanding Microsoft's Hyper-V Technology

Hyper-V is not Microsoft's first attempt at virtualization. Microsoft has been doing virtualization for years. There were two versions of virtualization that IT teams have used in the past. The two Microsoft virtualization products that you might have used before are Microsoft Virtual PC and Microsoft Virtual Server 2005.

Microsoft *Hyper-V* is the next-generation hypervisor-based virtualization technology. The Windows hypervisor is a thin layer of software that sits between the hardware and the Windows Server 2008 operating system. This thin layer allows one physical machine to run multiple operating systems in different Hyper-V virtual machines all at the same time. The hypervisor is the mechanism that is responsible for maintaining isolation between the different Hyper-V partitions.

With the release of Microsoft Windows Server 2008, Microsoft has now incorporated server virtualization into the operating system with the release of Hyper-V. This gives an organization the ability to take full advantage of the next generation of 64-bit server hardware.

Let's imagine an IT department for any size organization. You come in one morning before everyone else (common in our field) and see that one of your servers has crashed. The first thing that's going to happen is your heart drops into your stomach. After that, you start trying to fix the error and you might need to even rebuild the machine. Now your heart is racing and your blood pressure is going through the roof because you need to get this server up and running before anyone else comes into work. We have all been there before.

Now let's imagine the same situation but all of our servers are running Hyper-V. When you come in and see your crash, you know you can relax. All you need to do is move the Hyper-V virtual machine to another machine and you are back up and running. This is what Hyper-V can do for you. Hyper-v is a role-based feature that allows an organization to have multiple virtual machines (multiple operating systems, including Windows 7) on a single Windows Server 2008 machine.

A *virtual machine (VM)* is an implementation of an operating system that runs in its own virtualization window. The advantage to using virtual machines is that you can have multiple VMs on the same Windows Server 2008 machine. Each VM can have its own unique resources running on its operating system. An administrator can now run multiple operating systems (including non-Windows-based systems) or run multiple server roles in their own virtual machines, thus allowing an organization more flexibility without the need for more servers.

One of the greatest advantages of Hyper-V technology is that you have the ability to run both 32-bit and 64-bit applications within the virtual environment. Let's take a look at some more benefits of running Hyper-V.

BENEFITS OF HYPER-V

Microsoft's Hyper-V is a virtualization platform that gives you the ability to manage all your physical and virtual resources from a single set of integrated management utilities. Microsoft's Hyper-V can help an organization with all of the following:

Server Consolidation This is one of the major benefits that Hyper-V offers. Server consolidation allows an organization to run many versions of server (even non-Microsoft versions) on a single box. Each one of these versions is isolated from the other versions running on the same machine. This allows an organization to have a lower total cost of ownership (TCO) while maintaining all the services and servers that are required to make the network operate properly.

Downtime and Recoverability Two major concerns that all organizations face are downtime and recoverability. Downtime includes not only unscheduled events (such as machine errors or hardware failure) but also scheduled events like backups and maintenance. Microsoft's Hyper-V has many features like live backup that help reduce the server downtime for an organization.

Recoverability is also something that all IT staff members should be concerned about. Most organizations could not afford to lose their data and still stay in business. Disaster recoverability is supported by Hyper-V through clustering and backups, thus reducing downtime and saving an organization money.

Testing and Development One of the nice benefits of using Microsoft's Hyper-V is the ability to test or develop software in a safe virtual machine operating system. Any operating system, including Windows 7, can be used in a Hyper-V environment.

If you have been in this industry long enough, you have run into the situation of loading a service pack or utility and watching your system crash because of that install. By testing it in Hyper-V, an administrator can reduce the chances of network downtime on a live server.

Dynamic Datacenter Hyper-V virtualization allows you to design and create a dynamic network environment that not only addresses network problems but anticipates higher demands of network resources.

FEATURES OF HYPER-V

Now that you have seen some of the benefits of Microsoft Hyper-V, let's look at some of the new features included with Microsoft Hyper-V:

Symmetric Multiprocessors (SMP) Support Hyper-V allows a virtual machine environment to use up to four processors, allowing for SMP support.

New Architecture Design Hyper-V was designed to run on a 64-bit processor that allows an administrator to use many different types of devices. This 64-bit architecture also allows for better system performance.

Operating System Support Hyper-V allows an organization to run both Microsoft and non-Microsoft operating systems (Windows, Linux, UNIX, etc.), giving an organization more flexibility. The operating systems can be both 32-bit and 64-bit versions.

Virtual Machine Migration A nice feature of Hyper-V is the ability to migrate virtual machines from one server to another without long periods of downtime. Let's say that you have a server that is having hardware problems; you can switch the virtual machine to another server running Hyper-V without rebuilding the bad machine immediately.

Network Load Balancing Hyper-V gives an organization the ability to use Network Load Balancing (NLB). The NLB can be placed across multiple virtual machines even if they are on different physical machines.

Hardware Architecture With the new Hyper-V hardware architecture, all hardware resources in a virtual machine (disk, network card, RAM, and so forth) have access to those resources on the physical machine.

Scalability Microsoft's Hyper-V gives an organization the ability to place large number of virtual machines on the same physical machine. This gives an organization the ability to grow a network without purchasing additional hardware.

Now that you understand the benefits and features of Hyper-V, in the next section we install Hyper-V.

INSTALLING HYPER-V ON WINDOWS SERVER 2008

When you install Hyper-V onto a server, you have two options for the way you install Hyper-V on a server:

- ◆ You can install Hyper-V onto a Windows Server 2008 machine that had a full operating system installation.
- ◆ You can install Hyper-V onto a Windows Server 2008 server core installation.

When you install Hyper-V on a full installation of Microsoft Windows Server 2008, you can enjoy the advantages of having the traditional full GUI. This makes it easier for you to manage, configure, and maintain Hyper-V and the Windows environment. This is also a much more comfortable environment for newer administrators who might not be familiar with a command line-driven operating system.

Because the Windows Server 2008 full installation has a GUI environment, installing Hyper-V becomes a much easier task. Windows Server 2008 includes a new feature called *Server Manager*. Server Manager is a Microsoft Management Console (MMC) snap-in that lets you view information about server configuration and the status of roles that are installed, and includes links for adding and removing features and roles.

The following is a list of some of the roles that you can install and manage by using Server Manager:

- ◆ Active Directory Certificate Services
- ◆ Active Directory Domain Services
- ◆ Active Directory Federation Services

- ◆ Active Directory Lightweight Directory Services
- ◆ Active Directory Rights Management Services
- ◆ Application Server
- ◆ Availability and Scalability
- ◆ DHCP Server
- ◆ DNS Server
- ◆ Fax Server
- ◆ File Services
- ◆ Hyper-V
- ◆ Network Policy and Access Services
- ◆ Print Services
- ◆ Streaming Media Services
- ◆ Terminal Services
- ◆ Troubleshooting
- ◆ UDDI Services
- ◆ Web Server
- ◆ Windows Deployment Services

Before Server Manager, Windows Server 2003 administrators had to use many utilities like *Manage Your Server*, *Configure Your Server*, and *Add or Remove Windows Components* to install sever roles and features. Server Manager allows you to manage your server's features and roles from one central utility.

Perform the following steps to install Hyper-V on a Windows Server 2008 machine:

1. Start the Server Manager application by clicking Start > Administrative tools > Server Manager.
2. In the left-side pane, click Roles.
3. In the right-hand pane, click the Add Roles link.
4. When the Before You Begin window appears, click Next.
5. At the Select Server Roles screen, click the Hyper-V check box and click Next.
6. At the Introduction To Hyper-V screen, click Next.
7. The Create Virtual Networks screen appears; click the check box for your network card and then click Next.
8. At the Confirm Installation Selections screen, click the Install button.
9. The Progress screen appears next and shows you the progress of the installation. After you reboot, you need to log in with the same user who started the process. After the Results screen appears, click Finish.

Now that we have just installed Microsoft Hyper-V, we want to verify that it is up and running. To do this, start the Hyper-V Manager.

Perform the following steps to verify that the Microsoft Hyper-V role was installed onto your machine:

1. Open the Hyper-V Manager by clicking Start > Administrative Tools > Hyper-V Manager.
2. In the left-hand window, click your server name under Microsoft Hyper-V Servers.
3. If there are no errors or messages, close Hyper-V Manager.
4. Verify that the Microsoft Hyper-V services are up and running properly by clicking Start > Administrative Tools > Services.
5. Scroll down and verify that there are two services running under Microsoft Hyper-V (Image Management Service and Network Management Service).
6. Close the Services snap-in.

In the next section, we install the Windows 7 operating system in Hyper-V as a virtual machine.

CREATING A HYPER-V WINDOWS 7 VIRTUAL MACHINE

A virtual machine is an operating system that is running within the Hyper-V virtual environment. You can run multiple virtual machines on the same physical machine. By placing multiple virtual machines on the same physical machine, Hyper-V allows you to maximize performance by utilizing hardware resources.

The hypervisor is a 64-bit mechanism that allows Hyper-V to run multiple virtual machines on the same physical machine. The hypervisor's job is to create and manage the partitions between virtual machines. The hypervisor is a thin software layer that sits between the virtual machines and the hardware.

Virtual machines are full operating systems that run in a virtualized environment. The end users who connect to the virtual machines cannot tell the difference between a normal machine and a virtualized machine. Because of this, you can set up your virtual machine environment the same way you would set up a normal machine.

Perform the following steps to install Windows 7 as a virtual machine on Hyper-V:

1. Start the Hyper-V Manager by clicking Start > Administrative Tools > Hyper-V Manager.
2. When the Hyper-V Manager starts, click the New > Virtual Machine link in the Actions section.
3. Click Next at the Before You Begin screen.
4. At the Specify Name And Location screen, type **Win7VM** in the Name field. Leave the default location. Click Next.
5. At the Assign Memory screen, type **1024MB** and click Next.
6. At the Configure Networking screen, choose your network adapter from the Connection Type drop-down list. Click Next.
7. At the Connect Virtual Hard Disk screen, click Create A New Virtual Hard Disk.
8. Type **Win7.vhd** and make the hard drive size 20 GB. Click Next.

9. At the Summary screen, check the “Start the virtual machine after it is created” check box and click Finish.
10. When the Win7VM starts, you receive a boot failure. Click the Media menu option. Click DVD Drive and then capture your DVD drive. Place the Windows 7 DVD into the media device. Then press Enter.
11. The Windows 7 installation should start. Install the Windows 7 Enterprise Edition as normal.

WINDOWS HYPER-V

To learn more about Microsoft Hyper-V, see *MCTS: Windows Server Virtualization Configuration Study Guide: Exam 70-652*, by William Panek (Wiley, 2008).

Now it might not be feasible to set up a Windows Server 2008 machine with Hyper-V to run Windows 7. So there is a better way for client operating systems: Microsoft Virtual PC.

Understanding Microsoft Virtual PC

Microsoft also has a virtualization environment that can operate on its client software called Virtual PC. Virtual PC allows you to create and manage virtual machines without the need of a server operating system. The advantage here is that you can run server operating systems in a client environment like Windows XP, Windows Vista, or Windows 7.

Virtual PC gives you the ability to set up virtualization on a client operating system. This is beneficial for anyone in the industry who has to do testing or configuration. Virtual PC is not really meant to run a network like Hyper-V, but it does give you the ability to test software and patches before installing them live on a network. Also, it is beneficial to research problems in a controlled environment and not on a live server where you can end up doing more damage than good.

Finally, Virtual PC gives you a training advantage. Think about having the ability to train users on a real product like Windows Server 2008 or Windows 7 without having to purchase additional equipment. Virtual PC allows you to train users on products and software while using only one machine.



Real World Scenario

USING VIRTUAL PC

As an instructor and as a consultant, I can't begin to explain how valuable Microsoft Virtual PC can be as a tool. I have used it on many occasions to either test a piece of software before installation or find an answer to a problem in a controlled environment.

At the time this book was written, I use Microsoft Windows Vista on my laptop. On that same laptop I have a version of Virtual PC with both Windows Server 2008 and Windows 7 operating system virtual machines.

While I am on a client site or while I am in the classroom, having a way to test and research problems using multiple operating systems on one client computer system is an invaluable resource.

To run Virtual PC, you need a minimum of a 400 MHz Pentium-compatible processor (1.0 GHz or faster recommended), that requires at least 35 MB of free disk space. You can load Virtual PC on Windows 7, Windows Vista with SP1 (Enterprise, Business, Ultimate), or Windows XP with SP3.

Perform the following steps to download and configure Virtual PC:

1. Download Microsoft Virtual PC (currently version 2007) at www.microsoft.com/windows/virtual-pc/download.aspx.
2. After the download completes, install the application on your system.
3. After the product installs, open the Virtual PC application by clicking Start > All Programs > Virtual PC.
4. When you start Virtual PC, the New Virtual Machine Wizard automatically appears. Click Next.
5. At the Options screen, click the Create A Virtual Machine radio button.
6. At the Virtual Machine Name And Location screen, type **VirtualWin7** and then click Next.
7. At the Operating System screen, choose Other from the drop-down list (we are going to install Windows 7 32-bit). Click Next.
8. At the Memory screen, choose the Adjust The RAM radio button and set it to 1024 (512 minimum if needed). Click Next.
9. At the Virtual Hard Disk screen, click the New Virtual Hard Disk radio button and click Next.
10. At the Virtual Hard Disk Name And Location screen, accept the default location and click Next. You can change the name or location if needed.
11. At the Completing The New Virtual Machine screen, verify the settings and click Finish.
12. The Virtual PC Console now shows the VirtualWin7 virtual machine. Click the virtual machine and choose Settings from the Actions menu.
13. The Settings for VirtualWin7 appear. You can change or verify your settings here for this virtual machine. Click CD/DVD Drive and verify that you are using the local DVD drive. Click OK.
14. Put the Windows 7 32-bit DVD in the physical drive. At the Virtual PC Console screen, click VirtualWin7 and click Start.
15. Install Windows 7 on the virtual machine. If for any reason the DVD does not get recognized, click the CD menu and choose the Use Physical CD option. Press Enter and finish the install.
16. After Windows 7 is installed, close the VirtualWin7 virtual machine and save the changes.

Now that we have created a Windows 7 virtual machine for Virtual PC, let's go ahead and start the Windows 7 operating system on the virtual PC.

Perform the following steps to run the Windows 7 virtual PC virtual machine:

1. Open Microsoft Virtual PC.
2. Click the Windows 7 machine (VirtualWin7) and click Start.
3. When Windows 7 starts, log in as normal.

VIRTUAL PC COMMANDS

To do a Ctrl+Alt+Del in Virtual PC, you can use Right Alt+Del. You can go into a full-screen mode by clicking Right Alt+Enter. Enter the same command to get out of full-screen mode. When you use the mouse within Virtual PC, to release the mouse and go back to the host machine, press the Right Alt key.

Implementing Windows 7 in a Virtual PC environment allows you to start testing and learning about the new operating system before implementing it in your organization. The one downside to Virtual PC is that at the time this book was written, Virtual PC does not support 64-bit operating systems. Make sure that all operating systems that you use in Virtual PC are 32-bit and check Microsoft's website for any changes.

Virtualization is a fast-growing technology that many IT departments have embraced. If you have not started using virtualization yet, start doing your homework now. Virtualization can save your organization money and downtime and make you look great as the IT person who implemented it.

The Bottom Line

Connect Windows 7 to the domain. In almost all corporate environments, the client machines (Windows 7) will be connected to the domain environment. Having the Windows 7 machine on the domain offers many benefits, including:

- ◆ You can deploy GPOs from one location instead of LGPOs on each machine (see Chapter 9, "Managing Security").
- ◆ Users can back up their data to a server. This way, the nightly backups cover user information. Most Windows 7 machines will *not* be backed up separately.
- ◆ You can manage users and groups from one central location (Active Directory) instead of on each Windows 7 machine.
- ◆ You can manage security to resources on servers instead of resources on each Windows 7 machine.

Master It You are the administrator of a large organization that has decided to implement the Windows 7 operating system on all machines. As you load Windows 7 onto the machines, you need to join them to the domain. How do you accomplish this goal?

Configure Hyper-V. Microsoft *Hyper-V* is the next-generation hypervisor based virtualization technology. With the release of Microsoft Windows Server 2008, Microsoft has now incorporated server virtualization into the operating system with the release of Hyper-V. This gives an organization the ability to take full advantage of the next generation of 64-bit server hardware.

Master It You are the administrator for a large computer company. You need to set up a machine that can run multiple versions of Windows 2008 and Windows 7 for testing and evaluation. What Microsoft server product would you install to solve this issue?

Use Microsoft Virtual PC. Microsoft also has a virtualization environment that can operate on its client software called Virtual PC. Virtual PC allows you to create and manage virtual machines without the need of a server operating system. The advantage here is that you can run server operating systems in a client environment like Windows XP, Windows Vista, or Windows 7.

Master It You are asked by your organization to set up a training room. This training room will be required to run multiple operating systems, including Windows Server 2008, Windows Vista, and Windows 7. This solution is for training only. How can you implement the computers?