Windows Server Overview

Servers play a vital role on modern business computing networks. They provide such important services as e-mail, file storage, collaboration, and security. This chapter introduces you to servers in general and Microsoft Windows Server in specific. You will learn about the differences between servers and clients and the different designs of today's server hardware. Next, you will learn about the different roles servers play on modern computing networks and why these roles are important. Finally, you will explore the specifics of Windows Server. You will learn about the different interfaces it provides, networking features it offers, management features it supports, and the different editions of the product that are available. The following topics will provide coverage of this information:

▶ **Introducing Servers**

▶ **Understanding Server Roles**

▶ **Microsoft Windows Server Features**

Introducing Servers

If you want to understand Windows servers, you must begin by understanding servers in general. In this section, you will learn what servers are, how they differ from clients, and the various shapes and sizes in which they are manufactured. I will begin by defining what a server is so that you can keep this definition in mind as you read through the rest of this book.

Understanding Server Concepts

Computer networks are used to provide communications between computing devices. The computing devices include network infrastructure hardware devices, such as routers, switches, and firewalls. They also include clients and servers. Servers are used to provide services to the networked devices.

Servers must be connected to a network so that other devices (clients) can consume their services. These networks may include local area networks (LANs), wide area networks (WANs), and any other type of network on which the servers communicate. In the early days of computing, a server often sat on the other end of a telephone line allowing only one user to connect at a time. Even though this is not efficient, it still represents a network being used to access a server. The telephone line created the network connection between the client and the server.

The services provided by a server include three primary categories of service:

Network Services   Network services include any service that exists to provide network functionality. For example, the Dynamic Host Configuration Protocol (DHCP) is used to provide Internet Protocol (IP) configuration settings that allow client devices to communicate on the network. Another example is the Domain Name System (DNS) server service, which resolves Internet-like domain names to IP addresses. These Internet-like names are called *hostnames*.

Security Services   Security services include those services that provide authentication, authorization, confidentiality, or some form of protection to the network and networked devices. An example of a security service is the Active Directory Domain Service (AD DS), which could also be partially categorized as a network service. AD DS provides the user accounts that are used to log on to Windows Server-based networks. When these accounts are used for logon processes, authentication is performed and authentication is a security service. An additional security service is the IPSec Policy Service, which enforces security settings for Internet Protocol (IP)-based communications.

Information Services   Information services include any service that provides information access, information management, or information processing. For example, the Microsoft SQL Server service provides database access and database management. This functionality qualifies SQL Server as an information service. Microsoft SharePoint is another example of an information service. It provides for information storage and retrieval, as well as collaboration.

Understanding Client/Server Concepts

The term *client/server model* became very popular starting in the 1980s. The term simply indicates that an application is broken into two components: the *client* component—a computing device or application that consumes services—and the server component. Some of the processing is performed at the client and the rest is performed at the server. A modern example of this is a web-based application that depends on both the web server and the web browser (the client) to perform the required processing: The server retrieves and processes data that is then sent to the web browser. The browser reformats this data for the

A *modem* is a modulator and demodulator that uses the telephone network to carry digital data as analog signals.

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DNS names look like `mypc.domain.name` or `yourpc.domain.name`. The leftmost portion is the host name and the rest is the domain name. Together they form a *fully qualified domain name* (FQDN).

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Because they provide more than one type of service, some services can be placed in multiple categories of service.

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You will learn more about services in Chapter 4.

current screen resolution of the user's workstation. The point is that the two components work together.

It is not enough, however, to say that a server does part of the processing and the client does another part of the processing. In most client/server model systems, a single server can service many clients. You can define the relationship as a many-to-one relationship between the clients and the servers, as depicted in Figure 1.1: You can see that one file server provides file storage and retrieval services to multiple PC clients, a Mac client, and even a laptop computer. The clients are the many, and the server is the one in the many-to-one relationship.
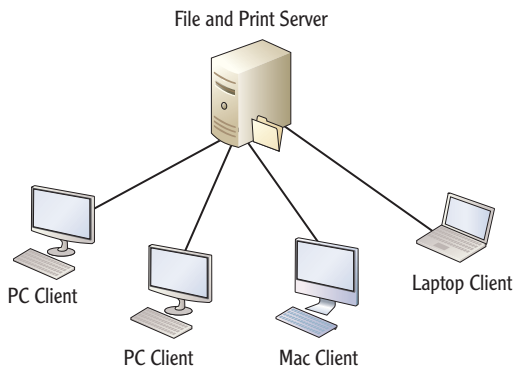
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The first multiuser computer sharing method was developed by Fernando Corbató at Massachusetts Institute of Technology (MIT) in 1961.

F I G U R E 1 . 1 The many-to-one relationship of client/server computing

Additionally, the clients consume services from the network itself in that they utilize bandwidth made available by the network. *Bandwidth*, in this context, is defined as the maximum information that can be transmitted simultaneously across a communications channel. Each client consumes a portion of this bandwidth for network communications.

Table 1.1 provides a comparison of servers and clients.

T A B L E 1 . 1 Comparing Servers and Clients

Typical Server Characteristics	Typical Client Characteristics
Used by many users	Used by one user at a time
Built from high-quality components	Built from average quality components
Optimized for background applications	Optimized for visual foreground applications
Provides services to the network	Consumes services from the network

In addition to the contrasting of servers and clients, you should understand the servers and clients available in the Microsoft product line. The following Microsoft server operating systems are still very popular today:
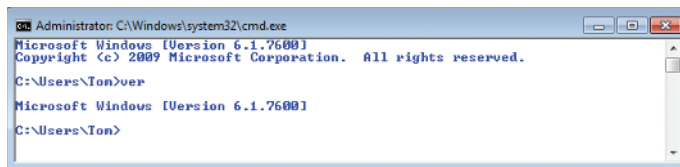
- ▶ Windows Server 2003
- ▶ Windows Server 2003 R2
- ▶ Windows Server 2008
- ▶ Windows Server 2008 R2

The following Microsoft client operating systems are very popular:

- ▶ Windows XP
- ▶ Windows Vista
- ▶ Windows 7

Historically, Microsoft has released a new version of their client and server operating systems every two to four years. For example, Windows Vista was released in 2006 for business customers, although it wasn't released until January, 2007 for consumers. Windows 7 was released in 2009. Similarly, Windows Server 2003 was released in 2003 and Windows Server 2003 R2 was released in 2005.

Furthermore, a greater period exists between major version number releases of the operating systems. For example, Windows Vista was considered a major version number release that changed the major version number of the operating system from 5 to 6, whereas Windows 7, released very shortly thereafter, was considered an interim minor version release. To see this, access a Command Prompt on a Windows 7 system by clicking Start ➢ All Programs ➢ Accessories ➢ Command Prompt and then execute the `ver` command. You will see that it is version 6.1, as shown in Figure 1.2. Windows Vista was version 6.0.

F I G U R E   1 . 2   Viewing the version of Windows

The time between the release of Windows Vista and Windows 7 was approximately three years; however, the time between the release of Windows 2000 (a major version release at version 5.0) and Windows Vista (the next major version

release) was six years. In most cases, the changes from a major version release to a minor version release are insignificant when compared to the changes made between major version releases, as is clearly seen when considering the minor differences between Windows 7 and Vista at the core operating system level and the major differences between Windows 2000 and Windows Vista. This is helpful to Information Technology (IT) professionals who must support these systems. In most cases, you will use the same or very similar operating system for a 4 to 6 year window of time. Every 4 to 6 years, you should be prepared to learn many new things and unlearn many old things in relation to the operating systems you support.

Clients can also be used to perform server functions. We often call these clients *peer servers* because they are not intended primarily as a server. They are also sometimes called *logical servers* because the services they provide are logical services that run on the machine (just like a dedicated server). The main difference between a server that runs server services and a client that runs server services is that the server is dedicated to running those services and the client is typically not.

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Many organizations plan upgrades for every other release. For example, they may have upgraded from Windows NT 4.0 to Windows XP, and their next upgrade will be to Windows 7, skipping Windows 2000 and Windows Vista.

UNDERSTANDING THE TERM "LOGICAL"

In this context, the word "logical" simply means that the device is intended as one thing but it performs the logic of another. For example, a client computer is intended to be a workstation for a user; however, if it shares a folder onto the network, it is providing the same service as a file server. The logic of sharing is included in both operating systems, but it is implemented more frequently in server operating systems. The server operating system is optimized to provide file sharing functions and overcomes connection limits in client operating systems. Additionally, the server operating system offers advanced share management tools for quota management and file filtering, which is used to limit the file types that may be placed in the shares.

An example of a server service that may run on a client machine is file and printer sharing. You may have a printer connected to your Windows 7 machine that you want to make available to other users in your work area. You can do this, assuming it is allowed by network policies, using the Windows printer sharing capabilities. Technically, this makes your Windows 7 machine a print server, but we would not call the machine a server because it is still primarily used as a user's workstation.

LOGICAL VERSUS DEDICATED SERVERS

If you browse around in the Services management tool on a Windows machine (accessed by clicking Start and typing **services.msc** into the Search field on a Windows Vista or later or Windows Server 2008 or later machine), you will notice that a service called Server exists. The existence of this service does not really classify the machine as a server in the traditional sense of the term. Technically, all network machines are servers in a logical sense, but they are not servers in a practical sense because they are not dedicated to server functions.

A Windows 7 machine may indeed respond to a network connection request and allow communications. Because the machine responded to a request and did not initiate the request, it is logically a server. However, we have traditionally considered a machine to be a server only when it is dedicated to server tasks. Therefore, a machine that sits in a special room and is rarely accessed at the console while being heavily accessed across the network is considered a server. But we would say it is impractical to consider a Windows 7 computer that is mostly used by a local user and rarely accessed as a logical server as a dedicated server.

While all of this might just seem like semantics, the reality is that we must clearly define servers versus clients so that we can plan our networks well. The placement of servers is very important because they are typically accessed by multiple users from multiple locations. The placement of desktop computing clients is typically fixed. We put them right in front of the users—at least, we do most of the time. This network location placement will impact security settings on routers and switches related to the devices. For example, you will allow certain communications to pass through a switch port to a server that you would not allow to pass through to a client. Keep this in mind as you're planning your servers, clients, and networks.

The form factor of a server is a reference to the design of the server's physical case and mounting methods.

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Choosing Server Hardware

The actual computing device we call a server comes in several form factors. The *form factor* simply defines the design of the server's case and internal component access methods. For example, the case may be slim and provide limited component

access or it may be large and bulky with easy component access. The form factor also dictates how the server may be installed or mounted in the environment.

Today, three major form factors exist and are available from many different vendors:

- ► Desktop
- ► Rack Mount
- ► Blade

The Desktop form factor looks just like a regular user's client computer. It may be slightly larger, but it will look much the same. The Desktop form factor includes those that stand upright (also known as a tower case) and those that lay horizontal (the traditional Desktop form factor). Figure 1.3 shows the IBM Power 780 desktop server. While it may appear a little fancier than a regular user's desktop computer, it is essentially the same thing with extra monitoring features and higher quality components.

FIGURE 1.3 The IBM Power 780 Desktop form factor server

The rack mount servers are specially designed to mount in a rack cabinet. These cabinets typically have doors and are specially ventilated to provide cooling. Figure 1.4 shows the IBM Power 755 rack mount system. To make efficient use of space, you can mount more than one server in a single rack cabinet. In many scenarios, you can also use a shared uninterruptible power supply (UPS) for all of the servers in the cabinet.

FIGURE 1.4 The IBM Power 755 Rack Mount form factor server

The final form factor is the server blade. In this case, the server is actually a removable blade that slides into a type of docking station used to house each blade. The docking station (called a BladeCenter by IBM, a Blade Enclosure by Dell, and by other names from other vendors) can house multiple blades. Because each blade is a server, you can store multiple servers in a single docking station. The blade docking station could be a desktop enclosure or it could mount in a rack cabinet, much like a rack server. Figure 1.5 shows the IBM BladeCenter PS701.

The form factor you choose will depend on the space in which it will be installed and the number of servers you require. For example, rack mount and blade servers are very popular when dozens or hundreds of servers are required. When only a few servers are required, the Desktop form factor is still quite common.

Understanding Server Roles

Now that you understand what a server is and how it differs from a client, it's important to grasp the concept of a *server role*. Much as you can play different roles in your life, the server can play different roles as well. In this section, you will first gain a clear understanding of what server roles are and then you will explore some common server roles.

FIGURE 1.5 The IBM BladeCenter PS701 Blade form factor
server enclosure

A server role is defined as a collection of responsibilities provided to the network or networked devices by a specific server. A more detailed definition is that a server role is a set of software programs (services) that enable a server to perform specific functions for users or computers on the network. Servers are typically dedicated to a role, but in smaller organizations a server may play several roles at the same time. Server roles are based on role services and one or more role services is used to implement a given server role. For example, the File Services role in Windows Server 2008 R2 includes the following role services:

► Share and Storage Management

► Distributed File System (DFS)

► File Server Resource Manager (FSRM)

► Services for Network File System (NFS)

► Windows Search Service

► Windows Server 2003 File Services (for backward compatibility)

► BranchCache for network files

In addition to server roles, features may be added to a Windows server installation. A *feature* is much smaller than a role and may be defined as a software

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These role services are explained in detail in Chapter 11.

program that can support or add to the functionality of one or more server roles or the general functionality of the server. Features may require a server role be installed before they can be installed. As an example, the Windows Server Backup tools are installed as a feature on Windows Server 2008 R2. If you want to use the Windows Server Backup tools to schedule backups for your server's data, the feature must first be installed.

Deploying Applications on Your Network

The Application Server role, in Windows servers, provides an integrated environment for the deployment of custom business applications. The applications can be built using the Microsoft .NET Framework, which is a special software framework for application development. The Application Server role provides the ability to run services and applications that are built on COM+, Message Queuing, Web Services and Distributed Transactions:

A software framework is a collection or prebuilt code and other functions that can be used to quickly develop complex business applications.

COM+   COM+ allows for the remote invocation of applications. You can execute application code that is stored on remote servers rather than require that the code be installed on the local machine.

Message Queuing   Message Queuing allows for asymmetric network communications, which means that a request can come into an application and be processed when the application has the available resources rather than requiring instant processing.

Web Services   The Web Services allow your application to communicate using the Hypertext Transfer Protocol (HTTP) that is common to web-based communications.

Distributed Transactions   The Distributed Transactions component allows for applications to complete transactions against multiple databases stored on multiple computers that participate in the network.

You will learn more about the Application Server role in Chapter 9.

   The Application Server role can be installed using the Server Manager on Windows Server 2008 and later. When you add the Application Server role, the following role services may be installed:

- ▶ Web Server (IIS)
- ▶ COM+ Network Access
- ▶ TCP Port Sharing
- ▶ Windows Process Activation Services Support
- ▶ Distributed Transactions

Providing Internet Access and Collaboration on Your Network

Web servers are some of the most common types of servers used on modern networks. Web servers are used to provide content to client computers and applications using HTTP for communications. HTTPS, which is the encrypted and secured version of HTTP, may also be used. Windows servers provide web server role functionality using the Internet Information Services (IIS) application and several other supporting services for authentication, logging, and application development.

With a web server, you can provide many different services to your users, including:

▶ Provide information to Internet users through your public website

▶ Allow for uploading and downloading of files through HTTP or FTP

▶ Host servers that contain business logic for multi-tier applications.

▶ Implement collaboration servers such as Microsoft SharePoint Server

Like any other role in Windows servers, you can add the Web Server role in the Server Manager. When you add the role, it is called the Web Server (IIS) role. Once installed, you can add components to the web server as needed. For example, you can add support for PHP as a programming language or you can add PERL support. Like most web servers, Microsoft's IIS is modular and extensible, allowing you to add features and components as needed. Additionally, a management tool called the IIS Manager is provided; it allows you to easily manage the web server using a GUI interface. The IIS Manager for IIS 7.5 running on Windows Server 2008 R2 is shown in Figure 1.6.

Multi-tier applications are applications that reside on more than one machine and perform different processes or functions, such as display, data access, and data retrieval, on each machine.

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You will learn more about the Web Server (IIS) role in Chapter 10. You can also learn more at `www.iis.net/overview`.
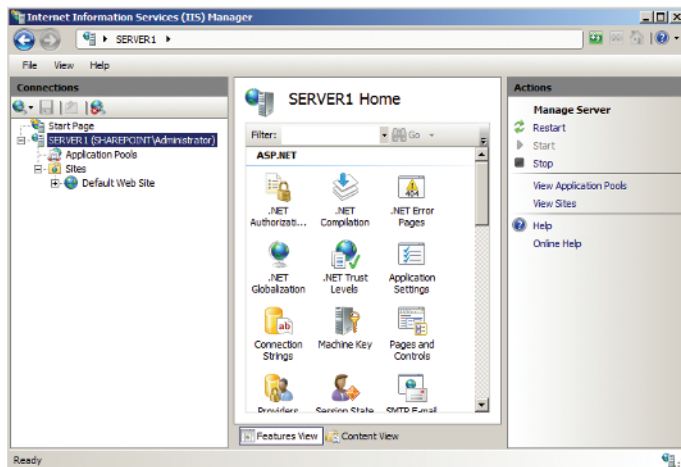

F I G U R E 1 . 6 The IIS Manager used to manage the web server on Windows Server 2008 R2

Managing Files and Printers on Your Network

In the past, File and Print Services were referenced as a single role. In Windows Server 2008 R2 installations, the File Services role and the Print and Document Services role are now separate.

The File Services role provides features such as share management, storage management, file replication, and search services. Additionally, a collection of tools called the File Server Resource Manager (FSRM) provide simplified management of quotas, file screening (restricting the file types allowed on the server), storage reports generation, file management tasks (such as searching for files on the server), and management of remote storage resources.

The Print and Document Services role allows you to share printers and scanners on the network. You can centralize both printer and scanner management through this role. Management tools called the Print Management console and Scan Management console are provided for centralized management. Additionally, you can install the management tools on Windows 7 clients so that administrators can run them remotely from the client computers.

Providing Network Access for Remote Users

In earlier versions of Windows servers, the remote access capabilities are easier to locate because they were simpler. You installed Routing and Remote Access Services (RRAS), and you had a remote access server. In Windows Server 2008 and later, RRAS is part of the Network Policy and Access Services role. This role provides several functions to your network:

Network Access Protection (NAP)   NAP provides a client health policy service to your network. NAP ensures that a connecting client meets a minimum set of requirements before allowing the client to communicate on the network. For example, it may require that the client have antivirus software installed and updated or that specific security updates have been applied to the operating system.

The IEEE is the Institute of Electrical and Electronics Engineers, and they are responsible for many of the standards used on modern computer networks.

When a client is not incompliance with the NAP requirements, the client may be denied access to the network or granted restricted access. The restricted access option is typically used to allow the client to download antivirus updates or other updates that will allow it to come into compliance with the NAP policies.

IEEE 802.1X Authentication   The IEEE developed an authentication mechanism that is used to ensure that devices are authenticated before they are

allowed to communicate on a network. This mechanism is known as 802.1X authentication. When a device first connects to the network, it is allowed to communicate only with an authentication server. Once authenticated, it is permitted to communicate with the rest of the network.

RADIUS Server   The Remote Authentication Dial-In User Service (RADIUS) was originally developed to authenticate users dialing in on modem lines. Today, it is used for authentication of Virtual Private Network (VPN) traffic and wireless clients, as well as wired clients that authenticate using 802.1X authentication. The Microsoft RADIUS server component is included in the Network Policy and Access Services role.

Routing and Remote Access Services (RRAS)   RRAS provides for both VPN server functionality and dial-up access to your network. As a VPN server, it allows client computers to connect across the Internet, or another network, and establish secured and encrypted communications. As a dial-up server, it allows client computers to connect using a modem, which is a communications device that allows network connections to be established across traditional telephone lines.

Adding More Roles as Needed

Windows servers can support several additional roles. In addition to the roles mentioned in the preceding sections, the following roles are also supported:

Active Directory Certificate Services   This role provides certificates for users and computers to use in authentication and encryption processes.

Active Directory Domain Services   This role provides the Active Directory services to the network, which include user and group provisioning as well as computer and server management.

Active Directory Federation Services   This role allows for two different authentication realms to share credentials so that users can use single sign-on procedures and not be required to sign on individually to each network.

Active Directory Lightweight Directory Services   This role enables a minimal version of the Active Directory services for application use. It is used when Active Directory is not your primary network directory service.

Active Directory Rights Management Services   This role is used to control access to and distribution of digital assets, such as documents and media. The assets are signed and secured so that only authorized users can access them.

A VPN is a secured and encrypted link between two computers. It allows for secure communications across public networks.

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You will learn more about the Network Policy and Access Services role in Chapter 12.

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You will learn more about the Active Directory role in Chapters 5, 6, and 7.

DHCP Server   The Dynamic Host Configuration Protocol (DHCP) Server role provides the dynamic configuration of the IP protocol for devices on the network.

DNS Server   The Domain Name System (DNS) Server role is used to resolve domain names to IP addresses.

Fax Server   This role can be used to allow sending and receiving of faxes through the server.

Hyper-V   Hyper-V is Microsoft's server virtualization solution starting with the Windows Server 2008 operating system.

Remote Desktop Services   This role allows for remote access to the Desktop of the Windows server through the use of a special client application. Once enabled, a user can control the Desktop from a remote machine.

Windows Deployment Services   This role provides operating system deployment services so that networked computers may install their operating system from the server.

Windows Server Update Services   This role checks with the Microsoft Update or Windows Update sites and downloads updates to the server. Clients can then receive their updates from the server rather than being required to access the Internet.

All of the roles are installed using Server Manager, as follows:

1. Click Start ➢ Administrative Tools ➢ Server Manager.

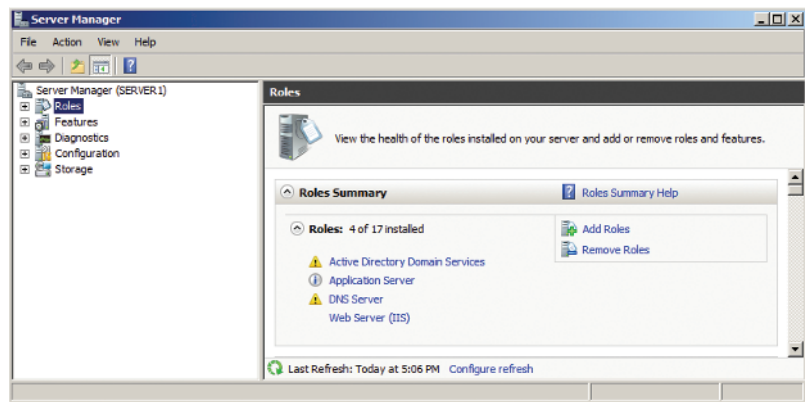When it loads you will see a screen similar to the one in Figure 1.7.

F I G U R E   1 . 7   The Server Manager is used to view installed roles, add new roles, and manage existing roles.

2. Select the Roles node in the left pane.

3. Right-click Roles and select Add Roles to add a new role to the server.

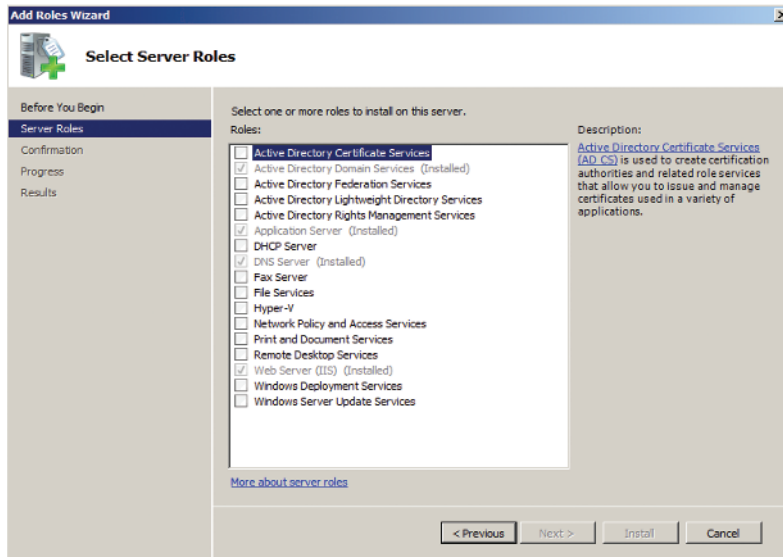4. Use the Add Roles Wizard, shown in Figure 1.8, to add the various roles.

FIGURE 1.8 The Add Roles Wizard is used to add roles to a Windows server installation.

Microsoft Windows Server Features

Now that you understand the basics of what a server is and how servers can play different roles, it's time to explore the specifics of Windows Server as an operating system. In this section, you will learn about the Windows Server user interfaces, which include both a graphical interface and a command-line text-mode interface. Next, you will learn about the basic networking features offered by the operating system. You'll then learn about the management features, which include Server Manager, Microsoft Management Consoles, PowerShell, and the traditional Command Prompt. Finally, you will compare and contrast the different editions of the Windows Server operating system, which will prepare you for the next chapter where you will learn to install Windows servers.

Windows Server User Interfaces

Microsoft Windows has provided a graphical user interface (GUI) for more than two decades. Starting in the early 1980s, Windows has evolved into a rich and

useful GUI. However, the Windows operating system offers more than just a GUI interface; command-line interfaces are provided as well.

The Windows GUI interface is the same on the server and the client versions of the operating system. By default, Windows Server 2008 and Windows Server 2008 R2 have the fancy animations and special features disabled, but they are there just as they are in Windows Vista and Windows 7.

Figure 1.9 shows the Windows Server 2008 R2 Desktop. Like the Windows 7 Desktop, it includes a Start menu, taskbar, notification tray, and Desktop for icon placement. The Start menu is used to launch application and access special features like the Control Panel and your personal folders. The taskbar displays icons for the running applications so that you can switch between tasks. The notification tray is used to display icons for running services and applications that may need to notify the user of state changes. The Desktop is your personal space for the placement of icons and folders so that you can have quick access to frequently used items.

To enable the Windows 7 Desktop features, you must add the Desktop Experience feature in Server Manager and then enable an Aero theme.
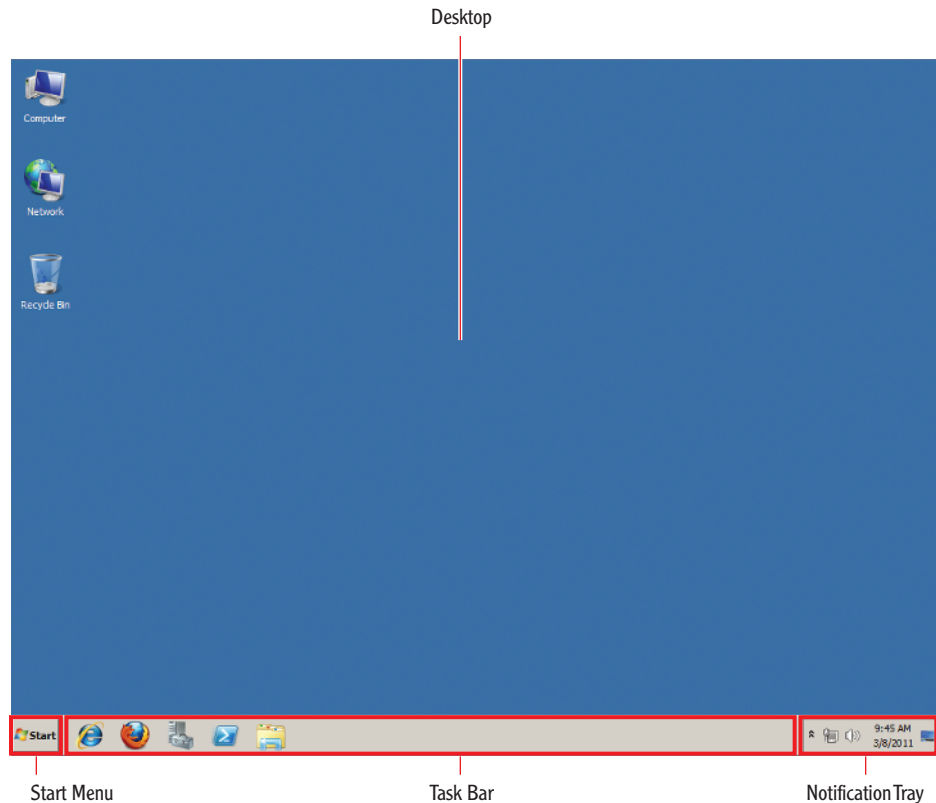

FIGURE 1.9   The Windows Server 2008 R2 Desktop

The oldest command-line interface in Windows operating systems is the Command Prompt, which is based on the older operating system named DOS. The Command Prompt is not DOS, but it supports commands similar to those in DOS. The Command Prompt is loaded using one of two common methods:

▶ Use the Start menu shortcuts: Click Start ➢ All Programs ➢ Accessories ➢ Command Prompt.

▶ Use the Start menu Search field:

a. Click Start.

b. Type **cmd** into the Search field.

c. Press Enter.

While the second option may seem longer, in practice you will find that it is the faster method. I recommend that you develop the habit of executing the Command Prompt using the Search field method. Figure 1.10 shows the process of entering the cmd command into the Search field.

In addition to the Command Prompt, Microsoft introduced Windows PowerShell, or simply PowerShell, in 2006. PowerShell is very new in the history of Windows interfaces, but it offers several benefits that will be discussed in the later section titled "Management Features." Both the Command Prompt and Windows PowerShell provide a text-mode interface to the operating system.
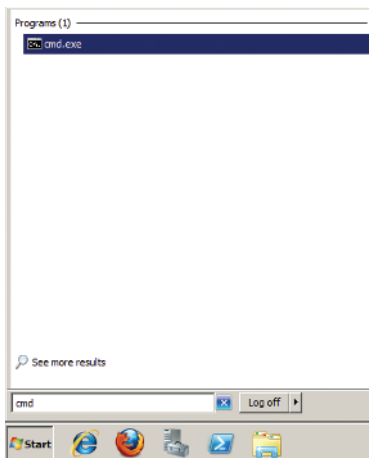
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The Command Prompt is CMD.EXE in Windows server and client operating systems.

F I G U R E   1 . 1 0 Launching the Command Prompt from the Start menu's Search field

Networking Features

Windows servers support the popular protocols in use on modern networks. Thanks to the Internet's rapid growth in the 1990s and the fact that it uses the TCP/IP protocol suite, the most popular protocols used today are part of this protocol suite. Windows servers support both the older Internet Protocol (IP) version 4 (IPv4) and the newer IP version 6 (IPv6). The primary difference between the two versions is in their addressing requirements. IPv4 uses a 32-bit (32 ones and zeros) address, and IPv6 uses a 128-bit address for each node on the network. Additional differences exist, but the change in address sizes has the greatest initial impact on organizations moving from IPv4 to IPv6.

Windows servers use the TCP/IP protocol suite, as well as other protocols, in order to provide network services. Built right into the Windows Server operating system is the ability to provide several network services including:

> ► File sharing
>
> ► Printer sharing
>
> ► Network authentication
>
> ► Web serving
>
> ► Media streaming
>
> ► Network-based operating system deployments
>
> ► Network-based operating system update deployments
>
> ► Network configuration and resolution services (DHCP and DNS)
>
> ► Centralized fax services
>
> ► Data caching services
>
> ► Remote command-line services (Telnet)

In addition to these network services, Windows servers can also be used to centrally manage and configure Windows clients across the network. A feature known as Group Policy is used to accomplish centralized administration. Using Group Policies on the network, you can deploy software to machines, configure operating system settings, and restrict which applications the users can run and much more.

For more information on the specifics of the TCP/IP protocol suite, see Darril Gibson's book titled *Microsoft Windows Networking Essentials* (Sybex, 2011).

When using Telnet, remember that your username and password are sent across the network as cleartext.

You will learn more about Group Policy in Chapter 8.

Management Features

When it comes to managing your servers, you have several options. You can use the Server Manager and Control Panel in the GUI interface as well as several graphical administration interfaces found on the Start menu in Administrative Tools. Additionally, you can use Windows PowerShell to administer the server and you can use the traditional Command Prompt.

The Server Manager is the primary GUI tool for managing your Windows servers. Figure 1.11 shows the Server Manager with the available nodes expanded in the left pane. Server Manager is used to manage roles and features. It is also used for diagnostics and troubleshooting with tools such as the Event Viewer, Performance, and the Device Manager. You can configure Task Scheduler events, the settings for the built-in firewall, services, and WMI Control options. Finally, you can manage storage using both Windows Server Backup and Disk Management.

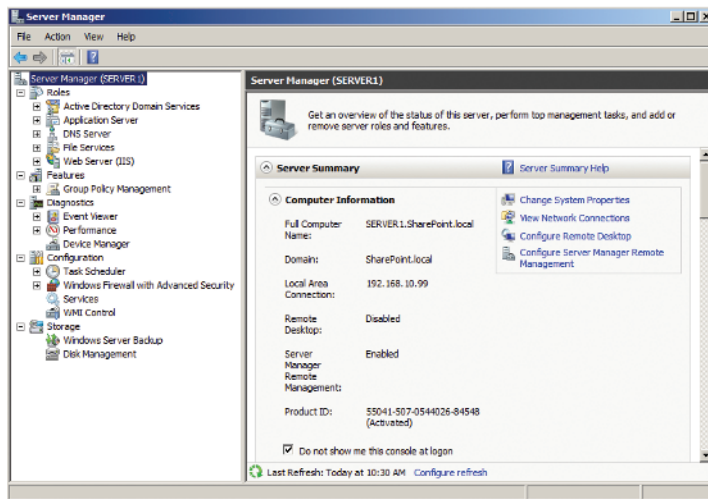**You will learn more about Server Manager in Chapters 3, 4, and 16.**

FIGURE 1.11 The Server Manager with all nodes expanded

Windows PowerShell provides a modern text-mode interface to the Windows operating system. It offers several features beyond the traditional Command Prompt, including:

► Improved scripting capabilities

► Object-based commands (all system information is considered in object and object property terminology)

> ► Cmdlets (the new name for a command in PowerShell) are available for administration of many Microsoft technologies
>
> ► Consistency for commands (all commands use a verb-noun or verb-object construct, such as `Get-Process` or `Set-Item`)

The Windows PowerShell interface is shown in Figure 1.12. In this image, the `Get-Process` command was executed to show several selected processes and the properties of those processes.
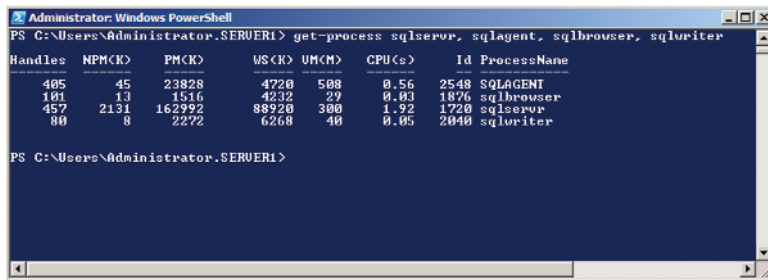

FIGURE 1.12   The Windows PowerShell interface

The Command Prompt is the oldest Microsoft interface still used today. In fact, the Command Prompt is one of the most commonly used administration interfaces by Windows Server professional administrators. Microsoft continues to release new Command Prompt features. For example, the new `PowerCfg` command introduced with Windows 7 allows you to manage power management profiles from the Command Prompt. Microsoft continues to support the Command Prompt with each new version of Windows on the clients and the servers. They add new commands and enhance existing commands to add new capabilities. You can be sure that an investment in learning to use the Command Prompt will be useful for years to come.

Windows Server Editions

In this final section, you will learn about the different editions of Windows Server and the various features they offer. Like many software applications, Microsoft Windows comes in different editions. Windows Server 2008 R2 comes in seven different editions:

Windows Server 2008 R2 Foundation   The Foundation Edition is a low cost, entry-level version of Windows Server. Microsoft recommends it for small business use only. The Foundation Edition supports the basic server roles such as Active Directory Domain Services, Application Server, DHCP Server, DNS Server,

Print and Document Services, and Web Services. It includes partial support for File Services in that only one Distributed File System (DFS) root can be created.

Windows Server 2008 R2 Standard   The Standard Edition is the most common edition used in both small and medium-sized businesses simply because it offers the majority of features that an organization requires. A key difference between Foundation and Standard is that Standard supports Hpyer-V for virtualization and Foundation does not. The Standard Edition has the same limits on the File Services role as the Foundation Edition.

Windows Server 2008 R2 Enterprise   The Enterprise Edition of Windows Server 2008 R2 is the first level at which all server roles are completely supported. For this reason, medium-sized and large organizations usually choose the Enterprise Edition of Windows Server 2008 R2. Additionally, the Enterprise Edition allows you to run four virtualized installations of Windows Server 2008 R2 within Hyper-V without requiring additional licenses.

Windows Server 2008 R2 Datacenter   The Datacenter Edition is a special edition of Windows Server 2008 R2 that comes only on pretested hardware. It is not supported on just any computer that you might choose to use. Instead, you buy tested hardware with a preconfigured installation of Datacenter Edition and in exchange you receive high availability guarantees. In most cases, the Datacenter Edition is an Original Equipment Manufacturer (OEM) install. This simply means that it comes preinstalled on tested and authorized equipment and is not supported on just any old machine. The Datacenter Edition provides unlimited virtual machine licenses, which far exceeds the Enterprise Edition allowances. However, the cost of Datacenter is much higher because it is licensed on a per-processor basis only. The licensing fees can quickly exceed $20,000.

Windows Web Server 2008 R2   The Web Server Edition is intended to be just what its name implies: a web server. It supports only the DNS Server and Web Server roles and is a streamlined installation of Windows Server 2008 R2 aimed at providing efficient delivery of web hosting services.

Windows HPC Server 2008 R2 Suite   The Higher Performance Computing (HPC) Edition of Windows Server is focused on performance. It supports significantly fewer roles than Standard Edition, but it is intended to run in a clustered configuration. A head node is the single point of management and job scheduling for the cluster and compute nodes receive computational task requests from the head node. The point of the HPC Edition is to provide rapid computations through the uses of multiple compute nodes in a cluster.

Windows Server 2008 R2 for Itanium-Based Systems   While the Itanium-Based Edition is still available, it is very limited in functionality. You can install the

◄

A *cluster* is a group of computers working together as one to improve performance or availability.

Application Server role and the Web Services role, but no other roles are available. For this reason, Itanium-Based systems are mostly used as web servers when they run Windows Server 2008 R2.

With an understanding of the different editions of Windows Server, you are prepared to make educated decisions as you select the right operating system for your needs. You can learn more about these editions at:

```
http://www.microsoft.com/windowsserver2008/en/us
/r2-editions-overview.aspx
```

THE ESSENTIALS AND BEYOND

It is important to know that a server is used to provide services to multiple devices on a network. Servers are different from clients because they are dedicated to service provisioning, while clients are not dedicated to this task. Servers can play many different roles, and Windows servers even use the phrase "server role" to define the roles they play. For example, Windows servers can play the role of a file server, a print server, a DNS server, an Active Directory server, and many other roles. Windows servers have many features that make them easy to deploy, manage, and troubleshoot. These features include a familiar graphical interface in the Windows Desktop and a familiar text-mode interface in the Command Prompt. Newer versions of Windows Server also include a new text-mode interface called Windows PowerShell, which enhances the capabilities of the old Command Prompt while still supporting many of its features.

ADDITIONAL EXERCISES

◄ Research the different editions of Windows Server online. Select the best edition for use as a dedicated web server in a small business with a limited budget.

◄ Add the File Services role to a Windows Server 2008 R2 installation and work with the FSRM tool.

◄ Browse a vendor's website and explore the different types of servers they sell. Pay special attention to the form factor of each server.

◄ Review the history of Microsoft Windows to learn how it has evolved to become the operating system it is today.

To compare your answers to the author's, please visit:

```
www.sybex.com/go/serveradminessentals
```

THE ESSENTIALS AND BEYOND (Continued)

REVIEW QUESTIONS

1. Which one of the following is the best definition of a server?

   A. A network-connected device that provides IP routing to the network

   B. A network-connected device that provides services to the network and the devices on that network

   C. A stand-alone device that is used by a user to perform mathematical analysis

   D. A network-connected device that is used to access websites using a web browser

2. True or false. SQL Server may be categorized as an information service.

3. What kind of computing device consumes services on a network?

   A. Web Server

   B. DNS Server

   C. Client

   D. Ethernet cable

4. What Command Prompt command can be used to determine the version of Windows running on a machine?

5. Which server form factor allows multiple services to be placed in an enclosure much as add-on cards are installed in individual computers?

   A. Blade

   B. Desktop

   C. Rack Mount

   D. Convertible

6. Define a server role.

7. Define a feature.

8. What server role, in Windows Server 2008 R2, supports centralized scanner management?

   A. File Services

   B. Application Server

   C. Web Server

   D. Print and Document Services

9. What command is used to launch the Windows Command Prompt in Windows Server 2008 R2?

   A. `Command.com`

   B. `PowerShell`

   C. `CMD`

   D. `Prompt`

10. True or false. Windows Server 2008 R2 supports only IPv4.