Chapter

1

Getting Started with Windows 2000 Server

MICROSOFT EXAM OBJECTIVES COVERED IN THIS CHAPTER

- ✓ **Perform an attended installation of Windows 2000 Server.**
- ✓ **Troubleshoot failed installations.**
- ✓ **Upgrade a server from Microsoft Windows NT 4.0.**

The Windows 2000 Server operating system provides many powerful features, such as the Active Directory, the Microsoft Management Console, and high levels of security. The Windows 2000 Server family is scalable through three versions: Windows 2000 Server, Windows 2000 Advanced Server, and Windows 2000 Datacenter Server.

Before you can do anything with Windows 2000 Server, you must first install the product. This process is actually fairly easy if you have prepared for the installation, know what the requirements are, and have met the prerequisites for a successful installation.

You also need to decide if you want to perform a clean install or an upgrade. In order to upgrade, you must be running Windows NT Server 3.51 or 4. You should perform a clean install if your operating system does not support a Windows 2000 upgrade, if you want to dual-boot with your existing Windows NT system, or if you want to start from scratch. If your previous operating system can be upgraded to Windows 2000 Server and you want to retain your system settings, you should choose to perform an upgrade.

Once you've completed all of the planning, you are ready to install Windows 2000 Server. A clean install is a straightforward process that involves running a Setup program, running a Setup Wizard, and installing Windows 2000 Networking. If you are installing Windows 2000 as a domain controller, the final part of the process is to upgrade the server to a domain controller.

When you install Windows 2000 Server, you should also consider if the computer will be used for dual-boot or multi-boot purposes. Dual-booting or multi-booting allows you to have your computer boot with operating systems other than Windows 2000 Server.

If you have any problems with the installation, you will need to troubleshoot them. Some problems that you might encounter are media defects or hardware that doesn't meet the minimum requirements.

In this chapter, you will learn how to install Windows 2000 Server. The first section of this chapter provides an overview of the Windows 2000 Server family. Next, you will learn how to prepare for a clean install of Windows 2000 Server, perform the installation, and set up for dual-booting. Then the upgrade process is covered. Finally, you will learn how to troubleshoot installation problems.

An Overview of the Windows 2000 Server Family

Windows 2000 Server is a powerful operating system with many features. The following are some of its main features:

- The Active Directory, which is based on Directory Services (the X.500 standard) and provides a scalable network architecture that can be used to support a single server with a few objects or thousands of servers with millions of objects
- An administrative console called the Microsoft Management Console (MMC), which can be customized by administrators to provide whatever administrative tools are required in a single logical framework
- Improved hardware support, including Plug-and-Play capabilities and hardware Wizards that facilitate new hardware installation
- File management services, which include features such as the Distributed file system (DFS), increased security through the Encrypting File System (EFS), and the ability to set disk quotas for users of volumes on a per volume basis
- High levels of security through utilities such as Security Configuration and Analysis, protocols such as Kerberos (for accessing resources in a Windows 2000 domain) and the IP Security Protocol (for authentication and data encryption), and the use of smart cards

Smart cards provide storage for protecting account numbers, passwords, and private keys.

- The ability to support remote operating system installations through services such as disk imaging
- Intellimirror services, which include features such as offline files and folders, automatic installation and repair of network applications, and the ability to control users' Desktops by specifying Desktop configurations
- Windows Terminal Services, which allow legacy Desktops to access the network using the server's processing power
- A high level of support for Internet connections through Internet Information Services (IIS)
- System recovery options available through Startup and Recovery Options when Windows 2000 Server is started

Windows 2000 Server is available in three different versions: Windows 2000 Server, Windows 2000 Advanced Server, and Windows 2000 Datacenter Server. You can choose the version that is best suited for your company's needs and budget. Windows 2000 Server is designed for use in small to medium-sized companies, and Windows 2000 Advanced Server and Windows 2000 Datacenter Server are designed for use by medium-sized to large companies or by Internet service providers (ISPs). The following sections describe the main features of the each of the three versions of Windows 2000 Server.

Windows 2000 Server

Windows 2000 Server contains all of the core features of the Windows 2000 Server family. Windows 2000 Server can serve as a file and print server, an applications server, a Web server, and a communications server. Some of the features that are supported by Windows 2000 Server include the following:

- Active Directory
- Internet and Web services
- High levels of security through Kerberos and a public key infrastructure
- Windows Terminal Services
- Support for up to 4GB of memory
- Support for up to four processors

Windows 2000 Advanced Server

Windows 2000 Advanced Server is a more powerful server designed for medium to large operations. It includes all of the features of Windows 2000 Server plus more, including the following:

- Network load balancing
- Cluster services for application fault tolerance
- Support for up to 8GB of memory
- Support for up to eight processors

Windows 2000 Datacenter Server

Windows 2000 Datacenter Server is the most powerful server in the Microsoft server family. This operating system is designed for large-scale enterprise networks. Windows 2000 Datacenter Server includes all of the features of Windows 2000 Advanced Server and adds the following features:

- More advanced clustering services
- Support for up to 32GB of memory
- Support for up to 16 processors (OEM versions can support up to 32 processors)

This book and the associated exam are based on Windows 2000 Server. All of the features of Windows 2000 Server are included in Windows 2000 Advanced Server and Windows 2000 Datacenter Server.

Preparing to Install Windows 2000 Server

Planning and preparation are key to making your Windows 2000 Server installation go smoothly. Before you begin the installation, you should know what is required for a successful installation and have all the pieces of information you'll need to supply during the installation process. In

preparing for the installation, you should make sure you have the following information:

- What the hardware requirements are for Windows 2000 Server
- How to determine if your hardware is supported by Windows 2000 Server
- The difference between a clean installation and an upgrade
- What installation options are suitable for your system, such as which disk-partitioning scheme and file system you should select for Windows 2000 Server to use

Hardware Requirements

In order to install Windows 2000 Server successfully, your system must meet certain hardware requirements. Table 1.1 lists the minimum requirements as well as the more realistic recommended requirements.

The minimum hardware requirements for Windows 2000 Server and Windows 2000 Advanced Server are the same.

The minimum requirements specify the minimum hardware required before you should even consider installing Windows 2000 Server. These requirements assume that you are just installing the operating system and not running any special services or applications. For example, you may be able to get by with the minimum requirements if you are just installing the operating system in order to learn the basics of the software.

The recommended requirements are what Microsoft recommends for achieving what would be considered "acceptable performance" for the most common configurations. Since computer technology and the standard for acceptable performance are constantly changing, the recommendations are somewhat subjective. However, the recommended hardware requirements are based on the standards at the time that Windows 2000 Server was released.

The hardware requirements listed in Table 1.1 were those specified at the time this book was published. Check Microsoft's Web site at `www.microsoft.com/windows2000/guide/server/sysreq/default.asp` for the most current information.

TABLE 1.1 Hardware Requirements

Component	Minimum Requirement	Recommended Requirement
Processor	Pentium 133MHz or higher	Pentium 166MHz or higher
Memory	128MB	256MB
Disk space	2GB hard drive with 1GB of free disk space (more free space is required if you are installing Windows 2000 Server from over the network)	Depends on the applications and data you will store on your server
Network	None	Network card and any other hardware required by your network topology (if you want to connect to a network)
Display	Video adapter and monitor with VGA resolution	Video adapter and monitor with VGA resolution or higher

These requirements represent the operating system requirements. If you are running any processor- or memory-intensive tasks or applications, factor these requirements separately. When determining disk-space requirements for add-on software and data, a good rule of thumb is to plan what you need for the next 12 months, then double that number.

Depending on the installation method you choose, other devices may be required:

- If you are installing Windows 2000 Server from the CD, you should have at least a 12x CD-ROM drive.
- To start the installation locally and to create an Emergency Repair Disk, you need a high-density floppy drive.
- If you choose to install Windows 2000 Server from the network, you need a network connection and a server with the distribution files.

The Hardware Compatibility List (HCL)

Along with meeting the minimum requirements, your hardware should appear on the *Hardware Compatibility List (HCL)*. The HCL is an extensive list of computers and peripheral hardware that have been tested with the Windows 2000 Server operating system.

The Windows 2000 Server operating system requires control of the hardware for stability, efficiency, and security. The hardware and supported drivers on the HCL have been put through rigorous tests. Microsoft guarantees that the items on the list meet the requirements for Windows 2000 Server and do not have any incompatibilities that could affect the stability of the operating system.

If you call Microsoft for support, the first thing a Microsoft support engineer will ask about is your configuration. If you have any hardware that is not on the HCL, there is no guarantee of support.

To determine if your computer and peripherals are on the HCL, check the most up-to-date list at `www.microsoft.com`.

Clean Install or Upgrade?

Once you've determined that your hardware not only meets the minimum requirements but is also on the HCL, you need to decide whether you want to do a clean install or an upgrade.

If you already have Windows NT installed on your computer, you might want to upgrade that system to Windows 2000 Server. In an *upgrade*, you

retain options such as the Desktop, users and groups, and program groups and items. During an upgrade, you point to a prior operating system, and the Windows 2000 Server files are loaded into the same folder that contained the former operating system. The upgrade process is covered in the "Upgrading to Windows 2000 Server" section later in this chapter.

The only operating systems that can be directly upgraded to Windows 2000 Server are Windows NT Server versions 3.51 and 4. Any other operating systems cannot be upgraded, but they may be able to coexist with Windows 2000 in a multi-boot environment. Multi-booting is covered in the "Supporting Multiple-Boot Options" section later in this chapter.

If you don't have Windows NT Server, you need to perform a clean install. A *clean install* puts the operating system into a new folder and uses its default settings the first time the operating system is loaded. You should perform a clean install if any of the following conditions are true:

- There is no operating system currently installed.
- You have an operating system installed that does not support an upgrade to Windows 2000 Server (such as DOS, Windows 3.*x*, Windows 9*x*, or Windows NT Workstation).
- You want to start from scratch, without keeping any existing preferences.
- You want to be able to dual-boot between Windows 2000 Server and your previous operating system.

The process for a clean installation is described in the "Running the Windows 2000 Server Installation Process" section later in this chapter.

Installation Options

There are many choices that you will need to make during the Windows 2000 Server installation process. The following are some of the options that you will configure:

- How your hard disk space will be partitioned
- The file system your partitions will use
- The licensing method the computer will use
- Whether the computer will be a part of a workgroup or a domain
- The language and locale for the computer's settings

Before you start the installation, you should know which choices you will select. The following sections describe the options and the considerations for picking the best ones for your installation.

Partitioning of Disk Space

Disk partitioning is the act of taking the physical hard drive and creating logical partitions. A *logical drive* is how space is allocated to the drive's primary and logical partitions. For example, if you have a 5GB hard drive, you might partition it into two logical drives: a C: drive, which might be 2GB, and a D: drive, which might be 3GB.

The following are some of the major considerations for disk partitioning:

- The amount of space required
- The location of the system and boot partition
- Any special disk configurations you will use
- The utility you will use to set up the partitions

These considerations are covered in detail in the following sections.

Size Matters

One important consideration in your disk-partitioning scheme is determining the partition size. You need to consider the amount of space taken up by your operating system, the applications that will be installed, and the amount of stored data. It is also important to consider the amount of space required in the future.

Just for Windows 2000 Server, Microsoft recommends that you allocate at least 1GB of disk space. This amount of space allows room for the operating system files and for future growth in terms of upgrades and installation files that are placed with the operating system files.

The System and Boot Partition

When you install Windows 2000, files will be stored in two locations: the system partition and the boot partition.

The *system partition* contains the files needed to boot the Windows 2000 Server operating system. The files stored on the system partition do not take any significant disk space. By default, the system partition uses the computer's active partition, which is usually the C: drive.

The *boot partition* contains the files that are the Windows operating system. By default, the Windows operating system files are located in a folder named WINNT. You can, however, specify the location of this folder during the installation process. Microsoft recommends that the boot partition be at least 1GB.

Special Disk Configurations

Windows 2000 Server supports several disk configurations. Options include simple, spanned, striped, mirrored, and RAID-5 volumes. These configuration options are covered in detail in Chapter 6, "Managing Disks."

Windows 2000 Professional does not support mirrored and RAID-5 volumes. It does support the dynamic volume types of simple, spanned, and striped.

Disk Partition Configuration Utilities

If you are partitioning your disk prior to installation, you can use several utilities, such as the DOS or Windows FDISK program or a third-party utility such as PowerQuest's Partition Magic. You might want to create only the first partition where Windows 2000 Server will be installed. You can then use the Disk Management utility in Windows 2000 to create any other partitions you need. The Windows 2000 Disk Management utility is covered in Chapter 6.

You can get more information about FDISK and other disk utilities from your DOS or Windows documentation. Also, basic DOS functions are covered in *MCSE 2000 JumpStart™ : Computer and Network Basics* by Lisa Donald (Sybex, 2000).

File System Selection

Another factor that determines your disk-partitioning scheme is the type of file system you use. Windows 2000 Server supports three file systems:

- File Allocation Table (FAT16)
- FAT32
- New Technology File System (NTFS)

FAT16

File Allocation Table (*FAT16*—originally just FAT) is the 16-bit file system widely used by DOS and Windows 3.*x*. FAT16 tracks where files are stored on a disk using a file allocation table and a directory-entry table. With FAT, the directory-entry table keeps track of the location of the file's first block, the filename and extension, the date and time stamps on the file, and any attributes associated with the file.

The disadvantages of FAT16 are that it only supports partitions up to 2GB and it does not offer the security features of NTFS.

The advantage of FAT is that it is backward compatible, which is important if the computer will be dual-booted with DOS or any other operating system. For example, DOS, Unix, Linux, OS/2, Windows 3.1, and Windows 9*x* are compatible with FAT16.

FAT32

FAT32 is the 32-bit version of FAT, which was first introduced in 1996 with Windows 95, OEM (original equipment manufacturer) Service Release 2 (OSR2).

FAT32's many advantages over FAT16 include the following:

- Disk partitions can be as large as 2TB (terabytes).
- More safeguards were added to provide fault tolerance in the event of disk failure.
- It improves disk-space usage by reducing cluster size.

The disadvantages of FAT32 are that it lacks several of the features offered by NTFS for a Windows 2000 system, such as local security, file encryption, disk quotas, and compression.

If you choose to use FAT, Windows 2000 will automatically format the partition with FAT16 if the partition is under 2GB. If the partition is over 2GB, it will be automatically partitioned as FAT32.

Windows NT 4 and earlier releases of NT do not support FAT32.

NTFS

New Technology File System (NTFS) is a file system designed to provide additional features for Windows NT and Windows 2000 computers. NTFS

version 5 ships with Windows 2000. The following are some of the features of NTFS:

- The ability to set local security on files and folders.
- The option to compress data. This feature reduces disk-storage requirements.
- The flexibility to assign disk quotas. Disk quotas are used to limit the amount of disk space a user can use.
- The option to encrypt files. Encryption offers an additional level of security.

Unless you are planning on dual-booting your computer to an operating system other than Windows NT, Microsoft recommends using NTFS.

Licensing Mode

Licensing pays the good folks at Microsoft for all of the hard work they put into developing the Windows 2000 operating system. There are two main aspects to licensing: You pay for the local operating system, and you pay for client access. This means that if you are running Windows 2000 Server as your server and Windows 2000 Professional and Windows 98 for your clients, you must license the appropriate operating system for each individual computer. You also license the access of network servers.

When you install Windows 2000 Server, you are given the choice between Per Server or Per Seat licensing. *Per Server licensing* specifies the concurrent number of network connections that can be made to a server. *Per Seat licensing* specifies that each client will be licensed separately and that each client can access as many servers as it needs to.

You should choose Per Server licensing if your users access only one server at a time. For example, if you have ten users and one server, it will be less expensive to use Per Server than Per Seat licensing.

If your users access more than one server concurrently, you should use Per Seat licensing. For example, if you have ten users and two servers with Per Seat licensing, you will need to buy only ten client licenses, called *Client Access Licenses (CALs)*. If you used Per Server licensing, each server would need to be licensed for 10 connections.

Windows 2000 Professional only requires that you license the operating system.

Membership in a Domain or Workgroup

One Windows 2000 Server installation choice is whether your computer will be installed as a part of a *workgroup* or as part of a *domain*.

You should install as part of a workgroup if you are a part of a small, decentralized network or if you are running Windows 2000 Server on a nonnetworked computer. To join a workgroup, you simply choose that workgroup.

Domains are part of larger, centrally administered networks. You should install your computer as part of a domain if any Windows 2000 servers on your network are configured as domain controllers with the Active Directory installed. To join a domain, you must specify the name of a valid domain and provide the username and password of a user who has rights to add a computer to the domain. You can also pre-authorize a computer to join a domain through the Active Directory Users and Computers utility. A domain controller for the domain and a Domain Name System (DNS) server must be available to authenticate the request to join the domain.

Language and Locale

Language and locale settings are used to determine the language the computer will use. Windows 2000 supports many languages for the operating system interface and utilities.

Locale settings are used to configure the locality for items such as numbers, currencies, times, and dates. An example of a locality is that English for United States specifies a short date as *mm/dd/yyyy* (month/day/year), and English for South Africa specifies a short date as *yyyy/mm/dd* (year/month/day).

Choosing Your Installation Method

You can install Windows 2000 Server by using the distribution files on the Windows 2000 Server CD or by using files that have been copied to a network share point. The following sections describe each installation method.

Installing Windows 2000 from the CD

When you install Windows 2000 Server from the Windows 2000 Server CD, you have three options for starting the installation:

- You can boot to another operating system, access your CD-ROM drive, and run `WINNT.EXE` or `WINNT32.EXE`, depending on which operating system you are using.
- If your computer can boot to the CD, you can insert the Windows 2000 Server CD into its CD-ROM drive and restart your computer.
- If your computer has no operating system installed and does not support booting from the CD-ROM drive, you can use the Windows 2000 Server Setup Boot Disks.

Installing from Another Operating System

If your computer already has an operating system installed and you want to upgrade your operating system or dual-boot your computer, you boot your computer to the currently installed operating system, then start the Windows 2000 Server installation process.

Depending on which operating system you are running, you would use one of the following commands from the I386 folder to start the installation process:

- From Windows 9*x* or Windows NT, use `WINNT32.EXE`.
- From any other operating system, use `WINNT.EXE`.

Installing by Booting the Windows 2000 CD

If your computer can boot from the CD, then all you need to do to start the installation process is insert the Windows 2000 Professional CD and restart your computer. When the computer boots, the Windows 2000 Server installation process will launch automatically.

Installing from Setup Boot Disks

If your computer cannot boot from the CD-ROM drive, you can create floppy disks that boot to the Windows 2000 Server operating system. These disks are called the *Windows 2000 Server Setup Boot Disks*. Using these disks, you can install or reinstall the Windows 2000 Server.

The Windows 2000 Server Setup Boot Disks are not specific to a computer; they are general Windows 2000 Server disks that can be used on any computer running Windows 2000 Server.

To create the Windows 2000 Server Startup disks, you need four high-density floppy disks. They should be labeled Windows 2000 Server Setup Boot Disk, Windows 2000 Server Setup Disk #2, Windows 2000 Server Setup Disk #3, and Windows 2000 Server Setup Disk #4.

The command to create boot disks from Windows 2000 or Windows NT is `MAKEBT32.EXE`. The command to make boot disks from Windows 9*x* or a 16-bit operating system is `MAKEBOOT.EXE`. These utilities are located on the Windows 2000 Server CD in the BOOTDISK folder.

The Windows 2000 Server Setup Boot Disks are also used for the Recovery Console and the Emergency Repair Disk (disaster-recovery methods), which are covered in Chapter 15, "Performing System Recovery Functions." You will create Windows 2000 Server Setup Boot Disks in an exercise in Chapter 15.

Installing Windows 2000 over a Network Connection

If you are installing Windows 2000 Server over the network, you need a distribution server and a computer with a network connection. A *distribution server* is a server that has the Windows 2000 Server distribution files in a shared folder. To install Windows 2000 Server over the network, boot the target computer. Then, attach to the distribution server and access the share that has the WINNT folder shared. Next, launch `WINNT.EXE` or `WINNT32.EXE` (depending on the computer's current operating system). Finally, complete the Windows 2000 Server installation.

Running the Windows 2000 Server Installation Process

This section describes how to run the Windows 2000 Server installation process. As explained in the previous section, you can run the installation from a CD or over a network. The only difference in the

installation procedure is the point where you start—from your CD-ROM drive or from a network share. The steps in the following sections assume that the disk drive is clean and that you are starting the installation using the Windows 2000 Server CD.

Microsoft Exam Objective

Perform an attended installation of Windows 2000 Server.

There are four main steps in the Windows 2000 Server installation process:

- Run the Setup program. If you boot from DOS or Windows 9*x*, the Setup program will be DOS-based. If you boot from Windows NT, the Setup program will be GUI-based.
- Run the Setup Wizard.
- Install Windows 2000 Networking.
- Upgrade the server to a domain controller (if this is a domain controller rather than a member server).

Each of these steps is covered in detail in the following sections.

The following sections give the details of the installation process to show how the process works. But you should not actually install Windows 2000 Server until you reach the "Setting Up Your Computer for Hands-on Exercises" section. In the exercises in that section, you'll set up a domain controller and a member server, which you'll use to complete the rest of the exercises in this book.

Running the Setup Program

The Setup program starts the Windows 2000 Server installation. In this stage of the installation, you start the installation program, choose the partition where Windows 2000 will be installed, and then copy files.

The following steps are involved in running the Setup program:

1. On an Intel computer, access your CD-ROM drive and open the I386 folder. This folder contains all of the installation files for an Intel-based computer.
2. Start the Setup program.
   - If you are installing Windows 2000 Server from an operating system other than Windows 9*x* or Windows NT, launch `WINNT.EXE`.
   - If you are installing Windows 2000 Server from 32-bit mode Windows 9*x* or Windows NT, launch `WINNT32.EXE`.
3. The Windows 2000 Setup dialog box appears. Your first choice is to specify the location of the distribution files. By default, this would be where you executed the WINNT program. Normally, you just accept the default path and press Enter.
4. The Setup files are copied to your disk. If the `SMARTDRV` program is not loaded on your computer, you will see a message recommending that you load `SMARTDRV`. This is a disk-caching program that speeds up the process of copying files. `SMARTDRV` ships with DOS and Windows.

With `SMARTDRV`, it usually takes a few minutes to copy the files. Without `SMARTDRV`, it can take more than an hour.

5. Once the files have been copied, you are prompted to remove any floppy disks and to restart the computer.
6. The opening Windows 2000 Setup dialog box appears. At this point, you can set up Windows by pressing Enter, repair a Windows 2000 installation by pressing R, or quit the setup process by pressing F3.
7. The Windows 2000 License Agreement dialog box appears. You can accept the License Agreement by pressing F8 or you can disagree by pressing Escape (or F3 if you are in DOS mode). If you press Escape, the installation program will terminate, and your name and address will be sent directly to Microsoft for further analysis (just kidding about that second part).
8. The next dialog box asks you which partition you want to use to set up Windows 2000. You can pick a partition that already exists, or you can choose free space and a partition will be created for you.

Whichever partition you choose must have at least 1GB of free space. The default folder name will be WINNT. At this point, you can create or delete partitions and the file systems the partitions will use.

After you indicate the partition that will be used as the Windows 2000 boot partition, the Windows installation files will be copied to the installation folders. Then the computer automatically reboots.

Running the Windows 2000 Setup Wizard

Once your computer finishes with the Setup program, the computer will restart, and the Windows 2000 Setup Wizard will start automatically. When the Setup Wizard starts, the first thing it will do is detect and install device drivers. This process will take several minutes, and during this process, your screen may flicker.

Then the Setup Wizard will gather information about your locale, name, product key, licensing mode, computer name, and password, using the following dialog boxes (you click Next after completing each dialog box):

Regional Settings From this dialog box, you choose your locale and keyboard settings. Locale settings are used to configure international options for numbers, currencies, times, and dates. Keyboard settings allow you to configure your keyboard to support different local characters or keyboard layouts. For example, you can choose Danish or United States-Dvorak through this option.

Personalize Your Software In this dialog box, you fill in the Name and Organization boxes. This information is used to personalize your operating system software and the applications that you install. If you install Windows 2000 Server in a workgroup, the Name entry here is used for the initial user.

Product Key In the boxes at the bottom of this dialog box, you type in the 25-character product key, which can be found on the back of your Windows 2000 Server CD case.

Licensing Modes You can choose from Per Server licensing or Per Seat licensing. (See the "Licensing Modes" section earlier in this chapter for details about these two choices.)

Computer Name and Administrator Password Your computer name can be up to 15 characters. Here you specify a name that will uniquely identify your computer on the network. The Setup Wizard suggests a

name, but you can change it to another name. In this dialog box, you also type and confirm the Administrator password. An account called Administrator will automatically be created as a part of the installation process.

Be sure that the computer name is a unique name within your network. If you are part of a corporate network, you should also verify that the computer name follows the naming convention specified by your Information Services (IS) department.

Modem Dialing Information If you have a Plug-and-Play modem installed, you will see the Modem Dialing Information dialog box. Here, you specify your country/region, your area code (or city code), whether you dial a number to get an outside line, and whether the telephone system uses tone dialing or pulse dialing.

Date and Time Settings In this dialog box, you set your date and time settings and the time zone in which your computer is located. You can also configure the computer to automatically adjust for daylight savings time.

Network Settings This dialog box is used to specify how you want to connect to other computers, networks, and the Internet. You have two choices:

- Typical Settings installs network connections for Client for Microsoft Networks, as well as File and Print Sharing for Microsoft Networks. It also installs the TCP/IP protocol with an automatically assigned address.
- Custom Settings allows you to customize your network settings. You can choose whether or not you want to use Client for Microsoft Networks, File and Print Sharing for Microsoft Networks, and the TCP/IP protocol. You should use the custom settings if you need to specify particular network settings, such as a specific IP address and subnet mask (rather than using an automatically assigned address).

Workgroup or Computer Domain In this dialog box, you specify whether your computer will be installed as a part of a local workgroup or as a part of a domain. (See the "Membership in Domain or Workgroup" section earlier in this chapter for details about these choices.)

The computer will perform some final tasks, including installing Start menu items, registering components, saving settings, and removing any temporary files. This will take several minutes. After the final tasks are complete, you will see the Completing the Windows 2000 Setup Wizard dialog box. Remove the CD from your computer, and click the Finish button to restart your computer.

Installing Windows 2000 Networking

Once your computer finishes with the Setup Wizard and the computer restarts, the Network Identification Wizard starts automatically. The Network Identification Wizard is responsible for the network component installation.

Depending on your server's configuration, you may see a dialog box that deals with how users will log on to the computer. This dialog box offers two choices:

- The Users Must Enter a User Name and Password to Use This Computer option does just what it says: Users must enter a username and password to log on to the computer.
- The Windows Always Assumes the Following User Has Logged On option sets up Windows 2000 so that the user does not need to enter a username or password to use the computer. If you are the only person using the computer in a secure, nonnetworked environment, you might choose this option. However, in a networked, business environment, you do not want to allow such a security risk.

Next, the Network Identification Wizard prompts you to finish the Wizard. If you chose the Users Must Enter a User Name and a Password option, you need to provide a valid Windows 2000 username and password in the Log On to Windows dialog box. At this point, the only users that are enabled are Administrator and the *initial user* (which is the username you entered for identification).

After the installation is complete, you are logged on and greeted with the Windows 2000 Server Getting Started Wizard. This Wizard helps new users navigate the operating system.

Upgrading a Member Server to a Domain Controller

Once a server has been installed with the Windows 2000 operating system, you can upgrade the server to a domain controller using the *DCPROMO* utility.

The Logical Organization of the Active Directory

The Windows 2000 *Active Directory* (*AD*) is designed to be a scalable network structure. The logical structure of the Active Directory consists of containers, domains, and organizational units (OUs).

A *container* is an Active Directory object that holds other Active Directory objects. Domains and OUs are examples of container objects.

A *domain* is the main logical unit of organization in the Active Directory. The objects in a domain share common security and account information. Each domain must have at least one domain controller. The *domain controller* is a Windows 2000 Server computer that stores the complete domain database.

Each domain can consist of multiple OUs, logically organized in a hierarchical structure. OUs may contain users, groups, security policies, computers, printers, file shares, and other Active Directory objects.

Domains are connected to one another through logical structure relationships. The relationships are implemented through domain trees and domain forests.

A domain tree is a hierarchical organization of domains in a single, contiguous namespace. In the Active Directory, a *tree* is a hierarchy of domains that are connected to each other through a series of trust relationships (logical links that combine two or more domains into a single administrative unit). The advantage of using trust relationships between domains is that they allow users in one domain to access resources in another domain, assuming the users have the proper access rights.

A *domain forest* is a set of trees that does not form a contiguous namespace. For example, you might have a forest if your company merged with another company. With a forest, you could each maintain a separate corporate identity through your namespace, but share information across the Active Directory.

You can specify that the server is the first domain controller in a new domain or add it to an existing domain. If you already have the Active Directory installed on your network, you can create a new child domain in the existing

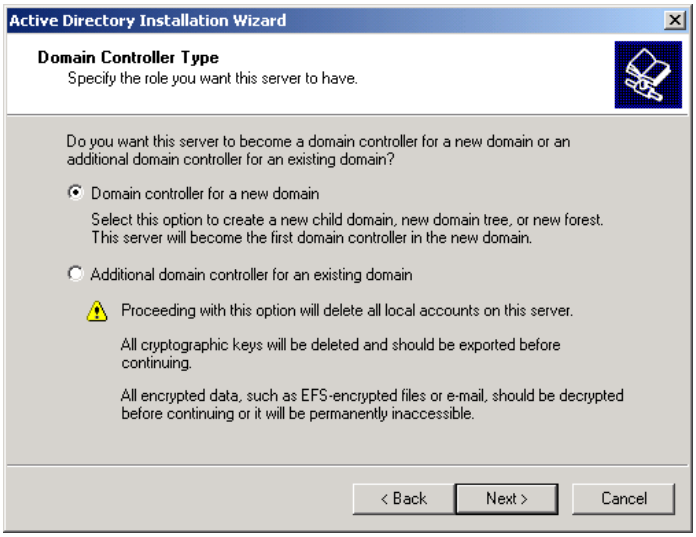
domain tree or install the domain tree as part of an existing forest. The steps in this section assume that you are creating the first domain controller in a new domain and that you are installing the Active Directory for the first time (this is our configuration for the exercises in the next section). These steps also assume that DNS is not yet configured on your network.

Configuring DNS and other networking services is covered in Chapter 9, "Managing Network Interoperability."

To upgrade a server to a domain controller, take the following steps:

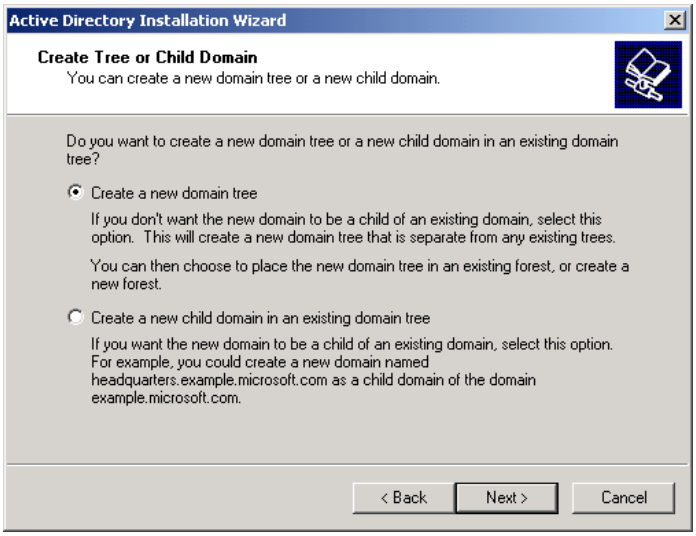
1. Select Start ➢ Run, type **DCPROMO** in the Run dialog box, and click the OK button.
2. The Active Directory Installation Wizard starts. Click the Next button.
3. The Domain Controller Type dialog box appears, as shown in Figure 1.1. Select the Domain Controller for a New Domain option and click the Next button. (If you wanted to add the domain controller to an existing domain, you would select the Additional Domain Controller for an Existing Domain option.)

FIGURE 1.1 The Domain Controller Type dialog box



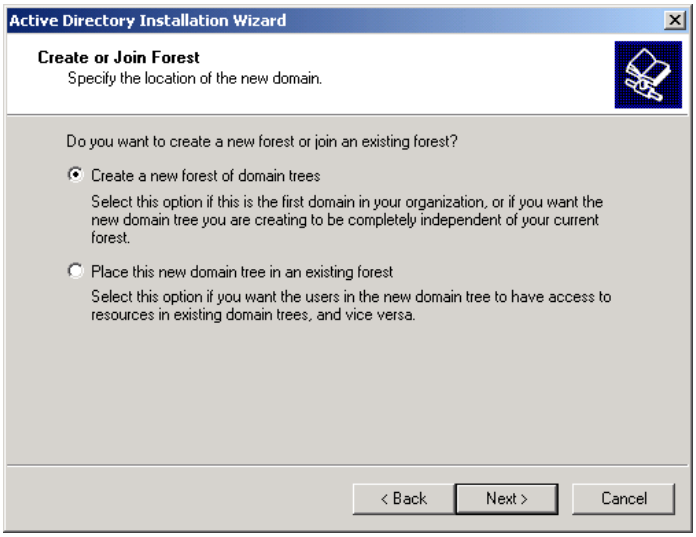
4. The Create Tree or Child Domain dialog box appears, as shown in Figure 1.2. To create a new domain tree, select the Create a New Domain Tree option and click the Next button. (If you already had the Active Directory installed on your network and you wanted to create a new child domain in the existing domain tree, you would select the Create a New Child Domain in an Existing Domain Tree option.)

FIGURE 1.2 The Create Tree or Child Domain dialog box



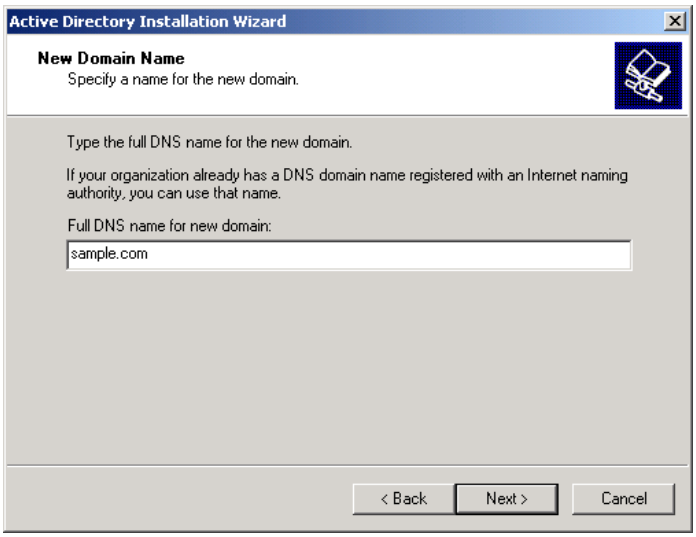
5. The Create or Join Forest dialog box appears, as shown in Figure 1.3. Select the Create a New Forest of Domain Trees option and click the Next button. (If you already had the Active Directory installed on your network and you wanted the domain tree to be installed as a part of an existing forest, you would select the Place This New Domain Tree in an Existing Forest option.)

FIGURE 1.3 The Create or Join Forest dialog box



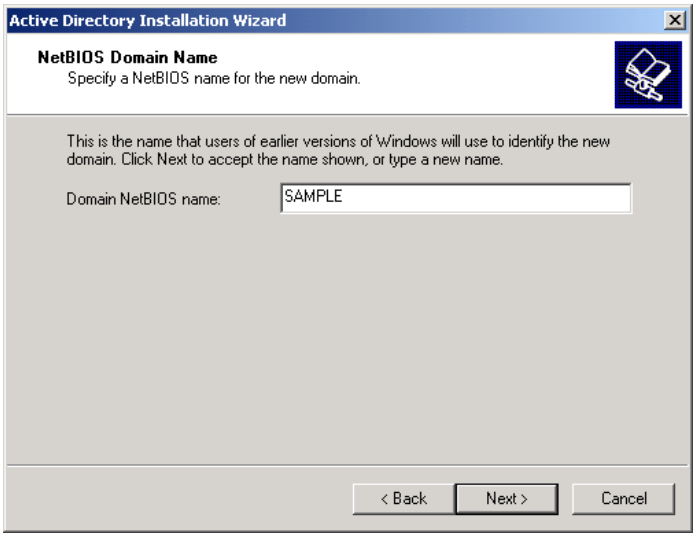
6. The New Domain Name dialog box appears, as shown in Figure 1.4. Specify the full DNS name for the new domain, such as `sampledomain.com`, and click the Next button to continue. (Usually, DNS is configured for the network before you create a domain controller.)

FIGURE 1.4 The New Domain Name dialog box



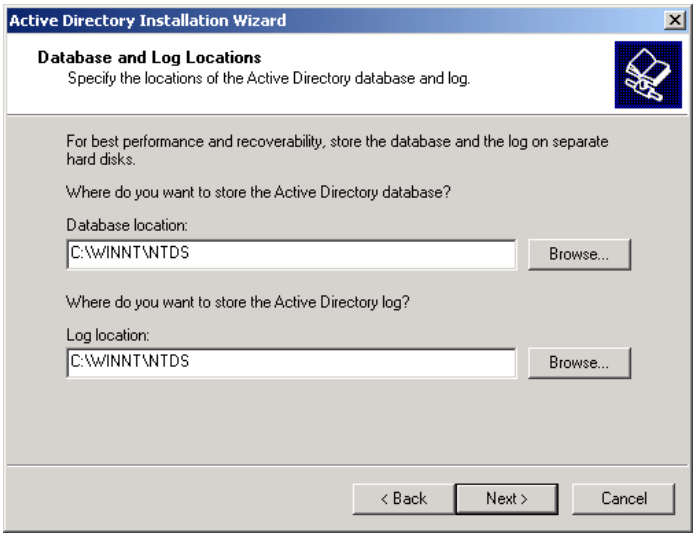
7. The NetBIOS Domain Name dialog box appears, as shown in Figure 1.5. NetBIOS domain names are used for compatibility with Windows NT clients. By default, the domain NetBIOS name is the same as the DNS name. You can change this to another name or accept the default. Click the Next button to continue.

FIGURE 1.5 The NetBIOS Domain Name dialog box



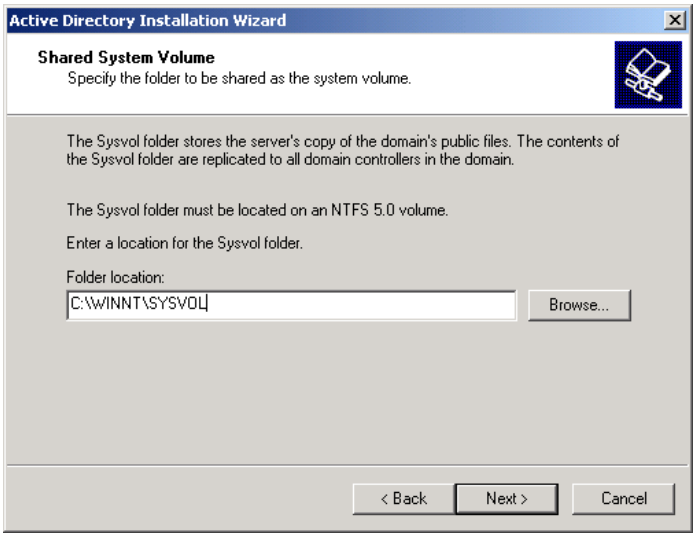
8. The Database and Log Locations dialog box appears, as shown in Figure 1.6. This dialog box allows you to specify the locations of the Active Directory database and the database log files. You can accept the default locations for these files or select other locations. Then click the Next button.

FIGURE 1.6 The Database and Log Locations dialog box



9. The Shared System Volume dialog box appears, as shown in Figure 1.7. This volume must be an NTFS 5 volume. You can accept the default folder location or select another location. Then click the Next button. (If the partition is not NTFS 5, you will see an error message indicating that the file system must be converted.)

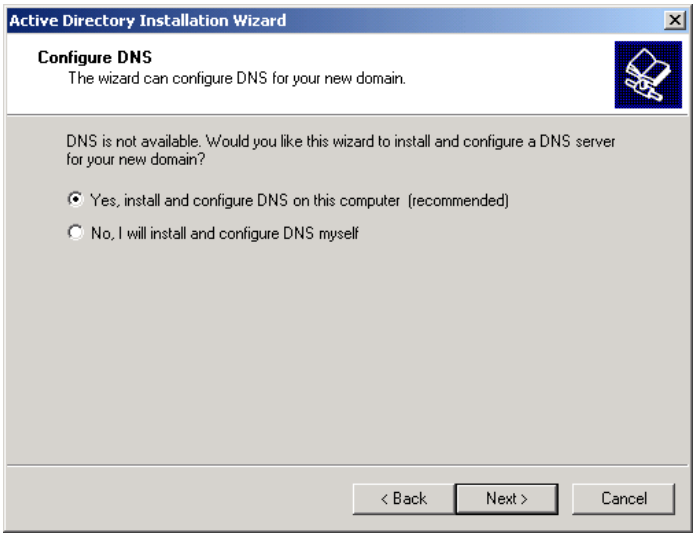
FIGURE 1.7 The Shared System Volume dialog box



10. If DNS has not been configured, you will see an informational message stating that the DNS server can't be located. Click the OK button to continue.

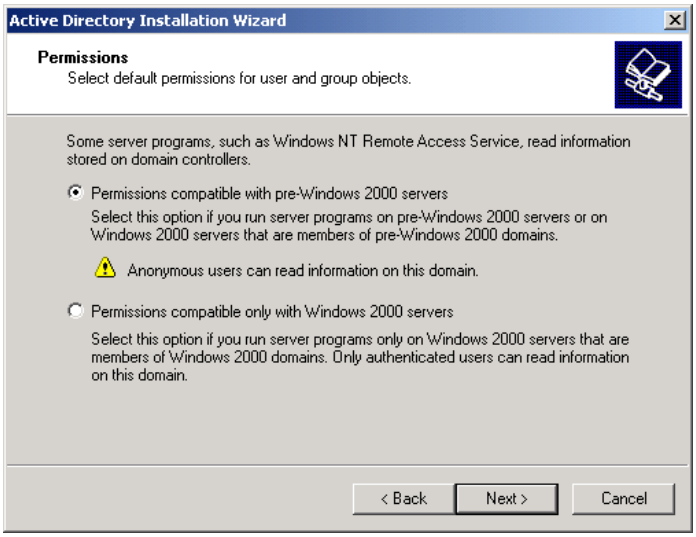
11. The Configure DNS dialog box appears, as shown in Figure 1.8. To configure DNS, select the Yes, Install and Configure DNS on This Computer (Recommended) option. If you want to install DNS manually, select No, I Will Install and Configure DNS Myself. After you have made your selection, click the Next button to continue.

FIGURE 1.8 The Configure DNS dialog box



12. The Permissions dialog box appears, as shown in Figure 1.9. If you want to be able to use server programs on servers that run earlier versions of Windows or are in a domain operating under a previous version of Windows, select the Permissions Compatible with pre-Windows 2000 Servers option. Otherwise, select the Permissions Compatible only with Windows 2000 Servers option. After you have made your selection, click the Next button to continue.

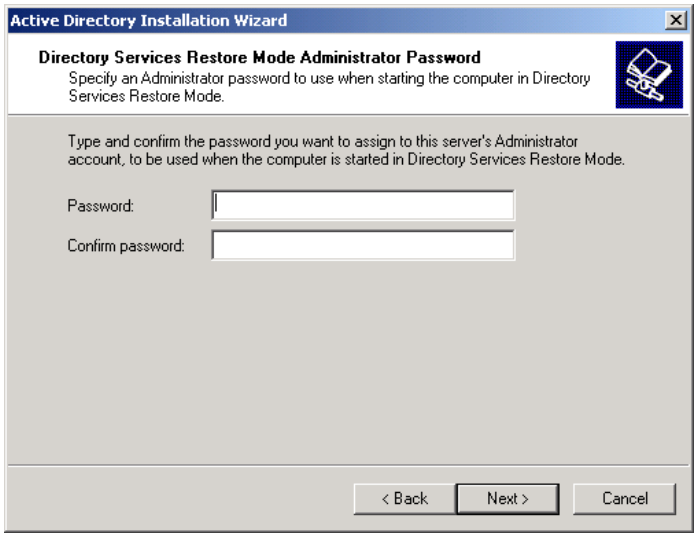
FIGURE 1.9 The Permissions dialog box



13. The Directory Services Restore Mode Administrator Password dialog box appears, as shown in Figure 1.10. This dialog box allows you to specify a password that can be used if the server needs to be restarted in the Directory Services Restore Mode. Enter and confirm this password, then click the Next button.

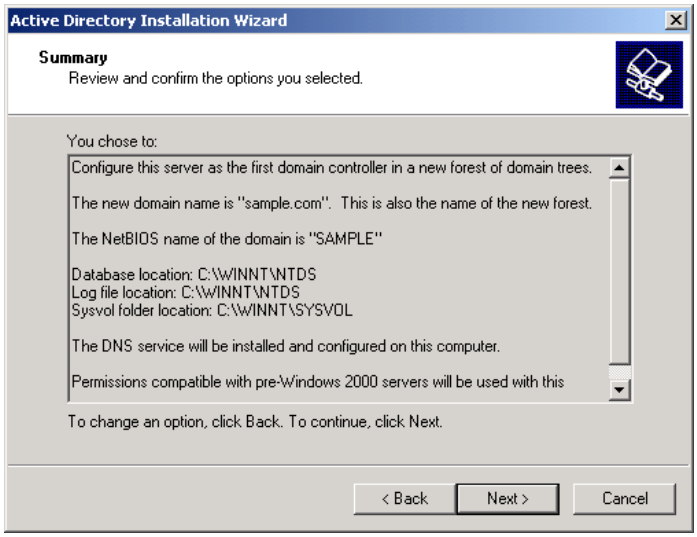
The Directory Services Restore Mode is an option on the Advanced Options menu, which is available at Windows 2000 startup. See Chapter 15 for details on this and other advanced startup options.

FIGURE 1.10 The Directory Services Restore Mode Administrator Password dialog box



14. The Summary dialog box appears, as shown in Figure 1.11. This dialog box allows you to confirm all of the selections you have made. If this information is correct, click the Next button.

FIGURE 1.11 The Summary dialog box



15. You see the Configuring Active Directory dialog box, which lets you know that the Wizard is configuring the Active Directory and that this process may take several minutes. Then you will be asked to insert your Windows 2000 Server CD so that additional files may be copied. Insert the CD and click the OK button.
16. The Configuring Active Directory dialog box reappears. When the process is complete, the Completing the Active Directory Installation Wizard dialog box appears. Click the Finish button.
17. You are prompted to restart Windows 2000 so that the changes will be in effect. Click the Restart Now button.

Once a server is upgraded to a domain controller, you can use the Active Directory. Creating domains, designing your DNS structure, and planning the Active Directory are covered in detail in *MCSE: Windows 2000 Directory Services Administration Study Guide*, 2nd. ed., by Anil Desai with James Chellis (Sybex, 2001).

Setting Up Your Computer for Hands-on Exercises

The exercises in this book assume that you have two computers configured in a specified manner. In the exercises in this chapter, you will install Windows 2000 Server on one computer as a domain controller and Windows 2000 Server on a second computer as a member server in the domain.

You should make a complete backup of your computer before doing any repartitioning or installation of new operating systems. All data will be lost during this process!

Installing Windows 2000 Server as a Domain Controller

For the exercises to work properly, you should make sure that the computer that will act as your server meets the list of requirements specified in Table 1.1. Your server should have a network card installed, and it should have at least a 3GB drive that is configured with the minimum space

requirements and partitions. Other exercises in this book assume that your server is configured as follows:

- 2GB (about 2000MB) C: primary partition with the FAT or FAT32 file system
- 500MB D: extended partition with the FAT or FAT32 file system (this partition will be converted to NTFS in Chapter 6)
- 500MB of free space (you will create a new partition with this free space in Chapter 6)

Of course, you can allocate more space to your partitions if it is available. Exercise 1.1 assumes that you are not currently running Windows NT and that you are performing a clean install and not an upgrade. Your partitions should be created and formatted, and `SMARTDRV` should be loaded.

As noted earlier in this chapter, you can set up your partitions through the DOS or Windows `FDISK` utility or a third-party program. For example, if you have a Windows 98 computer, you can use it to create a Windows 98 boot disk. Set up the disk with `FDISK`, `FORMAT`, and `SMARTDRV`. The hard drive will then boot, providing a C: drive of 1.2MB, a D: drive of 400MB, unallocated disk space, and access to the E: drive, which is the CD-ROM drive.

Before you start, you should note what values you will use for the following options for the domain controller:

- Name and Organization
- Computer Name
- Workgroup Name
- Administrator Password (if one will be assigned)
- Domain Name
- Directory Services Restore Mode Administrator Password (if one will be assigned)

EXERCISE 1.1

Installing Windows 2000 Server as a Domain Controller

In this exercise, you will install Windows 2000 Server as a domain controller, which is a four-part process.

Running the Setup Program

1. Boot your computer and insert the Windows 2000 CD into your CD-ROM drive.

EXERCISE 1.1 *(continued)*

2. From the DOS prompt on your computer, access your CD-ROM drive. If you have configured your computer as we recommended, your CD-ROM drive should be E:.
3. From the CD-ROM drive prompt, change directories to I386 by typing **`CD I386`** and pressing Enter.
4. From the `\I386>` prompt, type **WINNT** and press Enter.
5. From the Windows 2000 Setup dialog box, press Enter to accept the default path location for the Windows 2000 distribution files. It will take a few minutes to copy the files.
6. Remove any floppy disks from the computer and press Enter to restart the computer.
7. The computer restarts, and the Welcome to Setup screen appears. Press Enter to set up Windows 2000.
8. The License Agreement dialog box appears. Scroll down to the bottom of the page. Press F8 to agree to the license terms if you wish to continue.
9. In the next dialog box, specify the C: partition as the one you want to use to set up Windows 2000. Then press Enter.
10. In the next dialog box, choose to convert the partition to NTFS. Then confirm the conversion by pressing C.
11. Setup now examines your disks. The Windows installation files will be automatically copied to the installation folder, which will take a few minutes. After the files are copied, the computer will automatically reboot. After the computer reboots, the Welcome to the Setup Wizard dialog box will appear. When prompted, click the Next button to continue. (If you do not make a selection within 10 seconds, the installation will continue automatically.)

Running the Windows 2000 Setup Wizard

After the computer reboots, the Windows 2000 Server Setup program will automatically detect and install drivers on your computer. This process will take a few minutes.

EXERCISE 1.1 *(continued)*

1. The Regional Settings dialog box appears. Click the Next button to accept the default settings and continue.
2. In the Personalize Your Software dialog box, type your name and organization. Click the Next button.
3. In the Product Key dialog box, type the 25-character product key (this key can be found on a sticker on the CD case). Click the Next button.
4. The Licensing Modes dialog box appears. Accept the default configuration of Per Server licensing and five concurrent connections. Click the Next button to continue.
5. The Computer Name and Administrator Password dialog box appears. Type in the computer name. You can also specify an Administrator password (since this computer will be used for practice, you can leave the Password field blank if you want to). Click the Next button.
6. If you have a Plug-and-Play modem installed, the Modem Dialing Information dialog box appears. Specify the settings for your environment and click the Next button.
7. The Date and Time Settings dialog box appears. Verify that all of the settings are correct and click the Next button.
8. After the Networking component files are copied (which takes a few minutes), the Network Settings dialog box appears. Click the Custom Settings button and then click the Next button.
9. In the Windows 2000 Server Setup dialog box, highlight Internet Protocol (TCP/IP) and click the Properties button.
10. In the Internet Protocol (TCP/IP) Properties dialog box, click the Use the Following IP Address radio button. In the IP Address text box, enter **131.200.2.1**. In the Subnet Mask text box, enter **255.255.0.0**. Click the OK button. (Installing and configuring TCP/IP is discussed in detail in Chapter 9, "Managing Network Interoperability.")
11. Click the Next button in the Windows 2000 Server Setup dialog box.

EXERCISE 1.1 *(continued)*

12. In the Workgroup and Computer Domain dialog box, confirm that the No, This Computer Is Not on a Network, or Is on a Network without a Domain option is selected to indicate that you don't want to put the computer in a domain (because no domain exists at this stage). In this dialog box, you can accept the default workgroup name, WORKGROUP, or specify a unique workgroup name. Because this computer is a practice one, the workgroup name is not important. Click the Next button. The Setup components are installed, which takes several minutes.

13. When the Completing the Windows 2000 Setup Wizard appears, remove the CD from the drive and click the Finish button. The computer will restart.

14. When the computer reboots, choose Microsoft Windows 2000 from the boot selection options screen by pressing Enter. (This is the default selection if no choice is made.)

Running the Network Identification Wizard

15. Windows 2000 Server starts and displays the Welcome to the Network Identification Wizard dialog box. Press Ctrl+Alt+Delete to begin. By default, the Administrator account is displayed. Click the OK button to continue.

16. The Windows 2000 Configure Your Server dialog box appears. Click the I Will Configure This Server Later radio button and click the Next button.

17. Uncheck the Show This Screen at Startup option. Then close the Windows 2000 Configure Your Server dialog box.

Upgrading the Server to a Domain Controller

18. Select Start ➢ Run, type **DCPROMO** in the Run dialog box, and click the OK button.

19. When the Active Directory Installation Wizard begins, click the Next button.

20. In the Domain Controller Type dialog box, select the Domain Controller for a New Domain option and click the Next button.

EXERCISE 1.1 *(continued)*

21. In the Create Tree or Child Domain dialog box, select the Create a New Domain Tree option and click the Next button.
22. In the Create or Join Forest dialog box, select the Create a New Forest of Domain Trees option and click the Next button.
23. In the New Domain Name dialog box, enter a domain name (such as **`sampledomain.com`**) for the full DNS name and click the Next button.
24. In the NetBIOS Domain Name dialog box, click the Next button to accept the default value and continue.
25. In the Database and Log Locations dialog box, click the Next button to accept the default values and continue.
26. In the Shared System Volume dialog box, click the Next button to accept the default value and continue.
27. When you see an informational message stating that the DNS server can't be located, click the OK button to continue.
28. In the Configure DNS dialog box, select the Yes, Install and Configure DNS on This Computer (Recommended) option. Click the Next button to continue.
29. In the Permissions dialog box, select either option (whether you have permissions that are compatible with pre–Windows 2000 servers or not doesn't matter for this test server). Click the Next button to continue.
30. In the Directory Services Restore Mode Administrator Password dialog box, you can specify a password or leave this dialog box blank (since this is a test server). Click the Next button to continue.
31. If the information in the Summary dialog box is correct, click the Next button.
32. The Configuring Active Directory dialog box appears. When you are prompted, insert your Windows 2000 Server CD so that additional files may be copied and click the OK button.

EXERCISE 1.1 *(continued)*

33. The Configuring Active Directory dialog box appears again as the Wizard is configuring the Active Directory. When the process is complete, click the Finish button in the Completing the Active Directory Installation Wizard dialog box.
34. When you are prompted to click the Restart Now button to restart Windows 2000 Server, remove the Windows 2000 Server CD, and then click the Restart Now button.

Installing Windows 2000 Server as a Member Server

In Exercise 1.2, you will install Windows 2000 Server as a member server of the domain you created in Exercise 1.1. This computer should be configured in the same manner as the computer in Exercise 1.1.

Before you start, you should note what values you will use for the following options for the member server:

- Name and Organization
- Computer Name

EXERCISE 1.2

Installing Windows 2000 Server as a Member Server

In this exercise, you will install Windows 2000 Server as a member server, which is a three-part process.

Running the Setup Program

1. Boot your computer and insert the Windows 2000 CD into your CD-ROM drive.
2. From the DOS prompt on your computer, access your CD-ROM drive. If you have configured your computer as we recommended, your CD-ROM drive should be E:.
3. From the CD-ROM drive prompt, change directories to I386 by typing **`CD I386`** and pressing Enter.
4. From the `\I386>` prompt, type **`WINNT`** and press Enter.

EXERCISE 1.2 *(continued)*

5. From the Windows 2000 Setup dialog box, press Enter to accept the default path location for the Windows 2000 distribution files. It will take a few minutes to copy the files.
6. Remove any floppy disks from the computer and press Enter to restart the computer.
7. The computer restarts, and the Welcome to Setup screen appears. Press Enter to set up Windows 2000.
8. The License Agreement dialog box appears. Scroll down to the bottom of the page. Press F8 to agree to the license terms if you wish to continue.
9. In the next dialog box, specify the C: partition as the one you want to use to set up Windows 2000. Then press Enter.
10. In the next dialog box, choose to convert the partition to NTFS. Then confirm the conversion by pressing C.
11. Setup now examines your disks. The Windows installation files will be automatically copied to the installation folder, which will take a few minutes. After the files are copied, the computer will automatically reboot.

Running the Windows 2000 Setup Wizard

After the computer reboots, the Windows 2000 Server Setup program will automatically detect and install drivers on your computer. This process will take a few minutes.

12. The Regional Settings dialog box appears. Click Next to accept the default settings and continue.
13. In the Personalize Your Software dialog box, type your name and organization. Click the Next button.
14. In the Product Key dialog box, type the 25-character product key. Click the Next button.

EXERCISE 1.2 *(continued)*

15. The Licensing Modes dialog box appears. Accept the default configuration of Per Server licensing and five concurrent connections. Click the Next button to continue.
16. The Computer Name and Administrator Password dialog box appears. Type in the computer name. Specify an Administrator password if desired. Click the Next button.
17. If you have a Plug-and-Play modem installed, the Modem Dialing Information dialog box appears. Specify the settings for your environment and click the Next button.
18. The Date and Time Settings dialog box appears. Verify that all of the settings are correct and click the Next button.
19. After the Networking component files are copied (which takes a few minutes), the Network Settings dialog box appears. Click the Custom Settings button and then click the Next button.
20. In the Windows 2000 Server Setup dialog box, highlight Internet Protocol (TCP/IP) and click the Properties button.
21. In the Internet Protocol (TCP/IP) Properties dialog box, click the Use the Following IP Address radio button. In the IP Address text box, enter **131.200.2.2**. In the Subnet Mask text box, enter **255.255.0.0**. Click the OK button.
22. Click the Next button in the Windows 2000 Server Setup dialog box.
23. In the Workgroup and Computer Domain dialog box, select the Yes, Make This Computer a Member of the Following Domain option. In the Workgroup or Computer Domain field, type the domain name you specified in Exercise 1.1. Click the Next button.
24. In the Join Computer to *domain* Domain dialog box, specify **Administrator** as the username and enter the password you used in Exercise 1.1. Then click the OK button. The Setup components are installed, which takes several minutes.

EXERCISE 1.2 *(continued)*

25. When the Completing the Windows 2000 Setup Wizard appears, remove the CD from the drive and click the Finish button. The computer will restart.

26. When the computer reboots, choose Microsoft Windows 2000 from the boot selection options screen by pressing Enter. (This is the default selection if no choice is made.)

Running the Network Identification Wizard

27. Windows 2000 Server starts and displays the Welcome to the Network Identification Wizard dialog box. Press Ctrl+Alt+Delete to begin. By default, the Administrator account is displayed. Click the OK button to continue.

28. The Windows 2000 Configure Your Server dialog box appears. Click the I Will Configure This Server Later radio button and click the Next button.

29. Uncheck the Show This Screen at Startup option. Then close the Windows 2000 Configure Your Server dialog box.

Real World Scenario

Upgrading Your Network to Windows 2000

You are the network administrator of a Windows NT 4 network. You use the Windows NT domain model and have hundreds of NT Servers and Workstations. You want to upgrade to Windows 2000, but you're not sure how to proceed.

Upgrading a network from Windows NT 4.0 to Windows 2000 is not a trivial process and takes careful planning. The major steps that you should complete within the upgrade are as follows:

1. Create a deployment plan. This should include the goals and scope of the upgrade.

2. Build a test lab that can be used to test the upgrade in a nonproduction environment. Document all findings.

3. Prepare your network infrastructure for Windows 2000.
4. Determine the domain migration strategy. This will be used to migrate your Windows NT domains to the Windows 2000 Active Directory.
5. Plan the Windows 2000 security.
6. Upgrade or install your domain controllers.
7. Upgrade or install your member servers.
8. Ensure the availability of critical applications and services.
9. Test client computer's applications for compatibility.
10. Define the client requirements and configuration standards and upgrade client computers.

Microsoft provides documentation for Windows 2000 upgrade and deployment at `www.microsoft.com/windows2000/library/resources/reskit/dpg/default.asp`.

Supporting Multiple-Boot Options

You may want to install Windows 2000 Server but still be able to run other operating systems. *Dual-booting* or *multi-booting* allows your computer to boot multiple operating systems. Your computer will be automatically configured for dual-booting if there was a supported operating system on your computer prior to the Windows 2000 Server installation (and you didn't upgrade from that operating system).

One reason for dual-booting is to test various systems. If you have a limited number of computers in your test lab, and you want to be able to test multiple configurations, you dual-boot. For example, you might configure one computer to multiple-boot with Windows NT Workstation 4, Windows NT Server 4 configured as a primary domain controller (PDC), Windows 2000 Professional, and Windows 2000 Server.

Another reason to set up dual-booting is for software backward compatibility. For example, you may have an application that works with Windows 95 but not under Windows 2000 Server. If you want to use

Windows 2000 and still be able to access your legacy application, you can configure a dual-boot.

Here are the keys to successful dual-boot configurations:

- Make sure you have plenty of disk space. It's a good idea to put each operating system on a separate partition, although this is not required.
- Put the simplest operating systems on first. If you want to support dual-booting between DOS and Windows 2000 Server, DOS must be installed first. If you install Windows 2000 Server first, you cannot install DOS without ruining your Windows 2000 Server configuration. You would also install Windows 9*x* prior to installing Windows 2000 Server for the same reason.
- Never upgrade to Windows 2000 dynamic disks. Dynamic disks are seen only by Windows 2000 and are not recognized by any other operating system, including Windows NT.
- Do not convert your file system to NTFS if you are planning a dual-boot with any operating system other than Windows NT or Windows 2000. These operating systems are the only ones that recognize NTFS.
- If you will dual-boot with Windows NT 4, you must turn off disk compression, or Windows 2000 will not be able to read the drive properly.

If you are planning on dual-booting with Windows NT 4, you should upgrade it to NT 4 Service Pack 4 (or higher), which provides NTFS version 5 support.

Once you have installed each operating system, you can choose the operating system that you will boot to during the boot process. You will see a boot options screen that asks you to choose which operating system you want to boot.

Upgrading to Windows 2000 Server

An upgrade allows you to preserve existing settings. A clean install places Windows 2000 in a new folder. After a clean install, you need to reinstall all of your applications and reset your preferences.

Microsoft Exam Objective

Upgrade a server from Microsoft Windows NT 4.0.

You should perform an upgrade if the following conditions are true:

- You are running Windows NT Server 3.51 or 4.
- You want to keep your existing applications and preferences.
- You want to preserve any local users and groups you've created under Windows NT.
- You want to upgrade your current operating system with the Windows 2000 Server operating system.

The upgrade process for Windows 2000 Server and Professional is similar. The major differences involve the upgrade paths and hardware requirements.

Preparing to Upgrade to Windows 2000 Server

Before you run the upgrade process, you need to make sure that your system meets the operating system and hardware requirements. Then you should prepare your computer for the upgrade. These preparations are discussed in detail in the following sections.

Server Upgrade Paths and Requirements

The only operating systems that you can upgrade to Windows 2000 Server are Windows NT Server 3.51 and Windows NT Server 4. If you are running a version of Windows NT Server prior to 3.51, you first need to upgrade to Windows NT Server 3.51 or Windows NT Server 4 before you can upgrade to Windows 2000 Server.

There is no upgrade path from Windows NT Workstation to Windows 2000 Server.

The hardware requirements for upgrading are the same as those for a clean install:

- Pentium 133MHz or higher processor
- 128MB of RAM (256MB is better)
- 2GB hard drive with at least 1GB of free disk space
- VGA or better resolution monitor

Along with meeting these requirements, your hardware should be listed on the HCL, which was discussed earlier in this chapter.

The hardware requirements listed here were those specified at the time this book was published. Check Microsoft's Web site at `www.microsoft.com/windows2000/upgrade/` for the latest information about system requirements, upgrade issues, and hardware and software compatibility.

An Upgrade Checklist

Once you have made the decision to upgrade, you should develop a plan of attack. The following upgrade checklist will help you plan and implement a successful upgrade strategy.

- Back up all of your data and configuration files and verify that you can successfully restore your backup. Before you make any major changes to your computer's configuration, you should always back up your data and configuration files. Chances are if you have a valid backup, you won't have any problems. Chances are if you don't have a valid backup, you will have problems.
- Delete any unnecessary files or applications, and clean up any program groups or program items you don't use. Theoretically, you want to delete all of the junk on your computer before you upgrade. Think of this as the spring-cleaning step.

- Perform a disk scan, a current virus scan, and defragmentation. These are also similar to spring-cleaning chores. This step just prepares your drive for the upgrade. You should verify that there are no problems with your drive prior to the upgrade.
- Uncompress any partitions that have been compressed with DriveSpace or DoubleSpace. You cannot upgrade partitions that are currently compressed.
- Verify that your computer meets the requirements for an upgrade. Be sure that your computer meets the minimum hardware requirements for Windows 2000 Server and that all of your hardware is on the HCL.
- Take an inventory of your current configuration. This inventory should include documentation of your current network configuration, the applications that are installed, the hardware items and their configuration, the services that are running, and any profile and policy settings.
- Perform the upgrade. In this step, you upgrade from your previous operating system to Windows 2000 Server.
- Verify your configuration. After Windows 2000 Server has been installed, use your inventory to verify that the upgrade was successful.

Performing the Windows 2000 Server Upgrade

As you would expect, the process of upgrading to Windows 2000 is much simpler than performing a clean install. You pick the system from which you are upgrading, then follow the Setup Wizard's instructions to provide the information the Setup program needs. The final steps in the upgrade process are automatic.

If you are upgrading from a Windows NT domain controller, DCPROMO will be run automatically, as described in the "Upgrading a Member Server to a Domain Controller" section earlier in this chapter.

After the upgrade process is complete, verify that everything was upgraded properly. Using the inventory you made before upgrading (see the "Upgrade Checklist" section earlier in the chapter), check that your hardware and software have made it through the transition and are working properly.

Exercise 1.3 shows the steps for upgrading to Windows 2000 Server. To set up your computer for the exercises in this book, you installed

Windows 2000 Server from scratch in Exercises 1.1 and 1.2. You would follow the steps in Exercise 1.3 if you were upgrading from your current operating system, and you had not performed the clean install procedure outlined in the previous exercises.

For the purpose of studying for the MCSE exams with this book, it is recommended that you install Windows 2000 Server as outlined in Exercises 1.1 and 1.2. If you perform an upgrade instead, you may not be able to successfully complete some of the other exercises in this book.

EXERCISE 1.3

Upgrading to Windows 2000 Server

1. Insert the Windows 2000 Server CD into your CD-ROM drive. When the upgrade dialog box appears, click Yes to upgrade. (If necessary, from Windows NT 4, select Start ➢ Run and click the Browse button in the Run dialog box. Click My Computer and select your CD-ROM drive, then I386, then WINNT32. From Windows NT 3.51, open Program Manager, select File ➢ Run, and then click the Browse button in the Run dialog box. Select your CD-ROM drive, then I386, then WINNT32.)

EXERCISE 1.3 *(continued)*

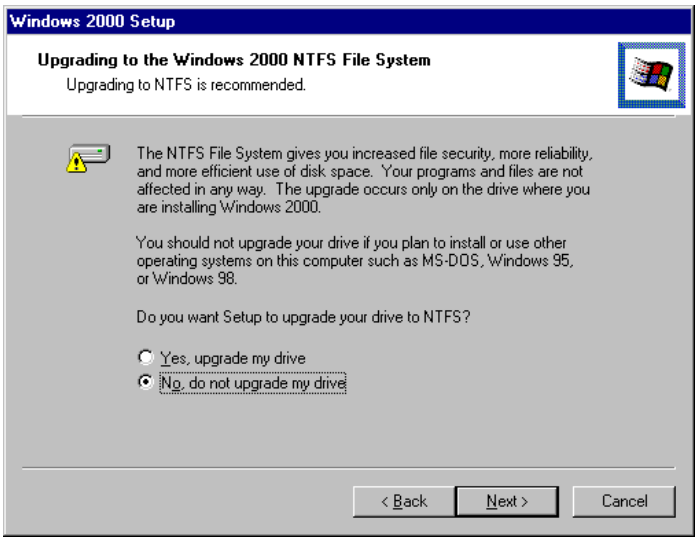
2. In the Welcome to the Windows 2000 Setup Wizard dialog box, click the Upgrade to Windows 2000 (Recommended) option. Click the Next button to continue.

3. In the License Agreement dialog box, click the option to accept the agreement.

4. In the Product Key dialog box, type in your 25-character product key. Then click the Next button.

EXERCISE 1.3 *(continued)*

5. If your computer has FAT16 or FAT32 partitions, the Upgrading to the Windows 2000 NTFS File System dialog box appears. Select the No, Do Not Upgrade My Drive option. (You will upgrade to NTFS in an exercise in Chapter 6.) Then click the Next button.



6. Wait while the computer copies files needed for installation and then automatically restarts. After the computer restarts, the Windows 2000 Server installation process automatically examines your disk and then begins copying more files. When the automated upgrade is complete, Windows 2000 Server will be installed on your computer.

7. Verify that everything was upgraded properly using the inventory you made before upgrading.

The computer will copy some files needed for installation and then will automatically restart. After the computer restarts, the Windows 2000 Server installation process automatically examines your disk and then begins copying files, which takes a few minutes. The installation will continue through several phases. When the automated upgrade is complete, Windows 2000 Server will be installed on your computer.

Troubleshooting Installation Problems

The Windows 2000 installation process is designed to be as simple as possible. The chances of installation errors are greatly minimized through the use of Wizards and the step-by-step process. However, it is possible that errors may occur.

Microsoft Exam Objective

Troubleshoot failed installations.

The following are some possible installation errors you might encounter:

Media errors	Media errors are caused by defective or damaged CDs. To check the CD, put it into another computer and see if you can read it. Also check your CD for scratches or dirt—it may just need to be cleaned.
Insufficient disk space	Windows 2000 needs at least 1GB of free space for the installation program to run properly. If the Setup program cannot verify that this space exists, the program will not let you continue.
Not enough memory	Make sure that your computer has the minimum amount of memory required by Windows 2000 Server (128MB). Not having enough memory may cause the installation to fail or blue-screen errors to occur after installation.
Not enough processing power	Make sure that your computer has the minimum processing power required by Windows 2000 Server (Pentium 133MHz). Not having enough processing power may cause the installation to fail or blue-screen errors to occur after installation.

Hardware that is not on the HCL	If your hardware is not on the HCL, Windows 2000 may not recognize the hardware, or the device may not work properly.
Hardware with no driver support	Windows 2000 will not recognize hardware without driver support.
Hardware that is not configured properly	If your hardware is Plug-and-Play compatible, Windows should configure it automatically. If your hardware is not Plug-and-Play compatible, you will need to manually configure the hardware per the manufacturer's instructions.
Incorrect CD key	Without a valid CD key, the installation will not go past the Product Key dialog box. Make sure that you have not typed in an incorrect key (check the back of your CD case for this key).
Failure to access TCP/IP network resources	If you install Windows 2000 with typical settings, the computer is configured as a DHCP client. If there is no DHCP server to provide IP configuration information, the client will be unable to access network resources through TCP/IP.
Failure to connect to a domain controller when joining a domain	Make sure that you have specified the correct domain name. If your domain name is correct, verify that your network settings have been set properly and that a domain controller and DNS server are available. If you still can't join a domain, install the computer in a workgroup, then join the domain after installation.

When you install Windows 2000 Server, several log files are created by the Setup program. You can view these logs to check for any problems during the installation process. Two log files are particularly useful for troubleshooting:

- The action log includes all of the actions that were performed during the setup process and a description of each action. These actions are listed

in chronological order. The action log is stored as *Windir*\ `setupact.log`.

- The error log includes any errors that occurred during the installation. For each error, there is a description and an indication of the severity of the error. This error log is stored as *Windir*\`setuperr.log`.

In Exercise 1.4, you will view the Windows 2000 setup logs to determine if there were any problems with your Windows 2000 installation.

EXERCISE 1.4

Troubleshooting Failed Installations with Setup Logs

1. Select Start ➢ Programs ➢ Accessories ➢ Windows Explorer.
2. In Windows Explorer, double-click My Computer, double-click Local Disk (C:), and double-click WINNT (this is the default *Windir* folder, set up in Exercise 1.1).
3. Since this is the first time you have opened the WINNT folder, click the Show All Files option to display all the files that it contains.
4. In the WINNT folder, double-click the `setupact` file to view your action log in Notepad. When you are finished viewing this file, close Notepad.
5. Double-click the `setuperr` file to view your error file in Notepad. If no errors occurred during installation, this file will be empty. When you are finished viewing this file, close Notepad.
6. Close Windows Explorer.

Summary

In this chapter, you learned how to install Windows 2000 Server. We covered the following topics:

- The three Windows 2000 Server platforms and the features of the main Windows 2000 Server operating system. The three versions are Windows 2000 Server, Windows 2000 Advanced Server, and Windows 2000 Datacenter Server.

- Installation preparation, which includes making sure that your computer meets the minimum system requirements and that all of your hardware is on the Hardware Compatibility List (HCL). Then you need to decide whether you will perform a clean install or an upgrade. Only Windows NT Server computers can be upgraded to Windows 2000 Server. Finally, you should plan which options you will select during installation. Options include how to partition your disk space, how to select a file system, whether the computer will be installed as a part of a workgroup or a domain, your licensing method, and your language and locale settings. You also decide whether Windows 2000 Server will be installed from the CD-ROM or from a network connection.
- How to install Windows 2000 Server, which occurs in three main installation phases: running the Setup program, running the Setup Wizard, and installing Windows 2000 Networking. If you are installing Windows 2000 as a domain controller, there is a fourth phase, in which you upgrade the server to a domain controller. This section also includes exercises for setting up a domain controller and a member server for all of the hands-on exercises that are presented throughout this book.
- Guidelines for setting up for dual-booting or multi-booting. Dual-booting and multi-booting allow you to boot to a choice of two or more operating systems.
- How to upgrade to Windows 2000 Server. Client upgrade paths and requirements are used to determine if your operating system can be upgraded to Windows 2000 Server. In order to upgrade directly, you must be running Windows NT 3.51 or 4, and your hardware must meet the minimum requirements. Indirect upgrades from NT 3.1 or 3.5 are allowed by upgrading to NT 3.51 or 4.0 first.
- How to troubleshoot installation problems. Common errors are caused by media problems, lack of disk space or memory, and hardware problems.

Exam Essentials

Be able to install Windows 2000 Server. Understand the requirements for installing Windows 2000 as well as the major steps required by the installation process.

Peform an upgrade to Windows 2000 Server. Know the requirements for upgrading to Windows 2000 Server. Be able to list possible problems with an upgrade. List the steps required to upgrade to a Windows 2000 Server.

Be able to troubleshoot failed installations. Know common installation problems and how to overcome them.

Key Terms

Before taking the exam, you should be familiar with the following terms:

Active Directory (AD)	FAT32
boot partition	File Allocation Table
clean install	Hardware Compatibility List (HCL)
Client Access Licenses (CALs)	logical drive
container	multi-booting
Disk partitioning	New Technology File System (NTFS)
distribution server	organizational unit (OUs)
domain	Per Seat licensing
domain controller	Per Server licensing
domain forest	system partition
domain tree	upgrade
dual-booting	Windows 2000 Server Setup Boot Disks
FAT16	workgroup

Review Questions

1. Tomas has just installed a Windows 2000 Server. The server needs to store the users, groups, and computers that compose the Active Directory. When Tomas installed the server he did not see any option to make the server a domain controller. What command should Tomas use to upgrade a Windows 2000 Server computer to a domain controller?

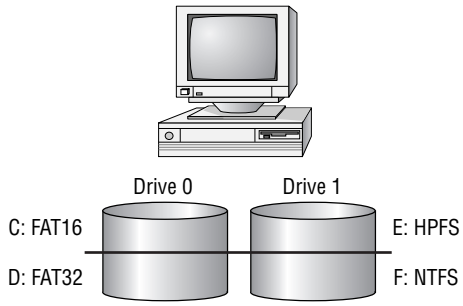
   A. UPGRADEDC

   B. DCUPGRADE

   C. PROMODC

   D. DCPROMO

2. Steve wants to multi-boot his computer with Windows 2000 Server and other operating systems. His other operating systems are Windows 95, OS/2, and Windows NT Server 4.0. His computer is currently configured as shown in the following exhibit. Which of the following file systems are supported by Windows 2000 Server and would be recognized when the Windows 2000 Server operating system was loaded? (Choose all that apply.)



   A. FAT16

   B. FAT32

   C. HPFS

   D. NTFS

3. Ricki is installing Windows 2000 Server on 10 computers. The servers need to be a part of a domain, act as domain controllers, dual-boot with another operating system, and have specific networking components installed. Which of the following options can be specified during the installation of Windows 2000 Server? (Choose all that apply.)

   A. The workgroup or domain that the server will join

   B. Whether or not the server will be installed as a domain controller or member server

   C. What other operating systems should be presented in a dual-boot or multi-boot configuration

   D. The networking components that the server will use

4. You are in charge of a test lab that has servers installed in a variety of configurations. Many of the servers are configured for dual-booting so that you can test compatibility with a variety of operating systems. Which of the following operating systems could dual-boot with Windows 2000 Server if you converted your disks to dynamic disks?

   A. Windows 2000 Professional

   B. Windows NT Server 4

   C. Windows NT Workstation 4

   D. Windows 98

5. Oscar is in the process of designing his company's deployment guide for the rollout of Windows 2000. Part of the deployment guide contains guidelines on naming conventions. When new servers are installed, what is the maximum number of characters that each server's name can contain?

   A. 12

   B. 15

   C. 24

   D. 36

6. Tony has a server that is used as the company's external Web server. The hardware configuration that is required is that it support eight processors and 4GB of memory. What is the minimum version of Windows 2000 Server that he should install?

   A. Windows 2000 Server

   B. Windows 2000 Advanced Server

   C. Windows 2000 Datacenter Server

   D. Windows 2000 Application

7. Elena is installing a clean copy of Windows 2000 Server. Her computer offers multiprocessing support. How many processors can be recognized by Windows 2000 Server?

   A. 2

   B. 4

   C. 6

   D. 8

8. Jamila is trying to determine which version of Windows 2000 Server she should install on her computer. One of the criteria is the services that are available with each version. Which of the following services is not available with the standard version of Windows 2000 Server?

   A. Terminal services

   B. Cluster services

   C. DFS

   D. EFS

9. Brant is making the hardware recommendations for a new server that his company is purchasing. He knows that he will use Windows 2000 Server with several memory-intensive applications. What is the maximum amount of RAM that will be recognized by Windows 2000 Server?

   A. 256MB

   B. 512MB

   C. 4GB

   D. 8GB

10. Brett has just finished installing Windows 2000 Server. He used all of the default settings. What is the default name of the folder that holds the Windows 2000 operating system files?

    A. WINNT

    B. WIN2K

    C. WIN2000

    D. WINDOWS

11. You are configuring your Windows 2000 Server to dual-boot with Windows NT Server 4. Which of the following file systems will be recognized by both operating systems? (Choose all that apply.)

    A. FAT16

    B. FAT32

    C. HPFS

    D. NTFS

12. Your company has a variety of Windows computers including Windows 95/98 and various flavors of Windows NT. You want to upgrade as many computers as possible to Windows 2000 Workstation or Windows 2000 Server. Which of the following operating systems can you upgrade to Windows 2000 Server?

    A. Windows NT Server 3.5

    B. Windows NT Workstation 3.51

    C. Windows NT Server 4

    D. Windows 95

13. You are upgrading a Windows NT Server to Windows 2000. When you insert the Windows 2000 Server CD, nothing happens. What command do you use to start an upgrade to Windows 2000 Server from a Windows NT Server 4 computer that does not have auto-run enabled?

    A. `WIN2K`

    B. `INSTALL`

    C. `WINNT`

    D. `WINNT32`

14. Jessica wants to upgrade her Windows NT Server to a Windows 2000 Server. Which of the following configuration options would cause the upgrade to fail?

    A. Compressed drive

    B. Windows 98 application installed

    C. Network card not on HCL

    D. FAT16 partition

15. Dustin has just installed a Windows 2000 Server. He wants to view the error log to verify that no errors occurred during the setup process. Where should he look for this file?

A. *Windir*\`error.log`

B. *Windir*\logs\`error.log`

C. *Windir*\`setuperr.log`

D. *Windir*\logs\`seterr.log`

Answers to Review Questions

1. D. The DCPROMO command-line utility is used to upgrade a Windows 2000 Server computer to a domain controller.

2. A, B, D. The only file systems supported by Windows 2000 are FAT16, FAT32, and NTFS. HPFS is not supported by Windows 2000.

3. A, D. You can specify which workgroup or domain the server will join. You can't specify the server's role. If you want the server to be a domain controller, you upgrade the server through the DCPROMO utility. Your computer will be automatically configured for dual-boot or multi-boot if a supported operating system was on your computer prior to the Windows 2000 Server installation.

4. A. The only operating system that can recognize dynamic disks is Windows 2000.

5. B. Computer names are limited to a maximum of 15 characters.

6. B. Windows 2000 Advanced Server offers support for up to eight processors and up to 8GB of memory.

7. A. If you perform a clean installation of Windows 2000 Server, there is support for two processors. If you upgrade your server from Windows NT Server, there is support for up to four processors.

8. B. Cluster services are only available in Windows 2000 Advanced Server and Windows 2000 Datacenter Server.

9. C. Windows 2000 Server supports up to 4GB of memory. Windows 2000 Advanced Server supports up to 8GB of memory.

10. A. By default, the boot partition, which holds all of the operating system files, is called WINNT.

11. A, D. Windows NT 4 will not recognize FAT32 partitions. Windows 2000 and Windows NT 4 will not recognize HPFS partitions.

12. C. You can only upgrade to Windows 2000 Server from Windows NT Server 3.51 and Windows NT Server 4.

13. D. Windows 2000 Server does not use an INSTALL program for installations or upgrades. You use `WINNT32` to start an upgrade from NT Server 3.51 or Windows NT Server 4. There is no command called `WIN2K`.

14. A. You can't upgrade to Windows 2000 with compressed drives. Windows 98 applications may not work, but will not cause the installation to fail. A network card not on the HCL may also not work, but will not cause the installation to fail. Windows 2000 recognizes FAT16 partitions.

15. C. The error log includes any errors that occurred during the installation. For each error, there is a description and an indication of the severity of the error. This error log is stored as *\Windir*`setuperr.log`.