EXAM OBJECTIVES

Professional ▶

Exam 70-210

- Perform an attended installation of Windows 2000 Professional.
- Troubleshoot failed installations.

Server ▶

Exam 70-215

- Perform an attended installation of Windows 2000 Server.
- Troubleshoot failed installations.

CHAPTER

3

Installing Windows 2000

In this chapter, I'll explore how to install Windows 2000. I'll describe the hardware required to install the various Windows 2000 operating systems, and walk you through a comprehensive preinstallation checklist. Next, I'll explain the actual installation process, including the different ways you can start the installation, what takes place during each phase of the installation, and a detailed listing of the steps involved in a typical attended installation of Windows 2000. Then, I'll cover how to uninstall Windows 2000. Finally, I'll present some tips on troubleshooting common Windows 2000 installation problems.

Chapter Pre-Test

1. What is the HCL?
2. Your computer has a Pentium/100MHz processor, 32MB of RAM, and 2GB of free hard disk space. Do you have the minimum hardware required to install Windows 2000 Professional?
3. By default, in which folder is Windows 2000 installed?
4. What's the difference between per server and per seat licensing?
5. Which method of starting Setup should you use to perform an over-the-network installation of Windows 2000?

Hardware Requirements for Installation

Before you can install Windows 2000, you need to make sure you have the appropriate hardware. To avoid problems, only use hardware that appears on the Windows 2000 *Hardware Compatibility List* (HCL). The HCL, which is updated periodically, ships with each of the Windows 2000 products. The file that contains the HCL, which is named `HCL.txt`, is located on the Windows 2000 compact disc in the `\Support` folder.

TIP

You can also access the most recent Hardware Compatibility List by visiting Microsoft's Web site at `http://www.microsoft.com/hcl`.

If you have hardware that is *not* listed on the HCL, contact the manufacturer of your equipment to see if the correct Windows 2000 drivers for that device can be obtained.

IN THE REAL WORLD

Many hardware manufacturers don't go to the effort of getting their hardware certified. However, I have found that most hardware will work with Windows 2000, and does not require special drivers—the drivers that come with the operating system work well in most situations.

Minimum Hardware Requirements

Table 3-1 shows the minimum hardware required to install Windows 2000 Professional and Windows 2000 Server/Advanced Server. Windows 2000 Server and Windows 2000 Advanced Server have virtually the same minimum hardware requirements for installation.

TABLE 3-1 Minimum Hardware Required to Install Windows 2000

Hardware Component	Windows 2000 Professional	Windows 2000 Server/ Advanced Server
Processor	Pentium/133MHz	Pentium/133MHz
Memory	64MB of RAM	256MB of RAM
Hard disk space	1GB	1GB
Display	VGA or better	VGA or better
Keyboard	Required	Required

Continued ▶

TABLE 3-1 *(continued)*

Hardware Component	Windows 2000 Professional	Windows 2000 Server/ Advanced Server
Mouse or other pointing device	Strongly recommended	Strongly recommended
CD-ROM drive	Required (Unless performing an over-the-network installation.)	Required (Unless performing an over-the-network installation.)
Floppy disk drive	3.5-inch high-density (Unless booting from CD-ROM drive or performing an over-the-network installation.)	3.5-inch high-density (Unless booting from CD-ROM drive or performing an over-the-network installation.)
Network adapter card	Optional (Required for over-the-network installation)	Optional (Required for over-the-network installation)

Table 3-1 shows the *minimum* hardware required for installation purposes only, as published by Microsoft.

More hard disk space is needed for applications and data files. In addition, extra hard disk space — up to 100MB more — may be needed if the FAT file system is used. Other factors to consider are that over-the-network installations require more disk space than installing from a CD-ROM, and that upgrades typically require more disk space than new installations.

Additional RAM may be required for some applications, and to speed up operations while running applications.

Maximum Hardware Limitations

Up to this point I've focused on the minimum hardware required to install Windows 2000. However, I should point out that there are some maximum hardware limitations, as well. The following maximum hardware is supported by the Windows 2000 operating systems:

- Windows 2000 Professional supports a maximum of two processors and up to 4GB of RAM.
- Windows 2000 Server supports a maximum of four processors and up to 4GB of RAM.

- Windows 2000 Advanced Server supports a maximum of eight processors and up to 8GB of RAM.

Getting Ready to Install Windows 2000

A fair amount of user input is required during the Windows 2000 installation process. To make the installation go smoother and to avoid the possibility of having to redo it, I recommend that you gather all the information you will need before doing the installation. This will enable you to give the appropriate responses as you are prompted by the Windows 2000 installation program.

Because Windows 2000 supports Plug and Play, you don't have to gather as much hardware-specific information prior to installing Windows 2000 as you would need to gather before installing Windows NT 4.0. Windows 2000 does a fairly good job of auto-detecting the various hardware components in a computer, and can automatically configure hardware interrupts and I/O addresses to avoid conflicts.

Because Windows 2000 automatically detects the hardware components in your computer during installation, there is no longer a need for the NT Hardware Qualifier (NTHQ) that was included with Windows NT 4.0. This utility, which examined and identified an individual computer's hardware configuration and produced a text file of configuration data, is not included with Windows 2000.

The rest of this section is devoted to assisting you in gathering and documenting information about your computer and network environment so you can successfully complete the installation. A detailed explanation accompanies each item you need to consider. You might even want to consider using the section as a worksheet and "filling in the blanks" as you go.

Source File Location

Path to Windows 2000 source files: _____

If you use `Winnt.exe` or `Winnt32.exe` to install Windows 2000, the installation program will prompt you to enter the location of the Windows 2000 source files. Provide the full local or network path to these source files.

`Winnt.exe` and `Winnt32.exe` are covered in detail later in this chapter.

Third-party SCSI or RAID Drivers

Do you need to install third-party SCSI/RAID drivers? **Yes ____ No ____**

If you use mass storage devices that make use of third-party SCSI or RAID drivers, you should have the disk that contains these drivers on hand when performing an installation of Windows 2000. The Windows 2000 installation program will prompt you for these drivers during installation.

Hard Disk Partition Information

Complete one of the following: **Drive to install Windows 2000 on (C:, D:, and so on): _____**

Or, number (1, 2, 3, and so on) of the hard disk with enough unpartitioned space for installation of Windows 2000: _____

The space on hard disks is divided into areas called *partitions*. Partitions are represented by drive letters, for example, C:, D:, and so on. The Windows 2000 installation program requires you to choose which partition or area of unpartitioned space you will use for the Windows 2000 installation. If you select an area of unpartitioned space, the Windows 2000 installation program will create a partition in the unpartitioned area, format the newly created partition, and assign a drive letter to this new partition. Refer to Table 3-1 to make sure the partition or area of unpartitioned space you choose has enough available free space to install Windows 2000.

There are several utilities you can use to gather information about the partitions on your computer's hard disk(s). You can run the `Fdisk.exe` utility from MS-DOS, Windows 95, or Windows 98 command line to view your computer's hard disk partition information. On a Windows NT 4.0 computer, you can use Disk Administrator to obtain this information. You can also use the `DIR` command at a command prompt in MS-DOS, Windows 95, Windows 98, or Windows NT to view the amount of free space in a formatted partition. Alternately, you can use Windows Explorer (on a Windows 95 or Windows 98 computer) or Windows NT Explorer (on a Windows NT Workstation 4.0 or Windows NT Server 4.0 computer) to view the amount of free space in a formatted partition.

File System

File system to be used for installation (choose one): **FAT ____**
FAT32 ____ NTFS ____

Windows 2000 supports three file system types: FAT, FAT32, and NTFS.

The *file allocation table (FAT) file system* (sometimes called the FAT16 file system) is supported by Windows 2000 and many other operating systems, including MS-DOS, OS/2, Windows 3.*x*, Windows 95, Windows 98, and Windows NT. Normally, if you want your computer to *dual boot* between Windows 2000 and one of these other operating systems (and both operating systems are located on the same hard disk partition), choose the FAT file system. The FAT file system supports neither extended attributes nor file-level security. For planning purposes, you should be aware that the maximum size FAT partition supported by Windows 2000 is 4GB. While Windows NT also supports FAT partitions up to 4GB in size, all other operating systems that support the FAT file system only support FAT partitions up to 2GB in size.

The *FAT32 file system* is supported by Windows 95 OSR2, Windows 98, and Windows 2000. If you want your system to dual boot between Windows 2000 and one of these other Windows operating systems, you can use the FAT32 file system instead of the FAT file system. The FAT32 file system is more efficient than the FAT file system and supports larger partition sizes. Windows 2000 will format FAT32 partitions up to 32GB in size. Windows 2000 supports the use of FAT32 partitions larger than 32GB that have been formatted by other operating systems.

The *Windows NT file system (NTFS)* is supported only by Windows 2000 and Windows NT. In general, choose NTFS if you do not want your computer to dual boot between Windows 2000 and another operating system and you want the added advantages provided by NTFS, including extended attributes, file-level security, and partitions larger than 32GB. The maximum practical size of an NTFS partition is 2 terabytes (TB).

TIP

I recommend you use the NTFS file system unless you require dual boot capability.

You should carefully consider your choice of file system before installing Windows 2000. If you select the FAT or FAT32 file system during your installation of Windows 2000, you can easily convert the file system to

NTFS at a later date if you change your mind. However, if you select the NTFS file system during your installation of Windows 2000 and then later want to convert to FAT or FAT32, the process is much more difficult. To convert from NTFS to any other file system, you must back up all data, repartition and format the computer's hard disk with FAT or FAT32, reinstall Windows 2000, and then restore all the files from backup.

Windows 2000 does not support the *high performance file system (HPFS)* used by OS/2. If you want to install Windows 2000 on a computer that uses HPFS, you must back up all data, repartition and format the computer's hard disk with FAT, FAT32, or NTFS, and then restore all the files from backup before you can install Windows 2000.

CROSS-REFERENCE

For a more in-depth discussion of file systems, see Chapter 6.

Installation Folder/Dual Boot

Name of folder to install Windows 2000 in: _____

By default, the Windows 2000 installation program installs Windows 2000 in the `\Winnt` folder on the selected partition (this is usually `C:\Winnt`). If the installation program detects another operating system in this folder, you will be prompted to choose whether to use this folder for the current installation and delete the existing operating system, or to install Windows 2000 in another folder.

CAUTION

If you choose to install Windows 2000 in the folder containing another operating system, Windows 2000 will delete the previously installed operating system. Do not select this option unless you're sure you will never need to boot to your old operating system again.

If you choose to install Windows 2000 in another folder, the installation program will prompt you to enter the name of the folder you want to use. When you install Windows 2000 in a different folder than the previously installed operating system, Windows 2000 will automatically configure the computer to dual boot between Windows 2000 and the previously installed operating system.

Regional Settings

Complete one of the following: **Accept English (United States) defaults for system and user locales and keyboard layout _____**
Or, use the following custom settings:

_____

Regional settings enable you to customize Windows 2000 for your specific region and language. The default option for both the system locale and user locale is English (United States). The default keyboard layout is the US keyboard layout.

If you work in the United States and use English for your primary language, you will most likely be able to accept the defaults in this section and continue on.

If you live in another part of the world, have a primary language other than English, or prefer a different keyboard layout, you can customize Windows 2000 to meet your needs.

If you don't want to bother with selecting regional settings during the installation process, you can accept the default options during the install, and then use the Regional Options application in Control Panel to configure your regional settings at a later time.

CROSS-REFERENCE

For more details on using the Regional Options application in Control Panel, see Chapter 5.

Product Key

25-Character Product Key: _____ - _____ - _____ - _____ - _____

During installation, you need to enter the 25-character product key that is located on the back of the Windows 2000 compact disc case. This entry is required.

Licensing Mode

This section applies only to Windows 2000 Server and Windows 2000 Advanced Server.

Choose one: **Per server ____ Per seat ____**
If per server, number of client access licenses: _____

Windows 2000 Server (and Advanced Server) has two licensing modes: per server and per seat.

- **Per server:** In the per server licensing mode, you must have one client access license for each concurrent connection to the server. For example, if you have 150 client computers (workstations), but only 100 of them will be logged on to the Windows 2000 Server (or Advanced Server) computer at any one time, then you would need 100 client access licenses. If you select the Per server option during installation, enter the number of client access licenses you have purchased for this server in the "Number of concurrent connections" spin box. The minimum number of client access licenses is 5, and the maximum number is 9,999.

  I recommend you choose the per server licensing mode when you have only one server, and not all of your client computers will access the server at the same time.

- **Per seat:** In the per seat licensing mode, you must have one client access license for each client computer that will ever connect to a Windows 2000 Server or Windows 2000 Advanced Server computer on your network.

  In general, I recommend you choose the per seat licensing mode when you have more than one server on your network, particularly when client computers will access multiple servers simultaneously.

WHEN USING PER SEAT LICENSING MAKES SENSE

The advantage to using the per seat licensing mode becomes apparent when you have multiple servers on a network. In such a situation, you only have to buy one client access license for each client computer, even if a client computer accesses multiple servers at the same time.

For example, suppose you have 500 client computers and 6 Windows 2000 Server computers on a network, and the client computers access several servers at a time. If you choose the per seat licensing mode, you only need to purchase 500 client access licenses, whereas if you choose the per server licensing mode, you probably need to have more than one client access license per client computer.

Computer Name

What will this computer's name be? _____

During the installation of Windows 2000, you are prompted to enter the name your computer will use on the network. The *computer name* is also used as the computer's NetBIOS name. NetBIOS names can be up to 15 characters long. You can use a computer name that is longer than 15 characters, but Windows 2000 will only use the first 15 characters for the computer's NetBIOS name.

All computers on the network must use different names. Uniqueness is the key here. If you have a small network, you can probably get by with naming the computers after the characters in your favorite movie, television series, or comic strip. If you have a large network, however, you will probably want to use some type of systematic naming scheme to ensure that each computer has a unique name.

Administrator Password

You may not want to write down the password for the Administrator account here, but you will need to enter an administrator password during the installation process.

CAUTION

Don't forget the password for the Administrator account—you'll need it to log on and to perform administrative tasks once the system is up and running. If you forget the administrator password, you'll probably have to reinstall Windows 2000.

When it comes time to type in the Administrator password, be aware that passwords are case sensitive in Windows 2000. You'll want to make sure your Caps Lock key is off.

Components

If you're only interested in installing Windows 2000 Professional, you can skip this section—it applies only to Windows 2000 Server and Windows 2000 Advanced Server.

This list represents a myriad of optional components that can be selected or deselected during the Windows 2000 Server (or Advanced Server) installation process. Note that several components have subcomponents that can be individually selected, and that some of the subcomponents have subcomponents, as well.

If you're not sure exactly which components to select, you can accept the default selections, and use the Add/Remove Programs application in Control Panel to change the components installed in your computer at a later time.

Choose the components you want to install during the Windows 2000 Server (or Advanced Server) installation:

Accessories and Utilities **Yes _____ No _____**
If yes, select subcomponents:

Accessibility Wizard ____

Accessories ____ **If selected, choose subcomponents:**

Calculator ____
Character Map ____
Desktop Wallpaper ____
Document Templates ____
Mouse Pointers ____
Object Packager ____
Paint ____
Screen Savers ____
WordPad ____

Communications ____ **If selected, choose subcomponents:**

Chat ____
HyperTerminal ____
Phone Dialer ____

Games ____ **If selected, choose subcomponents:**

Freecell ____
Minesweeper ____
Pinball ____
Solitaire ____

Multimedia ____ If selected, choose subcomponents:

CD Player ____

Media Player ____

Sample Sounds ____

Sound Recorder ____

Utopia Sound Scheme ____

Volume Control ____

Certificate Services **Yes _____ No _____**
If yes, select subcomponents:

Certificate Services CA ____

Certificate Services Web Enrollment Support ____

Cluster Service **(Windows 2000 Advanced Server only) Yes _____ No _____**

Indexing Service **Yes _____ No _____**

Internet Information Services (IIS) **Yes _____ No _____**
If yes, select subcomponents:

Common Files ____

Documentation ____

File Transfer Protocol (FTP) Server ____

FrontPage 2000 Server Extensions ____

Internet Information Services Snap-In ____

Internet Services Manager (HTML) ____

NNTP Service ____ If selected, choose subcomponents:

NNTP Service ____

NNTP Service Documentation ____

SMTP Service ____ If selected, choose subcomponents:

SMTP Service ____

SMTP Service Documentation ____

Visual InterDev RAD Remote Deployment Support ____

World Wide Web Server ___

Management and Monitoring Tools **Yes _____ No _____**
If yes, select subcomponents:

Connection Manager Components ____

Network Monitor Tools ____

Simple Network Management Protocol ____

Message Queuing Services **Yes _____ No _____**

Networking Services **Yes _____ No _____**
If yes, select subcomponents:

COM Internet Services Proxy ____

Directory Service Migration Tool ____

Domain Name System (DNS) ____

Dynamic Host Configuration Protocol (DHCP) ____

Internet Authentication Service ____

QoS Admission Control Service ____

Simple TCP/IP Services ____

Site Server ILS Services ____

Windows Internet Name Service (WINS) ____

Other Network File and Print Services **Yes _____ No _____**
If yes, select subcomponents:

File Services for Macintosh ____

Print Services for Macintosh ____

Print Services for Unix ____

Remote Installation Services **Yes _____ No _____**

Remote Storage **Yes _____ No _____**

Script Debugger **Yes _____ No _____**

Terminal Services **Yes _____ No _____**
If yes, select subcomponents:

Client Creator Files ____

Enable Terminal Services ____

Terminal Services Licensing **Yes _____ No _____**

Typical or Custom Networking Settings

Choose one: **Typical ____ Custom ____**

During the installation of Windows 2000, you are prompted to choose one of two options to use for network settings and options: typical settings or custom settings.

- **Typical settings:** If you select typical settings, a predefined set of network components and settings are automatically installed and configured. The network components that are installed are Client for Microsoft Networks, File and Print Sharing for Microsoft Networks, and the TCP/IP protocol. TCP/IP is configured to automatically receive configuration data from a DHCP server on your network. The typical settings option is often selected for installations of Windows 2000 Professional when the computer will function as a client computer on a Windows 2000 Server network. If the typical settings aren't the settings you want, you can select the custom settings option.
- **Custom settings:** If you select custom settings, you can manually add, remove, and configure networking components.

  The types of components you can add, remove, and configure are clients, services, and protocols. The specific networking components that you can select are:
- **Clients**:
  - Client for Microsoft Networks
  - Gateway (and Client) Services for NetWare (Windows 2000 Server/Advanced Server only)
  - Client Service for NetWare (Windows 2000 Professional only)

- **Services**:
  - Network Load Balancing (Windows 2000 Advanced Server only)
  - File and Printer Sharing for Microsoft Networks
  - QoS Packet Scheduler
  - SAP Agent
- **Protocols**:
  - Internet Protocol (TCP/IP)
  - AppleTalk Protocol
  - DLC Protocol
  - NetBEUI Protocol
  - Network Monitor Driver
  - NWLink IPX/SPX/NetBIOS Compatible Transport Protocol

  Although choosing the custom settings option permits you to manually add, remove, and configure components, I should point out that you don't really have to configure anything if you select this option. By default, Windows 2000 installs and configures Client for Microsoft Networks, File and Printer Sharing for Microsoft Networks, and Internet Protocol (TCP/IP). In addition, on a Windows 2000 Advanced Server computer, Network Load Balancing is also installed by default, but is not configured.

  Once you add a particular client, service, or protocol, you can enter specific configuration information for that client, service, or protocol by configuring the component's properties. Or, you can let Windows 2000 apply its predefined default configurations for each networking component.

If you decide that you want different networking components installed after the installation process, or you want to change the configuration of an installed network component, you can use the Network and Dial-up Connections application in Control Panel to make these changes.

CROSS-REFERENCE

For detailed information on installing, configuring, and removing these networking components, see Chapter 16.

Workgroup/Domain

Make this computer a member of (choose one):
Workgroup ____ Domain ____

Workgroup or domain name: _____

If domain, authorized user name: _____

If domain, authorized user password: _____

You must choose to participate in either a workgroup or a domain.

- **Workgroup:** In general, if your computer is not on a network, or is on a network that does not have a domain, select workgroup. If you elect to make this computer a member of a workgroup, only users that have user accounts physically located in this computer's user account database will be able to log on to this computer locally, or access this computer's shared resources over the network.
- **Domain:** If you want this computer to participate in an existing domain on your network, choose the domain option. If you decide to make this computer a member of a domain, two kinds of users will be able to log on to this computer locally and to access this computer's shared resources over the network: users that have accounts in this computer's user account database, and users that have user accounts in the Active Directory data store.

  If you select the domain option, during installation you will need to enter the user name and password of a user (often the administrator) who is authorized to join this computer to the domain.

Whether you choose to make this computer a member of a workgroup or a domain, you should be prepared to enter the name of the workgroup or domain during the installation process.

CROSS-REFERENCE

For more information on choosing between workgroups and domains, see the "Workgroups, Domains, and Active Directory" section in Chapter 1.

The Installation Process

Now that you understand the hardware required to install Windows 2000 and have all the information necessary to perform the installation, you're ready to move on to the actual installation process.

EXAM TIP

Both the Professional and Server exams have objectives on performing an attended installation of Windows 2000. Be sure to study the installation process carefully and do the labs at the end of this chapter.

In this section, I'll begin by explaining the three different ways you can start Setup, the Windows 2000 installation program. Then I'll discuss the setup flow in general, including the three distinct phases that take place during the installation process. Finally, I'll detail the specific steps necessary to perform an installation of Windows 2000.

CROSS-REFERENCE

This chapter focuses on how to perform a single, attended, "clean" installation of Windows 2000. For details on performing an upgrade to Windows 2000, see Chapter 4. For information on automating the installation of Windows 2000 and on using Remote Installation Services to deploy Windows 2000 on a larger scale, see Chapter 19.

Starting Setup

The Windows 2000 user interface refers to the Windows 2000 installation program by several different names during the installation process. It's called Windows 2000 Setup, Setup, and the Windows 2000 Setup Wizard. For now, I'll just call the program Setup.

There are three ways to start the installation process:

- From a CD-ROM drive
- Using `Winnt.exe`
- Using `Winnt32.exe`

In the following sections I'll explain how to use each of these three methods to begin the Windows 2000 installation process.

Starting from a CD-ROM Drive

The most common way to start Setup is from a CD-ROM drive. To start Setup from a CD-ROM drive, your computer must have a local CD-ROM drive that is listed on the HCL. Place the Windows 2000 compact disc in the CD-ROM drive. Then boot the computer from the CD-ROM drive, or by using the Windows 2000 Setup Boot Disks if your computer does not support booting directly from the CD-ROM drive.

If you want to make the Windows 2000 Setup Boot Disks, you will need the Windows 2000 product compact disc; four blank, formatted, high-density floppy disks; and access to a computer that currently runs MS-DOS, Windows 95, Windows 98, Windows NT Workstation or Server, or Windows 2000. To make the Windows 2000 Setup Boot Disks, run the `Makeboot.exe` utility from an MS-DOS command prompt, or on a Windows 95 or Windows 98 computer. Optionally, you can run the `Makebt32.exe` utility from a Windows NT Workstation or Server 4.0 or Windows 2000 computer. The `Makeboot.exe` and `Makebt32.exe` files are located in the `\Bootdisk` folder on the Windows 2000 compact disc.

Using Winnt.exe

You can use `Winnt.exe` to start Setup from an unsupported CD-ROM drive (a CD-ROM drive that is not listed on the HCL), or to start an over-the-network installation.

Before you can use `Winnt.exe`, you must partition and format your computer's hard disk using either MS-DOS or Windows 95/Windows 98 DOS. Then boot the computer to DOS, and load either the CD-ROM drivers or network drivers (depending on the type of installation you're doing). You should also run SmartDrive (`Smartdrv.exe`) to significantly speed up the installation process. (Detailed steps to perform each of these tasks are listed in the "Installing Windows 2000 by Using Winnt.exe" step-by-step section later in this chapter.) Then you're ready to begin an installation of Windows 2000 by using `Winnt.exe`.

`Winnt.exe` has several optional command-line switches that enable customization of the setup process. The syntax for the `Winnt.exe` command is:

```
winnt [/s:sourcepath] [/t:tempdrive]
[/u:answer_file] [/udf:id[,UDF_file]]
[/r:folder] [/rx:folder] [/e:command] [/a]
```

The various switches are not case sensitive — you can type them in either uppercase or lowercase. To install Windows 2000 by using `Winnt.exe`, you don't really need to use these optional command-line switches. They're primarily used when performing unattended/automated installations of Windows 2000. Table 3-2 lists each command-line switch, and its function.

TABLE 3-2 Winnt.exe Command-Line Switches

Switch	What the Switch Does
`/s:`*sourcepath*	Specifies the source location of Windows 2000 files. You must specify a full path, in the form *x*:*path*, or *server**share**path*. The default sourcepath is the current folder.
`/t:`*tempdrive*	Specifies the drive that will contain the Windows 2000 temporary setup files during the installation process. If not specified, Setup uses the first drive it finds that has enough free space to function as the tempdrive. The drive that is used for the tempdrive is also the drive on which Windows 2000 will be installed.
`/u:`*answer_file*	Specifies that an automated installation of Windows 2000 be performed. You must specify the complete path to the answer file that will be used to automate the installation. For more information on automating the setup process, see Chapter 19.
`/udf:`*id*`[,`*UDF_file*`]`	Specifies that a uniqueness database file (UDF) will be used in conjunction with the answer file to automate the setup.
`/r:`*folder*	Specifies that an optional folder be copied to the local hard disk during installation.
`/rx:`*folder*	Specifies an optional folder to be copied to the local hard disk during installation, and removed when the installation process is complete.
`/e:`*command*	Specifies a command to be executed at the end of the setup process.
`/a`	Specifies that accessiblity options be enabled.

Using Winnt32.exe

`Winnt32.exe` is used to upgrade a previous installation of Windows 95, Windows 98, Windows NT Workstation, or Windows NT Server to Windows 2000; or to perform a fresh installation of Windows 2000 in a different folder than the previously installed operating system. Installing Windows 2000 in a different folder will automatically configure Windows 2000 to dual boot between the previously installed operating system and Windows 2000. Because `Winnt32.exe` is used only to perform upgrades, no preparation of your computer is necessary prior to performing the installation.

You can either use the `Winnt32.exe` command to perform the upgrade, or you can use the autorun feature to automatically start the installation when you insert the compact disc into the CD-ROM drive of the computer to be upgraded. The primary advantage of using `Winnt32.exe` is that it enables you to perform an unattended installation of Windows 2000, whereas the autorun feature does not.

TIP

Unless you're planning on performing an unattended or automated installation, I recommend you use the autorun feature to automatically start the install when upgrading from a previous version of Windows to Windows 2000.

Like `Winnt.exe`, `Winnt32.exe` has several optional command-line switches that enable customization of the setup process. The syntax for the `Winnt32.exe` command is:

```
winnt32 [/s:sourcepath] [/tempdrive:drive_letter]
[/unattend[num]:[answer_file]] [/copydir:folder_name]
[/copysource:folder_name] [/cmd:command_line]
[/debug[level]:[filename]] [/udf:id[,UDF_file]]
[/syspart:drive_letter] [/checkupgradeonly] [/cmdcons]
[/m:folder_name] [/makelocalsource] [/noreboot]
```

Again, the switches are not case sensitive — you may type them in either uppercase or lowercase. To install Windows 2000 by using `Winnt32.exe`, you don't really need to use these optional command-line switches. They're primarily used when performing unattended/automated installations of Windows 2000. Table 3-3 lists each command-line switch, and its function.

TABLE 3-3 Winnt32.exe Command-Line Switches

Switch	What the Switch Does
`/s:`*`sourcepath`*	Specifies the source location of Windows 2000 files. You must specify a full path, in the form of *x*:*path*, or *server**share**path*. The default sourcepath is the current folder.
`/tempdrive:`*`drive_letter`*	Specifies the drive that will contain the Windows 2000 temporary setup files during the installation process. If not specified, Setup uses the first drive it finds that has enough free space to function as the tempdrive. The drive that is used for the tempdrive is also the drive on which Windows 2000 will be installed.
`/unattend`	Specifies that an automated upgrade of the existing operating system will be performed, and that all user settings are taken from the existing operating system.
`/unattend[`*`num`*`]:`*`answer_file`*	Specifies that an automated installation of Windows 2000 be performed. You must specify the complete path to the answer file that will be used to automate the installation. You can also specify the number of seconds that Setup will wait before rebooting the computer at the end of the file copy process. For more information on automating the setup process, see Chapter 19.
`/copydir:`*`folder`*	Specifies that an optional folder be copied to the local hard disk during installation.
`/copysource:`*`folder`*	Specifies an optional folder to be copied to the local hard disk during installation, and removed when the installation process is complete.
`/cmd:`*`command_line`*	Specifies a command to be executed at the end of the setup process.
`/debug[`*`level`*`]:[`*`filename`*`]`	Specifies that a debug log will be created. You can specify the level of detail from 1 to 4, with 1 representing the least level of detail, and 4 representing the highest. The log is created using the filename you specify.
`/udf:`*`id`*`[,`*`UDF_file`*`]`	Specifies that a uniqueness database file (UDF) will be used in conjunction with the answer file to automate the setup.

Switch	What the Switch Does
`/syspart:`*`drive_letter`*	Specifies that the sourcefiles will be copied to the partition specified by the /tempdrive switch, and that the partition will be marked active. Use this option when you plan to run the copy portion of the installation on one computer, and then install the drive in another computer to complete the installation.
`/checkupgradeonly`	Specifies that setup will check the computer for compatability with Windows 2000.
`/cmdcons`	Specifies that the recovery console be installed on this computer, and added as an option to the start menu.
`/makelocalsource`	Specifies that the source files be copied to the local hard disk. Use this option when the Windows 2000 compact disc will not be available after the computer is restarted, or when running Setup from a network share.
`/noreboot`	Specifies that Setup will not reboot the computer after the file copy phase is complete.

Setup Flow

An attended installation of Windows 2000 takes place in two to three distinct phases, depending on the installation method you use. For ease of reference, I call these three phases the MS-DOS–based/file copy phase, the text mode phase, and the Windows 2000 Setup Wizard phase. During each phase you respond to various prompts and enter requested information.

The Windows 2000 installation program is called Windows 2000 Setup or Setup in the first two phases, and is usually referred to as the Windows 2000 Setup Wizard in the third phase. The Windows 2000 installation program either prompts you to reboot your computer or automatically reboots your computer at the end of each of these three phases.

Here's a brief description of what takes place during each phase of a typical Windows 2000 installation.

MS-DOS–Based/File Copy Phase

The MS-DOS–based/file copy phase is the initial phase of the Windows 2000 installation process. This phase applies only when the `Winnt.exe` or the `Winnt32.exe` installation options are used. Setup prompts you to enter the location of Windows 2000 files, and then copies files to your computer's hard disk. Finally, Setup prompts you to restart your computer to continue the installation.

Text Mode Phase

The text mode phase begins when you boot the computer with the Windows 2000 Setup Boot Disk to perform an installation from a CD-ROM drive, when you boot the computer directly from the CD-ROM drive, or after you reboot the computer at the end of the MS-DOS–based phase when using `Winnt.exe` or `Winnt32.exe`. I call this phase the text mode phase because all of the screens are presented in a traditional DOS-like, character-based format.

During the text mode phase, Windows 2000 Setup inspects your computer's hardware configuration, and prompts you to install third-party SCSI or RAID drivers as necessary. The Windows 2000 Licensing Agreement is displayed and must be agreed to in order to continue. Setup prompts you to choose the partition you want to install Windows 2000 on and the file system you want to use on this partition.

Finally, Setup examines your computer's hard disk(s) for corruption, then copies files to the Windows 2000 installation folders. Setup automatically reboots your computer at the end of this phase.

Windows 2000 Setup Wizard Phase

In this phase the Windows 2000 Setup Wizard, which has a graphical user interface, starts. This wizard begins by automatically detecting and installing hardware devices on your computer.

The Windows 2000 Setup Wizard prompts you to supply quite a bit of information during this phase. You are prompted to configure regional settings, and to type in your name and the name of your organization. If you are installing Windows 2000 Server or Advanced Server, you are prompted to select a licensing mode. Then, you enter a computer name and Administrator password. Next, if you are installing Windows 2000 Server or Advanced Server, you select which components will be installed. Then, you can adjust the date and time settings if they are not correctly displayed.

At this point the Windows 2000 Setup Wizard installs networking components. Then you choose to use either typical or custom settings for the installation. Next, you choose whether to make your computer a member of a workgroup or a domain.

The last part of this phase takes a fair amount of time to complete. The Windows 2000 Setup Wizard installs and configures various components. Then, the wizard installs Start menu items, registers components, saves settings, and removes any temporary files used for the installation.

Finally, you are prompted to remove the compact disc from your CD-ROM drive, and to restart your computer.

Installing Windows 2000

Now that you have a basic understanding of how to start Setup and how the Windows 2000 installation/setup process flows, I'll move on to the nitty-gritty steps of installing Windows 2000.

In this section, I present the basic steps to perform an attended installation of Windows 2000 by using `Winnt.exe`. As you may recall, this method is typically used to start an over-the-network installation, or to start Setup from an unsupported CD-ROM drive. You can use these steps as a general guide, but don't be surprised to see different screens or prompts when you perform your own installation, because the Windows 2000 Setup Wizard adapts itself to the particular hardware it detects in each different computer. Also, depending on the components you choose to install, different options and screens will be displayed for you to respond to.

I used the following steps to install Windows 2000 Server on my laptop computer. When performing the installation, I chose the default options presented. Although these steps detail an installation of Windows 2000 Server, I have noted any different steps or options displayed when performing an installation of Windows 2000 Professional or Windows 2000 Advanced Server. Unless otherwise noted, the steps in this section apply to all three Windows 2000 operating systems.

If you use either the `Winnt.exe` or the `Winnt32.exe` methods to install Windows 2000, follow the steps as listed below. If you start an installation of Windows 2000 by booting with a Setup Boot Disk or from a CD-ROM drive, skip the first two sections below and begin directly with the text mode phase.

STEP BY STEP

INSTALLING WINDOWS 2000 BY USING WINNT.EXE: PREPARING YOUR COMPUTER FOR THE WINDOWS 2000 INSTALLATION

1. Boot your computer to MS-DOS from a floppy disk.
2. Use the MS-DOS `Fdisk.exe` command-line utility to partition your computer's hard disk. Then reboot your computer to MS-DOS from a floppy disk.
3. Use the MS-DOS `Format.exe` command-line utility to format your computer's hard disk. Use the `/s` switch with `Format.exe` to copy the MS-DOS system files from the floppy disk to your computer's hard disk. For example, to format the `C:` drive, type **format c: /s** at an MS-DOS command prompt and press Enter.
4. Follow your CD-ROM manufacturer's instructions to install the drivers for your CD-ROM drive. You might have to reboot your computer at the end of this step to cause the drivers to load.
5. At an MS-DOS command prompt, run SmartDrive by typing **smartdrv.exe** and pressing Enter.
6. Make sure the Windows 2000 product compact disc (Server, Professional, or Advanced Server) is in your CD-ROM drive.

PHASE 1 OF 3—MS-DOS–BASED/FILE COPY PHASE

1. Change the default drive to your CD-ROM drive by typing in the CD-ROM drive letter followed by a colon (for example, **D:**). Press Enter.
2. Type **cd I386** and press Enter.
3. Type **winnt** and press Enter.
4. Windows 2000 Setup prompts you to enter the path where Windows 2000 files are located. Press Enter.
5. Setup copies files to your computer's hard disk. (This process takes a few minutes.) The Windows 2000 [Server or Professional] Setup screen appears, notifying you that the MS-DOS–based portion of Setup is complete, as shown in Figure 3-1. If there is a floppy disk in drive A:, remove it. Then press Enter to restart your computer and continue the installation.

PHASE 2 OF 3—TEXT MODE PHASE

1. During the reboot process, Windows 2000 Setup inspects your computer's hardware configuration. If you have third-party SCSI or RAID drivers that need to be installed, Setup prompts you to press F6 during this process. Be quick about this—Setup only gives you about five seconds to respond. If you miss this screen, you can power off your computer and power it back on to have another chance to respond to this screen.

   At this point, Windows 2000 Setup loads numerous files and drivers, then starts Windows 2000.

STEP BY STEP *Continued*

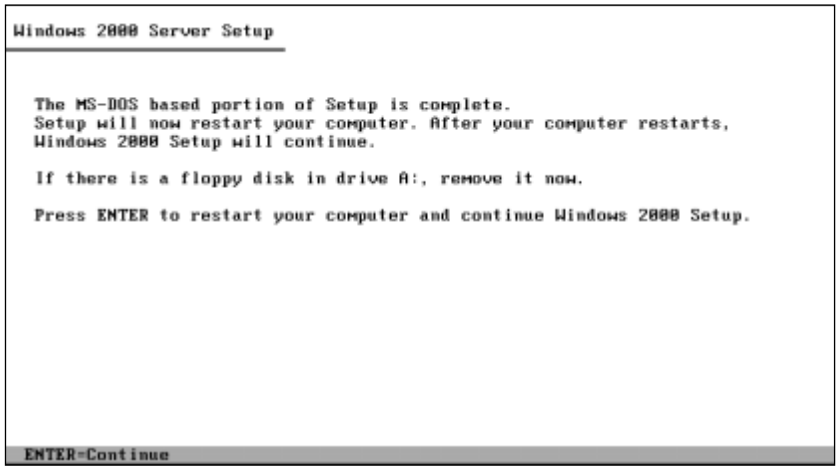

FIGURE 3-1 Completing the MS-DOS–based portion of Setup

2. The Windows 2000 [Server or Professional] Setup screen appears, welcoming you to Setup. Press Enter.
3. The Windows 2000 Licensing Agreement is displayed. After reading the agreement, press F8 to accept the terms of the licensing agreement and to continue the installation.
4. Setup searches for previously installed versions of Windows 2000. If it detects a previously installed version, Setup prompts you to either repair the previous version or to continue installing a fresh copy of Windows 2000. Press R to repair or Esc to continue installing a fresh copy.
5. The Windows 2000 [Server or Professional] Setup screen appears, listing the partitions and unpartitioned space on your computer's hard disk, as shown in Figure 3-2. Highlight the partition on which you want to install Windows 2000, and press Enter. Make sure the partition you select has enough free space for the installation. You can also create or delete a partition by using this screen.
6. If you chose to install Windows 2000 on a partition on which another operating system is installed, Setup prompts you to either press C to continue the installation, or to press Esc to choose another partition on which to install Windows 2000. If you press Esc, you will be returned to Step 5 and prompted to select the partition on which you want to install Windows 2000.

STEP BY STEP *Continued*

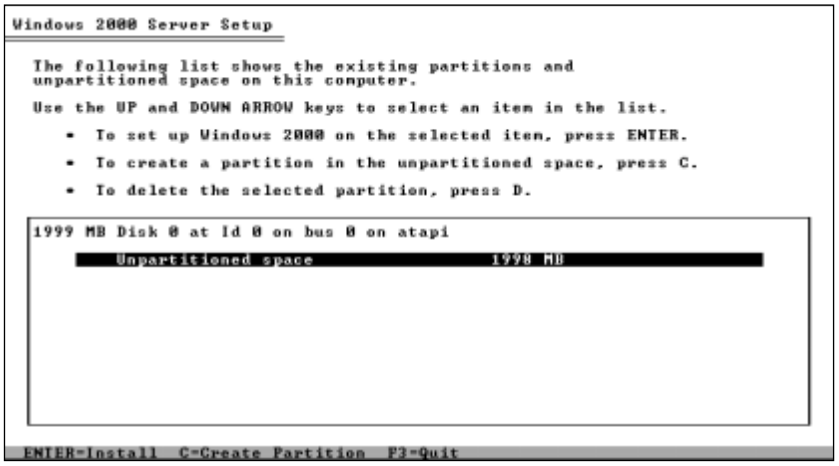

FIGURE 3-2 Selecting a partition on which to install Windows 2000

7. Setup prompts you to select the file system you want on the partition you selected in Step 5, as shown in Figure 3-3. Highlight the file system you want, and then press Enter.

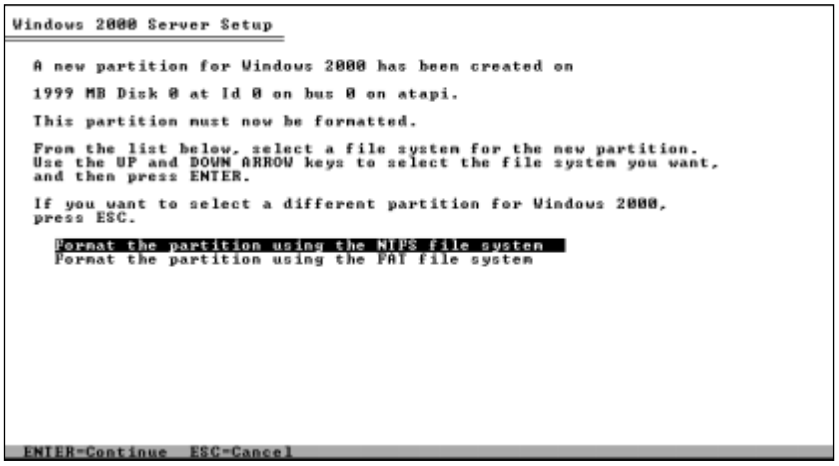

FIGURE 3-3 Selecting a file system

8. If you are installing Windows 2000 on a partition that contains another operating system in the `\Winnt` folder, Setup asks you to choose whether to use this folder for the current installation and delete the existing operating system, or to install Windows 2000 in another folder. If you choose to install Windows 2000 in another folder, Setup will prompt you to enter the name of the folder you want to use.

STEP BY STEP *Continued*

9. Setup examines your computer's hard disk(s) for corruption, then copies files to the Windows 2000 installation folders. (This process takes a few minutes.) Setup then initializes and saves the Windows 2000 configuration. Then Setup reports that this portion of Setup has been successfully completed. If there is a floppy disk in drive A:, remove it. Setup automatically reboots your computer.

PHASE 3 OF 3—WINDOWS 2000 SETUP WIZARD PHASE

1. When your computer reboots, Windows 2000 displays a "Starting up . . ." screen. Then, the Windows 2000 Setup Wizard starts, and, after a couple of minutes, displays the initial Windows 2000 Setup Wizard welcome screen, as shown in Figure 3-4. Click Next to continue.

FIGURE 3-4 The Windows 2000 Setup Wizard

2. The Windows 2000 Setup Wizard automatically detects and installs hardware devices on your computer. This takes several minutes, and your display may flicker during this time. If your computer stops during this process for a long period of time (more than an hour) or displays an error, reboot your computer and Setup will resume automatically.
3. The Regional Settings screen is displayed. You can configure your system locale and user locales, and select from various input languages and keyboard layout options on this screen. By default, the system and user locales are set to English (United States), and the keyboard layout is the US keyboard layout. When you finish customizing these options, click Next to continue.

STEP BY STEP *Continued*

4. The Personalize Your Software screen is displayed. Type in your name and the name of your company or organization. Click Next.
5. The Licensing Modes screen is displayed (for installations of Windows 2000 Server and Advanced Server only). Select the licensing mode you want to use. If you select the Per Server mode, enter the number of Client Access Licenses you have for this server. Click Next.
6. The Computer Name and Administrator Password screen is displayed, as shown in Figure 3-5. You can either accept the default computer name presented, or type in another name of your own choosing. After you choose a computer name, type in a password for the Administrator account, and confirm that password by retyping it. Click Next.

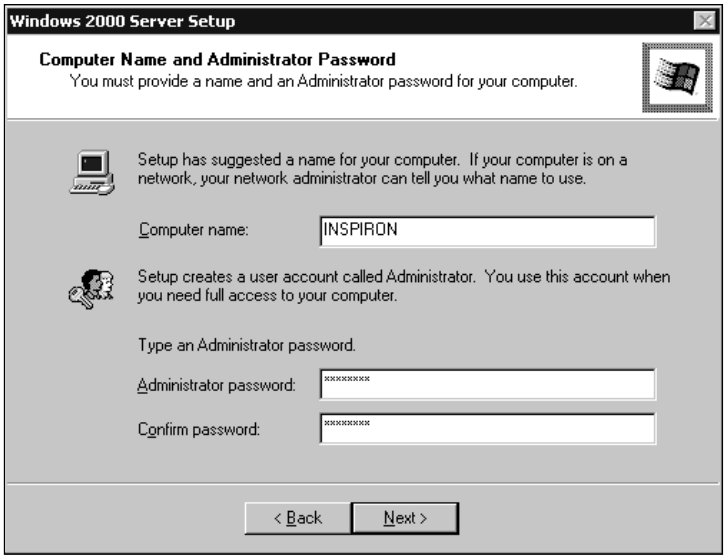

FIGURE 3-5 Entering a computer name and Administrator password

7. The Windows 2000 Components screen is displayed (for installations of Windows 2000 Server and Advanced Server only), as shown in Figure 3-6. This screen is not displayed for installations of Windows 2000 Professional.

   In this screen, you select which components will be installed. Some of the components listed in the Components list box have subcomponents, which can be selected individually. To display a list of subcomponents, highlight a component and click Details. Select the desired components and subcomponents you want to install by selecting the check box next to the component or subcomponent. When you are finished, click Next.

STEP BY STEP *Continued*

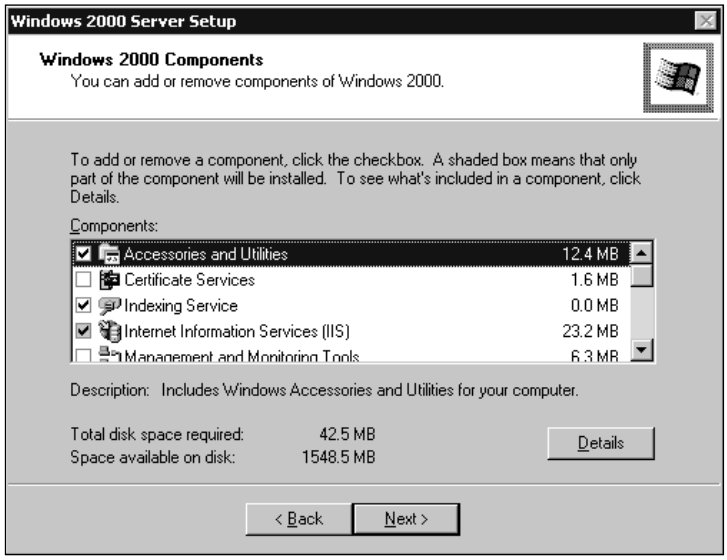

FIGURE 3-6 Selecting optional Windows 2000 components

8. The Date and Time Settings screen is displayed. You can set the correct day, date, time, and time zone if they do not appear correctly. Click Next.
9. The Networking Settings screen is displayed, and Windows 2000 installs the networking components you selected. Next, you are prompted to choose whether to use typical or custom settings. Select the option you want, then click Next.

TIP

If you select the custom settings option, you may want to enter configuration information for various networking clients, protocols, and services. Detailed configuration information for these components is presented in later chapters.

10. The Workgroup or Computer Domain screen is displayed. Select whether to make this computer a member of a workgroup or a domain, and then either accept the default or type in the name of a workgroup or domain. Click Next. (If you choose to make this computer a member of a domain, after you click Next you will be prompted to enter the user name and password of a user that is authorized to join this computer to the domain.)
11. The Installing Components screen is displayed, and Setup installs and configures various components. This takes a few minutes.

STEP BY STEP *Continued*

12. The Performing Final Tasks screen is displayed, as shown in Figure 3-7. Here Setup installs Start menu items, registers components, saves settings, and removes any temporary files used during the installation. This process takes several minutes to complete.

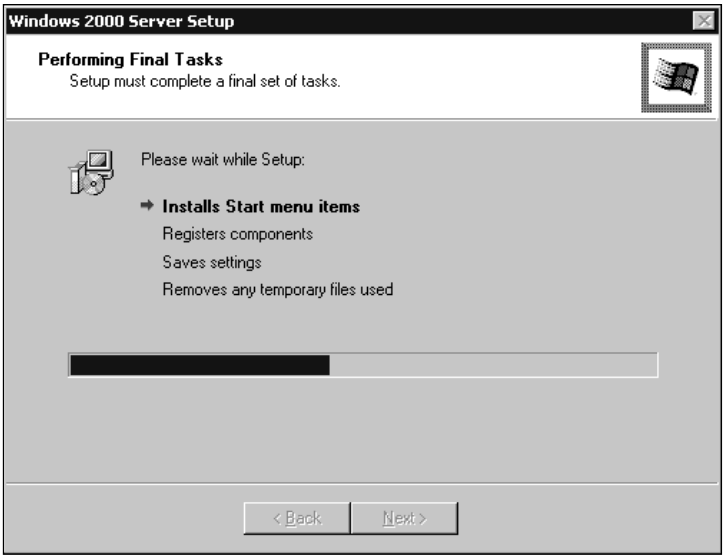

FIGURE 3-7 Windows 2000 performs final tasks

13. The Completing the Windows 2000 Setup Wizard screen appears. If there is a CD in your CD-ROM drive, remove it now. Then click Finish to restart your computer. This completes the installation of Windows 2000.

    The next two sections of steps deal with running Windows 2000 for the first time after an installation is performed. The first of these sections covers what to do when running Windows 2000 Server or Windows 2000 Advanced Server for the first time. The last section explains the steps to run Windows 2000 Professional for the first time.

AFTER THE INSTALLATION—RUNNING WINDOWS 2000 SERVER OR ADVANCED SERVER FOR THE FIRST TIME

1. When your computer reboots and Windows 2000 starts, press Ctrl+Alt+Delete. Then type in the password you selected earlier for the Administrator account. Click OK.
2. The Windows 2000 Configure Your Server screen appears, as shown in Figure 3-8. Select the type of network environment you have (I selected “I will configure my server later”), then click Next.

STEP BY STEP *Continued*

FIGURE 3-8 The Windows 2000 Configure Your Server screen

Because this chapter focuses on *installing* Windows 2000, I have deferred a detailed discussion of many configuration options until Chapters 5 through 7.

3. The Configure Your Server screen appears. You can configure your server now if you want to. Or, you can close this window now and reopen it at any time by selecting Start ➪ Programs ➪ Administrative Tools ➪ Configure Your Server. By default, the Configure Your Server screen will be shown each time you start Windows 2000. Close this window to exit.

AFTER THE INSTALLATION—RUNNING WINDOWS 2000 PROFESSIONAL FOR THE FIRST TIME

1. When your computer reboots, the Network Identification Wizard starts. Click Next.
2. The Users of This Computer screen is displayed, as shown in Figure 3-9. In this screen, you select from two options: users must enter a user name and password each time they use this computer, or Windows 2000 will automatically log on all users of this computer by using a predefined user name and password. If you select the second option (which is the default option), type in a user name and password, and confirm the password by retyping it. Click Next.

STEP BY STEP *Continued*

FIGURE 3-9 Configuring the Users of This Computer screen

3. The Completing the Network Identification Wizard screen is displayed. Click Finish.
4. If you selected the default option in Step 2, Windows 2000 Professional starts and automatically logs you on at this point.

Uninstalling Windows 2000

If you have incorrectly installed Windows 2000, or want to remove it from your computer for any other reason, this section outlines the necessary steps.

Removing Windows 2000 from a FAT or FAT32 Partition

If your computer is configured to dual boot between Windows 2000 and MS-DOS (or to dual boot between Windows 2000 and Windows 95 or Windows 98), it is fairly easy to uninstall Windows 2000.

STEP BY STEP

REMOVING WINDOWS 2000 FROM A FAT OR FAT32 PARTITION

1. Boot your computer to MS-DOS (or Windows 95 or Windows 98) from a floppy disk that has the `Sys.com` utility on it.
2. At the command prompt type **Sys a: c:** (and press Enter). This will replace the Windows 2000 boot sector with the boot sector for your other operating system (MS-DOS, Windows 95, or Windows 98).
3. Remove the floppy disk from drive A: and reboot the computer. MS-DOS, Windows 95, or Windows 98 should start automatically.
4. Now that you have disabled Windows 2000, you can complete the removal of Windows 2000 files from your computer. Free up hard disk space by removing `Pagefile.sys`, `Ntldr`, `Boot.ini`, `Ntdetect.com`, `Bootsect.dos`, and, if it exists on your computer, `Ntbootdd.sys`. (Because some of these files have attributes of hidden, system, and read-only, you will have to remove the file attributes before you can delete these files.) You can also remove the entire Windows 2000 installation folder (usually `C:\Winnt`), and the `\Program files\Windows NT` folder. This completes the removal of Windows 2000.

Removing Windows 2000 from an NTFS Partition

If you want to remove Windows 2000 from an NTFS partition, you may want to delete that partition, because most other operating systems do not support NTFS.

Depending on your situation, to accomplish this you need to either delete an NTFS primary partition, or delete NTFS from an extended partition. In a nutshell, a *primary partition* is a disk partition that can be configured as the active partition, and that can only be formatted as a single logical drive. An *extended partition* is a disk partition that can be subdivided into one or more logical drives, but cannot be the active partition.

CROSS-REFERENCE

For more information on primary and extended partitions, see Chapter 6.

Deleting an NTFS Primary Partition

There are several ways to delete an NTFS primary partition:

- You can use the `Fdisk.exe` utility that is included with MS-DOS 6.*x*, Windows 95, or Windows 98.

  To do this, boot your computer to one of these operating systems by using a bootable floppy disk. Then run `Fdisk.exe` from a command prompt.

- You can use the `Delpart.exe` utility from an MS-DOS 6.*x*, Windows 95, or Windows 98 command prompt.

TIP

The `Delpart.exe` utility is not included in the Windows 2000 product. However, you can download this utility via the Internet by accessing `ftp://ftp.teleprint.ch/pub/ms`. The filename at this location is `Delpart.exe`.

  To use the `Delpart.exe` utility, boot your computer to MS-DOS 6.*x*, Windows 95, or Windows 98 by using a bootable floppy disk. Then run `Delpart.exe` from a command prompt.

- You can use the Windows 2000 Setup Boot Disks.

  Boot the computer from the Windows 2000 Setup Boot Disks. Go through the installation process until you get to the disk partition information section. Highlight the NTFS partition you want to delete, and press D. Follow the instructions displayed onscreen to finish deleting the partition. Then press F3 to exit Setup.

Other operating systems also have partitioning utilities that are capable of deleting an NTFS partition.

Deleting NTFS from an Extended Partition

You can't use `Fdisk.exe` to delete NTFS from an extended partition. You must either use `Delpart.exe` or the Windows 2000 Setup Boot Disks, as described previously.

Troubleshooting Common Installation Problems

There are many common problems that can cause your installation of Windows 2000 to fail. Most of these problems occur because of hardware incompatibilities and/or misconfigured hardware.

When troubleshooting an installation problem, your first troubleshooting step should generally be to ensure that all of your hardware is on the HCL or is supported by the manufacturer. Next, ensure that there are no hardware conflicts, such as interrupt or I/O address conflicts.

Table 3-4 lists some common Windows 2000 installation problems and their possible causes and solutions.

TABLE 3-4 Troubleshooting Common Installation Problems

Problem	Possible Cause/Solution
You have the recommended amount of free disk space, but still run out of disk space during the installation.	The most likely cause of this problem is that your partition is formatted using larger sectors than were anticipated by the engineers who developed the minimum hardware requirements. Either use a larger partition for the installation, or free up disk space on your existing partition and restart the installation.
A blue screen or STOP message is displayed during installation or after a reboot.	This can be caused by several things. Some of the most common causes are a corrupt boot sector, a boot sector virus, a failed hardware device, or a hardware configuration conflict. On another Windows 2000 computer, start Windows 2000 Help (Start ➪ Help) and search for the specific STOP message displayed. Windows 2000 Help contains, for many specific STOP messages, the most likely cause of the problem and a detailed recommended solution.
You can't install from your CD-ROM drive.	This could be caused by an unsupported CD-ROM or by an unsupported SCSI adapter card. Some SCSI adapter cards, such as PC card SCSI adapters, are not supported during installation, but you can install the drivers for them after the installation is complete. Try installing over the network using `Winnt.exe`.

Continued ▶

TABLE 3-4 *(continued)*

Problem	Possible Cause/Solution
You can't join a domain during installation.	The most common causes of this problem are incorrect TCP/IP configuration settings on the computer being installed, a bad or incorrect network adapter driver, loose or failed network connections, or an incorrectly typed user name, password, or domain name. Verify the TCP/IP settings on your computer. Ensure that you have the correct network adapter driver. Check network cables and connections. Confirm that you have correctly typed in the user account name, password, and domain name. (All passwords in Windows 2000 are case sensitive.)
Network services don't start correctly.	Common causes of this problem include incorrect TCP/IP configuration settings, a bad or incorrect network adapter driver, and duplicate computer names. Verify the TCP/IP settings on your computer. Ensure that you have the correct network adapter driver. Confirm that the newly assigned computer name is unique – that it does not match any other computer, domain, or workgroup name used on the network.

Microsoft has some valuable resources for troubleshooting installation (and other Windows 2000) problems, such as the Microsoft Technical Support Web site, which you can access at `http://www.microsoft.com/support`. This Web site features links to several searchable knowledge bases, some of which are free, and some of which require that you subscribe and pay a fee to access.

KEY POINT SUMMARY

This chapter explored numerous Windows 2000 installation topics:

- The minimum hardware required to install Windows 2000 Professional includes a Pentium/133MHz processor, 64MB of RAM, and 1GB of free hard disk space.

- The minimum hardware required to install Windows 2000 Server/Advanced Server includes a Pentium/133MHz processor, 256MB of RAM, and 1GB of free hard disk space.
- There are three methods that can be used to start an installation of Windows 2000:
  - **From a CD-ROM drive:** This is the most common way to start Setup.
  - **By using `Winnt.exe`:** This method is used to start Setup from an unsupported CD-ROM drive, or to start an over-the-network installation.
  - **By using `Winnt32.exe`:** This method is used to upgrade a previous installation of Windows 95, Windows 98, Windows NT Workstation, or Windows NT Server to Windows 2000; or to perform a fresh installation of Windows 2000 in a different folder than the previously installed operating system.
- A typical attended installation of Windows 2000 takes place in two to three distinct phases, depending on the installation method you use. I call these three phases the MS-DOS–based/file copy phase, the text mode phase, and the Windows 2000 Setup Wizard phase.
- There are many common problems that can cause your installation of Windows 2000 to fail. Most of these problems occur because of hardware incompatibilities, misconfigured hardware, or both.

STUDY GUIDE

This section contains several exercises that are designed to cement your knowledge and help your prepare for the Professional and Server exams:

- **Exam readiness questions:** These questions test your knowledge of the Windows 2000 installation topics covered in this chapter. You can find the answers to these questions at the end of this chapter.
- **Scenario:** The situation-based questions in scenarios challenge you to apply your understanding of the material to solve a hypothetical problem. In a scenario, you may be asked to decide "why" or "how," to design a structure or strategy, or to devise a solution to a problem. You don't need to be at a computer to do scenarios. Answers to this chapter's scenario are presented at the end of this chapter.

EXAM TIP

Since many questions on Microsoft certification exams are scenario-based, the Scenario exercises will help you prepare for the types of complex questions you're likely to encounter when you take the Windows 2000 exams.

- **Lab Exercises:** These exercises are hands-on practice activities that you perform on a computer. The labs in this chapter give you an opportunity to install Windows 2000 Professional and Windows 2000 Server.

EXAM TIP

The labs in this book are extremely important for your exam preparation. Don't even *think* about skipping them! There's no substitute for using the Windows 2000 products to master the skills that the Microsoft Certified Professional exams test.

Assessment Questions

1. You want to install Windows 2000 Professional on a computer. What are the minimum hardware requirements to install this operating system?
   A. Pentium/75MHz processor, 16MB of RAM, 400MB of free hard disk space
   B. Pentium/100MHz processor, 32MB of RAM, 500MB of free hard disk space
   C. Pentium/133MHz processor, 64MB of RAM, 1GB of free hard disk space
   D. Pentium/166MHz processor, 128MB of RAM, 1GB of free hard disk space
2. You want to install Windows 2000 Server on a computer. What are the minimum hardware requirements to install this operating system?
   A. Pentium/75MHz processor, 16MB of RAM, 400MB of free hard disk space
   B. Pentium/100MHz processor, 32MB of RAM, 500MB of free hard disk space
   C. Pentium/133MHz processor, 256MB of RAM, 1GB of free hard disk space
   D. Pentium/166MHz processor, 128MB of RAM, 2GB of free hard disk space
3. You are preparing to install Windows 2000 on a computer, and you want this computer to be able to dual boot between Windows 2000 and Windows 98. Which file system should you use?
   A. FAT (or FAT32)
   B. NTFS
   C. HPFS
   D. You can use either FAT or NTFS.

4. You want to install Windows 2000 Professional on a new computer you just purchased for your home. The computer was sold to you without an operating system installed. Which method will you attempt to use first to start the Windows 2000 installation?
   A. From a CD-ROM drive
   B. By using `Winnt.exe`
   C. By using `Winnt32.exe`
   D. By using a network installation startup disk
5. You are preparing to install Windows 2000 Server on a new computer at your office. You want to perform an over-the-network installation. Which method will you use to start the installation?
   A. From a CD-ROM drive
   B. By using `Winnt.exe`
   C. By using `Winnt32.exe`
   D. By using a network installation startup disk
6. You are installing Windows 2000 on a computer that already has another operating system installed on it. You choose to install Windows 2000 in a different folder than the previously installed operating system. What will Windows 2000 do?
   A. Abort the installation process.
   B. Delete the previously installed operating system.
   C. Display an error message indicating that Windows 2000 cannot be installed in a different folder.
   D. Cause the computer to dual boot between Windows 2000 and the previously installed operating system.
7. You are performing an attended installation of Windows 2000 Server. During the installation you choose "Custom settings" for network settings and options. Which types of components can you select when configuring "Custom settings"? (Choose all that apply.)
   A. Accessories
   B. Clients
   C. Protocols
   D. Services
   E. Utilities

8. You are installing Windows 2000 Professional on a computer that is *not* on a network. When prompted by Windows 2000 Setup during the installation, what should you "Make this computer a member of"?
   A. Domain
   B. Active Directory domain
   C. E-mail group
   D. Workgroup

Scenarios

Scenarios provide you with an opportunity to apply the knowledge you've gained in this chapter. In this particular scenario, you'll get to practice applying the facts you've learned about troubleshooting failed Windows 2000 installations.

A Windows 2000 installation can fail for a number of reasons. For each of the following problems, consider the given facts and answer these questions: What do you think the possible causes of the failed installation are? What course of action would you take to try to resolve the problem?

1. You attempt to perform an attended installation of Windows 2000 Professional on a new computer at your office. During the installation, the process stops and a blue screen is displayed.
2. You are performing an attended installation of Windows 2000 Server. During the installation, you try to join a domain, but an error message is displayed indicating that the domain controller for this domain cannot be located.

Lab Exercises

The objective of these labs is to provide you with hands-on experience installing Windows 2000 Server and Windows 2000 Professional.

CAUTION

You need to have access to a dedicated computer (or a dedicated hard disk) to perform the labs in this book, because installing Windows 2000 and converting to NTFS will render your computer unbootable by any other operating system (such as Windows 95, Windows 98, and so on).

If you're using a home computer or office computer (or any other computer that other people use), I strongly recommend that you obtain a separate hard disk to use to perform the labs in this book. That way, you'll be able to do the Windows 2000 labs, and the other people who use the computer will be able to continue using it the way they always have, without change to their operating system, applications, or data. Using a separate hard disk will also ensure that your labs will not corrupt existing data or programs on the computer's original hard disk.

Using a Separate, Dedicated Hard Disk

Short of having access to a dedicated computer to perform the labs in this book, the next best thing is having your own separate, dedicated hard disk — one that only you use. With the way hardware prices have been dropping lately, this is a very inexpensive way to promote harmony in your home (or office, or anywhere that you share a computer with someone else). (Have you ever changed the settings on a computer that your spouse or coworker uses? If you have, you've probably experienced the pain and suffering I'm trying to prevent.) Using a dedicated hard disk can also protect your original disk from potential data corruption or loss.

Working with a dedicated hard disk is fairly painless. I recommend that (with your computer powered off) you bolt the new hard disk (the one you will use only to perform the labs in this book and to practice with Windows 2000) into an empty drive bay in your computer near your existing primary hard disk (`C:`). Then, when you want to use the computer to perform a lab, with the computer powered off, disconnect the cables from the existing hard disk and connect them to the new, dedicated hard disk. Since most computers now autodetect hard disks, you shouldn't have to reconfigure your computer's BIOS or change jumper settings each time you swap hard disks. When you're finished working with Windows 2000, power off the computer, then move the cables on the dedicated hard disk back to the original hard disk.

Lab Exercises

Lab 3-1 Performing an Attended Installation of Windows 2000 Server

► Server

The objective of this lab is for you to practice performing an attended installation of Windows 2000 Server and develop the skills used to perform this task. In this lab, you install Windows 2000 Server by starting Setup from a CD-ROM drive.

I make a few assumptions about the hardware you'll be using to perform the labs in this book. I assume that:

- You plan to use a dedicated hard disk (or a dedicated computer).

CAUTION

If you don't use a dedicated hard disk or dedicated computer, I strongly recommend that you back up all important data and programs *before* performing any of the labs in this book.

- Your hard disk is not yet partitioned and does not contain any data.
- Your computer meets the minimum hardware requirements specified in the "Hardware and Software You'll Need" section in the Preface of this book.
- Your computer is configured to boot directly to its CD-ROM drive. (If it is not configured in this way, or can't be configured to boot this way, you'll need to create the Windows 2000 Setup Boot Disks as explained in the "Starting from a CD-ROM drive" section earlier in this chapter.)

This lab consists of three parts:

- Part 1: Starting Setup from a CD-ROM Drive
- Part 2: Running the Windows 2000 Setup Wizard
- Part 3: Running Windows 2000 Server for the First Time

Follow the steps presented here carefully.

Part 1: Starting Setup from a CD-ROM Drive

1. Place the Windows 2000 Server compact disc in your computer's CD-ROM drive.
2. Power the computer on and boot from the CD-ROM drive. (Your computer may prompt you to press a key to boot from the CD-ROM drive.)

TIP

If your computer can't be configured to boot from its CD-ROM drive, boot the computer by using the Windows 2000 Setup Boot Disks. Follow the instructions presented on-screen until Windows 2000 Setup begins.

3. Windows 2000 Setup begins. Setup inspects your computer's hardware configuration. If you have third-party SCSI or RAID drivers that need to be installed, press F6 during this process. (If you don't have these drivers, just ignore this screen.) Then Windows 2000 Setup loads numerous files and drivers, and starts Windows 2000.
4. If you're using an evaluation copy of Windows 2000, a screen may appear notifying you that you are installing such a version. Press Enter.
5. The Windows 2000 Server Setup screen appears, welcoming you to Setup. Press Enter.
6. The Windows 2000 Licensing Agreement is displayed. Press F8 to accept the terms of the licensing agreement and to continue the installation.
7. The Windows 2000 Server Setup screen appears, listing the unpartitioned space on your computer's hard disk. Highlight the largest area of unpartitioned space and press Enter. (This space should be at least 2GB in size to perform all of the labs in this book.)
8. Setup prompts you to select the file system you want to use. Highlight "Format the partition using the FAT file system" and press Enter.
9. Setup notifies you that because of the size of the partition, it will format the partition using the FAT32 file system. Press Enter.

10. Setup formats the new partition. (This process takes a few minutes.) Then Setup examines your computer's hard disk(s) for corruption, and copies files to the Windows 2000 installation folders. (This process also takes a few minutes.) Setup then initializes and saves the Windows 2000 configuration. Finally, Setup reports that this portion of Setup has been successfully completed. At this point, remove the Windows 2000 Server compact disc from the CD-ROM drive. In addition, if there is a floppy disk in drive A:, remove it. Setup then automatically reboots your computer.

Part 2: Running the Windows 2000 Setup Wizard

1. After your computer reboots, place the Windows 2000 Server compact disc back in your computer's CD-ROM drive when prompted, and click OK.
2. After a couple of minutes, Setup displays the initial Windows 2000 Setup Wizard welcome screen. Click Next to continue. (If you don't click Next immediately, Windows 2000 automatically continues on to the next step.)
3. The Windows 2000 Setup Wizard automatically detects and installs hardware devices on your computer. This takes several minutes, and your display may flicker during this time. If your computer stops during this process for a long period of time (more than an hour) or displays an error, reboot your computer and Setup will resume automatically.
4. The Regional Settings screen is displayed. Click Next.
5. The Personalize Your Software screen is displayed. Type your name in the Name text box. If applicable, type the name of your company or organization in the Organization text box. Click Next.
6. The Licensing Modes screen is displayed. Click Next.
7. The Computer Name and Administrator Password screen is displayed. In the "Computer name" text box, type **Server01**. (If you're doing this lab in a classroom with multiple computers on a network, your instructor will provide you with the appropriate computer name to use.) In the "Administrator password" text box, type **password**. Confirm the password by typing **password** in the "Confirm password" text box. Click Next.

8. The Windows 2000 Components screen is displayed. Accept the default selections, and click Next.
9. The Date and Time Settings screen is displayed. Set the correct day, date, time, and time zone if they do not appear correctly. Click Next.
10. The Networking Settings screen is displayed, and Windows 2000 installs networking components. When prompted, select the "Custom settings" option and click Next.
11. In the Networking Components screen, highlight Internet Protocol (TCP/IP). Click Properties.
12. In the Internet Protocol (TCP/IP) Properties dialog box, select the "Use the following IP address" option.

    If you are on a network that uses TCP/IP, in a classroom environment, or if you are connected to the Internet, obtain an IP address, subnet mask, and default gateway address from your network administrator or instructor. Otherwise, type an IP address of **192.168.59.101** and a subnet mask of **255.255.255.0** in the appropriate text boxes. Click OK.
13. In the Networking Components screen, click Next.
14. The Workgroup or Computer Domain screen is displayed. Accept the default option of "No, this computer is not on a network, or is on a network without a domain." Also accept the default workgroup name WORKGROUP, and click Next.
15. The Installing Components screen is displayed, and Setup installs and configures various components. This takes a few minutes.
16. The Performing Final Tasks screen is displayed. Here Setup installs Start menu items, registers components, saves settings, and removes any temporary files used during the installation. This process takes several minutes to complete.
17. The Completing the Windows 2000 Setup Wizard screen appears. Remove the Windows 2000 Server compact disc from your CD-ROM drive. Then click Finish to restart your computer. This completes the installation of Windows 2000 Server.

Part 3: Running Windows 2000 Server for the First Time

1. When your computer reboots and Windows 2000 Server starts, press Ctrl+Alt+Delete. When prompted, enter a password of **password**. Click OK.
2. The Windows 2000 Configure Your Server screen appears. Select the "I will configure this server later" option, then click Next.

   Because this chapter focuses on *installing* Windows 2000, I have deferred a detailed discussion of many configuration options until Chapters 5 through 7.
3. The Configure Your Server screen appears. Clear the check box next to "Show this screen at startup." Close this window.

Lab 3-2 Performing an Attended Installation of Windows 2000 Professional and Configuring Dual Boot with Windows 2000 Server

► Professional

The objective of this lab is for you to practice performing an attended installation of Windows 2000 Professional and develop the skills used to perform this task. After you complete this lab, you will be able to dual boot your computer between Windows 2000 Server and Windows 2000 Professional.

TIP

Before you can successfully complete this lab, you should complete Lab 3-1.

This lab consists of four parts:

- Part 1: Starting Setup from a CD-ROM Drive
- Part 2: Completing the Text Mode Phase
- Part 3: Running the Windows 2000 Setup Wizard
- Part 4: Running Windows 2000 Professional for the First Time

Follow the steps in this lab carefully.

Part 1: Starting Setup from a CD-ROM Drive

1. Start Windows 2000 Server on your computer, and log on as Administrator. (Remember the password? It's **password**.)
2. Place the Windows 2000 Professional compact disc in your computer's CD-ROM drive.
3. The Microsoft Windows 2000 CD dialog box appears. Click "Install Windows 2000" from the list on the left side of the box.
4. A warning message appears, notifying you that you can't upgrade from Windows 2000 Server to Windows 2000 Professional. Click OK.
5. The Windows 2000 Setup wizard begins. Click Next to install a new copy of Windows 2000.
6. The Windows 2000 License Agreement is displayed. Select the option next to "I accept this agreement" and click Next.
7. The Select Special Options screen appears. Click Advanced Options.
8. In the Advanced Options dialog box, replace the text in the "Windows installation folder" text box with **\WINNTPRO**. Select the check box next to "Copy all Setup files from the Setup CD to the hard drive." Click OK.
9. In the Select Special Options screen, click Next.
10. The Upgrading to the Windows 2000 NTFS File System screen appears. Select the option next to "No, do not upgrade my drive" and click Next. Setup copies files from the compact disc to your hard disk. (This takes a few minutes.)
11. Setup notifies you that this portion of setup has completed successfully. When this happens, remove the Windows 2000 Professional compact disc from your CD-ROM drive. Windows 2000 automatically reboots your computer.

Part 2: Completing the Text Mode Phase

1. When your computer reboots, Setup inspects your computer's hardware configuration. If you have third-party SCSI or RAID drivers that need to be installed, press F6 during this process. (If you don't

have these drivers, just ignore this screen.) Then Windows 2000 Setup loads numerous files and drivers, and starts Windows 2000.

2. If you're using an evaluation copy of Windows 2000, a screen may appear notifying you that you are installing such a version. Press Enter.
3. The Windows 2000 Server Setup screen appears, welcoming you to Setup. Press Enter.
4. The Windows 2000 Professional Setup screen appears. Press Esc.
5. On the next Windows 2000 Professional Setup screen that appears, ensure that the partition you installed Windows 2000 Server on (usually C:) is highlighted. Press Enter.
6. On the next Windows 2000 Professional Setup screen that appears, press C to continue.
7. On the next Windows 2000 Professional Setup screen that appears, ensure that "Leave the current file system intact (no changes)" is highlighted. Press Enter.
8. Setup examines your hard disk(s), then copies files to the Windows 2000 installation folders. This can take a few minutes. Setup initializes and saves your Windows 2000 configuration, and then automatically reboots your computer.

Part 3: Running the Windows 2000 Setup Wizard

1. When your computer reboots, Setup displays the Windows 2000 Setup Wizard welcome screen. Click Next to continue. (If you don't click Next immediately, Windows 2000 automatically continues on to the next step.)
2. The Windows 2000 Setup Wizard automatically detects and installs hardware devices on your computer. This takes several minutes, and your display may flicker during this time. If your computer stops during this process for a long period of time (more than an hour) or displays an error, reboot your computer and Setup will resume automatically.
3. The Regional Settings screen is displayed. Click Next.
4. The Personalize Your Software screen is displayed. Type your name in the Name text box. If applicable, type the name of your company or organization in the Organization text box. Click Next.

5. The Computer Name and Administrator Password screen is displayed. In the "Computer name" text box, type **Professional01**. (If you're doing this lab in a classroom with multiple computers on a network, your instructor will provide you with the appropriate computer name to use.) In the "Administrator password" text box, type **password**. Confirm the password by typing **password** in the "Confirm password" text box. Click Next.
6. The Date and Time Settings screen is displayed. Set the correct day, date, time, and time zone if they do not appear correctly. Click Next.
7. The Networking Settings screen is displayed, and Windows 2000 installs networking components. When prompted, select the "Custom settings" option and click Next.
8. In the Networking Components screen, highlight Internet Protocol (TCP/IP). Click Properties.
9. In the Internet Protocol (TCP/IP) Properties dialog box, select the "Use the following IP address" option.

   If you are on a network that uses TCP/IP, in a classroom environment, or if you are connected to the Internet, obtain an IP address, subnet mask, and default gateway address from your network administrator or instructor. Otherwise, type an IP address of **192.168.59.101** and a subnet mask of **255.255.255.0** in the appropriate text boxes. Click OK.
10. In the Networking Components screen, click Next.
11. The Workgroup or Computer Domain screen is displayed. Accept the default option of "No, this computer is not on a network, or is on a network without a domain." Also accept the default workgroup name WORKGROUP, and click Next.
12. The Installing Components screen is displayed, and Setup installs and configures various components. This takes a few minutes.
13. The Performing Final Tasks screen is displayed. Here Setup installs Start menu items, registers components, saves settings, and removes any temporary files used during the installation. This process takes several minutes to complete.
14. The Completing the Windows 2000 Setup Wizard screen appears. Click Finish to restart your computer. This completes the installation of Windows 2000 Professional.

Part 4: Running Windows 2000 Professional for the First Time

1. When your computer reboots, the Network Identification Wizard starts. Click Next.
2. The Users of This Computer screen is displayed. Select the option next to "Users must enter a user name and password to use this computer." Click Next.
3. The Completing the Network Identification Wizard screen is displayed. Click Finish.
4. In the Log On to Windows dialog box, type the Administrator password (remember — it's **password)** in the Password text box. Click OK. Windows 2000 Professional logs you on, brings up the desktop, and displays the Getting Started with Windows 2000 dialog box. (If you don't want this dialog box to appear each time you start Windows 2000 Professional, clear the check box next to "Show this screen at startup," and click Exit.)

Answers to Chapter Questions

Chapter Pre-Test

1. The HCL is the Windows 2000 Hardware Compatibility List.
2. No. The minimum hardware required to install Windows 2000 Professional includes a Pentium/133MHz processor, 64MB of RAM, and 1GB of hard disk space. The computer in question does not have an adequate processor or enough RAM. See Table 3-1.
3. By default, the Windows 2000 installation program installs Windows 2000 in the `\Winnt` folder on the selected partition.
4. Per server licensing requires one client access license for each concurrent connection to the server, and is useful when you have only one server. Per seat licensing requires one client access license for each client computer that will ever connect to a Windows 2000 Server/Advanced Server computer, and is useful when you have more than one server on the network and client computers will access multiple servers simultaneously.
5. Use `Winnt.exe` to start an over-the-network installation of Windows 2000.

Assessment Questions

1. **C.** See Table 3-1.
2. **C.** See Table 3-1.
3. **A.** If you want your computer to dual boot between Windows 2000 and Windows 98, you should choose the FAT or FAT32 file system, because Windows 98 does not support NTFS or HPFS, and Windows 2000 does not support HPFS.
4. **A.** The most common way to install Windows 2000 on a new computer is from a CD-ROM drive.
5. **B.** `Winnt.exe` is used to start an over-the-network installation of Windows 2000.
6. **D.** When Windows 2000 is installed in the *same* folder as the other operating system, Windows 2000 will delete the previously installed operating system. When Windows 2000 is installed in a *different* folder than the other operating system, it will automatically configure the computer to dual boot between Windows 2000 and the previously installed operating system.
7. **B, C, D.** The types of components you can select from in "Custom settings" are clients, services, and protocols.
8. **D.** In general, if your computer is not on a network, make the computer a member of a workgroup.

Scenarios

1. Some possible causes of the failed installation are hardware conflicts (or incompatibilities), a failed hardware device, a corrupt boot sector, or a boot sector virus.

   Possible courses of action to resolve the problem include starting Windows 2000 Help on another Windows 2000 computer and searching for the specific STOP message displayed on the computer with the blue screen, checking for two pieces of hardware with the same settings (I/O port, interrupt, and so on) and reconfiguring hardware if conflicts are found, and repairing the boot sector by using `Fdisk/mbr` from MS-DOS or by using a virus detection utility.

2. Probably the most common cause of this type of failed installation is that the domain name or the user's name or password has been typed incorrectly, or typed in the wrong case. Remember that all passwords in Windows 2000 are case sensitive. Is the Caps Lock feature on? Other possible causes of this failed installation are incorrect TCP/IP configuration settings, a bad or incorrect network adapter driver, a bad network cable or connection, or a domain controller that is inaccessible.

   Possible courses of action you could take to resolve this problem include retyping the domain name, user's name, or password (making sure to use the proper case and making sure the Caps Lock key is turned off), and ensuring that all TCP/IP settings on the computer are correct. You might also check to make sure you have the correct network adapter driver, check the network cable and connections, and verify that the domain controller is up and accessible on the network.