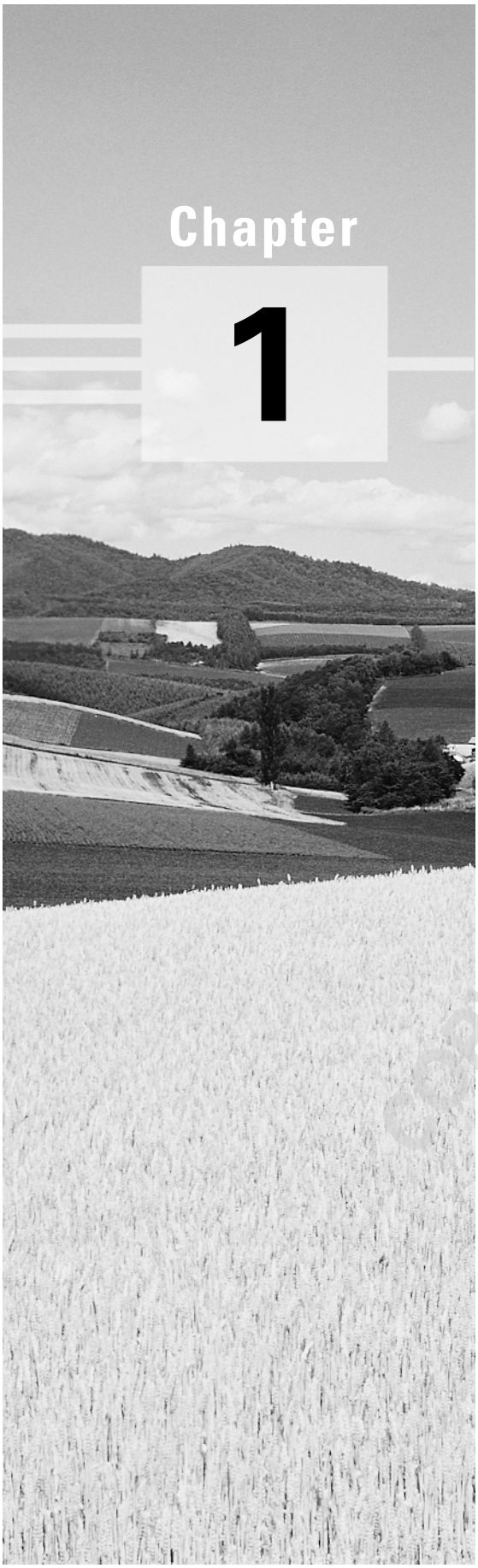


Chapter

1

Getting Started with Windows 2000 Professional

MICROSOFT EXAM OBJECTIVES COVERED IN THIS CHAPTER:

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

Windows 2000 Professional is not just an upgraded version of Windows 98 or Windows NT 4. Instead, it integrates the best features of both of those operating systems and adds other features, such as more hardware support and reduced cost of ownership. You should evaluate the features that Windows 2000 Professional offers to determine if it meets your requirements.

After you decide that Windows 2000 Professional is the operating system for you, your next step is to install it. This process is fairly easy if you have prepared for the installation, know what the requirements are, and have met the prerequisites for a successful installation.

Preparing for an installation involves making sure that your hardware meets the minimum requirements and that Windows 2000 Professional supports your hardware. When you install Windows 2000 Professional, you should also decide if you are upgrading or installing a clean copy on your computer. An upgrade preserves existing settings; a clean install puts a fresh copy of the operating system on your computer. Installation preparation also involves making choices about your system's configuration, such as selecting a file system and a disk-partitioning scheme.

Once you've completed all the planning, you are ready to install Windows 2000 Professional. This is a straightforward process that involves running a Setup program, running a Setup Wizard, and installing Windows 2000 Networking.

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.

When you install Windows 2000, 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 Professional.

The first section of this chapter covers the design goals of Windows 2000 Professional. Then you will learn how to prepare for Windows 2000 Professional installation, perform the installation, troubleshoot any installation problems, and set up for dual-booting or multi-booting.

The Design Goals of Windows 2000 Professional

In order to develop Windows 2000 Professional, Microsoft devised the following design goals:

- Integrate the best features of Windows 98
- Integrate the best features of Windows NT Workstation 4
- Provide a wide range of support for hardware
- Make the operating system easier to use
- Reduce the cost of ownership

The Windows 2000 Professional features associated with these design goals are covered in the following sections.

Features from Windows 98

Windows 98 offers a variety of features that were not integrated into Windows NT Workstation 4. The following Windows 98 features are included in Windows 2000 Professional:

- Support for *Plug and Play*, which allows the operating system to recognize and configure hardware without any user intervention.
- Added support for the *Advanced Configuration and Power Interface (ACPI),* considered to be the next generation of power management for Plug and Play technology. Features of ACPI include:
  - The automatic and dynamic detection of hardware that is installed

  - The ability to determine what hardware resources (such as IRQs and I/O ports) are required by the new device, and whether other devices need to be automatically reconfigured to accommodate the new device
  - The ability to load the appropriate driver automatically (if the driver is available)
- Added support for the *Universal Serial Bus (USB),* which is an external serial bus standard that allows a single USB port to support up to 127 devices. Common USB devices include mice, modems, and keyboards. USB supports hot-plug (which allows you to add devices to the computer without powering down the computer) and Plug and Play technology.
- New support for the *Institute of Electrical and Electronic Engineers (IEEE) 1394 standard*, which supports data transfer at speeds up to 400Mbps. Trademark names for this standard are FireWire, I-link, and Lynx.
- The use of the Active Desktop, which integrates the user's browser and shell into a single integrated Desktop.

Features from Windows NT Workstation 4

Windows NT Workstation 4 is the foundation upon which Windows 2000 Professional is built. The following features that made Windows NT Workstation 4 a powerful operating system are included in Windows 2000 Professional:

- An operating system with a high degree of reliability. Windows 2000 Professional is more robust and less likely to crash than Windows 9*x* operating systems.
- Local security that is built into the operating system. Windows 2000 Professional requires that users be authenticated with a valid logon name and password before they can access the computer. Support is also included for the NTFS file system, which allows you to set local security for the file system.
- A high-performance operating system, with true 32-bit processing.

Hardware Support

The ability to support a wide range of hardware was a major design goal for Windows 2000 Professional. The operating system provides drivers for many types of peripherals, including monitors, sound cards, digital cameras, printers, scanners, DVD drives, CDRW (CD Read/Write) drives, and network cards.

Ease of Use

When you use Windows 2000 Professional for the first time, you will notice that the user interface is not exactly the same as the Windows 9*x* or NT 4 interface. The operating system is designed so that users who need to perform a specific task can intuitively figure out how to accomplish that task. Following are some of the features that make Windows 2000 Professional easier to use:

- The installation process is simpler than the process for Windows NT installations and requires less user input.
- The user shell (interface) is more logically organized and offers more customization options.
- Users can easily add hardware. Windows 2000 Professional supports self-repairing applications, Plug and Play, and ACPI. These features reduce the possibility of system downtime when new hardware is installed.

Lower Cost of Ownership

Windows 2000 Professional reduces the cost of ownership by minimizing the maintenance and rollout costs associated with installing, upgrading, and maintaining the operating system. Windows 2000 Professional comes with many deployment options, such as support for remote installations and automated unattended installations. Through Remote Installation Services (RIS), you can easily install the Windows 2000 operating system and applications.

RIS and automated installations are covered in Chapter 2, "Automating the Windows 2000 Installation."

New Features of Windows 2000

There are a host of new features created for Windows 2000 Professional to set it aside from all its competitors. The following are some of the new features:

- Disk quota support
- Inherited and uninherited permissions
- Internet printing support
- The ability to configure printer drivers for additional operating systems that will connect to your print server
- The Encrypting File System (EFS), which uses public and private encryption, allowing a user to transparently encrypt files
- A highly integrated Wizard technology to make configuration tasks easier
- Enhanced virtual private networking support (previous versions have VPN support; Windows 2000 Professional adds IPSec and L2TP support)

Why Do You Really Want to Use Windows 2000 Professional?

Now that Windows 2000 Professional has been out for over one year, has the new operating system been widely implemented? Are people happy with the updates? The answer to both questions is yes. By selecting Windows 2000 over Windows 95, 98, or NT, companies and users have seen better application performance, improved support for mobile users (which is extremely important in today's business environment), and better cost efficiency (in terms of less IT support required).

Preparing to Install Windows 2000 Professional

As mentioned in the previous section, Windows 2000 Professional is easy to install. But this doesn't mean you don't need to prepare for the installation process. Before you begin the installation, you should know what is required for a successful installation and have all of 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:

- The hardware requirements for Windows 2000 Professional
- How to use the Hardware Compatibility List (HCL) to determine if your hardware is supported by Windows 2000 Professional
- The difference between a clean install and an upgrade
- The installation options suitable for your system, including which disk-partitioning scheme and file system you should select for Windows 2000 Professional to use

The following sections describe the hardware requirements and installation considerations.

Hardware Requirements

In order to install Windows 2000 Professional 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 requirements specify the minimum hardware required before you should even consider installing Windows 2000 Professional. These requirements assume that you are installing only 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 to learn the basics of the software.

The recommended requirements are what Microsoft suggests to achieve 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 Professional 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 `http://www.microsoft.com/windows2000/guide/professional/sysreq/default.asp` for the most current information.

TABLE 1.1 Hardware Requirements

Component	Minimum Requirement	Recommended Requirement
Processor	Intel Pentium 133MHz or higher	Intel Pentium 133MHz or higher
Memory	64MB	128MB
Disk space	2GB hard disk with 650MB of free disk space	1GB or more of free disk space
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

Real World Scenario

Deciding on Minimum Hardware Requirements

The company you work for has decided that everyone will have their own laptop running Windows 2000 Professional. You need to decide on the new computers' specifications for processor, memory, and disk space.

The first step is to determine what applications will be used. Typically most users will work with an e-mail program, a word processor, a spreadsheet, presentation software, and maybe a drawing or graphics program. Under these demands, a low-end Pentium processor and 64MB of RAM will make for a very slow-running machine with a real likelihood of memory errors. So for this usage, you can assume that the minimum baseline configuration would be a Pentium III processor with 128MB of RAM.

Based on your choice of baseline configuration, you should then fit a test computer with the applications that will be used on it, and test the configuration in a lab environment simulating normal use. This will give you an idea if the RAM and processor calculations you have made for your environment are going to provide suitable response.

Today's disk drives have become capable of much larger capacity, while dropping drastically in price. So for disk space, the rule of thumb is to buy whatever is the current standard. Hard drives are currently shipping in the GB range, which is sufficient for most users. If users plan to store substantial graphics or video files, you may need to consider buying larger-than-standard drives.

Also consider what the business requirements will be over the next 12 to 18 months. If you will be implementing applications that are memory or processor intensive, you may want to spec out the computers initially with hardware sufficient to support upcoming needs, to avoid costly upgrades in the near future.

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

- If you are installing Windows 2000 Professional 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 Professional from the network, you need a network connection and a server with the distribution files.

Windows 2000 Professional supports computers with one or two processors.

Measurement Units Used in Hardware Specifications

Computer processors are typically rated by speed. The speed of the processor, or *central processing unit (CPU),* is rated by the number of clock cycles that can be performed in one second. This measurement is typically expressed in *megahertz (MHz).* One MHz is one million cycles per second.

Hard disks are commonly rated by capacity. The following measurements are used for disk space and memory capacity:

1*MB (megabyte)* = 1024KB (kilobytes)

1*GB (gigabyte)* = 1024MB

1*TB (terabyte)* = 1024GB

1*PB (petabyte)* = 1024TB

1*EB (exabyte)* = 1024PB

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 Professional operating system.

The Windows 2000 Professional 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 to ensure their compatibility with Windows 2000 Professional. Microsoft guarantees that the items on the list meet the requirements for Windows 2000 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, you won't be able to get support from Microsoft.

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

As I learned from my own mistake, you shouldn't just assume that a hardware item is on the HCL. I recently purchased a computer manufactured by a well-known, brand-name company. Because it was a higher-end Pentium with all the bells and whistles and came with Windows 98 preinstalled, I assumed that it would support Windows NT and Windows 2000. The salesperson said it would. When I got home and opened the box, I couldn't find any documentation about loading Windows NT or Windows 2000. A check of the vendor's Web site and a call to their technical support hotline verified that the computer did not support either operating system. I had to return the computer and argue with the store manager to get my money back.

Clean Install or Upgrade?

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

The only operating systems that can be upgraded to Windows 2000 Professional are Windows 95, Windows 98, and Windows NT 3.51 or 4. Any other operating system cannot be upgraded, but it may be able to coexist with Windows 2000 in a dual-boot environment. Dual-booting is covered in the "Supporting Multiple-Boot Options" section later in this chapter.

If you don't have an operating system that can be upgraded, or if you want to keep your previous operating system intact, you need to perform a clean install. A clean install puts Windows 2000 Professional operating system into a new folder and uses its default settings the first time the operating system is loaded. The process for a clean installation is described in the "Running the Windows 2000 Professional Installation Process" section later in this chapter.

Installation Options

There are many choices that you will need to make during the Windows 2000 Professional installation process. 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
- 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 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.

Partition Size

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, Microsoft recommends that you allocate at least 1GB of disk space. This 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 Partitions

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 Professional 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 Professional supports several disk configurations. Options include simple, spanned, and striped volumes. These configuration options are covered in detail in Chapter 9, "Managing Disks."

Windows 2000 Server also includes options for mirrored and RAID 5 volumes.

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 Professional 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 9.

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 supports three file systems:

- *File Allocation Table (FAT16)*

- *FAT32*
- *New Technology File System (NTFS)*

The following sections briefly describe these three file systems. See Chapter 9 for more details about the features of FAT, FAT32, and NTFS.

FAT16

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. 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 another operating system, such as DOS, Unix, Linux, OS/2, or Windows 3.1. Almost all PC operating systems read FAT16 partitions.

FAT32

FAT32 is the 32-bit version of FAT, which was first introduced in 1996 with Windows 95, with OEM (original equipment manufacturer) Service Release 2 (OSR2). With FAT32, disk partitions can be as large as 2TB (terabytes). It has more fault-tolerance features than FAT16, and also improves disk-space usage by reducing the size of clusters. However, 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 less than 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 partitions.

NTFS

NTFS is a file system designed to provide additional features for Windows NT and Windows 2000 computers. Some of the features NTFS offers include the following:

- 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.

Membership in a Domain or Workgroup

One Windows 2000 Professional 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 on a computer that is not part of a network. To join a workgroup, you simply choose that workgroup.

Domains are part of larger, centrally administered networks. You should install as part of a domain if any Windows 2000 servers on your network are configured as domain controllers with the Microsoft Active Directory installed. There are two ways to join a domain. You can preauthorize a computer before installation, through Active Directory Users and Computers utility. The second way is done during the Windows 2000 Professional installation, when you specify an Administrator name and password (or other user who has rights to add computers to the domain). In order to successfully join a domain, a domain controller for the domain and a 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 Professional either by using the distribution files on the Windows 2000 Professional CD, or by using files that have been copied to a network share point. The following sections discuss both installation methods.

Installing Windows 2000 from the CD

When you install Windows 2000 from the Windows 2000 Professional CD, you have several 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 the operating system you are using, as explained in the next section).
- If your computer is able to boot to the CD, you can insert the Windows 2000 Professional 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 Professional 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 operating system that is currently installed, then start the Windows 2000 Professional installation process. Depending on the operating system that is running, you start the installation by using one of the following commands from the I386 folder:

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

Installing by Booting from the Windows 2000 CD

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

Installing from Setup Boot Disks

If your computer cannot boot from the CD-ROM drive, you can create floppy disks that can boot to the Windows 2000 Professional operating system. These disks are called the *Windows 2000 Professional Setup Boot Disks*. From these floppy disks, you can install or reinstall the Windows 2000 operating system. The Windows 2000 Professional Setup Boot Disks are not specific to a computer; they can be used by any computer running Windows 2000 Professional.

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

The command to create boot disks from a Windows 2000, Windows 9*x* or Windows NT computer is `MAKEBT32.EXE`. The command to make boot disks from any other operating system is `MAKEBOOT.EXE`. These utilities are located on the Windows 2000 Professional CD in the BOOTDISK folder.

The Windows 2000 Professional 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 Professional Setup Boot Disks in an exercise in Chapter 15.

Installing Windows 2000 over a Network

If you are installing Windows 2000 Professional from 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 Professional distribution files copied to a shared folder. The following steps are used to install Windows 2000 Professional over the network:

1. Boot the target computer.
2. Attach to the distribution server. This server should have a share created for the folder that contains the \I386 folder from the Windows 2000 Professional distribution CD.

3. Launch WINNT or WINNT32 (depending on the computer's current operating system).
4. Complete the Windows 2000 Professional installation.

You can also install Windows 2000 Professional through an unattended process, which is covered in greater detail in Chapter 2, "Automating the Windows 2000 Installation."

Running the Windows 2000 Professional Installation Process

This section describes how to run the Windows 2000 Professional installation process. As explained in the previous section, you can run the installation from the CD or over a network. The only difference in the installation procedure is your starting point: 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 Professional CD.

Microsoft Exam Objective

Perform an attended installation of Windows 2000 Professional.

There are three main steps in the Windows 2000 Professional 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, Setup will be GUI based.

- Run the Setup Wizard.
- Install Windows 2000 Networking.

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 Professional until you reach Exercise 1.1. In that exercise, you'll set up your computer to complete the rest of the exercises in this book.

Running the Setup Program

The Setup program starts the Windows 2000 installation. In this stage of the installation, you start the installation program, choose the partition where Windows 2000 Professional 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 from an operating system other than Windows *9x* or Windows NT, launch WINNT.
   - If you are installing Windows 2000 from 32-bit mode Windows *9x* or Windows NT, launch WINNT32.
3. The Windows 2000 Setup dialog box appears. Your first choice is to specify the location of the distribution files. By default, this is 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 Esc (or F3 if you are in DOS mode). If you press Esc, 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. The Setup Wizard begins by detecting and installing device drivers. This process will take several minutes, and your screen may flicker during this process.

Then the Setup Wizard will gather information about your locale, name, and product key, as follows (you click Next after completing each dialog box):

1. The Regional Settings dialog box appears. 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.
2. In the Personalize Your Software 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 Professional in a workgroup, the Name entry here is used for the initial user.
3. The Product Key dialog box appears. 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 CD case.
4. The Computer Name and Administrator Password dialog box appears. Here, you specify a name that will uniquely identify your computer on the network. Your computer name can be up to 15 characters. The Setup Wizard suggests a name, but you can change it to another name. Through 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.

5. 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.

6. The Date and Time Settings dialog box appears. In this dialog box, you specify 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.
7. The Network Settings dialog box appears. 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).
8. In the next dialog box, Workgroup or Computer Domain, 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.)
9. 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 then 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 computer'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. If you select this option, 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, non-networked 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 to Use This Computer option, you need to provide a valid Window 2000 username and password in the Windows logon dialog box. At this point, the only users defined on the system are Administrator and the *initial user* (which is the username you entered for identification).

The installation is complete. You are logged on and greeted with the Windows 2000 Professional Getting Started Wizard, which helps new users navigate the operating system.

Setting Up Your Computer for Hands-on Exercises

The exercises in this book assume that your computer is configured in a specific manner. Your computer should have at least a 3GB drive that is configured with the minimum space requirements and partitions. Other exercises in this book make assumptions that your computer is configured as follows:

- 2GB (about 2000MB) C: primary partition with the FAT file system
- 250MB D: extended partition with the FAT file system
- 250MB of free space

Of course, you can allocate more space to your partitions if it is available.

You are probably wondering why we are not using any NTFS partitions. The reason is that you will convert a FAT partition to NTFS and use the features of NTFS in Chapter 9. You will also use the features of NTFS in Chapter 10, "Accessing Files and Folders." You are probably also wondering about the free space requirement. You need free space because you will create partitions in Chapter 9. If no free space exists, you won't be able to complete that exercise.

Exercise 1.1 assumes that you are not currently running Windows NT and that you are performing a clean installation and not an upgrade. Your partitions should be created and formatted, and SMARTDRV should be loaded. Also, before you begin, make sure that your hardware meets the requirements listed in Table 1.1.

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 and FORMAT, and manually copy the SMARTDRV utility from the Windows folder on the Windows 98 computer to the Windows 98 boot disk. Then you will be able to boot your computer and see your CD-ROM drive.

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

EXERCISE 1.1

Installing Windows 2000 Professional

In this exercise, you will install Windows 2000 Professional, 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.

EXERCISE 1.1 ***(continued)***

2. From the DOS prompt on your computer, access your CD-ROM drive. If you have configured your computer to our recommended specifications, your CD-ROM drive should be E:.
3. From the CD-ROM drive prompt, change to the I386 directory 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 leave the current file system intact (no changes). Press Enter to continue.

    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. You are prompted to click Next to continue. If you do not make a selection within 10 seconds, the installation will continue automatically. The Windows 2000 Professional Setup program will automatically detect and install drivers on your computer. This process will take a few minutes.

EXERCISE 1.1 ***(continued)***

Running the Windows 2000 Setup Wizard

11. The Regional Settings dialog box appears. Click Next to accept the default settings and continue.
12. In the Personalize Your Software dialog box, type your name and organization. Click the Next button.
13. 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.
14. 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.
15. 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.
16. The Date and Time Settings dialog box appears. Verify that all of the settings are correct and click the Next button.
17. After the Networking component files are copied (which takes a few minutes), the Network Settings dialog box appears. Confirm that the Typical Settings button is selected. Then click the Next button.
18. In the Workgroup and Computer Domain dialog box, confirm that the option No, This Computer Is Not on a Network, or Is on a Network without a Domain, is selected to indicate that you don't want to put the computer in a domain. In this dialog box, you can accept the default workgroup name, WORKGROUP, or you can specify a unique workgroup name. Since this is a practice computer, the workgroup name is not important. Click the Next button. The Setup components are installed, which takes several minutes.

EXERCISE 1.1 *(continued)*

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

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

Running the Network Identification Wizard

21. Windows 2000 Professional starts and displays the Welcome to the Network Identification Wizard dialog box. Click the Next button to continue.

22. In the Users of This Computer dialog box, click to turn on the Users Must Enter a User Name and Password to Use This Computer option. Click the Next button to continue.

23. In the Completing the Network Identification Wizard dialog box, click the Finish button.

Windows 2000 Professional is now installed, and you should be logged on to Windows 2000 and see the Getting Started with Windows 2000 dialog box.

Troubleshooting Installation Problems

The Windows 2000 installation process is designed to be as simple as possible. The chances for 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 Professional (64MB). Having insufficient 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 Professional (Pentium 133MHz). Having insufficient 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 Professional, 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 1.2, you will view the Windows 2000 setup logs to determine if there were any problems with your Windows 2000 installation.

EXERCISE 1.2

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).

EXERCISE 1.2 *(continued)*

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.

Supporting Multiple-Boot Options

You may want to install Windows 2000 Professional 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 Professional 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 multi-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 Professional. If you want to use Windows 2000 but still access your legacy application, you can configure a dual-boot.

Here are some 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 with DOS and Windows 2000 Professional, DOS must be installed first. If you install Windows 2000 Professional first, you cannot install DOS without ruining your Windows 2000 configuration. This requirement also applies to Windows 9*x*.
- Never, ever, 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 except 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 selection screen that asks you to choose which operating system you want to boot.

Summary

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

- The design goals of Windows 2000 Professional, which include taking the best features of Windows 98 and Windows NT 4, providing a wide range of support for hardware, making the operating system easy to use, and lowering the cost of ownership.

- Installation preparation, which begins with 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. Finally, you should plan which options you will select during installation. Options include method of partitioning your disk space, selecting a file system, whether the computer will be installed as a part of a workgroup or a domain, and your language and locale settings.
- The methods you can use for installation, which include using the distribution files on the Windows 2000 Professional CD or using files that have been copied to a network share point. If you will be installing Windows 2000 from the CD, you can start the installation by booting from another operating system, booting from the CD, or using the Windows 2000 Professional Setup Boot Disks.
- How to install Windows 2000 Professional, which proceeds in three main installation phases: running the Setup program, running the Setup Wizard, and installing Windows 2000 Networking.
- How to troubleshoot installation problems. Common errors are caused by media problems, lack of disk space or memory, and hardware problems. You can view Setup log files to check for problems that occurred during the installation.
- Information about supporting dual-boot or multi-boot environments. Dual-booting and multi-booting allow you to boot to a choice of two or more operating systems.

Exam Essentials

Be able to tell if a computer meets minimum hardware requirements for Windows 2000 Professional. Windows 2000 has minimum hardware requirements that must be met. In addition, the hardware must be on the HCL, and Windows 2000 drivers must be available for all devices.

Understand the different methods that can be used for Windows 2000 Professional installation. Be able to specify the steps and setup involved in installing Windows 2000 through options such as local CD (with or without the Setup Boot Disks) and through network installation.

Understand the reasons why a Windows 2000 installation would fail. You should be able to list common reasons for failure of a Windows 2000 Professional installation and be able to offer possible fixes or solutions.

Specify what is required to support multiple-boot configurations. If you plan to install Windows 2000 Professional on the same computer that is running other operating systems, be able to specify what must be configured to support dual- or multiple-boot configurations.

Key Terms

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

- Advanced Configuration and Power Interface (ACPI)
- boot partition
- central processing unit (CPU)
- clean install
- disk partitioning
- distribution server
- domain
- dual-boot
- EB (exabyte)
- FAT32
- File Allocation Table (FAT16)
- GB (gigabyte)
- Hardware Compatibility List (HCL)
- Institute of Electrical and Electronic Engineers (IEEE) 1394 standard
- logical drive
- MB (megabyte)
- multi-boot
- NTFS (New Technology File System)
- PB (petabyte)
- Plug and Play
- system partition
- TB (terabyte)
- Universal Serial Bus (USB)
- Windows 2000 Professional Setup Boot Disks
- Workgroup

Review Questions

1. James has decided to install Windows 2000 on a test computer in the lab. He can choose among several computers. When making his selection, what is the minimum processor required for an Intel-based computer to install and run Windows 2000 Professional?

   A. 80486

   B. A Pentium with a 133MHz or better processor

   C. A Pentium II with a 166MHz or better processor

   D. A Pentium III with a 333MHz or better processor

2. Martina wants to install Windows 2000 on a computer that is already running Windows NT 4 Workstation. She has an extra 4GB partition that can be used. What is the minimum free disk space required to install Windows 2000 Professional on the extra partition?

   A. 500MB

   B. 650MB

   C. 1GB

   D. 1.2GB

3. Dionne is purchasing 12 new computers for the training room. She needs to make sure that the computers will support Windows 2000 Professional. What is the name of the list that shows the computers and peripheral hardware that have been extensively tested with the Windows 2000 Professional operating system?

   A. The Windows Compatibility List

   B. The W2K Compatibility List

   C. The Microsoft Compatibility List

   D. The Hardware Compatibility List

4. Selecting file systems is a very important part of the Windows 2000 configuration. What three file systems supported by Windows 2000 Professional can you consider?

   A. FAT16

   B. HPFS

   C. FAT32

   D. NTFS

5. Mike is installing a Windows 2000 Professional machine. He has decided that he wants the computer to be a part of the Active Directory within SJ.MASTERMCSE.COM. Which of the following options should he choose for computer membership?

   A. Workgroup

   B. Active Directory

   C. Domain

   D. MDS

6. John is installing Windows 2000 Professional. He has a good understanding of the installation process. Which of the following is *not* a major step in the Windows 2000 Professional installation process?

   A. Running the Configuration Setup Wizard

   B. Running the Setup program

   C. Running the Setup Wizard

   D. Installing Windows 2000 Networking

7. Tom has machines running DOS, Windows 95, Windows 98, and Windows NT 4 Workstation that he needs to upgrade to Windows 2000 Professional. He is not sure if he should use WINNT or WINNT32. From which of the following operating systems would you run the WINNT32 command? Choose all that apply.

   A. DOS

   B. Windows 95

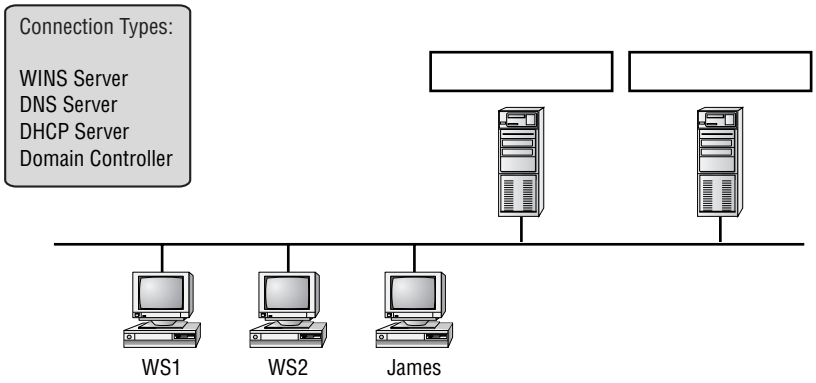
   C. Windows 98

   D. Windows NT

8. Sean has four computers in the test lab. He wants to install Windows 2000 Professional. The configurations for each of his computers are listed in the exhibit below. Place a mark on the computer that does *not* meet the minimum requirements for Windows 2000 Professional.

	Computer A	Computer B	Computer C	Computer D
Processor	PII/266	PIII/450	PII/166	Pentium/133
Memory	64MB	64MB	32MB	64MB
Free Disk Space	2GB	750MB	650MB	1GB

9. James is installing a Window 2000 Professional computer in the Sales.ABCCorp.com domain. Select and place the servers that must be available on the network to support the addition of James' computer to the domain.



10. Your computer is configured with two hard drives. You have decided to configure logical drive C: on disk 0, and logical disk D: on disk 1. You want to run Windows 98 for backward compatibility with some applications that will not run under Windows 2000. However, you also want to run Windows 2000 Professional to take advantage of the Windows 2000 features. On drive D:, you want to store files that should have a high level of security. You will install Windows 98 on drive C: and Windows 2000 Professional on drive D:. How should the drives on this computer be configured?

    A. Configure both logical drives as FAT32.

    B. Configure both logical drives with NTFS.

    C. Configure logical drive C: as FAT32 and logical drive D: as NTFS.

    D. Configure logical drive C: as NTFS and logical drive D: as FAT32.

11. You have a computer that will dual-boot between Windows NT 4 and Windows 2000 Professional. Which of the following statements reflects proper configuration?

    A. You should turn off disk compression on the Windows NT 4 configuration.

    B. You should enable dynamic disks on the Windows 2000 Professional configuration.

    C. You should install both operating systems into the same Windir directory so you will be able to access applications under both operating systems.

    D. You should edit the Registry on the Windows 2000 computer for `HKEY_LOCAL_MACHINE\DualBoot` to a value of 1 so that you will be able to access applications under both operating systems.

12. You have a computer that is on the HCL. The hard drive was erased and you are unable to access the CD-ROM drive. Where can you find the 32-bit command to create the Windows 2000 Professional Setup Boot Disks on the Windows 2000 Professional CD? The computer that will create the disks is already running Windows 2000 Professional.

A. \I386\MAKEBOOT

B. \I386\MAKEBT32

C. \BOOTDISK\MAKEBOOT

D. \BOOTDISK\MAKEBT32

13. Catherine wants to be able to install Windows 2000 Professional over the network on 20 computers. What folder must be copied from the Windows 2000 Professional CD?

A. \OEM

B. \I386

C. \Intel

D. \$WINI386

14. Eammon installed a computer with Windows 2000 Professional. The network card was not recognized. Eammon needs to troubleshoot the computer. Which of the following steps should he take? Choose all that apply.

A. Make sure the network card is on the HCL.

B. Check to see if the network card is Plug and Play compatible or if it needs to be manually configured.

C. Make sure the network card is compatible with the other network cards on the network.

D. Make sure you have the latest driver for the network card.

15. You are in the process of troubleshooting a Windows 2000 Professional installation. You want to verify all of the actions that were taken during the Setup phase. Where can you find a log file that will tell you this information?

    A. *Windir*\verify.log

    B. \Logfiles\verify.log

    C. *Windir*\setupact.log

    D. \Logfiles\setup.log

Answers to Review Questions

1. B. The processor must be at least a Pentium 133MHz or better.

2. B. You must have a minimum of a 2GB drive with at least 650MB of free space to install Windows 2000 Professional.

3. D. The Hardware Compatibility List (HCL) shows the computers and components that have been tested to work with Windows 2000.

4. A, C, D. Windows 2000 supports the FAT16, FAT32, and NTFS file systems. Windows NT 3.51 was the last version of NT to support the HPFS file system.

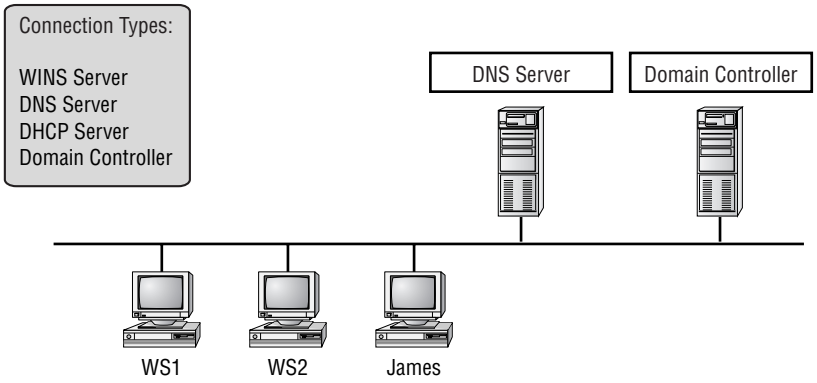
5. C. You can install your computer as a part of a workgroup or as a part of the domain. Domains are part of the Active Directory, but you install computers into domains, not directly into the Active Directory. There is no such thing as MDS within the context of Windows 2000.

6. A. Option A does not exist.

7. B, C, D. You can run WINNT32 only from Windows 95, Winows 98, Windows NT, or Windows 2000.

8. You should have placed a mark on Computer C. Computers A, B, and D meet the minimum requirements of a Pentium 133MHz or higher processor, 64MB of memory, and at least 650MB of free disk space. Computer C does not.

9. You should have dragged and dropped a DNS Server and a domain controller.



   You must have a domain controller and a DNS server running in your domain in order to add a computer to the domain.

10. C. You should configure logical drive C: as FAT32 because Windows 98 will not read NTFS partitions. Logical drive D: should be configured as NTFS because you want to implement local security.

11. A. You should turn off disk compression before you dual-boot. Windows 2000 does not support the disk compression that was used by Windows NT 4. There is no way to configure the operating systems to recognize applications under both platforms.

12. D. If you are creating Windows 2000 Professional Setup Boot Disks from a computer that is running Windows 2000, Windows NT, or Windows 9*x*, you use the `MAKEBT32.EXE` command. If you are making the boot disks from a 16-bit operating system, you use the `MAKEBOOT.EXE` command. These commands can be found in the BOOTDISK folder on the Windows 2000 Professional CD.

13. B. You must copy the \I386 folder and share the folder to install Windows 2000 Professional over a network.

14. A, B, D. If your computer will not recognize your network card, you should ensure that the network card is on the HCL and make sure you have the latest driver. You can check for the latest driver on the vendor's Web site. Even if the card is not on the HCL and is not Plug and Play compatible, it may work if it is properly configured.

15. C. You can find the log file that details Setup actions in `\Windir\setupact.log`.