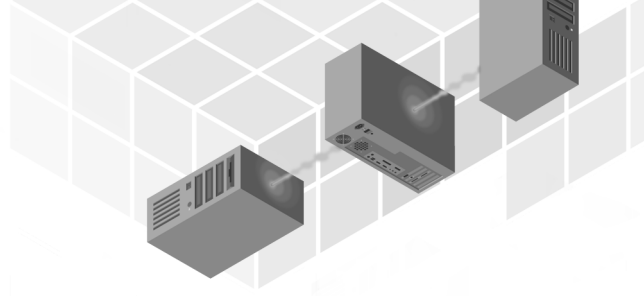


15



Deploying Windows Server 2003

The purpose of this chapter is to help you plan for the installation of Windows Server 2003 in a network environment. This chapter only scratches the surface, though. The *Microsoft Windows Server 2003 Deployment Kit* (Microsoft Press, 2003) contains much more help with planning and deploying Microsoft's latest server operating system. Also, for information about setting up multiple domains with structured relationships, see the deployment kit. You can view the Resource Kits on Microsoft's Web site at <http://www.microsoft.com/windows/reskits/>.

After reading this chapter, you'll be ready to run Windows Server 2003 Setup and, later, use the Configure Your Server Wizard. Together, Setup and the Configure Your Server Wizard help you get your servers up and running quickly. To find out more about Configure Your Server, see Help and Support Center in Windows Server 2003. To open Help and Support Center, after completing Setup, click Start, and then click Help And Support. You can also view Help and Support topics on Microsoft's Web site at <http://www.microsoft.com/windowsserver2003/>.

Upgrades Compared with New Installations

This section compares upgrading with performing a new installation to help you decide whether to perform a new installation. (See Chapter 16, "Upgrading from Windows NT 4.0 Server," and Chapter 17, "Upgrading from Windows 2000 Server," for more information about upgrading.) Upgrading is either replacing Windows NT 4.0 (with Service Pack 5 or later) with a product in the Windows

Server 2003 family or replacing Windows 2000 with a product in the Windows Server 2003 family. Installing, in contrast with upgrading, means completely removing the previous operating system or installing a product in the Windows Server 2003 family on a disk or disk partition with no previous operating system.

Upgrade Considerations

The following list contains some points to consider when doing an upgrade:

- With an upgrade, configuration is simpler, and your existing users, settings, groups, rights, and permissions are retained.
- With an upgrade, you do not need to reinstall files and applications. As with any major changes to the hard disk, however, it is recommended that you back up the disk before beginning an upgrade.
- If you want to upgrade and then use the same applications as before, be sure to review application information in *Relnotes.htm* (in the `\Docs` folder on the Setup CD). Also, for the most recent information on compatible applications for products in the Windows Server 2003 family, see the software compatibility information in the Windows Catalog at <http://www.microsoft.com/windows/catalog/>.

New Installation Considerations

The following list contains some points to consider when doing clean installations:

- If you reformat your hard disk and then perform a new installation, the efficiency of your disk might improve (compared with not reformatting it). Reformatting also gives you the opportunity to modify the size or number of disk partitions to make them match your requirements more closely.
- If you want to practice careful configuration management, such as on a server where high availability is important, you might want to perform a new installation on that server instead of an upgrade. This is especially true on servers on which the operating system has been upgraded several times in the past.
- It's possible to install Windows Server 2003 and also allow the computer to sometimes run another operating system. Setting up the computer this way, however, presents complexities because of file system issues. For more information, see "Installing Multiple Operating Systems" later in this chapter.

- If you want to install Windows Server 2003 on a computer that previously ran an operating system released before Windows 2000, note theServer 2003 following:
 - Do not upgrade to or install Windows Server 2003 on a compressed drive unless the drive was compressed with the NTFS file system compression utility. Uncompress a DriveSpace or DoubleSpace volume before running Setup on it.
 - If you used Windows NT 4.0 to create a volume set, mirror set, stripe set, or stripe set with parity and you want to run Setup for Windows Server 2003 on that computer, you must prepare the disk set first. For details, see “Working with Volumes, Mirrors, and Stripes” later in this chapter.

System Requirements

To ensure adequate performance, make sure computers on which you install Windows Server 2003 meet the following requirements:

- One or more processors with a recommended minimum speed of 550 MHz. (The minimum supported speed is 133 MHz.) Processors from the Intel Pentium/Celeron family or AMD K6/Athlon/Duron family or compatible processors are recommended. See Chapter 1, “Product Family,” to learn how many processors each edition of Windows Server 2003 supports.
- 256 MB of RAM recommended minimum. (128 MB is the minimum supported.) See Chapter 1, “Product Family,” to learn the maximum amount of memory that each edition of Windows Server 2003 supports. For computers with more than 4 GB of RAM, be sure to check the hardware compatibility information in the Windows Catalog at <http://www.microsoft.com/windows/catalog/>.

Note For Windows Server 2003, Enterprise Edition, running on Itanium-based computers, the requirements are slightly different: one or more processors with a minimum speed of 733 MHz (a maximum of eight processors per computer is supported) and 1 GB of RAM minimum.

- A hard disk partition or volume with enough free space to accommodate the setup process. To ensure that you have flexibility in your later use of the operating system, it is recommended that you allow considerably more space than the minimum required for running Setup, which is approximately 1.25 GB to 2 GB on an x86-based computer and 3 GB to 4 GB on an Itanium-based computer. The larger amount of space is required if you are running Setup across a network instead of from a CD-ROM or if you are installing on a FAT or FAT32 partition. (NTFS is the recommended file system.)

After Setup is finished, actual hard disk space used for the operating system will be more than the free space required for Setup because of space needed for the paging file, for any optional components you install, and (on domain controllers) for user accounts and other Active Directory information. The usual size for the paging file is 1.5 times the size of the RAM. For information about the paging file, optional components, user accounts, and information stored in Active Directory, see Help and Support Center. To open Help and Support Center, after completing Setup, click Start, and then click Help And Support.

- VGA or higher-resolution monitor (Super VGA 800×600 or higher recommended), keyboard, and (optionally) a mouse or other pointing device.

As an alternative, for operation without a monitor or keyboard, you can choose a remote diagnostic and support processor that is designed for products in the Windows Server 2003 family. See the hardware compatibility information in the Windows Catalog at <http://www.microsoft.com/windows/catalog/> for more information.

- For CD installation, a CD-ROM or DVD drive.
- For network installation, one or more network adapters and related cables that are designed for products in the Windows Server 2003 family. Also a requirement is a server from which to offer network access for the Setup files.
- Appropriate hardware for the functionality you require. For example, if you plan to support network clients, the servers and clients must have appropriate network adapters and cables. As another example, if you require a server cluster, the entire cluster solution must be listed as compatible with Windows Server 2003. For more

details about your hardware, see the hardware compatibility information in the Windows Catalog at <http://www.microsoft.com/windows/catalog/>.

Hardware Compatibility

One of the most important steps to take before installing a server is to confirm that your hardware is compatible with products in the Windows Server 2003 family. You can do this by running a preinstallation compatibility check from the Setup CD or by checking the hardware compatibility information at the Windows Catalog Web site. Also, as part of confirming hardware compatibility, verify that you have obtained updated hardware device drivers and an updated system basic input/output system (BIOS). (For an Itanium-based computer, check for an updated Extensible Firmware Interface.) Regardless of whether you run a preinstallation compatibility check, Setup checks hardware and software compatibility at the beginning of an installation and displays a report if there are incompatibilities.

Running a Preinstallation Compatibility Check

You can run a hardware and software compatibility check from the Setup CD. The compatibility check does not require you to actually begin an installation. You can run the compatibility check in either of two ways:

- Insert the Setup CD in the CD-ROM drive, and, when a display appears, follow the prompts for checking system compatibility. You will be offered the option to download the latest Setup files (through Dynamic Update) when you run the check. If you have Internet connectivity, it is recommended that you allow the download.
- Insert the Setup CD in the CD-ROM drive, open a command prompt, and type `d:\i386\winnt32 /checkupgradeonly`, where *d* represents the CD-ROM drive.

Checking Drivers and System BIOS

Check that you have obtained updated drivers for your hardware devices and that you have the latest system BIOS (for an x86-based computer) or Extensible Firmware Interface (for an Itanium-based computer). The device manufacturers can help you obtain these items. Finally, if you have devices that do not use Plug and Play, or if you are aware that your Plug and Play devices are not

implemented exactly to the standards, consider taking a device inventory of the hardware devices on your computer.

Inventorying Non-Plug and Play Devices

Products in the Windows Server 2003 family include Plug and Play technology so that devices (for example, video and network adapters) can be automatically recognized by the operating system, configuration conflicts are avoided, and you do not have to specify each device's settings by hand. However, if you have devices that do not use Plug and Play, or you are aware that your Plug and Play devices are not implemented exactly to the standards, you might want to take steps to avoid device configuration conflicts. This section describes steps you can take, if you choose, to understand your device configuration before running Setup.

To take an inventory of your devices, if your computer has an existing operating system, use it to obtain the current settings, such as memory address and interrupt request (IRQ), used with your devices. For example, with Windows NT 4.0, you can use Control Panel to view settings. (On the Start menu, point to Settings, click Control Panel, and then double-click icons such as Network and Ports.) You might also choose to view system BIOS information. To do this, watch the screen while starting the computer, and then press the appropriate key when prompted.

At the beginning of an installation, the Setup program automatically takes a device inventory as well. For devices that do not use Plug and Play or that are not implemented exactly to Plug and Play standards, taking your own inventory helps prevent the following difficulties:

- If two or more adapters share IRQ settings or memory addresses, the Setup program might not be able to resolve the conflict. To prevent this, you can take one of two approaches:
 - You can remove one of the adapters before running Setup and reinstall it afterward. For information about installing and configuring adapters and other hardware devices, see Help and Support Center.
 - As an alternative, you can modify one adapter's IRQ settings and memory addresses before running Setup so that each adapter's settings are unique.
- If adapters do not respond in a standard way to the attempts by Setup to detect or enumerate them, Setup might receive indecipher-

able or inaccurate information. In this case, you might need to remove these devices before running Setup and reinstall and configure them afterward. For information about installing and configuring adapters and other hardware devices, see Help and Support Center.

Table 15-1 shows the kinds of information to gather if you have devices that do not use Plug and Play and you decide to take a device inventory before starting Setup.

Table 15-1 Inventorying Device Configurations

Adapter	Information to Gather
Video	Adapter or chip set type and how many video adapters
Network	IRQ, I/O address, direct memory access (DMA) channel (if used), connector type (for example, BNC or twisted pair), and bus type
SCSI controller	Adapter model or chip set, IRQ, and bus type
Mouse	Mouse type and port (COM1, COM2, or PS/2) or USB
I/O port	IRQ, I/O address, and DMA channel (if used) for each I/O port
Sound adapter	IRQ, I/O address, and DMA channel
Universal serial bus (USB)	Which devices and hubs are attached
PC card	Which adapters are inserted and in which slots
Plug and Play	Whether enabled or disabled in BIOS
BIOS settings	BIOS revision and date
External modem	COM port connections (COM1, COM2, and so on)
Internal modem	COM port connections; for nonstandard configurations, IRQ and I/O address
Advanced Configuration and Power Interface (ACPI); power options	Enabled or disabled; current setting
PCI	Which PCI adapters are inserted and in which slots

Mass Storage Drivers and the Setup Process

If your mass storage controller (such as a SCSI, RAID, or Fibre Channel adapter) is compatible with products in the Windows Server 2003 family but you are aware that the manufacturer has supplied a separate driver file for use with your operating system, obtain the file (on a floppy disk) before you begin Setup. During the early part of Setup, a line at the bottom of the screen will prompt you to press F6. Further prompts will guide you in supplying the driver file to Setup so that it can gain access to the mass storage controller.

If you are not sure whether you must obtain a separate driver file from the manufacturer of your mass storage controller, you can try running Setup. If the controller is not supported by the driver files on the Setup CD and therefore requires a driver file supplied by the hardware manufacturer, Setup stops and displays a message saying that no disk devices can be found or displays an incomplete list of controllers. After you obtain the necessary driver file, restart Setup, and press F6 when prompted.

Note Don't forget that you can check all compatibility issues in the Windows Catalog at <http://www.microsoft.com/windows/catalog/>.

Using a Custom Hardware Abstraction Layer File

If you have a custom hardware abstraction layer (HAL) file supplied by your computer manufacturer, before you begin Setup, locate the floppy disk or other medium containing the file. During the early part of Setup, a line at the bottom of the screen will prompt you to press F6; at this time, press F5 (not F6) to include your HAL file in the setup process. After you press F5, follow the prompts that are provided.

Understanding the ACPI BIOS for an x86-Based Computer

For an x86-based computer, the BIOS is a set of software through which the operating system (or Setup) communicates with the computer's hardware devices. ACPI is the current standard for the way the BIOS works. Products in the Windows Server 2003 family support not only ACPI-compliant BIOS versions but also some BIOS versions based on older Advanced Power Management (APM) and Plug and Play designs.

Some ACPI-based BIOS versions are not compliant with the standard. The more recent the version of an ACPI BIOS, the more likely that it's compliant. An ACPI-based BIOS that isn't compliant with the ACPI standard might not support workable communication between the operating system (or Setup) and your hardware. If workable communication is not supported, Setup stops and displays instructions for contacting your hardware manufacturer and taking other steps to solve the problem. If this happens, follow the instructions provided.

To learn more about the ACPI compliance of your BIOS:

- For information about your BIOS version, before running Setup, restart the computer and watch the text on the screen. Pay particular attention to blocks of text containing the words *BIOS* or *ACPI BIOS*.
- For information about BIOS versions for your hardware, check your hardware documentation and contact your hardware manufacturer.

Using Dynamic Update for Updated Drivers

If you have a working Internet connection on the computer on which you run Setup, you can choose Dynamic Update during Setup and obtain the most up-to-date Setup files, including drivers and other files. Whenever an important update is made to any crucial Setup file, that update is made available through Dynamic Update functionality built into the Windows Update Web site. Some of the updated files will be replacements (for example, an updated driver or updated Setup file), and some will be additions (for example, a driver not available at the time the Setup CD was created). It's recommended that you use Dynamic Update when running Setup.

Dynamic Update has been carefully designed so that it's reliable and easy to use:

- The files on the Dynamic Update section of the Windows Update Web site have been carefully tested and selected. Only files that are important in ensuring that Setup runs well are made available through Dynamic Update. Files with minor updates that will not significantly affect Setup are not part of Dynamic Update.
- Because Dynamic Update downloads only the files that are required for your computer, the Dynamic Update software briefly examines your computer hardware. No personal information is collected, and no information is saved. The only purpose is to select appropriate drivers for your hardware configuration. This keeps the download as

short as possible and ensures that only necessary drivers are downloaded to your hard disk.

- You can use Dynamic Update when running a preinstallation compatibility check from the product CD or when running Setup itself. Either way, you obtain the most up-to-date files for running Setup. For information about running the compatibility check, see “Hardware Compatibility” earlier in this chapter.
- You can use Dynamic Update with unattended Setup. Preparing for this requires several steps. For details about how to use Dynamic Update with unattended Setup (also called automated installation), see the *Microsoft Windows XP Professional Resource Kit* or the *Microsoft Windows Server 2003 Deployment Kit*.

The Windows Update Web site offers a variety of updates that you can use after completing Setup. To learn more, see <http://windowsupdate.microsoft.com/>.

Important Files to Review

At some point in your planning process, before you run Setup, familiarize yourself with the `Relnotes.htm` file found in the `\Docs` folder on the CD for Windows Server 2003. This file contains important usage information about hardware, networking, applications, and printing. Also familiarize yourself with information about hardware compatibility for products in the Windows Server 2003 family. For more information, see “Hardware Compatibility” earlier in this chapter.

Decisions to Make for a New Installation

This list outlines the basic decisions to make for a new installation:

- **Which licensing modes to use.** Products in the Windows Server 2003 family support two licensing modes: *Per Device or Per User* and *Per Server*. *Per Device or Per User* mode requires a separate Client Access License (CAL) for each computer that accesses a server running a product in the Windows Server 2003 family. *Per Server* mode requires a separate CAL for each concurrent connection to a server. For more information about licensing, see the next section, “Choosing a Licensing Mode.”

- **Whether you want to be able to choose between different operating systems each time you start the computer.** You can set up a computer so that each time you restart it, you can choose from several different operating systems. For more information, see “Installing Multiple Operating Systems” later in this chapter.
- **Which file system to use on the installation partition.** You can potentially choose among three file systems for an installation partition: NTFS, FAT, and FAT32. NTFS is strongly recommended in most situations. It’s the only file system that supports Active Directory, which includes many important features such as domains and domain-based security. However, it might be necessary to have a FAT or FAT32 partition on a basic disk in an x86-based computer if you must set up the computer so that it sometimes runs Windows Server 2003 and sometimes runs Windows NT 4.0 or an earlier operating system. For more information, see “Choosing a File System” later in this chapter.
- **Which partition or volume you plan to install the operating system on.** If you are performing a new installation, review your disk partitions or volumes before you run Setup. (For an upgrade, you will use existing partitions or volumes.) Both partitions and volumes divide a disk into one or more areas that can be formatted for use by one file system. Different partitions and volumes often have different drive letters (for example, C and D). After you run Setup, you can make adjustments to the disk configuration as long as you do not reformat or change the partition or volume that contains the operating system. For information about planning the partitions or volumes for a new installation, see “Planning Disk Partitions” later in this chapter.
- **How to handle IP addresses and TCP/IP name resolution.** With TCP/IP, you need to make decisions about how to handle IP addressing and name resolution (the translating of IP addresses into names that users recognize). For more information, see “Configuring Networking” later in this chapter.

Choosing a Licensing Mode

Products in the Windows Server 2003 family support two licensing modes: Per Device or Per User and Per Server. If you choose the Per Device or Per User mode, each computer or user that accesses a server running a product in the

Windows Server 2003 family requires a separate CAL. With one CAL, a particular client computer can connect to any number of servers running products in the Windows Server 2003 family. This is the most commonly used licensing method for companies with more than one server running products in the Windows Server 2003 family. Figure 15-1 illustrates this mode.

In contrast, Per Server licensing means that each concurrent connection to this server requires a separate CAL. In other words, this server can support a fixed number of connections at any one time. For example, if you select the Per Server client licensing mode with five licenses, this server can have five concurrent connections. (If each client requires one connection, this is five clients at any one time.) The clients using the connections do not need any additional licenses. The Per Server licensing mode is often preferred by small companies with only one server. It's also useful for Internet or remote access servers, where the client computers might not be licensed as network clients for products in the Windows Server 2003 family. You can specify a maximum number of concurrent server connections and reject any additional logon requests. Figure 15-2 shows Per Server licensing mode.

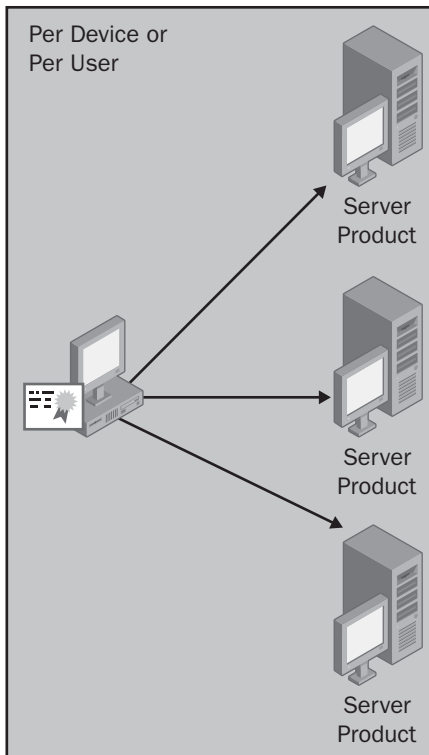


Figure 15-1 This diagram shows Per Device or Per User licensing mode.

If you are unsure which mode to use, choose Per Server because you can change once from Per Server mode to Per Device or Per User mode at no cost. After you choose Per Server and complete Setup, you can display topics about licensing modes in Help and Support Center. (Click Start, and then click Help and Support.)

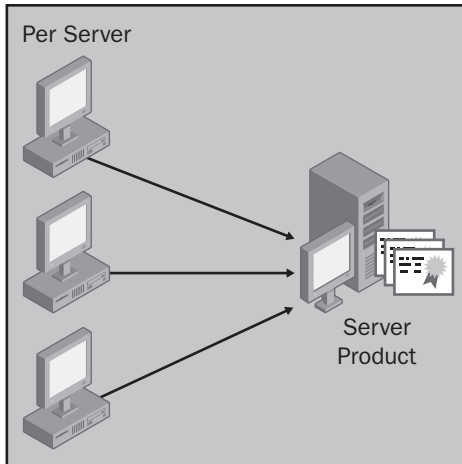


Figure 15-2 This diagram illustrates Per Server licensing mode.

Installing Multiple Operating Systems

On a computer with an appropriate disk configuration (outlined in Table 15-2), you can install more than one operating system and then choose between the operating systems each time you restart the computer.

For example, on an x86-based computer, you can set up a server to run Windows Server 2003 most of the time but allow the server to sometimes run Windows NT Server 4.0, Enterprise Edition, in order to support an older application. (However, to do this you would need to make specific file system choices and would need Service Pack 5 or later, as described in “File System Compatibility” and “Choosing a File System” later in this chapter.) During restarts, a display appears for a specified number of seconds, allowing you to select between the two operating systems. (You can specify a default operating system that will run if no selection is made during the restart process.)

Table 15-2 shows the disk configurations on which you can install more than one operating system. You must follow the requirements in the table. For example, on a basic disk, you must install each operating system, including Windows Server 2003, in a separate partition. This ensures that each operating system does not overwrite crucial files that are needed by another operating system.

Table 15-2 Requirements for Multiple Operating Systems

Disk Configuration	Requirements
Basic disk or disks	You can install multiple operating systems, including Windows NT 4.0 and earlier operating systems, on a basic disk. Each operating system must be on a separate partition or logical drive on the disk. A partition or logical drive is a section of the disk that functions as a separate unit. Different partitions often have different drive letters, for example, C and D.
Single dynamic disk	You can install only one operating system. However, if you used Windows 2000 or Windows XP to change a disk with no partitions directly to a dynamic disk, you must return the disk to basic before you can install an operating system on it. For more information, see the paragraph that follows this table.
Multiple dynamic disks	Each dynamic disk can contain one installation of Windows 2000, Windows XP, or a product in the Windows Server 2003 family. No other operating systems can start from a dynamic disk. However, if you used Windows 2000 or Windows XP to change a disk with no partitions directly to a dynamic disk, you must return the disk to basic before you can install an operating system on it. For more information, see the paragraph that follows this table.
Master Boot Record (MBR) disk on an Itanium-based computer	You cannot start operating systems from an MBR disk on an Itanium-based computer. You must use a GPT disk for this purpose.
GUID partition table (GPT) disk on an Itanium-based computer	You can install one or more operating systems on a GPT disk on an Itanium-based computer. The guidelines in this table for basic and dynamic disks apply to GPT disks on Itanium-based computers.

Note On an Itanium-based computer, the operating systems that you can install include Windows XP, 64-Bit Edition; the 64-bit version of Windows Server 2003, Enterprise Edition; and the 64-bit version of Windows Server 2003, Datacenter Edition. On an Itanium-based computer, you cannot install earlier operating systems such as Windows 2000.

If you used Windows 2000 or Windows XP to change a disk with no partitions directly to a dynamic disk, you must return the disk to basic before you can install an operating system on it. All data will be lost in this process, so back it up first. You can then use Windows 2000 or Windows XP to revert to basic, or you can use Windows Server 2003 Setup. To use Windows 2000 or Windows XP, follow the instructions in Help for your operating system. To use Windows Server 2003 Setup, during the partitioning phase, find the dynamic disk among the list of available partitions and then delete it (which erases all data on all volumes). You will be prompted to confirm your action. After you do this, the disk will contain only unpartitioned space, and you can use Setup to create a new (basic disk) partition on it.

Reasons to Install Only One Operating System

Setting up a computer so that you can choose between two or more operating systems at startup does have an advantage: It allows you to use applications that run only with a particular operating system. However, there are definite reasons to install only one operating system:

- Each operating system uses valuable disk space.
- Compatibility issues such as file system compatibility can be complex. For more information, see “File System Compatibility” later in this chapter.
- On a dynamic disk, you can have only one operating system per disk. Dynamic disks also will not work with some operating systems. For more information, see Table 15-2.
- It’s no longer necessary to maintain multiple operating systems as a safeguard against problems with starting the computer. With products in the Windows Server 2003 family, you have other options for

system recovery. For example, if you have a problem with a newly installed device driver, you can use safe mode, in which Windows Server 2003 restarts with default settings and the minimum number of drivers.

Requirements for Installing Multiple Operating Systems

Before you decide to set up a computer with more than one operating system, review the following restrictions.

- On computers that contain MS-DOS and Windows Server 2003:
 - Install each operating system on a different partition, and install the applications used with an operating system on the same partition with it. If an application is used with two different operating systems, install it on two partitions.
 - MS-DOS must be installed on a basic disk on a partition formatted with FAT. If MS-DOS is not installed on the system partition, which is almost always the first partition on the disk, the system partition must also be formatted with FAT.
 - Windows Server 2003 must be installed last. Otherwise, important files that are needed for starting Windows Server 2003 might be overwritten.
 - File system compatibility might be an issue. See the upcoming section “File System Compatibility.”
- On computers that contain Windows 98 or Windows Me and Windows Server 2003:
 - Install each operating system on a different partition, and install the applications used with an operating system on the same partition with it. If an application is used with two different operating systems, install it on two partitions.
 - Windows 98 or Windows Me must be installed on a basic disk on a partition formatted with FAT or FAT32. If either Windows 98 or Windows Me is not installed on the system partition, which is almost always the first partition on the disk, the system partition must also be formatted with FAT or FAT32.
 - Windows Server 2003 must be installed last. Otherwise, important files that are needed for starting Windows Server 2003 might be overwritten.

- File system compatibility might be an issue. See the upcoming section “File System Compatibility.”
- Regarding computers that contain Windows NT 4.0 and Windows Server 2003, see the upcoming sections “File System Compatibility” and “Multibooting with Windows NT 4.0.”
- On computers that contain some combination of Windows Server 2003 with Windows 2000 or Windows XP, or that contain multiple partitions with products in the Windows Server 2003 family:
 - Install each operating system on a different partition or, for dynamic disks, on a different disk, and install the applications used with an operating system on the same disk or partition with it. If an application is used with two different operating systems, install it in two places.
 - For an x86-based computer, choose any product in the Windows Server 2003 family for installation on a specific partition. For example, you can install Windows Server 2003, Standard Edition, in one location and Windows Server 2003, Web Edition, in another.
 - For an Itanium-based computer, you can choose among Windows XP, 64-Bit Edition; the 64-bit version of Windows Server 2003, Enterprise Edition; and the 64-bit version of Windows Server 2003, Datacenter Edition.
 - If Windows 2000 and Windows Server 2003 are installed, Windows Server 2003 must be installed last. Otherwise, important files that are needed for starting Windows Server 2003 might be overwritten.
 - If the computer participates in a domain, use a different computer name for each installation. Because a unique security identifier (SID) is used for each installation on a domain, the computer name for each installation must be unique, even for multiple installations on the same computer.
 - If you want to use the Encrypting File System (EFS), you must take certain steps to ensure that encrypted files will be available from each of the installations. For more information, see “Encrypting File System” later in this chapter.

File System Compatibility

On computers that contain multiple operating systems, compatibility becomes more complex when you consider file system choices. The file systems to choose from are NTFS, FAT, and FAT32. (For more information, see “Choosing a File System” later in this chapter.)

NTFS is normally the recommended file system because it is more efficient and reliable and supports important features, including Active Directory and domain-based security. With NTFS, however, you need to take file system compatibility into account when considering whether to set up a computer to contain more than one operating system because with Windows 2000 and the Windows Server 2003 family, NTFS has new features in addition to those in Windows NT. Files that use any new features will be completely usable or readable only when the computer is started with Windows 2000 or a product in the Windows Server 2003 family. For example, a file that uses the new encryption feature won't be readable when the computer is started with Windows NT Server 4.0 or Windows NT Server 4.0, Enterprise Edition, which were released before the encryption feature existed.

Note If you want to set up a computer with both Windows NT and Windows Server 2003, and you want to have an NTFS partition, the only appropriate version of Windows NT is version 4.0 with the latest released service pack. Using the latest service pack maximizes compatibility between Windows NT 4.0 and Windows Server 2003. (Specifically, you must have Service Pack 5 or later.) Even the latest service pack, however, does not provide access to files using the new features in NTFS.

Using NTFS as the only file system on a computer that contains both Windows Server 2003 and Windows NT is not recommended. On these computers, a FAT partition containing the Windows NT 4.0 operating system ensures that when started with Windows NT 4.0, the computer will have access to needed files. In addition, if Windows NT is not installed on the system partition, which is almost always the first partition on the disk, it's recommended that the system partition also be formatted with FAT.

If you set up a computer so that it starts with Windows NT 3.51 or earlier on a FAT partition and Windows Server 2003 on an NTFS partition, when that computer starts with Windows NT 3.51, the NTFS partition will not be visible. If you

set up a computer this way, and the partition containing Windows NT 3.51 is not the system partition (which is almost always the first partition on the disk), the system partition must also be formatted with FAT.

Multibooting with Windows NT 4.0

If you plan to set up a computer so that it contains Windows NT 4.0 and Windows Server 2003, first review the following precautions:

- If your only concern is ensuring that you can always start the computer, setting up the computer so that you can start it with different operating systems at different times is not necessary.
- Using NTFS as the only file system on a computer that contains both Windows Server 2003 and Windows NT is not recommended.
- Make sure that Windows NT 4.0 has been updated with the latest released service pack.
- Install each operating system on a different partition, and install the applications used with an operating system on the same partition with it. If an application is used with two different operating systems, install it on two partitions.
- Don't install Windows Server 2003 on a compressed drive unless the drive was compressed with the NTFS file system compression feature.
- Windows Server 2003 must be installed last. Otherwise, important files that are needed for starting Windows Server 2003 might be overwritten.
- If the computer participates in a domain, use a different computer name for each installation.

Encrypting File System

If you set up a server so that it contains some combination of Windows Server 2003 and Windows 2000 or Windows XP, or contains multiple partitions with products in the Windows Server 2003 family, and you want to use EFS on the computer, you must take certain steps. These steps make encrypted files readable between the different installations:

- One approach is to ensure that all the installations are in the same domain and that the user of these installations has a roaming profile.

- Another approach is to export the user's file encryption certificate and associated private key from one installation and import it into the other installations.

For more information about EFS, roaming user profiles, and importing and exporting certificates, see Help and Support Center.

Choosing a File System

You can choose among three file systems for an installation partition: NTFS, FAT, and FAT32. NTFS is strongly recommended in most situations. You can use important features such as Active Directory and domain-based security only by choosing NTFS as your file system.

Note On GPT disks, which are available only on Itanium-based computers, it's strongly recommended that you use NTFS for the installation partition. However, if you have an Itanium-based computer and you see that it has a small FAT partition of 100 MB or more, do not delete or reformat this partition. The partition is required for the loading of the operating system.

Table 15-3 describes a number of installation scenarios for x86-based computers (the last two scenarios are fairly uncommon) and provides file system guidelines for each one:

Table 15-3 File Systems for Scenarios

Scenario	File System
The computer currently uses NTFS only (no FAT or FAT32).	Continue to use NTFS. No additional information about file systems is needed.
The computer is x86-based and has one or more FAT or FAT32 partitions; and the computer contains only one operating system, or the operating systems on the computer include Windows 2000, Windows XP, or a product in the Windows Server 2003 family but no other operating systems.	If the computer is Itanium-based, see the important note earlier in this section. Consider reformatting or converting partitions so that all partitions use NTFS.

Table 15-3 File Systems for Scenarios *(continued)*

Scenario	File System
The computer will contain multiple operating systems, one of which is MS-DOS, Windows 95, Windows 98, or Windows Me.	For any partition that must be accessible from MS-DOS, Windows 95, Windows 98, or Windows Me, use FAT (or, when appropriate, FAT32).
The computer will contain multiple operating systems, one of which is Windows NT.	Read “File System Compatibility” earlier in this chapter.

The sections that follow provide information about reformatting or converting a FAT or FAT32 partition to use NTFS, as well as additional background information about NTFS, FAT, and FAT32.

Reformatting or Converting to NTFS

If you have a FAT or FAT32 partition on which you want to install a product in the Windows Server 2003 family, and you want to use NTFS instead, you have two choices:

- You can convert the FAT or FAT32 partition to NTFS. This leaves files intact, although the partition might have somewhat more fragmentation and slower performance than a partition formatted with NTFS. However, it is still advantageous to use NTFS, regardless of whether the partition was formatted with NTFS or converted.

If you install a product in the Windows Server 2003 family on a FAT or FAT32 partition, you are offered the option to convert the partition to NTFS. You can also convert a FAT or FAT32 partition after Setup by using `Convert.exe`. For more information about `Convert.exe`, after completing Setup, type **help convert** at the command prompt.

- You can reformat the partition with NTFS. This erases all files on the partition but results in less fragmentation and better performance than with a converted partition.

Note If you have an Itanium-based computer and you see that it has a small FAT partition of 100 MB or more, do not delete or reformat this partition. The partition is required for loading the operating system.

If you format a partition during Setup, the file system choices are listed as NTFS and FAT. Table 15-4 provides information about the relationship between partition size and file system choices during Setup.

Table 15-4 Formatting Partitions during Setup

Partition State	Setup Choices
Unformatted, less than 2 GB.	Setup offers NTFS or FAT. Setup uses the format chosen.
Unformatted, 2 GB or larger, up to a maximum of 32 GB.	Setup offers NTFS or FAT. If FAT is chosen, Setup uses FAT32.
Unformatted, larger than 32 GB.	Setup allows only NTFS.
Previously formatted with FAT32 and larger than 32 GB. (Partition created with Windows 95, Windows 98, or Windows Me.)	No formatting needed, even though an unformatted partition of this size, when formatted during or after Setup for a product in the Windows Server 2003 family, would have to use NTFS. In other words, previously formatted FAT32 partitions of this size continue to be supported by the Windows Server 2003 family.

If you format a partition during Setup, you can choose between a quick format and a full format:

- **Quick format.** Quick format creates the file system structure on the disk without verifying the integrity of every sector. Choose this method for any disk that has no bad sectors and no history of file-corruption problems that might be related to bad sectors.
- **Full format.** A full format identifies and tracks bad sectors so that they are not used for storing data. Choose this method for any disk that has bad sectors or has a history of file-corruption problems that might be related to bad sectors.

NTFS Compared with FAT and FAT32

NTFS has always been a more powerful file system than FAT and FAT32. Windows 2000, Windows XP, and the Windows Server 2003 family include a new version of NTFS, with support for a variety of features, including Active Directory, which is needed for domains, user accounts, and other important security features.

FAT and FAT32 are similar to each other except that FAT32 is designed for larger disks than FAT. The file system that works most easily with large disks is NTFS. Note that file system choices have no effect on access to files across the network. For example, using NTFS on all partitions on a server does not affect clients connecting across a network to shared folders or shared files on that server, even if those clients run an earlier operating system such as Windows 98 or Windows NT. The following list describes the compatibility and sizes of each file system with various operating systems:

- **NTFS.** A computer running Windows 2000, Windows XP, or a product in the Windows Server 2003 family can access files on a local NTFS partition. A computer running Windows NT 4.0 with Service Pack 5 or later might be able to access some files. Other operating systems allow no local access. The recommended minimum volume size is approximately 10 MB. The maximum volume and partition sizes start at 2 terabytes (TB) and range upward. For example, a dynamic disk formatted with a standard allocation unit size (4 KB) can have partitions of 16 TB minus 4 KB. The maximum file size is potentially 16 TB minus 64 KB, although files cannot be larger than the volume or partition they are located on.
- **FAT.** Access to files on a local partition is available through MS-DOS, all versions of Windows, and OS/2. Volumes can be from floppy-disk size up to 4 GB. The maximum file size is 2 GB.
- **FAT32.** Access to files on a local partition is available only through Windows 95 OSR2, Windows 98, Windows Me, Windows 2000, Windows XP, and products in the Windows Server 2003 family. Volumes from 512 MB to 2 TB can be written to or read using products in the Windows Server 2003 family. Volumes up to 32 GB can be formatted as FAT32 using products in the Windows Server 2003 family. The maximum file size is 4 GB.

Note On Itanium-based computers with multiple disks, your choices include not only file systems but also partition styles. A partition style determines the way that information about the partition is stored. There are two partition styles. The newer style (used on Itanium-based computers only) stores partition information in the GPT. The older style stores information in the MBR. On Itanium-based computers, you must install Windows Server 2003 on a GPT disk.

Understanding NTFS

This section provides background information about the features available with NTFS. Some of these features are as follows:

- Better scalability to large drives. The maximum partition or volume size for NTFS is much greater than that for FAT, and as volume or partition sizes increase, performance with NTFS doesn't degrade as it does with FAT.
- Active Directory (and domains, which are part of Active Directory). With Active Directory, you can view and control network resources easily. With domains, you can fine-tune security options while keeping administration simple. Domain controllers and Active Directory require NTFS.
- Compression features, including the ability to compress or uncompress a drive, a folder, or a specific file. A file cannot be both compressed and encrypted at the same time.
- File encryption, which greatly enhances security. A file cannot be both compressed and encrypted at the same time.
- Permissions that can be set on individual files rather than just folders.
- Remote Storage, which provides an extension to your disk space by making removable media such as tapes more accessible.
- Recovery logging of disk activities, which allows NTFS to restore information quickly in the event of power failure or other system problems.
- Sparse files. These are very large files created by applications in such a way that only limited disk space is needed. That is, NTFS allocates disk space only to the portions of a file that are written to.
- Disk quotas, which you can use to monitor and control the amount of disk space used by individual users.

This is only a partial list of the features in NTFS in the Windows Server 2003 family. For more information about new features, see Chapter 11, "File Services."

Planning Disk Partitions

You must plan your disk partitions before you run Setup only if both of the following conditions are true:

- You are performing a new installation, not an upgrade.
- The disk on which you are installing is a basic disk, not a dynamic disk. Basic disks are the disk type that existed before Windows 2000; most disks are basic disks. Dynamic disks are disks that once were basic but were changed to dynamic using Windows 2000, Windows XP, or a product in the Windows Server 2003 family. If you plan to install to a dynamic disk, you cannot change the volume or partition sizes on the disk during Setup, and therefore no planning is needed regarding partition sizes. Instead, review the guidelines in “Working with Dynamic Disks” later in this chapter.

Disk partitioning is a way of dividing your physical disk so that each section functions as a separate unit. When you create partitions on a basic disk, you divide the disk into one or more areas that can be formatted for use by a file system, such as FAT or NTFS. Different partitions often have different drive letters (for example, C and D). A basic disk can have up to four primary partitions, or three primary partitions and one extended partition. (An extended partition can be subdivided into logical drives, while a primary partition cannot be subdivided.)

Note If you plan to delete or create partitions on a hard disk, be sure to back up the disk contents beforehand because these actions will destroy any existing data. As with any major change to disk contents, it's recommended that you back up the entire contents of the hard disk before working with partitions, even if you plan to leave one or more of your partitions alone.

Before you run Setup to perform a new installation, determine the size of the partition on which to install. There is no set formula for figuring a partition size. The basic principle is to allow plenty of room for the operating system, applications, and other files that you plan to put on the installation partition. The files for setting up Windows Server 2003 require approximately 1.25 GB to 2 GB on an x86-based computer and 3 GB to 4 GB on an Itanium-based computer, as described in “System Requirements” earlier in this chapter. It's recommended that you allow considerably more disk space than the minimum amount. It's not unreasonable to allow 4 GB to 10 GB on the partition, or more for large installations. This allows space for a variety of items, including

optional components, user accounts, Active Directory information, logs, future service packs, the paging file used by the operating system, and other items.

When you perform a new installation, you can specify the partition on which to install. If you specify a partition on which another operating system exists, you will be prompted to confirm your choice.

During Setup, create and size only the partition on which you want to install Windows Server 2003. After installation is complete, you can use Disk Management to manage new and existing disks and volumes. This includes creating new partitions from unpartitioned space; deleting, renaming, and reformatting existing partitions; adding and removing hard disks; and changing a basic disk to the dynamic disk storage type, or changing dynamic to basic.

On Itanium-based computers with more than one disk, you can plan not only the sizes of partitions but also the partition style for each disk. A partition style determines the way that information about the partition is stored. There are two partition styles. The newer style (used on Itanium-based computers only) stores partition information in the GUID partition table (GPT). The older style stores information in the MBR. On Itanium-based computers, you must install Windows Server 2003 on a GPT disk. With GPT, you can create more partitions and larger volumes and take advantage of other benefits. For more information about partition styles on Itanium-based computers, see Help and Support Center and the *Microsoft Windows Server 2003 Resource Kit, Server Management Guide*.

Remote Installation Services

If you plan to use Remote Installation Services on this server so that you can install operating systems on other computers, a separate partition for use by Remote Installation Services is necessary. Plan on using NTFS on this partition: NTFS is required for the Single Instance Store feature of Remote Installation Services.

If you need to create a new partition for Remote Installation Services, plan on doing it after Setup, and leave enough unpartitioned disk space so that you can create it. (At least 4 GB of space is recommended.) As an alternative, for the system disk (not cluster disks), you can plan to make the disk a dynamic disk, which allows more flexibility in the use of the disk space than a basic disk. For more information about Remote Installation Services and about disk and partition choices, see Help and Support Center.

Options When Partitioning a Disk

You can change the partitions on your disk during Setup only if you are performing a new installation, not an upgrade. You can modify the partitioning of the disk after Setup by using Disk Management.

If you are performing a new installation, Setup examines the hard disk to determine its existing configuration and then offers the following options:

- If the hard disk is unpartitioned, you can create and size the partition on which you will install a product in the Windows Server 2003 family.
- If the hard disk is partitioned but has enough unpartitioned disk space, you can create the partition for your Windows Server 2003 family product by using the unpartitioned space.
- If the hard disk has an existing partition that is large enough, you can install a product in the Windows Server 2003 family on that partition, with or without reformatting the partition first. Reformatting a partition erases all data on the partition. If you do not reformat the partition but you do install a Windows Server 2003 family product where there is already an operating system, the operating system will be overwritten, and you must reinstall any applications you want to use with the Windows Server 2003 family product.
- If the hard disk has an existing partition, you can delete it to create more unpartitioned disk space for a partition for a Windows Server 2003 family product. Deleting an existing partition also erases any data on that partition.

Working with Dynamic Disks

A dynamic disk is a disk using the new storage type introduced with Windows 2000. If you changed a disk to dynamic and you want to perform a new installation on the disk, review the following:

- If you used Windows 2000 or Windows XP to change a disk with no partitions directly to a dynamic disk, you must revert the disk to basic before you can install an operating system on it. All data will be lost in the process of returning the disk to basic, so back it up first.

You can use Windows 2000 or Windows XP to return to basic, or you can use the Setup program for a product in the Windows Server 2003 family. To use Windows 2000 or Windows XP, follow the instructions in Help for your operating system. To use Setup for a

product in the Windows Server 2003 family, during the partitioning phase, find the dynamic disk among the list of available partitions and then delete it (which erases all data on all volumes). You will be prompted to confirm your action. After you do this, the disk will contain only unpartitioned space, and you can use Setup to create a new (basic disk) partition on it.

- If you plan to rerun Setup on a computer on which a product in the Windows Server 2003 family was already installed, and the computer contains dynamic disks, be sure to read about the limitations for installing operating systems on disks that are changed to dynamic using a product in the Windows Server 2003 family. For more information, see topics about dynamic disks and the partition table in Help and Support Center.

Working with Volumes, Mirrors, and Stripes

With the disk management technologies in Windows NT 4.0, you could create volume sets, mirror sets, stripe sets, or stripe sets with parity, each with specific capabilities and limitations. By using the dynamic disk technology introduced with Windows 2000, you can use similar technologies, with the added flexibility of being able to extend disk volumes without repartitioning or reformatting.

This transition from the technologies used in Windows NT 4.0 means that you must make certain choices before running Setup for Windows Server 2003. Any volume sets, mirror sets, stripe sets, or stripe sets with parity that you created with Windows NT 4.0 are not supported in Windows Server 2003, although they were supported to a limited extent in Windows 2000.

If you used Windows NT 4.0 to create a volume set, mirror set, stripe set, or stripe set with parity, and you want to run Setup for Windows Server 2003 on that computer, you must choose one of the following methods:

- **For a mirror set, break the mirror.** If you are running Windows NT 4.0 on a computer that has a mirror set and you want to run Setup for Windows Server 2003 on that computer, first back up the data (as a safeguard—the data will not be erased) and then break the mirror. Ensure that you have applied Service Pack 5 or later, required before running Setup for Windows Server 2003. Then run Setup.
- **For a volume set, stripe set, or stripe set with parity, back up the data and delete the set.** If you are running Windows NT 4.0 on a computer that has a volume set, stripe set, or stripe set with par-

ity, and you want to run Setup for Windows Server 2003 on that computer, first back up the data. Next delete the set (which will delete the data). Ensure that you have applied Service Pack 5 or later, required before running Setup for Windows Server 2003. Then run Setup. After running Setup for Windows Server 2003, you can make the disk dynamic, restore backed-up data as necessary, and make use of the volume options shown in the next section, “Types of Multidisk Volumes on Dynamic Disks.” For more information about dynamic disks, see Help and Support Center.

- **If necessary, use the Ftonline support tool.** The preceding methods are the recommended methods for preparing to run Setup for Windows Server 2003 on a computer that contains a volume set, mirror set, stripe set, or stripe set with parity created with Windows NT 4.0. However, if you do not use these methods and you must access one of these sets after running Setup for Windows Server 2003, you can use the Ftonline tool. The Ftonline tool is part of the Windows Server 2003 family Support Tools. For more information, see topics on Support Tools and on Ftonline in Help and Support Center.

Types of Multidisk Volumes on Dynamic Disks

The disk sets described in the preceding section have different names in the Windows Server 2003 family than they had in Windows NT 4.0:

- A *volume set* is now a *spanned volume on a dynamic disk*.
- A *mirror set* is now a *mirrored volume on a dynamic disk*.
- A *stripe set* is now a *striped volume on a dynamic disk*.
- A *stripe set with parity* is now a *RAID-5 volume on a dynamic disk*.

Configuring Networking

TCP/IP is the network protocol that provides Internet access. It's the protocol used by most servers, although you can use additional or different network adapters and their associated protocols on your servers. Setup and the Configure Your Server Wizard are designed to make it easy to configure TCP/IP and the services that support it.

To use TCP/IP, make sure that each server is provided with an IP address, either a dynamic address provided through software or a static address that you

obtain and set. You will also have to provide users with names that are easy to use. Name resolution can be accomplished by various methods, primarily Domain Name System (DNS) and Windows Internet Naming Service (WINS). The following sections provide more information.

For detailed information about TCP/IP, Dynamic Host Configuration Protocol (DHCP), DNS, and WINS, see Help and Support Center as well as the Resource Kits for the Windows Server 2003 family. You can also view Help and Support topics on the Web at <http://www.microsoft.com/windowsserver2003/>.

IP Addresses

As described in the preceding section, using TCP/IP requires an IP address to be provided for each computer. There are two basic approaches for providing an IP address for a server you are installing:

- **DHCP.** You can provide IP addresses to the computers on your network by configuring one or more DHCP servers, which provide IP addresses dynamically to other computers. A DHCP server must itself be assigned a static IP address.

One server or several servers can provide DHCP along with one or more name resolution services, which are called DNS and WINS. The name resolution services are described in the next section, “Name Resolution.”

If you want to run Setup before you have finalized your decisions about which server to use as your DHCP server and what static IP address to assign to that server, you can choose Typical Settings in the Networking Settings dialog box during Setup and complete the network configuration later. If you do this and there is no DHCP server on the network, Setup will use a limited IP addressing option called Automatic Private IP Addressing (APIPA). During the time that a server is using APIPA, it can communicate only with other computers using APIPA on the same network segment. A server that is using APIPA cannot make connections to the Internet (for browsing or e-mail) and cannot be used with DNS or Active Directory (which depends on DNS).

If you know which server you want to use as your DHCP server, when installing that server, in the Networking Settings dialog box in Setup, choose Custom settings, and specify a static IP address and related network settings. After Setup, use Configure Your Server, along with information in Help and Support Center, to install the DHCP component and complete the configuration of the DHCP server.

- **Static IPs.** For certain types of servers, you must assign a static IP address and subnet mask during or after Setup. These servers include DHCP servers, DNS servers, WINS servers, and any server providing access to users on the Internet. It is also recommended that you assign a static IP address and subnet mask for each domain controller. If a computer has more than one network adapter, you must assign a separate IP address for each adapter.

If you want to run Setup on a server before you have finalized your decision about the static IP address you want to assign to that server, you can choose Typical Settings in the Networking Settings dialog box during Setup and configure that server later. In this situation, if a DHCP server is on the network, Setup will obtain an IP address configuration from DHCP. If no DHCP server is on the network, Setup will use APIPA. APIPA is described in the preceding item in this list.

For more information about static IP addresses, including private IP addresses (which you choose from certain ranges of addresses) and public IP addresses (which you obtain from an Internet service provider), see Help and Support Center.

Name Resolution

After you have formed a plan for IP addressing, the next components to consider are those for name resolution, which is the process of mapping a computer name (something that users can recognize and remember) to the appropriate IP address. Name resolution is a process that provides users with easy-to-remember server names instead of requiring them to use the numeric IP addresses by which servers identify themselves on the TCP/IP network. The name resolution services are DNS and WINS:

- **DNS.** DNS is a hierarchical naming system used for locating computers on the Internet and private TCP/IP networks. One or more DNS servers are needed in most installations. DNS is required for Internet e-mail, Web browsing, and Active Directory. DNS is often used as a name resolution service in domains with clients running Windows 2000, Windows XP, or products in the Windows Server 2003 family.

DNS is installed automatically when you create a domain controller (or promote a server to become a domain controller) unless the Windows Server 2003 software detects that a DNS server already exists for that domain. You can also install DNS by using Configure

Your Server or by using Add/Remove Windows Components, which is part of Add Or Remove Programs in Control Panel.

If you plan to install DNS on a server, specify a static IP address on that server and configure that server to use that IP address for its own name resolution. For information about assigning a static IP address, see the preceding section, “IP Addresses.” For more information about configuring DNS, see Help and Support Center.

- **Windows Internet Naming Service.** If you provide support for clients running Windows NT or any earlier Microsoft operating system, you might need to install WINS on one or more servers in the domain. You might also need to install WINS if it's required by your applications. You can install WINS after Setup by using Configure Your Server or by using Add/Remove Windows Components, which is part of Add Or Remove Programs in Control Panel.

If you plan to install WINS on a server, specify a static IP address on that server. For information about assigning a static IP address, see the preceding section, “IP Addresses.” For more information about configuring WINS, see Help and Support Center.

Planning for Your Servers

Domains, and the Active Directory directory system of which they are a part, provide many options for making resources easily available to users while maintaining good monitoring and security. For more information about Active Directory, see Chapter 3, “Active Directory.”

With Windows Server 2003, servers in a domain can have one of two roles: domain controllers, which contain matching copies of the user accounts and other Active Directory data in a given domain; and member servers, which belong to a domain but do not contain a copy of the Active Directory data. (A server that belongs to a workgroup, not a domain, is called a stand-alone server.) It's possible to change the role of a server from domain controller to member server (or stand-alone server) and back again, even after Setup is complete. However, it's recommended that you plan your domain before running Setup and change server roles (and server names) only when necessary.

Multiple domain controllers provide better support for users, compared with a single domain controller. With multiple domain controllers, you have multiple copies of user account data and other Active Directory data; however, it's still important to perform regular backups, including Automated System Recovery backups, and familiarize yourself with the methods for restoring a

domain controller. In addition, multiple domain controllers work together to support domain controller functions, such as carrying out logon validations.

As you manage your Windows Server 2003 family domains, you might want to learn more about operations master roles. Operations master roles are special roles that are assigned to one or more domain controllers in an Active Directory domain. The domain controllers that are assigned these roles perform operations that are single-master (not permitted to occur at different places on a network at the same time). For example, the creation of security identifiers for new resources (such as new computers) must be overseen by a single domain controller to ensure that the identifiers are unique.

The first domain controller installed in a domain is automatically assigned all the operations master roles. You can change the assignment of operations master roles after Setup, but in most cases this is not necessary. You will need to be particularly aware of operations masters roles if problems develop on an operations master or if you plan to take one out of service. For more information about operations master roles, which are part of Active Directory, see Help and Support Center.

For More Information

See the following resource for more information:

- Microsoft Windows Server 2003 Deployment Kit at <http://www.microsoft.com/technet/prodtechnol/windowsnetserver/evaluate/cpp/reskit/>