Chapter 2
Planning for and Installing Windows 98

This chapter covers issues important in planning for the use of Windows 98, as well as its installation as a new operating system or as an upgrade to an earlier operating system. This material is covered in the Planning as well as the Installation and Configuration sections of Microsoft’s Implementing and Supporting Microsoft Windows 98 exam (70-098). Microsoft defines the goals for these sections as follows:

• Developing an appropriate implementation model for specific requirements in a Microsoft or mixed Microsoft and Novell NetWare networking environment. Among the considerations are choosing the appropriate file system and planning a workgroup.

• Developing a security strategy in a Microsoft or mixed Microsoft and NetWare environment. Among the considerations are system policies, user profiles, file and printer sharing, and share-level access control versus user-level access control.
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- Installing Windows 98. Options include using an automated Windows setup, new installs, upgrading, uninstalling, and dual booting with Windows NT 4.0.
- Configuring Windows 98 server components, including Personal Web Server and Dial-Up Networking server.

MCSE 1.1 Planning for Windows 98

This section will begin with a comparison of Windows operating systems and a look at the hardware and software requirements of Windows 98. It will also cover the required exam elements of choosing an appropriate file system and planning for a workgroup. Finally, this section will cover the elements of choosing a security strategy for standalone desktops or computers in a network environment.

Selecting Microsoft Operating Systems

In developing an implementation model for your organizations desktops, you should consider the functional needs of those desktops and compare Windows 98 with other operating systems, such as Windows NT, to determine how best to meet those needs.

Microsoft began its rise to market dominance with the introduction of the Microsoft Disk Operating System (MS-DOS), a command line operating system that was made synonymous with the phrase “personal computer (PC)” in the early 1980s. In the early 1990s, MS-DOS evolved into a Graphical User Interface (GUI) operating system with the introduction of Windows (which still supports MS-DOS via the Command Prompt shell). At the time of this exam’s creation, Microsoft sold three versions of its market-leading Windows operating system for PCs:

- Windows 98
- Windows NT Workstation 4.0
- Windows NT Server 4.0

The operating system you choose depends on the type of hardware on which it is to run and which features the operating system is required (or desired) to have for a given environment.

CONSIDERING WINDOWS 98

Like its predecessor Windows 95, Windows 98 is a 32-bit operating system that is designed to control a number of Intel-based computers and variety of compatible peripherals. Windows 98 is commonly considered Microsoft’s
operating system for the consumer market, although it supports many features that integrate well in business environments.

Like most modern operating systems, Windows 98 supports *multitasking*, the ability to perform multiple operations simultaneously. Windows 98 also supports *Plug and Play* standards that give PCs the ability to recognize newly installed hardware and self-configure the software needed for it. Windows 98 supports a wide range of hardware devices and device drivers. Finally, Windows 98 is able to support both 16-bit (older) and 32-bit (newer) Windows applications, as well as MS-DOS applications. This backward-compatibility makes it appealing to some businesses that still use 16-bit legacy applications, such as custom databases.

Windows 98 is designed for use with the Intel family of processors. It does not support *multiprocessing*, a technique that distributes a computer’s workload across multiple processors to achieve a logarithmic gain in performance. In other words, Windows 98 supports a single processor.

Windows 98 addresses disk drives using the File Allocation Table (FAT) file system. Here too it supports both 16-bit and 32-bit versions, and so can support older Windows and MS-DOS applications. This compatibility comes at a cost, however, as FAT is not as secure as the 32-bit-only New Technology Filing System (NTFS) available under Windows NT.

Windows 98 systems can be networked as clients in workgroups and appear in Windows NT network domains (two networking methodologies that will be explained later in this chapter). They can also be hosts on the Internet, and can publish Web pages using the built-in Personal Web Server.

The next step in evolution for Microsoft’s consumer-level operating system is Windows Millennium.

**CONSIDERING WINDOWS NT WORKSTATION 4.0**

Like Windows 98, Windows NT Workstation is a 32-bit GUI operating system. Unlike Windows 98, it can be used to control both Intel-based PCs and some other types of computers, such as the Reduced Instruction Set Chip (RISC)-based Alpha from Digital Equipment Corp. (DEC). Windows NT is commonly considered Microsoft’s operating system for the business market.

Originally one product, Windows NT later diverged into Windows NT Workstation and Windows NT Server. The only real difference between the two is in the roles they perform. Windows NT Workstation performs the role of network client and desktop operating system, much as Windows 98 does. In this role, Windows NT Workstation differs from Windows 98 primarily in that it affords a greater level of security and system stability.
Windows NT does not support as many peripheral devices and device drivers as does Windows 98. It does, however, support both multitasking and multiprocessing. It is also a more stable operating system that runs each application in its own memory address space, ensuring that a crash in one application will not crash the computer.

Windows NT maintains backward-compatibility with MS-DOS 5.0, Windows 3.1.x, and OS/2 1.x. It maintains lateral-compatibility with Portable Operating System Interface Unix (POSIX) applications.

Windows NT Workstation provides strong support for legacy applications through its use of a Virtual DOS Machine (VDM). This is a 32-bit emulator application that supports older DOS and 16-bit Windows applications. Windows NT Workstation loads the VDM into RAM in order to shorten load times for the older programs. Windows NT Server, which is not intended to be used primarily on a workstation, does not do this.

The role filled by Windows NT Workstation 4.0 has recently been replaced by Windows 2000 Professional, which was not available at the time of this exam’s creation.

**CONSIDERING WINDOWS NT SERVER 4.0**

Windows NT Server is the same as Windows NT Workstation in most respects. It differs in that its role is to provide services for other networked computers, such as centralized logon authentication and security, rather than act as a client workstation. It is capable of assuming the workstation role as well, however.

_Caching—_the process of storing commonly accessed information in RAM—is handled differently under Windows NT Server than it is under Windows NT Workstation. In the former case, caching is optimized for faster network throughput, while in the latter case, caching is optimized for faster disk drive access. The same is true of _paging_, where Windows NT Server will act to optimize network performance over application performance by paging little of the server software to the hard disk even in low memory conditions. In addition, Windows NT Server can be configured (optimally) as either an application server or as a file and print server. Windows NT Workstation cannot.

Because Windows NT Server is designed to handle the workload from more than just the computer on which it resides, it has a number of other features and capabilities not found in Windows NT Workstation. These include the following:
SERVICES FOR MACINTOSH • Windows NT Server permits direct access to Apple Macintosh computers via the AppleTalk networking protocol. It also permits AppleTalk print spooling.

RAID FAULT TOLERANCE • A server exhibits fault tolerance when it is able to compensate for a hardware failure without losing data or disrupting operations. Disk drive fault tolerance schemes are embodied in the various levels of the Redundant Array of Inexpensive Disks (RAID) standards. Windows NT offers two levels of RAID protection. RAID Level 1, also known as disk mirroring, involves the use of two disk drives. Under this scheme, data is written to both disks so that if one fails, the other is still available to carry on. Because Windows NT must write to two hard disks simultaneously, this method results in somewhat slower write operations. The speed of read operations is increased, however, because Windows NT can read from both disks simultaneously.

Under a basic disk mirroring scenario, a single disk controller writes to both the primary and the mirror (redundant) disk drive (collectively called the mirror set). Should one of the two disks fail, operations can continue without interruption. If the disk controller fails, however, both the primary and the mirrored disk become inaccessible. True fault tolerance, then, requires that the server be equipped with two disk drives and two disk controllers, a method called disk duplexing. In addition, because the two controllers act independently, disk duplexing does not incur the same performance degradation in write operations that disk mirroring does.

RAID Level 5 refers to disk striping with parity. Under this scheme, data is written across an array of disks. Because data is written to and read from multiple disks simultaneously, this greatly increases performance. Data is not duplicated across disks, however. Instead, parity information is written to each disk so that, should one disk drive fail, its data can be recreated from other disks.

Windows NT can stripe from three to 32 disk drives. This collection of disks is called the stripe set. When data is written to a stripe set with parity, it is laid down in rows across the component disk drives. For each of these rows, or stripes, a parity stripe block is also written on one of the disks for use in recreating the data should one of the disks fail. Because only a parity stripe block is written, this is more efficient than disk mirroring (which writes a complete, redundant copy of data).

The formula for determining how much disk space will be available for data storage in a stripe set is:

% Utilization = (no. of disks - 1) / (no. of disks) X 100%
So, if you were to stripe five disks, eighty percent of the stripe set would be available as free space. Obviously, the most storage you will ever get from a mirror set is 50 percent. Striping is therefore more efficient than disk mirroring. One caveat: Write operations take three times as much RAM when using a stripe set with parity because Windows NT must perform the parity calculations with each write.

Windows NT Server supports RAID Levels 1 and 5. There is a RAID Level 0 that is also supported by Windows NT, however it is simply striping without parity and therefore does not count as a fault tolerance method. Windows 98 does not support RAID, so if your applications require fault tolerance, you should either deploy Windows NT or use your Windows 98 workstations in conjunction with Windows NT Server (e.g., save your files on the server’s RAID-protected disk drives).

**DOMAIN LOGON VALIDATION** • Windows NT Server can authenticate user access for all of the resources in a domain, not just for the workstation that a person is currently using.

**DIRECTORY REPLICATION** • Windows NT Server can maintain version control on files through the use of its Directory Replicator service. Under this system the export server maintains master copies of directories and files that are to be shared. Workstations, or import computers, maintain identical directories of files. When a file is updated on the server, it is then copied to all other computers automatically.

**NETWORK SERVICES AND MULTIPROTOCL ROUTER** • Windows NT Server can provide routing services for Windows Internet Naming Service (WINS), Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), Internet Protocol (IP), Internetwork Packet Exchange (IPX), and AppleTalk through its Multiprotocol Router (MPR).

**MORE CONCURRENT CLIENT SESSIONS** • In theory, an unlimited number of users can log on to a Windows NT Server simultaneously, while Windows NT Workstation supports just 10.

**MORE REMOTE ACCESS SESSIONS** • A virtually unlimited number of users can log on to a Windows NT Server simultaneously over a remote connection (e.g., via telephone lines), while Windows NT Workstation supports just one.

**MORE PROCESSORS** • Windows NT Server supports up to four processors while Windows NT Workstation supports just two. (Both can support up to 32 processors when used in specially designed computers, however).

**BETTER SERVER APPLICATIONS** • Windows NT Workstation can publish Web pages using built-in Peer Web Services. Windows NT Server supports more
robust Web publishing and file distribution capabilities with Internet Information Server (IIS). Both support Microsoft’s BackOffice suite and its components: Structured Query Language (SQL) database server, Systems Management Server (SMS), System Network Architecture (SNA), and Exchange. Here too, however, Windows NT Server is more robust.

The role filled by Windows NT Server 4.0 has recently been replaced by Windows 2000 Advanced Server, which was not available at the time of this exam’s creation.

Choosing Windows 98

In creating an implementation model, you should first determine whether or not Windows 98’s capabilities will meet your overall needs based on a comparison of Microsoft’s available operating systems. You might decide, for example, that Windows 98 is well suited to most of your organization’s desktops, but that you will also need a Windows NT Server machine configured with fault tolerance to store and share vital data, and a couple of secure Windows NT Workstation computers to support special legacy software.

Having arrived at the conclusion that Windows 98’s capabilities will meet the needs of a majority of your users, you should also ensure that your desktop computers have the necessary hardware configurations to support it.

CONSIDERING WINDOWS 98 SYSTEM REQUIREMENTS

The minimum hardware and software requirements for a PC that is to run Windows 98 differ from the requirements of its predecessor operating systems, Windows 3.x and Windows 95, as well as those for Windows NT.

MINIMUM HARDWARE REQUIREMENTS • Windows 98’s hardware requirements are as follows:

• at least an Intel 486DX processor running at 66 Mhz
• at least 16 Mbytes of RAM
• at least 120 Mbytes of hard disk space (see Table 1.1, “Minimum Disk Space Required for Installation”)
• a VGA or SVGA monitor
• a 3.5-inch 1.44 Mbyte floppy disk drive and/or a CD-ROM drive
• a pointing device, such as a mouse

Optional requirements include the following:

• 14,400 Bps or faster modem and an Internet Service Provider (ISP), such as Microsoft Network
• sound card and speakers
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- DVD-ROM drive and compatible DVD decoder card (or DVD decoder software) for DVD video
- TV tuner card for broadcast reception
- network adapter

The amount of disk space required is detailed in Table 1.1.

**Table 1.1 Minimum Disk Space Required for Installation**

<table>
<thead>
<tr>
<th>Installation method</th>
<th>Required hard disk space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrade from Windows 95 (or 3.x)</td>
<td>120–195 Mbytes (Suggested: 195 Mbytes)</td>
</tr>
<tr>
<td>New installation, FAT16 file system</td>
<td>165–355 Mbytes (Suggested: 225 Mbytes)</td>
</tr>
<tr>
<td>New installation, FAT32 file system</td>
<td>140–255 Mbytes (Suggested: 175 Mbytes)</td>
</tr>
</tbody>
</table>

A comparison of the three Windows operating system’s hardware requirements is provided in Table 1.2.

**Table 1.2 Comparison of Windows Operating System Requirements**

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Processor</th>
<th>RAM</th>
<th>Disk Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 98</td>
<td>486DX/66</td>
<td>16 Mbytes</td>
<td>120 Mbytes</td>
</tr>
<tr>
<td>Windows NT Workstation 4.0</td>
<td>486DX/33</td>
<td>12 Mbytes</td>
<td>120 Mbytes</td>
</tr>
<tr>
<td>Windows NT Server 4.0</td>
<td>486DX/33</td>
<td>16 Mbytes</td>
<td>130 Mbytes</td>
</tr>
</tbody>
</table>

**MINIMUM SOFTWARE REQUIREMENTS** • You can introduce the retail version of Windows 98 as either a new install or as an upgrade to an existing operating system. The minimum operating system software necessary for installing an upgrade version of Windows 98 includes one of the following:

- Windows 95
- MS-DOS version 5.0 or higher. (Or an equivalent version from the hardware manufacturer. Windows 98 ships with DOS 7.1)
- Windows 3.x (with MS-DOS)
- Windows for Workgroups 3.x (with MS-DOS)
- IBM OS/2 2.x (with MS-DOS)

You can also install Windows 98 to dual-boot with OS/2 (with MS-DOS) or Windows NT (with MS-DOS).

You could install Windows 98 on an old Intel 486 or (or even a 386) PC with at least 16 Mbytes of RAM running Windows 3.x or MS-DOS. However, it will almost certainly run too slowly to make it worthwhile.

To check the operating system version that is installed on the computer, type the VER command at the command prompt (e.g., in MS-DOS, etc.).
Under Windows, select the General tab in the System Control Panel application.

The minimum hardware requirements for Windows 95 were significantly less than those of Windows 98: a 386DX processor running at 20 Mhz., 4 Mbytes of RAM (although 8 Mbytes was recommended), and 40 Mbytes of hard disk space. Because of this, you are likely to encounter Windows 95 or Windows 3.x when working with older computers, especially if their owners did not upgrade their hardware as required by the purchase of a Windows 98 upgrade.

**CHOOSING A SETUP OPTION**

Within the Windows 98 Setup program, you can choose from several installation options. The choice you make will dictate the size of the Windows 98 installation on the target computer. Setup options are as follows:

**TYPICAL** • This is the default option, which Microsoft recommends for most users. This option performs most installation steps automatically for a standard Windows 98 installation with minimal user interaction. You only need to confirm which directory you want to install Windows 98 into, provide user and computer identification information, and specify whether or not to create an Emergency Startup floppy diskette.

**PORTABLE** • This is the recommended option for mobile users with laptop or otherwise portable computers. This installation includes the Briefcase utility, which keeps selected files constantly synchronized with those on a desktop computer or file server, and software for direct cable connections and file exchange.

**COMPACT** • This is the option for users who have limited disk space, it installs only the minimum files required to run Windows 98. You can still use the Add/Remove Programs utility to add programs or accessories later.

**CUSTOM** • This is the option for users who want to select and configure applications and network components that may not be installed by default. This is recommended for advanced users and administrators who need to control the various elements of Windows 98 Setup.

**Selecting a File System**

One major distinction between Windows 98 and Windows NT are the file systems they support. Among the factors that must be considered in choos-
ing a file system are the sizes of destination disk drives, the operating systems
with which the drives will be used, and the level of file security that is
desired.

In selecting a file system, you should initially plan for the physical and
logical structure that is appropriate for your desktops’ disk drives. On new
disk drives—or existing disks on which you wish to irrevocably delete all
existing data—this involves formatting. During this process you are given
the opportunity to create partitions.

PLANNING FOR PARTITIONS

A hard disk can be formatted as a single drive with its own drive letter desig-
nation (e.g., “C.”). This is commonly the case with smaller disk drives, often
less than 1 Gbyte. Alternately, a hard disk can be subdivided into multiple
partitions. Although each partition resides on the same physical hard disk,
each has its own drive letter designation and can be used as if it was a sepa-
rate drive. This method is commonly used with larger disk drives because it
is easier to navigate a smaller directory structure. It is also a common prac-
tice to create different partitions for multiple operating systems, thereby
keeping their associated software separated.

Partitions result from the logical organization of a single physical disk.
Creating a subdivision from the free space on a hard disk is the process of
partitioning. When setting up a Windows computer, one must define two
types of partitions.

**PRIMARY PARTITION** • A primary partition can support a bootable operating
system. Each disk drive can contain as many as four primary partitions. A
primary partition cannot be further partitioned.

**EXTENDED PARTITION** • An extended partition will not support a bootable operat-
ing system. On single disk drive systems, then, an extended partition is
used in addition to one or more primary partitions. An extended partition
can, however, be subdivided into multiple logical partitions, each with its
own letter designation (e.g., “D:, E:, F:,” etc.). Only one extended partition
can reside on a disk drive.

There can be no more than four partitions on a disk drive, so if an
extended partition is established, only three primary partitions can be used.

On an Intel-based computer, it is necessary to mark one primary parti-
tion as active. This is the partition from which the computer will boot on
startup.

Computers with disk drives containing multiple operating systems are
typically formatted with a primary partition for each operating system.
Computers with disk drives containing a single operating system are commonly formatted with either a single primary partition, or a primary partition and an extended partition. On a new computer, the Windows Setup program will create an active partition when it installs the operating system. If an active partition already exists on a destination computer, it will be used.

**PLANNING FOR FILE SYSTEM FORMATTING**

As previously described, a partition creates a logical subdivision on a disk drive into which files can be installed. Before that can happen, however, the partition must be formatted to support the file system that will organize and manage the disk drive’s data.

By default, Windows 98 uses the 16-bit File Allocation Table (FAT16) file system, just as previous versions of Windows did. In Windows 98, however, you also have the option of converting to a 32-bit version, FAT32, that provides improved disk performance and frees up some disk space.

At its most basic level, the FAT is like the directory in an apartment building. When you wish to visit someone in an apartment complex, you will usually locate their name in a directory and call up the appropriate unit number. Likewise, when you call on the computer to access a file, that file’s location is first looked up in the FAT. Needless to say, this methodology is faster than walking through an apartment complex knocking on doors, or scouring the entire contents of a hard disk.

Windows operating systems support three primary file systems. Windows 98 supports FAT and FAT32, while Windows NT supports FAT and NTFS. In creating an implementation plan, you should evaluate the pros and cons of each and consider how they can be used together in mixed network environments.
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CONSIDERING NTFS

Unlike FAT, NTFS can take advantage of all of Windows NT’s capabilities. Unfortunately, only the Windows NT operating system can access an NTFS drive, so if you plan to run Windows 98 on the same computer, its usefulness is limited to Windows NT.

If you plan to run Windows NT from its own partition on a dual-boot desktop, you might want to forgo Windows 98 accessibility and choose the NTFS format for its increased performance. As previously mentioned, FAT is best suited to disk drives in the 200 Mbyte to 400 Mbyte range. Beyond that size, NTFS is faster. In addition, FAT cannot handle disk drives larger than 4 Gbytes, while NTFS is good for up to 16 Ebytes (exabytes) — that is one billion gigabytes!

Even if performance is not a prime consideration, you might want to choose NTFS because of its inherent safety. For example, NTFS is capable of sector sparing on Small Computer Serial Interface (SCSI) drives. Should a hard disk sector fail on an NTFS-formatted SCSI drive partition, NTFS will attempt to write the data from RAM to a good sector and then automatically map out the bad sector so that it will not be used again.

NTFS also supports far greater security. For example, an NTFS-formatted disk drive supports both directory level and file level permissions.

Traditional FAT compression utilities, including Microsoft’s DriveSpace and DoubleSpace, cannot be used with NTFS. Windows NT has its own built-in compression capabilities, however.

CONSIDERING FAT

The FAT file system was first used with MS-DOS. FAT is also supported by Windows 98, Windows NT, and IBM’s OS/2. Because it is the most universally supported file system, FAT is used most often.

FAT works most efficiently with small partitions (400 Mbytes or less). It is the file system that must be used with dual-boot computers that host multiple operating systems (if one is to access a partition from all of them).

The following are some advantages and disadvantages to using FAT over the newer NTFS format (discussed next):

- NTFS has higher system disk space overhead (as much as 10 Mbytes as opposed to FAT’s 1 Mbyte). As a result, one cannot run Windows NT from a traditional floppy diskette (e.g., 1.44 Mbyte).
- NTFS takes less time to find and open files on partitions greater than 200 Mbytes.
• NTFS supports maximum file, directory, and partition sizes in excess of 4 Gbytes. FAT does not.
• NTFS offers a higher level of security.
The FAT file system might become corrupted with cross-linked files or orphan clusters in the event of a power loss.

Table 1.3 provides a brief summary of some of both file systems’ characteristics.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>FAT</th>
<th>NTFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. partition size</td>
<td>4 Gbytes</td>
<td>16 Ebytes</td>
</tr>
<tr>
<td>Max. directory size</td>
<td>4 Gbytes</td>
<td>16 Ebytes</td>
</tr>
<tr>
<td>Max. filename length</td>
<td>255</td>
<td>255</td>
</tr>
<tr>
<td>Can use 8.3 convention</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Case sensitive</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Case preserving</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Local security controls</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Transaction log</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sector sparing</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Disk space overhead</td>
<td>1 Mbyte</td>
<td>2–10 Mbytes</td>
</tr>
<tr>
<td>Accessible to MS-DOS</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Accessible to Windows 98</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Accessible to Windows NT</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Accessible to OS/2</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Can be converted</td>
<td>To NTFS</td>
<td>No</td>
</tr>
<tr>
<td>Best efficiency</td>
<td>200–400 Mbytes</td>
<td>400 Mbytes +</td>
</tr>
<tr>
<td>Fragmentation level</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>File compression</td>
<td>With utilities</td>
<td>Built-in</td>
</tr>
</tbody>
</table>

CONSIDERING FAT32

Although the difference is seldom noted in most references, when talking about FAT16 under Windows 98 we are really talking about VFAT. The original FAT was available in MS-DOS through version 6.22, but was superseded with VFAT by the introduction of Windows 95. Among the limitations of the original FAT were filenames of only eight characters plus a three character
extension (the 8.3 convention), no more than 512 files in a root directory, no more than 65,535 files in a non-root directory, and a partition size limit of 2 Gbytes. VFAT is also limited to 512 files in a root directory, but it supports file names of up to 255 characters, unlimited files in a non-root directory, and a partition size limit of 4 Gbytes.

With the introduction of Windows 95 Release B and Windows 98 has come FAT32. This file system has the following advantages over FAT:

- FAT32 is optimized for disk access, allowing programs to open up to 36 percent more quickly, according to Microsoft.
- FAT32 uses a smaller cluster size, resulting in an average of almost 30 percent more disk space, according to Microsoft. For example, FAT uses a 32 Kbyte cluster on drives of 2 Gbytes or greater. That means that if you were to store a 36 Kbyte file on such a drive, two 32 Kbyte clusters would be needed, wasting 28 Kbytes of disk space. FAT32 would use eight 4 Kbyte clusters in the same situation, wasting no space. A comparison of FAT versus FAT32 cluster sizes is provided in Table 1.4.

<table>
<thead>
<tr>
<th>Partition size</th>
<th>FAT32 cluster size</th>
<th>FAT16 cluster size</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 Mbytes</td>
<td>–</td>
<td>2 Kbytes</td>
</tr>
<tr>
<td>128 Mbytes</td>
<td>–</td>
<td>2 Kbytes</td>
</tr>
<tr>
<td>256 Mbytes</td>
<td>–</td>
<td>4 Kbytes</td>
</tr>
<tr>
<td>512 Mbytes</td>
<td>4 Kbytes</td>
<td>8 Kbytes</td>
</tr>
<tr>
<td>1 Gbyte</td>
<td>4 Kbytes</td>
<td>16 Kbytes</td>
</tr>
<tr>
<td>2 Gbytes</td>
<td>4 Kbytes</td>
<td>32 Kbytes</td>
</tr>
<tr>
<td>3–7 Gbytes</td>
<td>4 Kbytes</td>
<td>–</td>
</tr>
<tr>
<td>8–16 Gbytes</td>
<td>8 Kbytes</td>
<td>–</td>
</tr>
<tr>
<td>16–32 Gbytes</td>
<td>16 Kbytes</td>
<td>–</td>
</tr>
<tr>
<td>33 Gbytes or Greater</td>
<td>32 Kbytes</td>
<td>–</td>
</tr>
</tbody>
</table>

Table 1.4 FAT Cluster Sizes
• FAT32 eliminates the need for partitioning large hard disks by allowing a disk drive of up to 2 Tbytes to be formatted as a single disk.
• FAT32 can relocate the root directory and use backup copies of the file system, reducing the risk of crashes.

When formatting a new hard disk, you are asked whether or not to enable “large drive support.” Choosing Yes results in a FAT32 installation, while choosing No installs FAT (VFAT).

FAT32 may allow your program to run faster, but it also has a number of potential problems.

You will not be able to boot with Windows 95, so if for some reason you need to revert, you will need to convert to FAT first. You cannot convert from FAT32 to FAT unless you re-partition and reformat the FAT32 drive. However, Windows 95 OSR2 (Service Release 2), one of the last versions of Windows 95, supported FAT32.

FAT32 does not allow you to dual-boot with any previous versions of Windows (Windows 95 [Version 4.00.950], Windows NT 3.x and 4.0, or Windows 3.x). However, if computers running these operating systems access the Windows 98 computer remotely over the network, they can still gain access to the FAT32 hard drive.

Although most programs are not affected by the conversion from FAT to FAT32, some disk utilities that depend on FAT do not work with FAT32 drives. The system will prompt you if you are running one of these utilities. You can then check with the manufacturer of the disk utility to see if an updated, FAT32-compatible version is available.

Most disk compression software is not compatible with FAT32. If your FAT drive is compressed, you probably will not be able to convert it.

If you convert a removable disk and use it with other operating systems that are not compatible with FAT32, you will not be able to access the disk while you are running the other operating system.

If your computer has a hibernate feature, the conversion might turn this feature off. Your computer’s manual should provide details on this feature.

FAT32 is a much more efficient file system than is FAT16 if it supports a large number of small files. However, if it supports a smaller number of larger files, its efficiency will be reduced and it may be less efficient than FAT.

Neither FAT nor FAT32 provide file-level security like NTFS. If you require this type of security, consider a move to Windows NT.

Table 1.5 provides a summary of some of the FAT file systems’ other characteristics.
FILE SYSTEMS IN MIXED MICROSOFT/NETWARE ENVIRONMENTS

From a Microsoft networking perspective, the file systems you choose are largely irrelevant in terms of remote file access. For example, it is common for a Microsoft network to have client computers running NTFS, FAT, and FAT32. They can easily share files across the network.

In a mixed Microsoft/Novell NetWare environment, one advantage to using NTFS is that it can provide local file and directory permissions that both the Windows NT and NetWare security models supply but which FAT does not support. The inability of FAT, and therefore Windows 98, to provide local file and directory security is less of an issue in networking because access will be performed remotely and will therefore be subject to share security.
CONVERTING TO FAT32

You should plan to install the most advantageous file system for your computers, based on the previously described considerations. All other factors being equal, the determining factor will probably be the size of the computer’s disk drive (see Table 1.4, “FAT Cluster Sizes”). FAT32 does not support partitions smaller than 512 Mbytes, while FAT16 does not support partitions larger than 2 Gbytes. You might want to move to a FAT32 file system if your hard disk is between 2 Gbytes and 2 Tbytes.

In planning for your Windows 98 implementation, it is probably safest to take a cautious approach that ensures the highest possible compatibility with legacy applications by rolling out FAT initially. As your applications are upgraded, you can later switch your computers from a standard FAT file system to FAT32 using the Drive Converter application (see Figure 1.1), which can be installed into the System Tools program group using the Windows 98 Setup program.

Figure 1.1  Using Drive Converter to convert the disk drive to FAT32.

Planning for Workgroups

Under Microsoft networking, Windows computers can reside on the network in either workgroups or domains.

Like a group of people in an office that communicate for the purpose of collaboration, a Windows workgroup is a group of networked computers that share information and resources to perform common tasks. Each computer in the workgroup keeps track of accounts (e.g., names, passwords, and permissions) for all users that might need to use it locally. This works well enough in small network environments, but it can result in a great deal of administrative overhead when the workgroup becomes large.
Both Windows NT Workstation and Windows 98 computers can form workgroups. A Windows NT Server computer can participate in a workgroup if it has been configured as a stand-alone, or member, server. Computers running the now discontinued Windows for Workgroups can also participate in workgroups.

Conceptually, a domain is much the same as a workgroup except that user accounts are kept in a central database instead of on each individual workstation. This database resides on a Windows NT Server computer configured as a domain controller. Administrative overhead is greatly reduced under this model because users log on using one central account to access resources anywhere in the domain, rather than having a separate account for each of those resources.

The workgroup method lends itself best to the peer-to-peer networking model, wherein all computers may act as both servers and clients to each other. The domain method lends itself best to the client-server networking model, wherein one or more computers are dedicated to network services and other computers act solely as clients to them. It is possible to create a client-server workgroup, however, by dedicating one or more workstations as servers or by deploying one or more Windows NT Server computers in a stand-alone server capacity.

In considering workgroups, you should choose among the following planning options:

• **No planning.** If you select this option, users will only be able to share resources by setting up workgroups on their own, or by finding their way into any existing workgroups or domains. When such users enable file and printer sharing on their computers, they will likely associate their computers with a workgroup of their own choosing in the Network Identification dialog box. The result will probably be multiple workgroups visible in the Network Neighborhood, each containing just one computer. Needless to say, this somewhat defeats the point of having a workgroup naming mechanism which is supposed to make locating networked resources logical and less time-consuming.

• **Single workgroup planning.** If you select this option, you take on the responsibility of creating at least an initial structure for a single workgroup that will be home to all of your users’ desktops. In this case, only a single workgroup is seen in the Network Neighborhood, within which all shared resources can be found. This methodology makes it easier for your users to find the resources they need, as they
need only know the computer name of the machine hosting the service rather than the workgroup and service name. To implement this option, simply ensure that each desktop is configured with the same workgroup name (e.g., “Company X”).

• **Multiple workgroup planning.** If you select this option, you take on the responsibility of creating a series of workgroups that will be the logical home to the computers of users who collaborate most frequently. For example, you might create workgroups based on departments or locations. In this way, users will have a smaller listing to wade through when searching for commonly accessed resources than they would if you created a workgroup that contains all the machines within your organization. To implement this option, ensure that each desktop is configured with the workgroup name that is the same as its peer machines (e.g., “Accounting,” “2nd Floor,” “Building 6”).

• **Integration.** You would consider this option if you are adding Windows 98 desktops to an existing workgroup, domain, or NetWare structure.

**WORKGROUPS IN MIXED MICROSOFT/NETWARE ENVIRONMENTS**

If you have the choice of creating a workgroup or integrating your desktops with a pre-existing domain or NetWare network, you might wish to consider which security methodology is most appropriate for your needs in making your decision.

Security under the workgroup model is applied to whatever a given computer is sharing on the network, and is referred to as *share-level security*. Under this system, resource passwords are used rather than user account authentication.

Security under the domain model involves the authentication of user accounts with a centralized server. The resources a given user may access is determined by the access permissions granted to that user throughout the network, or more commonly, to the permissions granted to the groups to which the user belongs. This model is referred to as *user-level security*.

In planning for the implementation of a Windows workgroup, you should pay particular attention to the name you choose. From a true security perspective, Windows 98 computers are only capable of forming workgroups. This is because only Windows NT computers can have computer accounts in a domain. However, if you use the same name for your Windows 98 workgroup that is used by an existing network domain, the workgroup will be able to share the domain's list of resources. As far as users are concerned, their computers will appear to have joined the domain and they will
be able to view the domain’s servers as soon as they open the Network Neighborhood.

If you choose a workgroup name that differs from an existing domain, users will only see their peer Windows 98 computers when they open the Network Neighborhood. This will make the list of peer resources appear more quickly, but it will require greater effort when users wish to navigate to domain-based resources that appear in the Network Neighborhood beyond their workgroups.

It is useful to create a plan for multiple installations of Windows 98, which can then be used to configure network workgroups. Determine the number of computers from which you want to share resources. Document the specific configuration and use of each computer that will have Windows 98 installed, as well as any problems or inefficiencies with the systems. If you are going to install on only a few computers, you can perform all the installations with the Windows 98 CD-ROM locally. However, if you are installing on several computers, you might want to install over the network.

You might also wish to deploy system policies during installation, as described later on in this chapter. You can customize policies by workgroups, or you can maintain individual settings for users and computers. If you choose to deploy system policies by workgroup, you might wish to use workgroup naming schemes that correspond to capabilities or restrictions enabled through system policies. For example, you might have a “public” workgroup whose computers have access the Internet and an “Intranet” workgroup whose computers have no access beyond the local LAN.

Typically, network administrators apply system policies by groups. Group policies make it possible to add specific restrictions to Windows NT Directory Services (NTDS) global groups or NetWare groups.

When a Windows 98 user logs onto a mixed Microsoft and NetWare network, the operating system searches for a policy file that relates to the primary network logon. When using Microsoft’s Client for NetWare Networks, this file can be found in the SYS:PUBLIC directory on the preferred NetWare server. To use group policies on a NetWare network, at least one NetWare 4.1 server must be running in bindery emulation mode. Also, the group and all users in the group must be in the bindery context for that server.

You can add a group through the Network Control Panel application. First, select the Add button, then choose Novell from the Manufacturers pane and one of the NetWare versions from the Network Clients pane of the Add dialog box. Next, you may add the appropriate group. If you already have a group established, select that group. Otherwise, navigate to and select
the users that you want to include in a group. You should be able to select users from across the network.

You might wish to set specific policies for those groups as well, especially if you do not want those users to access certain files or change settings on the server (or even on their own computers).

**Study Break**

Create an Implementation Plan

Practice what you have learned by creating an implementation plan for Windows 98. First, identify which of your organization’s computers are appropriate for Windows 98 installations, and which—if any—are better suited to another operating system, such as Windows NT. You will need to consider the hardware capabilities of target computers in making this decision, for you might find that some do not meet Windows 98’s minimum requirements. Next, consider the file system that should be used for target computers. Computers running in dual-boot capacity with other operating systems or which host legacy applications should use FAT, while others will benefit from using FAT32. Finally, determine whether or not your target computers will form their own workgroup, or whether or not they will be integrated with an existing Windows NT domain or NetWare context. Also make note of any network services that various computers need to offer, such as attached printers or shared directories.

**Selecting a Security Strategy**

Security encompasses the level of access control applied both locally and on the network. It includes such items as system policies, which override user and group policies, and file and printer sharing.

Multiple levels of security are built into Windows 98. They include the security of the computer itself, the resources (directories, drivers, CD-ROMs) that are shared on the network in a peer-to-peer manner, and the file server. Basic security implementations include:

- **Unified logon process.** Users can enter a single user name and password to log on to all configured network clients and the operating system from a single authentication dialog box.

- **Windows 98 logon security.** A system policy prevents users from easily logging onto Windows 98 if their Windows NT logon or NetWare logon is not validated when the desktop is used in conjunction with a central security provider, such as a domain controller or NetWare server. (However, the user can still break in by rebooting and then
accessing the Windows 98 boot menu, using a Windows 98 Startup disk, or bypassing the logon prompt by using the Cancel button).

- **Share-level security.** This control-level security lets you assign passwords to shared resources on the computer, such as directories or printers.

- **User-level security.** This control-level security lets you base access to shared resources on a user accounts list stored on either Windows NT Server or a NetWare server. Pass-through security passes the authentication requests to either Window NT or NetWare, so the Windows 98 computer does not have to implement its own user-level security scheme (see Figure 1.2).

- **Password caching.** This mechanism is used for saving passwords when connecting to a password-protected resource. As you access a password-protected resource for the first time, you are given the option of saving a password in your passwords list. The Password List (PWL) file is encrypted and stored in the WINdOWS directory.

![Figure 1.2 Setting user-level access control.](image)

**SETTING UP SYSTEM POLICIES**

By using *system policies*, you can restrict user access to the hardware and environment settings of the Windows 98 computer. These policies can be implemented as default computer settings for all computers in a workgroup, or as specific to individual computers. System policies containing your preferred configuration settings can be created using the System Policy Editor application.
You can assign computer policies to specific desktops by using the computer’s name. Otherwise, the default configuration is used when users log onto a computer that does not have individual policies assigned.

Computer policies are applied after user settings are copied to the workstation’s Registry. If a computer policy exists that matches the computer name, the policy file is downloaded and copied into the SYSTEM.DAT file section of the Registry. If a specific policy file does not exist for the computer, then default computer policies are copied into the SYSTEM.DAT section of the Registry.

**DEFINING SYSTEM POLICIES** • System policies can be used to allow administrators to centrally manage desktop computers from across the network. System policy files can be downloaded from Windows NT or NetWare servers to which Windows 98 acts as a client.

A system policy is a collection of settings that overwrite the current user and local machine areas of the Registry. System policies are defined in a policy file (usually CONFIG.POL). System Policy Editor modifies only a subset of keys in the Registry, while the Registry Editor (REGEDIT.EXE) application allows access to the entire Registry.

A policy file may contain default user settings, default computer settings, settings for specific users, settings for defined groups, and settings for specific computers. System policies allow you to customize parts of the Desktop, configure network settings, restrict what users can do from the Desktop, limit user access to certain applications, and restrict user access to options in the Control Panel program group.

System policy entries can be used to override the following Registry settings:

- **Desktop settings.** These settings are used to modify the HKEY_CURRENT_USER key in the Registry, which defines the content of the USER.DAT file. Using these settings, you can define policy settings that affect the USER.DAT information for a specific user, group, or the default user.

- **Network access settings.** These settings are used to modify the HKEY_LOCAL_MACHINE key, which defines the contents of the SYSTEM.DAT file. Using these settings, you can define policy settings that affect the SYSTEM.DAT information for a specific computer or make a default configuration for all computers.

Normally, when a user logs on, the computer searches for a user policy first. If it does not find one, it searches for a group policy. If it finds more than one, it uses the least restrictive one.
Next, the computer searches for a computer policy that matches the computer name. It will apply these computer-specific policies to the Registry if it finds one. Otherwise, it will apply the default computer policies.

**PLANNING FOR SYSTEM POLICY CREATION** • In order to create and implement system policies, you must first install some software. The administrative tool System Policy Editor (Poledit.exe) is not automatically included when you install Windows 98, so you will have to install it manually. You will also need to have group policy support (Grouppol.dll) for each computer used to create group policies as well as each computer to which those policies will apply.

**PLANNING FOR SYSTEM POLICY FILE INSTALLATION** • To install System Policy Editor, open the Add/Remove Programs application in the Control Panel program group and switch to the Windows Setup tab. Next, press the Have Disk button. On the Windows 98 installation CD-ROM, locate the System Policy Editor (POLEDIT) directory. In the Copy Manufacturer’s Files From dialog box, type the drive letter and path in the following format:

D:\tools\reskit\netadmin\poledit

In the Have Disk dialog box, select the System Policy Editor check box and press the Install button. Installation of System Policy Editor adds a shortcut to the System Tools program group.

You can also install group policy support (GROUPPOL.DLL) through the System Tools category under the Windows Setup tab of the Add/Remove Programs utility. Group policies require a central security server, such as a Windows NT domain controller or a NetWare server. Group policies apply only to existing Windows NT global groups or Novell NetWare groups. You cannot create new groups with System Policy Editor.

Computers without Grouppol.dll installed do not process group policies. However, you can still use the same CONFIG.POL file for all computers. The computers that do not support group policies will simply disregard that section of the policy file.

**USING SYSTEM POLICIES IN MIXED MICROSOFT/NETWARE ENVIRONMENTS** • Once you have created a system policy file, you must save it to the correct location. Planning for this depends on the type of network you employ. In a NetWare environment, for example, you save it to SYS:PUBLIC directory on the Net-
Ware server. In a domain, it is stored in the Netlogon share of the domain controller.

In a mixed Microsoft/NetWare environment, as with a standalone Windows 98 computer, you can use the Manual Update option in the Remote Update utility to specify the name and location of the system policy file. Manual Update applies different policy files to groups of users in order to distribute the administration of system policies.

WORKING WITH USER PROFILES

Unless otherwise configured, all Windows 98 users are assigned the default user profile. If multiple users use the same Windows 98 computer, they can have their own user-specific configuration information stored in a unique user profile. When such a user profile is created, the user-specific information is stored in a hidden \PROFILES folder in the \WINDOWS folder.

Under the Registry, user profiles are stored in the HKEY_USERS keys. When a user logs on, the USER.DAT file is opened and the entries for that user are copied to the HKEY_CURRENT_USER keys in the Registry. When a user logs off, the changes are saved to the USER.DAT file.

A user profile establishes certain desktop parameters, such as wallpaper, screen saver, shortcuts to applications and utilities, history of Web pages visited, and folders in the Start menu. By default, each user in the All Users group will have the same preferences and Desktop settings. Alternately, you can change this by enabling user profiles through the Passwords Control Panel application, as shown in Figure 1.3.

![Figure 1.3 Enabling the use of User Profiles.](image)
Here you can also disable user profiles by choosing the All users of this computer use the same preferences and desktop settings radio button.

Depending on the options you choose, Windows 98 will create a default profile that contains the settings in use at the time of its creation. When a user logs on, he can choose to save settings, at which time Windows 98 will create a user profile for the specified user name.

You can also enable user profiles through the Users application in the Control Panel program group. Here you can also modify user profiles.

**Disabling User Profiles** • You may want to disable user profiles so that every user applies the default user profile settings (see Figure 1.3, “Enabling the use of User Profiles”). If you do, users will still be allowed to change their settings and configurations during a session, but the setting changes are not saved.

User profiles can also be configured to permit network users to access the same user profiles no matter the Windows 98 computer from which they log on. These are referred to as *roaming* user profiles. On Windows NT servers, such a profile is stored in the home directory. On NetWare 3.x networks, the profile is stored in the SYS:\MAIL\<user_id> directory. On NetWare 4.x servers, mail directories are not available, so the Microsoft Service for NetWare Directory Services uses the home directory.

**Mandatory User Profiles** • If you do not want users to customize their user profile settings, you can use *mandatory* user profile. When such a user logs on, he can change the settings on his computer, but when the user logs off, the changes are not copied to the server.

You may use mandatory user profiles instead of system policies. A mandatory user profile does not establish computer-specific settings, however. It establishes only user-specific settings. In addition, while you can specify particular user settings to control within system policies, mandatory user profiles affect every user-specific setting.

**Setting up File and Printer Sharing**

In order to implement file and print sharing under Windows 98, you must have the File and Printer Sharing for Microsoft Networks service and Client
for Microsoft Networks service installed. These can be added via the Net-
work Control Panel application, as shown in Figure 1.4.

Client for Microsoft Networks is a 32-bit, protected-mode network cli-
ent for Windows 98 that provides network support for communicating with
other Microsoft operating systems, including Windows NT, Windows 95,
Windows for Workgroups, Workgroup Add-on for MS-DOS, and LAN Man-
ger. Client for Microsoft Networks can use NetBEUI, IPX/SPX-Compatible
Transport, and TCP/IP network protocols.

If the Setup program detects your network adapter during installation,
the program will install Client for Microsoft Networks by default.

Enabling File and Printer Sharing • You may enable file and printer shar-
ing under the Configuration tab in the Network Control Panel application.
Here, press the File and Print Sharing button and enable the check boxes in
the File and Print Sharing dialog box, as shown in Figure 1.5.

You cannot install File and Printer Sharing for Microsoft Networks if
another sharing service is already installed, such as File and Printer
Sharing for NetWare Networks. Only one file and print sharing service
can be installed at any time.
File and Print sharing for Microsoft Networks is based on the Server Message Block (SMB) protocol. It is compatible with other SMB network operating clients, such as Windows NT, Windows 95, Windows for Workgroups, LAN Manager, IBM LAN Server, and DEC Pathworks.

Sharing Resources • After you install the File and Printer Sharing for Microsoft Networks service, you can share the computer’s resources with other Windows 98 computers in peer-to-peer relationships, or on a Windows NT network. You must first address the issue of security, however. You can assign user-level access, in which case you specify certain users and give them access rights. Alternately, you can assign share-level access, in which case you assign a password to the resource and any user who supplies the password gains access.

Sharing Resources in Mixed Microsoft/NetWare Environments • Windows 98 can be integrated with NetWare version 3.x. These versions of NetWare use a database called the bindery to organize network objects such as users, groups, and print queues. Every server has a bindery, which it does not share with other servers.

Windows 98 also works with NetWare 4.x servers that emulate the bindery. Windows 98 further supports NetWare Directory Services (NDS) with NetWare 4.x, which implements a network-wide, hierarchical directory structure for network objects called a tree. All NetWare 4.x servers on a network can share one tree.

Using File and Printer Sharing for NetWare Networks to share resources is similar to using File and Printer Sharing for Microsoft Networks, with some exceptions. First, you must apply user-level access control. Because there is no option for share-level access control, a NetWare server must act as a security provider. Second, The World account allows access only to users who have an account on the security provider. This differs from File and Printer Sharing for Microsoft Networks, which allows access to unknown users through The World account.

When a user logs onto the server, he must use pass-through authentication to have a Windows NT or NetWare server authenticate his log on. You can use this user-level security to provide security for a variety of services such as network management, backup agents, and Dial-Up Networking.
Study Break

Create a Security Strategy

Practice what you have learned by creating a security strategy for networked computers. First, determine whether you will create specific system policies or rely on default policies. Also decide whether you will employ user profiles specific to each user or if you will use only default policies. Also decide whether or not your users will require roaming or mandatory user profiles. Finally, decide whether or not to enable file and printer sharing. If you choose to, decide whether to employ user-level security with pass-through authentication in conjunction with a server, or share-level security.

MCSE 1.2 Installing Windows 98

This section covers the installation and configuration of the Windows 98. It includes various methods of installation, as well as uninstalling and setting up dual-boot operating systems on separate partitions.

Preparing for Installation

Some of the activities that can be performed ahead of time to ensure that the Windows 98 installation goes smoothly include the following:

- **Make sure that your hardware is supported.** The Microsoft Hardware Compatibility List (HCL) details the computer hardware that is supported by Windows 98. You can access the list from the Microsoft Web site. Newer computer hardware might not appear on the list. If in doubt, check with the manufacturer.
- **Make sure that your hardware meets minimum requirements.** One design goal for Windows 98 was to have it run on computers capable of running Windows 95. In reality, the minimum hardware requirements are higher.
- **Back up your data.** Always back up your files, especially your important document files, before performing any significant installation. You should also back up the system files from a prior operating system if you are upgrading to Windows 98.
- **Disable TSRs and virus checkers.** Terminate-and-Stay-Resident (TSR) programs and anti-virus applications are loaded from CON-
FIG.SYS, AUTOEXEC.BAT, WIN.INI, and the StartUp program group within Windows. These programs should all be disabled.

- **Remove unused programs.** Unused applications can sometimes sit idle on the hard drive, taking up valuable space. Deleting these will help ensure that you do not run into an insufficient disk space message during installation.

- **Scan and defragment the hard drive.** The ScanDisk utility can be used to do a quick check of the integrity of the hard disk on which Windows 98 will be installed. The Defrag utility is useful for defragmenting the hard drive.

- **Back up critical file systems.** System files and their extensions that should be backed up include initialization (.INI), Program Manager Group (.GRP), Registry (.DAT), and password (.PWL) files in the \WINDOWS directory. Also include the CONFIG.SYS and AUTOEXEC.BAT files in the root directory, and any critical hardware drivers, support programs, and batch files listed in them. Finally, include network configuration (NET.CFG) files.

**SETUP INFORMATION**

At least three pieces of information are needed for a successful Windows 98 installation.

**DEFAULT USER NAME** • This is the name of the initial user defined on the Windows 98 computer when the operating system was first launched. User names are limited to 15 characters (with no spaces) and can contain any of these special characters:

! @ # $ % ^ & ( ) - _ ` { } í .

This name should be unique and should correspond to your network’s conventions for user names in either the Windows NT domain environment or the NetWare bindery/NDS environment, especially when employing user-level access control. When you are installing Windows 98 as a stand-alone machine, or in a peer-to-peer environment, the user name is not as critical.

**COMPUTER NAME** • This is the computer name as it will be known on the network. Computer names are also limited to 15 characters, with no embedded spaces, and can contain any of the same characters listed previously.

You can also have an optional computer description of up to 48 characters, which enables other information to be shared throughout the network and seen in the Network Neighborhood, such as the purpose of the desktop
(e.g., “production computer”), special resources it supports (e.g., “database,” “color printer,” “etc.”), or its location (e.g., “Timbuktu office”).

**Workgroup Name** • This name refers to the logical grouping of computers with which the Windows 98 computer most often connects. The workgroup names also are limited to 15 characters, with no spaces, and can include the same special characters.

If you need more help with these issues, the Windows 98 CD-ROM provides a SETUP.TXT file that can be useful, as shown in Figure 1.6.

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**Installing or Upgrading the Operating System**

Two versions of Windows 98 are available: a full version and an upgrade version. The full version is intended for computers that do not already have an operating system, or for installation onto a hard drive that is unpartitioned and unformatted. The upgrade version is used when the computer already contains a copy of MS-DOS in combination with a prior version of Windows—most likely Windows 95—or a copy of OS/2.

The Windows 98 upgrade program checks for Windows 3.0 or later and OS/2 2.0 or later. If you are trying to upgrade Windows 98 from an MS-DOS-only machine, Setup will stop if it does not find a qualifying upgrade product already installed. The Windows 98 Setup program checks for certain files to determine whether the current installation is an upgrade from Windows 3.x. These files are WINVWER.EXE, USER.EXE, WIN.COM, SY-
Chapter 1 • Planning for and Installing Windows 98

TEM.INI, WIN.INI, and PROTOCOL.INI (Windows for Workgroups 3.x). This check includes version information. False files with the same names will not be accepted.

You can install Windows 98 from the CD-ROM, floppy disks, or across the network. Local CD-ROM or floppy disk installations are efficient enough where only a few desktops are involved, but you will probably save time in upgrading multiple desktops by using a networked installation that can run on numerous computers simultaneously.

Whether you are upgrading or installing anew, the Windows 98 installation is performed through the Setup program, which is usually run from within Windows but can also be launched from MS-DOS.

UPGRADING USING AN EXISTING WINDOWS DIRECTORY

If you choose to install into an existing \WINDOWS directory, the Windows 98 Setup program uses any existing configuration settings to configure Windows 98. This includes configuration settings in SYSTEM.INI, WIN.INI, and PROTOCOL.INI files, plus file associations from Windows 3.x. These configuration settings are moved into the Windows 98 Registry. Windows 3.x Program Manager groups are also converted into folders in the Programs folder (directory), which enables them to be displayed from the Windows 98 Start menu from the Programs command.

AUTOMATING WINDOWS SETUPS

Automated Windows setups permit administrators to install multiple copies of Windows 98 across numerous desktops in a uniform matter without significant intervention from them or their users. This saves time and reduces the likelihood of installation problems due to human error.

PUSH INSTALLATION • A push installation sends an automated setup of Windows 98 from a network server to the client workstation. The network administrator initiates the push installation. Windows 98 does not come with a push installation tool, but the Microsoft System Management Server (SMS) add-on to Windows NT Server can perform such installations.

Because a push installation sends the installation files over the network, its efficiency is dependent on the inherent speed of the network and the level of network utilization. If there is significant network traffic, the installation could take a lot more time than installing locally would. In most cases, however, this method should be more efficient than individual installations.

PULL INSTALLATION • A pull installation can also make multiple installations easier, although it does require more people doing the work. In a pull instal-
lation, users actively request data from the server. You need to copy the Windows 98 source files to a server and allow users to access them. Thereafter, this process allows users at client computers to install Windows 98 at their convenience. It also gives the administrator less control over the process, however.

**WORKING WITH BATCH** • An automated Windows setup can include a batch script file to automate much, if not all, of the Windows 98 setup process. A batch script file is used in conjunction with a CD-ROM, local hard drive, or a network-based setup to supply information that is usually entered manually at prompts, such as product ID, owner name, IP address, and time zone. This is particularly useful for multiple installations of Windows 98 which all require the same basic configuration parameters.

The Microsoft Batch 98 program makes it easy to create setup scripts. You can run BATCH.EXE and select certain options to create a file in .INF format that will run Windows 98 Setup with little user input. The program can also be used to save time by scanning a prototype computer’s Registry and storing its settings in the .INF file.

To install BATCH.EXE, you should first install Windows 98 on a computer that will be your prototype for all machines, then configure the options that you want to include for each batch installation. From the installation CD-ROM, you can then install Batch with a Run dialog box command in the following format (where “D:” is the CD-ROM drive):

```
D:\tools\reskit\batch\setup.exe
```

The Microsoft Batch 98 icon will appear in the Programs program group in the Start menu. Launch it to create a batch file for use in other Windows 98 installations that is based on the configuration of the prototype computer.

How you run Batch will depend on whether you are starting from a “clean” computer (no software or applications installed), or one that has already been in use. If you are running Batch on a clean computer, you can simply press the Gather Now button to collect the current Registry settings (see Figure 1.7). If you are running Batch on a previously configured com-
puter, you will need to select only the system settings that you want to include in the batch file installation.

To create the batch file, choose the Save Settings to INF command, then either accept the default file name that appears in the Save As dialog box (e.g., "MSBATCH.INF"), or type in a new name.

After you create the setup script, you can launch Windows 98 Setup by specifying a command-line parameter to the script name. Depending on which options you selected in creating the batch file, you might not need to provide any additional input for installation.

To install Windows 98 from a CD-ROM with a batch script, first copy the batch file to a floppy diskette. Insert the floppy diskette and Windows 98 installation CD-ROM on the target computer. Next, issue a command in the following format (where “D:” is the CD-ROM drive and “a:” is the floppy disk drive):

```
D:\win98\setup.exe a:\msbatch.inf
```

Once you have installed Batch onto a designated server, you should remove the computer name from the batch file and create multiple machine names in order to perform a pull installation. To remove the computer name, press the General Setup Options button and select the User Info tab, as shown in Figure 1.8. Here, delete the text in the Computer Name field, and

![Figure 1.7 Gathering settings in Batch.](image)
any other user-centric information, and choose the Save Settings to INF option.

![Figure 1.8 Deleting user-centric information.](image)

In addition to those that can be specified using Batch, you can add other services and components to be included with your automated installation during setup by running the INF Installer tool, installed from the `\TOOLS\RESKIT\INFINST` sub-directory on the Windows 98 installation CD-ROM. Under Windows 98, software components typically include an .INF file that scripts the installation procedure for that component. INF Installer edits the CUSTOM.INF file created by the Batch application to include additional installation directions. INF Installer also adds an entry to the Optional Components section of CUSTOM.INF when you add an application, or modifies the Service entry to the Network section when you add a network service.

The NETSETUP utility was required for installing Windows 95 over a network. Windows 98, however, only requires the source installation files and the .INF file created using the Batch utility.
LAUNCHING SETUP FROM MS-DOS OR WINDOWS

The Windows 98 Setup program can be run from either an MS-DOS command prompt or from within Windows 95 (or 3.x). If a previous version of Windows is on the computer, the Windows 98 Setup program offers to install itself into the same directory, upgrading the existing operating system. If you choose to install into the same directory, the configuration settings in SYSTEM.INI and WIN.INI, and any file associations from the Windows 95 Registry, are moved into the Windows 98 Registry.

If you want Windows 98 to retain the same settings already established in Windows 95, run the Setup program from the Windows 95 GUI. If, however, you wish to configure Windows 98 with new settings, you should launch the setup program (SETUP.EXE) from the command prompt.

INSTALLING WINDOWS 98 AS A NEW INSTALLATION

You can choose to perform a new installation of Windows 98 even if you have Windows 95 already on your computer. If you do, Setup installs Windows 98 in a new directory and does not transfer any existing settings from the old operating system. Windows 98 then becomes your default operating system and uses standard system settings.

Because this creates an entirely new installation of Windows, you will need to re-install any existing programs you want to use with it. At the same time, however, you will not have moved any previously installed and problematic settings and software from your old operating system to your new one. In short, you are given a fresh start with Windows 98.

NEW INSTALLATION FROM CD-ROM • To install Windows 98 as a new installation from the CD-ROM, you must start by inserting the Windows 98 Setup floppy diskette into the disk drive. Next, reboot the computer from the floppy diskette and perform the following steps:

1. Insert the installation CD-ROM when the Windows 98 menu appears. Type “1,” then press Enter to proceed.
2. When the MS-DOS prompt appears, type “setup,” then press Enter.
3. Setup will perform a verification and ScanDisk will check your disk drive for errors. When ScanDisk is done, type “x,” then press Enter.

After Setup initializes, the installation will begin.

NEW INSTALLATION FROM FLOPPY DISKETTES • To install Windows 98 as a new installation from the floppy diskettes, insert Setup Disk 1 and reboot the computer from the diskette. At the MS-DOS prompt, type “setup.” After you press Enter, the Windows 98 Setup Wizard will launch.
Installing Windows 98

INSTALLING FROM MS-DOS • If Setup fails, or if you want to customize some configurations, you will have to install Windows 98 from MS-DOS. The process is similar. Insert the installation media and use the “setup” command at the command prompt. ScanDisk will run. If it finds any errors, you should run it again to scan for any surface errors on the disk. Next, Setup checks the Registry for corrupt data and repairs it if necessary. If repair is not successful, however, you will be instructed to install Windows 98 into a different directory.

UPGRADING TO WINDOWS 98

If you are upgrading from Windows 95 or from Windows 3.1, Windows will retain the system settings and file programs from the previous operating system.

BACKING UP WINDOWS FILES • Because errors can occur during setup, it is always wise back up your files before beginning an upgrade from a previous version of Windows. This can be done in both Windows 3.1 and Windows 95 using the Backup application.

Once you have installed Windows 98, you can use its new version of Backup to back up and restore files using read/write CD-ROMs, floppy diskettes, Digital Audio Tape (DAT) drives, or other removable media devices like the Iomega Zip drive. Backup can restore backups created using the Windows 95 Backup program. It cannot, however, restore backups created with the Backup utility used in MS-DOS 6.x or earlier.

The Windows 98 Backup program can be installed via the Add/Remove Programs Control Panel application, as shown in Figure 1.9. Be sure to
include this utility in your Windows 98 installation if you have backed up data files that will need to be restored.

**STARTING THE UPGRADE FROM WINDOWS 95** • Before attempting to install Windows 98 from a computer running Windows 95, close all programs, especially any anti-virus applications. Next, launch the Setup application from the command line for a floppy diskette or network installation. If you are installing from a CD-ROM, the Autorun screen shown in Figure 1.10 is displayed automatically and a dialog box prompts you to upgrade the operating system.

**Figure 1.9** Installing Backup for Windows 98.

**Figure 1.10** Windows 98 CD-ROM installation screen.
When the Windows 98 Setup Wizard begins, simply follow its instructions. It will perform the following steps:

1. Prepare to run Windows 98 Setup.
2. Collect information about the computer.
3. Copy Windows 98 files to the computer.
4. Restart the computer.
5. Set up hardware and finalize operating system settings.

If ScanDisk does not run properly, you can restart in MS-DOS mode launch Setup again from the command line.

When the Setup Wizard asks if you want to save your existing MS-DOS and Windows 95 files, it is wisest to select Yes (assuming sufficient disk space is available). You then have the option of uninstalling Windows 98 and reverting to the older operating system if Windows 98 is found to be problematic.

Eventually, Windows 98 will ask you to select a country for Internet Channels, an Internet Explorer feature integrated with Windows 98. This feature may be disabled later, if you like.

You will also be prompted to create an Emergency Startup Disk. It is wise to select Yes here, as this feature can help you recover from severe system problems should they occur later.

**STARTING THE UPGRADE FROM WINDOWS 3.X •** It is worth noting that a computer still running Windows 3.x might not be powerful enough to run Windows 98 effectively. You might consider purchasing a new computer if yours barely meets the minimum requirements for Windows 98.

Before launching Setup, close all open programs. (If Setup detects a program that you forget to close, you can press Alt-Tab to identify and then close it). You can invoke setup by typing its path (e.g., D:\SETUP) in Program Manager’s Run dialog box.

Some upgrades require special circumstances, as shown in Table 1.5.

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Upgrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-DOS (3.2 or greater)</td>
<td>You should install from within Windows if 3.1x or Windows for Workgroups 3.x is on the computer</td>
</tr>
<tr>
<td>Windows 3.0</td>
<td>You must install from MS-DOS</td>
</tr>
<tr>
<td>OS/2 (2.x or greater)</td>
<td>You must install from MS-DOS</td>
</tr>
</tbody>
</table>
The Windows 98 Setup program deletes some of the old DOS files, replaces the compression programs such as DBLSPACE or DRVSPACE with Windows 98 versions, and renames the boot files. Some of the old DOS files are deleted only if you install Windows 98 into the existing \WINDOWS directory.

**COMPLETING SETUP** • After about 45 minutes of installation time, the computer will reboot. The initial boot-up of Windows 98 is called the *First-Time Run*. Windows 98 will prompt you to log on at this point. It then establishes its hardware configurations and recognizes any Plug-and-Play devices. Finally, Windows 98 gives you several options for configuration. These run-once options are as follows:

- **Control Panel configuration.** Lets you set up the Control Panel program group icons and programs.
- **Start menu configuration.** Builds the Start menu shortcuts and converts old Program Manager groups into folders and menu selections.
- **Help file configuration.** Builds the Help File index for search capability.
- **MS-DOS program settings.** Creates the default MS-DOS prompt shortcut.
- **Time zone configuration.** Asks you to select the time zone appropriate to your location, and decide whether or not the clock should automatically make adjustments for Daylight Savings Time.
- **Printer configuration.** Lets you launch the Printer Wizard to define either a local or a network printer.

Depending on the options you selected during Setup, the computer’s configuration, and the hardware devices it has, additional run-once options might need to be completed. When upgrading, Windows 98 retains as much of the existing configuration as possible.

**Uninstalling Windows 98**

If you upgrade from Windows 95, you are presented with an option to Save System Files. This saves the existing MS-DOS and Windows-based system files and enables you to uninstall Windows 98 if necessary, such as in the event that mission-critical applications do not run properly.

To restore Windows 95 from Windows 98, switch to the Install/Uninstall tab of the Add/Remove Programs utility. Here you can select Uninstall Windows 98, as shown in Figure 1.11. The system runs ScanDisk, and then
restarts in MS-DOS mode before proceeding. Any changes you made in Windows 98 will be lost.

Figure 1.11  Uninstalling Windows 98.

This option is only available when you upgrade from Windows 95 to Windows 98, not when you setup Windows 98 as a new installation or to dual-boot with another operating system.

Restoring Windows 3.x requires manually uninstalling Windows 98, re-installing MS-DOS, and then re-installing Windows 3.x. This is a lot of work, so be sure that your mission-critical applications will function properly before upgrading from Windows 3.x to Windows 98.

If you think there might be a chance that you will have to revert to an earlier operating system (e.g., MS-DOS, Windows 3.x, Windows 95) that you left on the hard disk for use in a dual-boot capacity, you should create a startup disk from the older operating system before you install Windows 98. You can then remove Windows 98, boot from the startup disk, and use the following command to transfer the basic operating system boot files to the hard drive (where “C:” is the primary partition):

SYS C:

Uninstalling Windows 98 from a desktop on which it was installed in a dual-boot capacity with Windows NT does not pose a problem, because Windows NT’s boot files are unaffected.
Installing for Dual Boot

Dual-boot is a generic term for having multiple operating systems on the computer at the same time and using a menu system front-end to select the operating systems with which to boot the computer.

To set up a dual-boot configuration, you can install Windows 98 in the usual way and then edit the BOOT.INI text file (if necessary). This file, which is created automatically during Setup at the root of your computer’s hard disk, contains all the system startup information. The Setup program will usually modify it automatically for dual operating system computers. (Manual configuration of this file will be described later in this book).

You can choose to install Windows 98 in dual-boot mode with several existing operating systems, as shown in Table 1.6.

Table 1.6 Installing Windows 98 with a Pre-existing Operating System

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Upgrade to Windows 98</th>
<th>Dual-boot</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-DOS (3.2 or greater)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Novell DR.DOS</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>PC-DOS</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows 95</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows 3.x</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows for Workgroups 3.x</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Windows NT</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>OS/2 (2.x or greater)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Some dual-boots require special circumstances, as shown in Table 1.7.

Table 1.7 Special Circumstances for Dual-Boots

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Dual-boot</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-DOS (3.2 or greater)</td>
<td>You must install MS-DOS 5.x or 6.x</td>
</tr>
<tr>
<td>PC-DOS</td>
<td>You must install to a different directory with version 5.x or 6.x of MS-DOS or PC-DOS</td>
</tr>
<tr>
<td>Windows 3.1x</td>
<td>You must install to a different directory with version 5.x or 6.x of MS-DOS or PC-DOS</td>
</tr>
<tr>
<td>Windows for Workgroups 3.x</td>
<td>You must install to a different directory with version 5.x or 6.x of MS-DOS or PC-DOS</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RUNNING WINDOWS 98 LOCALLY VERSUS FROM A SERVER

You can choose to run Windows 98 from the local hard disk, or run a shared copy from a network file server. If you plan to permit the installation and running of a shared copy of Windows 98 from the file server, you can configure it in one of three ways:

• It can run on a computer that has a local disk drive, with system files stored on and running from the file server.
• It can run on a computer that only has a floppy disk drive and boots from the floppy diskette, with system files stored on and running from the file server.
• It can run from a NetWare file server that supports workstations without disk drives and with a StartUp disk image.

Table 1.7 Special Circumstances for Dual-Boots (continued)

<table>
<thead>
<tr>
<th>Windows NT</th>
<th>MS-DOS must already be installed, and Windows 98 must be installed to a different directory within a FAT partition</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS/2 (2.x or greater)</td>
<td>MS-DOS must already be installed, and Windows 98 must be installed to a different directory within a FAT partition.</td>
</tr>
</tbody>
</table>

RUNNING WINDOWS 98 LOCALLY VERSUS FROM A SERVER

You can choose to run Windows 98 from the local hard disk, or run a shared copy from a network file server. If you plan to permit the installation and running of a shared copy of Windows 98 from the file server, you can configure it in one of three ways:

• It can run on a computer that has a local disk drive, with system files stored on and running from the file server.
• It can run on a computer that only has a floppy disk drive and boots from the floppy diskette, with system files stored on and running from the file server.
• It can run from a NetWare file server that supports workstations without disk drives and with a StartUp disk image.

Study Break

Install Windows 98

Practice what you have learned by installing Windows 98. For your first installation, select a computer that is typical of the types of desktops you will encounter throughout your organization in terms of hardware and software configurations. First, determine whether or not you will upgrade from a previous operating systems, or install anew. If you will upgrade, decide whether or not to replace the existing operating system, if possible, or make the previous operating system available through dual-boot. Back up important files before installing Windows 98. While installing, note the occurrence and solution of any problems that arise and which might reoccur in other installations.

MCSE 1.3 Configuring Windows 98 Server Components

Among the add-on components that can be used to extend the capabilities of Windows 98 are Personal Web Server, which allows users to create and main-
tain a Web site, and Dial-Up Networking, which allows users to share resources with other computers over telephone connections.

**Working with Personal Web Server**

The Personal Web Server add-on to Windows 98 transmits files using the TCP/IP-based HyperText Transfer Protocol (HTTP). With it, users can publish Web pages on the Internet or your corporate intranet. Its features include the following:

- Some pre-written HTML documents, including a home page, guest book, and drop box.
- Support for Visual Basic Scripting (VBScript), a Microsoft language used to create Active Server Pages (ASP) applications.
- Support for JScript, another language used to create interactive Web applications.

Personal Web Server is a scaled down version of the more robust Internet Information Server (IIS) that runs on Windows NT Server. Among the features present in IIS but not available in Personal Web Server are the following:

- The ability to restrict access by IP address, an important security control.
- The ability to host more than one Web site (using virtual servers).
- The ability to log access to an Open Database Collaboration (ODBC) datasource, which is handy when gathering access statistics.
- The ability to limit the amount of network bandwidth used by the Web server.
- The ability to use 128-bit encryption (U.S. and Canada). Personal Web Server provides only 40-bit encryption.

Personal Web Server’s limitations make its use appropriate for only small-scale, peer-to-peer networks, or for a corporate intranet. It is limited to 10 simultaneous users, for example. If you wish to provide users with the ability to publish Web data to a limited audience, or to develop small Web applications locally that can later be uploaded to a more powerful Web server, Personal Web Server is handy.

Before you include Personal Web Server in your installation, consider the implications to your network environment. If your network is connected to the Internet and does not use a firewall to restrict HTTP requests from the outside, Web surfers from outside your network might be able to view your users’ published data. In some cases, this access will be benign. A users’ friends might access their sites to view information about a hobby or pic-
Configuring Windows 98 Server Components

There are concerns about distributing Web services throughout your organization. Although harmless, this sort of access will still increase your network traffic, which may or may not be acceptable.

In other cases, more malicious access might result. A competitor might gain access to documents intended to be viewed only internally, for example. Alternatively, a user might publish material that reflects badly on your organization, such as pornography or racial slurs.

It is wise to carefully review the possibilities that distributing Web services throughout your organization will have. If you choose to include Personal Web Server with your Windows 98 installations, you might also consider distributing a usage policy along with it.

**INSTALLING PERSONAL WEB SERVER**

You can install Personal Web Server via the Internet Tools category of the Windows Setup tab in the Add/Remove Programs Control Panel application.

Before you install Personal Web Server, you must have TCP/IP configured on your computer. If your network is configured to use static addressing, permitting access to the local Web site is a simple matter of distributing a Universal Resource Locator (URL) to others that is based on the computer’s IP address or host name, as in the following example:

http://my_pc.company.com/default.htm

If your network is configured to use DHCP, a given URL cannot be relied upon because the computer’s IP address will be subject to change.

Personal Web Server provides some Web pages that serve as examples to new users. The default home page, for example, is located in the following path (where “C:” is the hard drive):

C:\Inetpub\wwwroot\default.htm

Users can view this file using a Web browser, such as Internet Explorer, and edit it to include their own information using a text editor or FrontPage Express.

**CONFIGURING PERSONAL WEB SERVER**

Personal Web Server is configured through the Personal Web Manager application that appears in the Taskbar. Its main window displays publishing, monitoring, and statistical information. Pressing the Web Site button opens the Home Page Wizard, in which you may create a guest book, drop box, and customize the home page.
Under the Main category, you can track the number of visitors, page requests, bytes served, active connections, and concurrent connections.

**Working with Dial-Up Server**

Although Windows 98 automatically installs Dial-Up Networking along with other communications tools when you set up the operating system, you must install Dial-Up Server manually via the Internet Tools category of the Windows Setup tab in the Add/Remove Programs Control Panel application. Doing so gives users the ability to permit outsiders to access their computers through a simple telephone call. This can be invaluable to such users as telecommuters or mobile workers who need to access files on their desktops from home or on the road. As with Personal Web Server, however, it also creates a doorway in your organization and therefore has the same security and policy implications.

**CONFIGURING DIAL-UP SERVER**

Once installed, you configure this service by opening the Connections menu from the Dial-Up Networking folder and selecting Dial-Up Server to open the dialog box shown in Figure 1.12.

![Figure 1.12 Configuring options for Dial-Up Server.](image)

If you enable the Allow caller access radio button here, you should press the Change Password button to create a password for the connection.

By pressing the Server Type button, you can specify an option for Type of Dial-Up Server, either PPP or Asynchronous NetBEUI (Windows for Workgroups and Windows NT 3.1), manually. Selecting Default allows the client and server to negotiate a protocol, attempting PPP first, then NetBEUI. PPP supports both NetBEUI and IPX/SPX-Compatible Protocols.
You can also choose to enable software compression and require an encrypted password.

Windows 98 Dial-Up Server does not support TCP/IP. To host remote connections to your intranet, use a Windows NT Remote Access Service (RAS) server.

SECURING DIAL-UP SERVER

The type of security available for Dial-Up Networking depends on the type of access control used on the computer that has Dial-Up Server enabled.

On a computer with share-level access control, you can assign a password to Dial-Up Server. Any user who knows the password for the server will be able to connect to it.

If you are connected to a Windows NT domain controller or to a NetWare server that authenticates requests, you can use user-level access control. The user must enter a user name and password as defined on your computer’s security provider in order to establish the connection.

With both share-level and user-access controls, you can require encrypted passwords from clients. Encrypted password authentication uses Challenge Handshake Authentication Protocol (CHAP). A handshake is a series of signals acknowledging that communication or the transfer of information can take place between computers or other devices. With CHAP, the server uses a handshake to verify the identity of the client without sending the password across the link.

Study Break

Install Personal Web Server

Practice what you have learned by installing and configuring the Personal Web Server. First, configure TCP/IP networking on at least two computers, one to host the Web server and one to browse it. Next, install Personal Web Server and use Internet Explorer locally to verify that the default Web page is properly installed. Next, use Internet Explorer from the peer computer to verify that the Web page is visible on the network. To configure Personal Web Server, launch Personal Web Manager. Peruse the settings in main window. Pay particular attention to the statistics that can be gathered on Web usage.
Summary

In this chapter, we looked at issues surrounding the creation of an implementation plan for deploying Windows 98 in a Microsoft-only or mixed Microsoft/NetWare networking environment. This included reviewing system requirements, choosing a file system, and planning a workgroup. We also considered a security strategy, which included such elements as system policies, user policies, file and printer sharing, user-level access, and share-level access. This chapter continued with the installation of Windows 98, including new, automated, upgrade, and dual-boot installations, and uninstalling. Finally, we looked at the installation and configuration of the optional Windows 98 server components Personal Web Server and Dial-Up Networking Server.

Planning for Windows 98

Windows 98 requires at least an Intel 486 with 16 Mbytes of RAM and 120 Mbytes of free space on the hard drive. However, minimum requirements translate into minimum performance. If you want to take advantage of Windows 98’s new features, you should use a more powerful computer, especially if you plan to use the FAT32 file system.

Windows 98 requires that several issues be considered before installation. Depending on the target computer and its intended uses, you will have to choose between the traditional FAT file system and the new FAT32 file system. FAT32 is faster and more efficient in its use of large drives, but FAT is more compatible with legacy applications and the only choice for dual-boot computers from which you plan to access the same partition using either operating system.

Also prior to the installation of Windows 98, you should determine the type of network environment into which it will be introduced. One option is to create a workgroup, in which case all computers will operate in a peer-to-peer manner and employ share-level security. Another option might be to co-exist with a Windows NT domain or NetWare context in a client-server system, in which case computers can use pass-through authentication with a server to employ user-level security.

The user-level versus share-level security issue is just part of a security strategy. You must also plan for whether or not desktops will host network services using file and printer sharing, and decide whether or not to employ system policies and/or user policies that restrict user access to certain features. You will also need to decide whether or not to apply policies locally, or
host them from a server to centralize your control of permitted desktop functionality.

**Installing Windows 98**

Windows 98 is available in a full version and an upgrade version. The full version is intended for computers that do not already have an operating system installed, or for installation onto a hard drive that is unpartitioned and unformatted. The upgrade version is used when the computer already contains a copy of MS-DOS in combination with a prior version of Windows or OS/2.

During the installation, you will be asked for the important default user name, computer name, and workgroup name. For multiple installations, Windows 98 setup can be automated with the Batch application. Windows 98 can be installed in a dual-boot environment, but only in certain circumstances.

**Configuring Windows 98 Server Components**

Windows 98 can be optionally configured with Personal Web Server and Dial-up Server. Using Personal Web Server, you can make Web pages available to as many as 10 simultaneous users through a browser such as Internet Explorer. Using Dial-Up Server, you can make the Windows 98 desktop available to other users who are equipped with the Dial-Up Networking client, a modem, and a telephone connection.

▲ **CHAPTER REVIEW QUESTIONS**

Here are a few questions relating to the material covered in the Planning and Installation and Configuration sections of Microsoft’s *Implementing and Supporting Microsoft Windows 98* exam (70-098).

1. *FAT16 is a better system than FAT32 if …? Select all that apply:*
   - A. Your computer has many small files
   - B. Your computer has a few very large files
   - C. Your computer has many files that start with the letter F
   - D. You installed Windows 98 as a new installation
2. You can dual-boot Windows 98 on a FAT32 partition with which of the following? Select all that apply:
   A. Windows 95
   B. Windows NT 4.0
   C. Macintosh OS 8.1
   D. Windows NT 3.x

3. Windows 98 ships with several protocols that are enabled for Plug and Play.
   A. True
   B. False

4. You can automate Windows 98 installation with which of the following? Select all that apply:
   A. Any upgrade from Windows 95
   B. Any installation from the CD-ROM but not from floppy disks
   C. A batch file
   D. You cannot automate Windows 98 installation

5. User policies can modify which of the following? Select all that apply:
   A. User settings
   B. Group settings
   C. Computer settings
   D. User, group, and computer settings

6. If Windows 98 installation fails, your best bet is to do which of the following? Select all that apply:
   A. Buy a new computer
   B. Order a new Windows 98 CD-ROM
   C. Wait 15 minutes and try again
   D. Try installing Windows 98 with MS-DOS

7. How can you restore FAT16 from the FAT32 file system? Select all that apply:
   A. Use the File System Wizard in the Control Panel
   B. You must repartition the hard disk
   C. Right click on the desktop and choose Properties
   D. You must switch to the NTFS file system first
8. Why can you not restore a pre-OSR2 Windows 95 from Windows 98 running FAT32? Select all that apply:
   A. Windows 95 doesn’t support FAT32
   B. FAT32 is supported by Windows 95 only as an original installation
   C. FAT32 opens applications too quickly for Windows 95
   D. Windows 95 must be dual-booted with Windows 98

9. You can list several computer names for a network installation of Windows 98 in what application? Select all that apply:
   A. Computername.exe
   B. Microsoft Word 7.0 or higher
   C. Notepad
   D. Batchname.exe

10. Where would you save a system policy file in a NetWare network environment? Select all that apply:
    A. On any client computer
    B. In the Control Panel of every computer on the network
    C. On a CD-ROM or floppy disk, which must be inserted upon each new logon
    D. In the SYS:PUBLIC directory on the NetWare server

11. You are performing a new installation of Windows 98 with FAT32. How much hard disk space do you need? Select only one:
    A. 120–195 Mbytes
    B. 165–355 Mbytes
    C. 140–255 Mbytes
    D. 240–375 Mbytes

12. You want to install Windows 98, but you are not sure you have enough disk space. What sort of installation should you use? Select all that apply:
    A. Typical
    B. Portable
    C. Compact
    D. Custom
13. Which protocol is the norm for working in a NetWare environment? Select all that apply:
   A. TCP/IP
   B. IPX/SPX
   C. Fast Infrared
   D. NetBEUI

14. A Windows 98 Dial-Up Server does not support TCP/IP.
   A. True
   B. False

15. NetBEUI is best suited for which of the following. Select all that apply:
   A. Small networks
   B. Large networks
   C. The Internet
   D. Cross-platform networks

16. To apply group policies for a workgroup on a NetWare network, at least one NetWare 4.1 server on the network must be running in bindery emulation mode.
   A. True
   B. False

17. Roaming user profiles can only be implemented in conjunction with a Windows NT Server.
   A. True
   B. False

18. When sharing file and printer resources with computers in a NetWare environment, either share-level or user-level access controls can be applied.
   A. True
   B. False

19. A security provider is required to employ user-level access controls in a NetWare environment, but it is optional in a Microsoft-only environment.
   A. True
   B. False
20. If you are upgrading from Windows 95 or Windows 3.1, Windows will retain the system settings and file programs from the previous operating system.
   A. True
   B. False

21. Should you encounter an incompatibility with a mission-critical application, you can restore Windows 95 from Windows 98 using the Add/Remove Programs utility.
   A. True
   B. False

22. You cannot edit the HTML files supplied with the Microsoft Personal Web Server.
   A. True
   B. False

23. Windows 98 automatically installs Dial-Up Server along with other communications tools when you set up the operating system.
   A. True
   B. False

24. Client for Microsoft Networks can only be used with the NetBEUI network protocol.
   A. True
   B. False