

Windows NT Workstation 4.0



“Excuse me,” growled Moody, “you’ve got strengths if I say you’ve got them. Think now. What are you best at?”

—HARRY POTTER AND THE
GOBLET OF FIRE,
BY J. K. ROWLING

From its introduction as version 3.1, Windows NT has been an entirely different operating system than Microsoft’s initial Windows desktop OSs—a better, more secure OS. Windows NT 4.0 Workstation brought an improved user interface and support for more and newer hardware than was previously supported in NT 3.51, and it was offered in parallel with the Windows 9x products. Although Windows NT 4.0 Workstation was a more secure and stable alternative, it came at a price: you couldn’t use it with the wide range of hardware supported by Windows 9x.

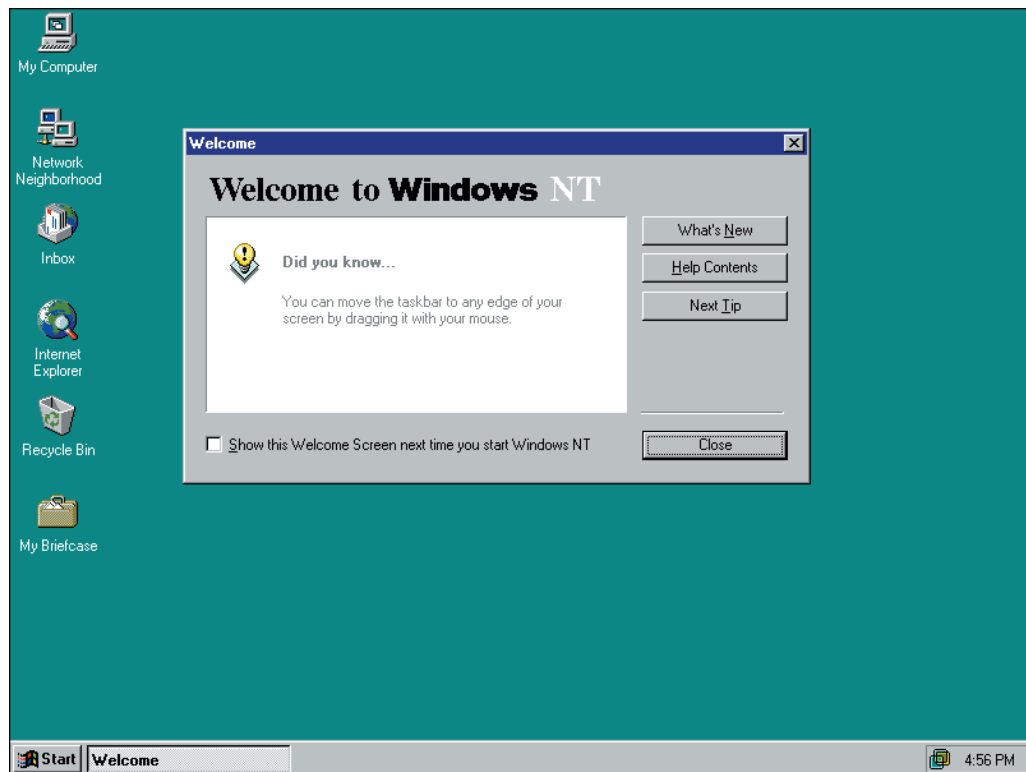
In this chapter, you will learn how to install and configure NT 4.0 Workstation and then to manage the desktop. You will learn some maintenance tasks and how to troubleshoot common Windows NT 4.0 Workstation problems.

In this chapter, you will learn how to:

- **Describe Windows NT Workstation 4.0 features and benefits**
- **Install and upgrade Windows NT Workstation 4.0**
- **Configure and manage Windows NT Workstation 4.0**
- **Perform proactive maintenance tasks**
- **Troubleshoot common Windows NT 4.0 problems**

■ NT Workstation 4.0 Overview

What can NT 4.0 do for you? Are there reasons why you shouldn't have NT 4.0 on your desktop? It's been around a while; how much longer will you be able to buy it? We answer these questions and a few others in the following sections.



- Welcome to Windows NT



This chapter is about Windows NT Workstation 4.0. In the real world people tend to shorten and/or reorder the wording of a lengthy name like that. We are no exception, so you will see various permutations and abbreviations in this chapter. Don't worry about it! They all refer to the same operating system.



Windows NT 4.0 also personalized the Microsoft Internet strategy of including the software needed to be both a client browsing the Internet and an Internet server—even in Windows NT 4.0 Workstation on the desktop.

Features and Benefits

What can Windows NT 4.0 do for you? We'll examine the features and the benefits, but let's first turn the clock back to 1993, the year the first version, Windows NT 3.1, was introduced. Even then, there was more than met the eye. Although it was an entirely different OS than Windows 3.1, Microsoft gave it a Windows 3.1 look and called it Windows NT 3.1. They brought this first version out strictly as a network server OS. This was followed in the next few years by an upgrade, introduced as two products: Windows NT 3.5 Server and a desktop product, Windows NT 3.5 Workstation. This was in recognition of the need for a desktop operating system with more stability and security than Windows 3.1. The last version of NT with the Windows 3.1 desktop was 3.51.

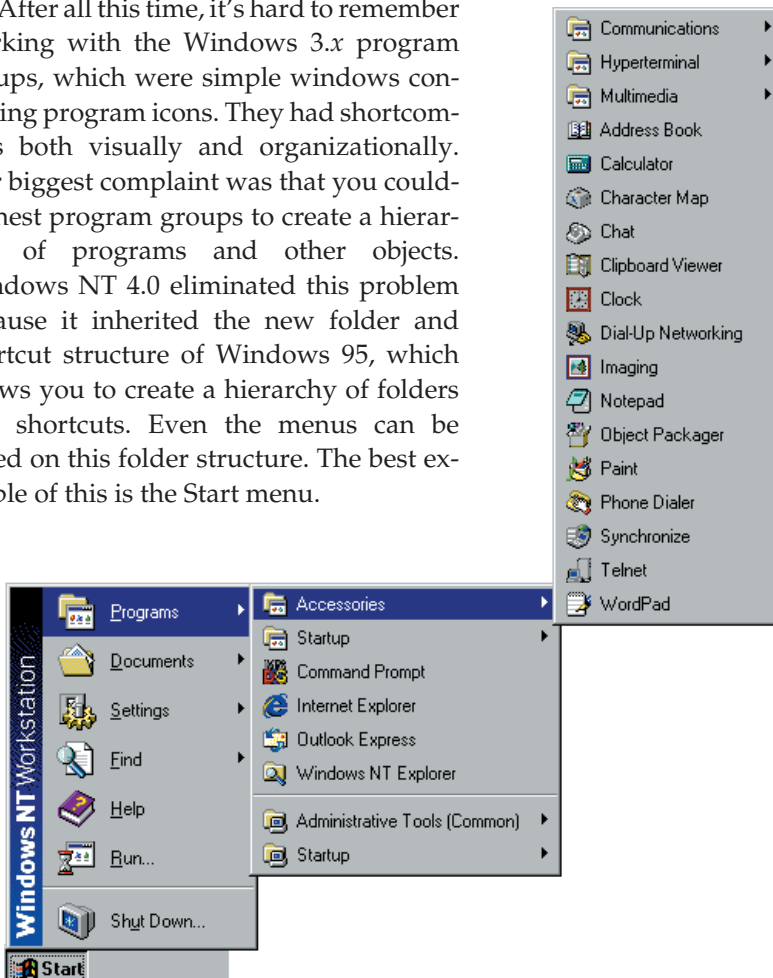
When Windows NT 4.0 was introduced in the fall of 1996, Windows 3.x and Windows 95 dominated the PC desktop. Whereas the Windows NT 3.x products were stuck in a graphical time warp using the Windows 3.x GUI, Windows NT 4.0 adopted the more pleasant and (dare we say?) more intuitive interface of Windows 95. However, behind the scenes, it was an entirely different OS from Windows 95. Let's look at its features in the

following categories: desktop, file systems, security, stability, memory, and software compatibility.

Desktop

The Windows NT 4.0 desktop resembles that of the Windows 95 GUI with the familiar objects: taskbar, Start button (with its Start menu), right-click context menus, My Computer, and Windows Explorer (called Windows NT Explorer). Microsoft saw this change to the user interface (or shell) from that of NT 3.1 to be so important that Windows NT 4.0 was called the Shell Update Release.

After all this time, it's hard to remember working with the Windows 3.x program groups, which were simple windows containing program icons. They had shortcomings both visually and organizationally. Our biggest complaint was that you couldn't nest program groups to create a hierarchy of programs and other objects. Windows NT 4.0 eliminated this problem because it inherited the new folder and shortcut structure of Windows 95, which allows you to create a hierarchy of folders and shortcuts. Even the menus can be based on this folder structure. The best example of this is the Start menu.

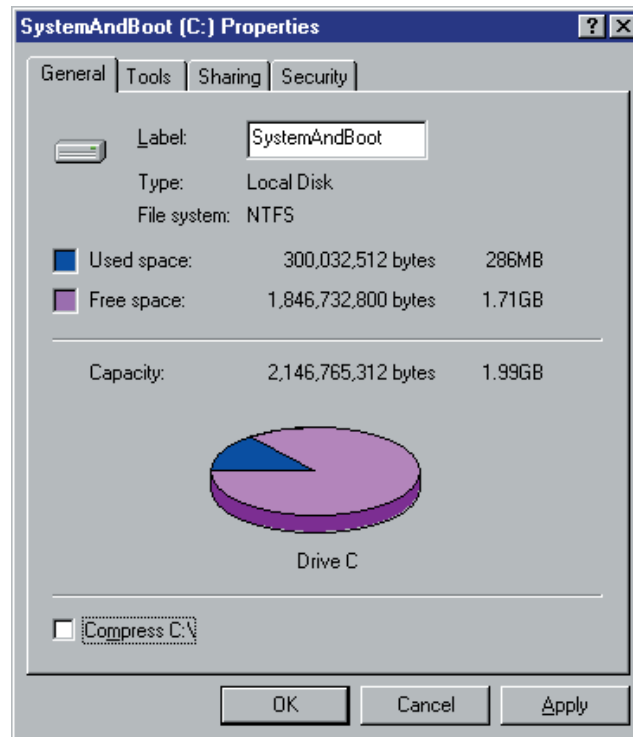


Quickly open the Start menu by pressing the CTRL-ESC key combination, or simply press the Windows Logo key if it is on your keyboard.

- Windows NT 4.0 Start menu hierarchy

File Systems

Windows NT 4.0 fully supports two file systems: **NT file system version 4 (NTFS4)** and an implementation of FAT16 (introduced in Windows 95) called the **virtual file allocation table (VFAT)**. Both file systems have on-disk components and memory-base (program code) components in the operating system. In other words, the operating system must have some code in memory that can manage the on-disk components of the file system. The on-disk components are placed there when an operating system formats a disk with



• **Figure 3-1.** The General tab of the Properties of a drive showing NTFS as the file system

one or the other file system. Since a disk partition can only be formatted with a single file system at a time, the General tab of the Properties dialog box of a drive will show which file system is installed on a drive. (See Figure 3-1.)

FAT Although the FAT files system under NT is actually VFAT, it is common to refer to VFAT simply as FAT. It is nearly identical to how FAT16 existed in DOS, except that beginning with Windows 95 and continuing through NT and newer Windows versions, the directory entries are modified to save long file names (with up to 255 characters, including spaces, which were not allowed in 8.3 file names) as well as the legacy 8.3 file names. A **long file name (LFN)** is any file or folder name that breaks the 8.3 file naming convention described in Chapter 2. When you name a file or folder with a file name that does not comply with this convention, Windows saves both the actual name (as a long file name) and an 8.3 version of the name, called an alias, that consists of the first six 8.3-valid characters, followed by a tilde (~) and a number, beginning with zero (0).

A floppy disk formatted in Windows is automatically formatted with the FAT file system, using a modified version of the FAT12 file system used for floppy disks in DOS. NT supports long file names on floppy disk as well as logical drives on hard disks.

NTFS4 NTFS, however, is a much more advanced file system than any form of the FAT file system. In contrast to the simple FAT table and root directory structure on disk that is the basis for the FAT file system, NTFS4



NT does not support FAT32, which was introduced in a special release of Windows 95 and is supported in Windows 98, Windows 2000, and Windows XP.

has a far more sophisticated structure, using a Master File Table (MFT) that allows for additional file attributes. In fact, even a file's actual contents are saved as one or more file attributes. This makes the file system adaptable to future changes. In addition, NTFS4 works like a transaction-based database, in that it sees all file access as transactions, and if a transaction is not complete, it will roll back to the last successful transaction. NTFS4 will also avoid saving files to damaged portions of a disk, called bad sectors. Windows NT will not allow you to format a floppy disk with NTFS4, because it requires much more space on disk for its structure than FAT. This is referred to as the file system's overhead. You may format a fairly small hard disk partition, but because of the space required for overhead, the smallest recommended size is 10MB.

NT supports long file names (LFNs) in NTFS similar to the way in which it supports LFNs in the FAT file system. NT creates 8.3 aliases for long file names on both FAT and NTFS partitions.

Finally, NTFS provides folder and file security, which allows permissions to be applied to any file or folder on an NTFS partition. This is one of the most important differences between the NTFS and FAT file systems. This leads us to the next feature, security.

Security

Windows NT 4.0 can be made secure on the desktop, meaning that even a stand-alone Windows NT 4.0 computer has significant security components. This is a claim that can't be made for Windows 95, Windows 98, or Windows ME. Windows NT 4.0 requires a logon, by means of a user account (either on the local computer or in a network domain). If the user account is local, it is an actual user account in a local security accounts database, which the Windows 9x products do not have. Moreover, Windows NT 4.0 has file- and folder-level security if you use Windows NT 4.0's advanced file system, NT File System version 4 (NTFS4), on your local hard drive. The Properties dialog box of each folder and file on a drive formatted with NTFS will have a Security tab (see Figure 3-2) with a Permissions button that brings up a dialog box in which you can assign permissions (Read Only, Full Control, No Access, and so on) controlling user access to the file and folder. Learn more about file and folder security in Chapter 7.

Stability

Windows NT 4.0 is more stable than Windows 3.x or 9x. What does stability in an OS mean? Mainly, it means that you can work all day in many different applications without risking loss of your data because the system has *hung up*—a term that means that your computer has stopped responding to input from the keyboard and the mouse. Back when Windows NT 4.0 was the newest Windows OS, the best reason for installing it on a desktop computer was its stability. This appealed to a significant number of users and to IT people who had to support desktop computers. In Chapter 8 you will learn more about the “under-the-hood” components that contribute to this stability.

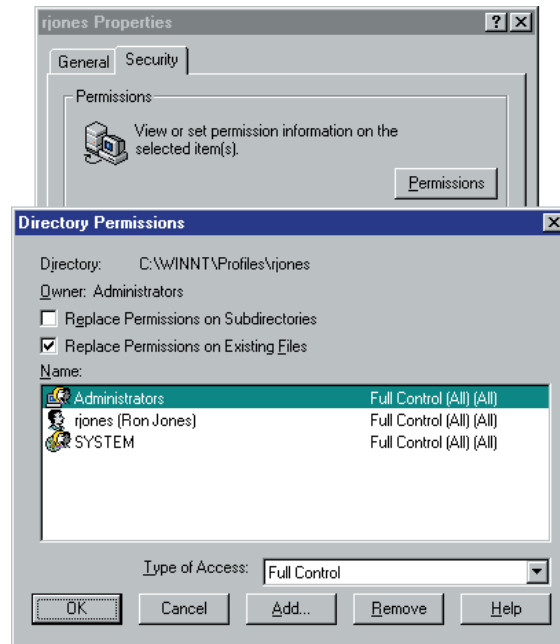
The proof is in the performance. Hermione is a believer in the stability of NT 4.0 compared to earlier versions of Windows. During the five years that she used Windows NT 4.0 on her desktop computer, her coworker Neville



At the time Windows NT 4.0 was introduced, NTFS4 was referred to simply as **NTFS**. After Windows 2000 came out with version 5 of NTFS, called NTFS5, it became important to use the version-specific name (NTFS4 or NTFS5).



While Windows NT uses folders graphically, many of the dialog boxes and messages continued to use the old term of *directory* for what we now know as a disk folder. These two terms are frequently used interchangeably even to this day.



• Figure 3-2. The Directory Permissions dialog box

Inside Information

The Memory Race

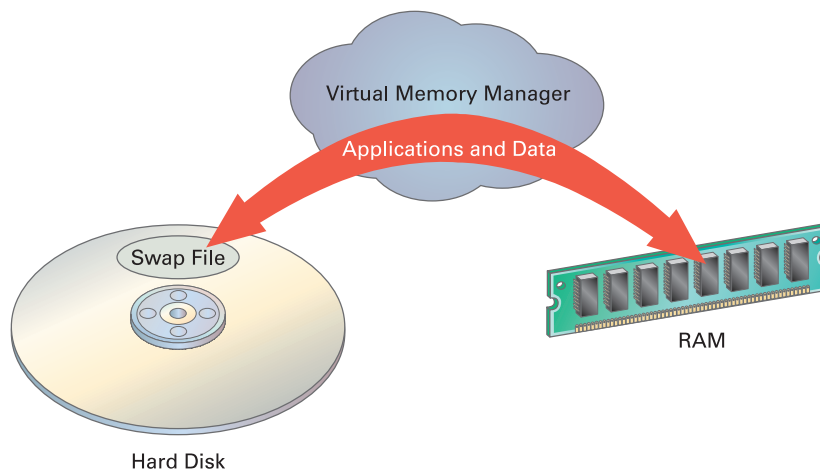
When NT 4.0 came out several years ago, 4GB sounded like a truckload of RAM, but in the context of today's desktop PCs with ever increasing amounts of RAM, 4GB seems generous, but not outlandish. The programs being created today are increasing in size, too. Therefore, the way Windows NT 4.0 handles memory begins to make sense.

was using Windows 95 and then Windows 98. As the two worked in adjacent cubicles, Hermione would occasionally hear an anguished cry from Neville: his computer had hung up, had to be restarted, and he frequently lost his current work. Hermione might go for months without problems.

Memory

Windows NT 4.0 can use up to 4GB of RAM. On top of that, it uses virtual memory, which simply means that it can use some of your hard disk storage space as RAM. You can have more programs and data in memory than your

physical memory can hold, thanks to the Virtual Memory Manager, which decides what can be safely moved out of RAM and onto a special disk area that the OS uses as memory. The file the operating system creates for this purpose is called the **swap file**.



- The Virtual Memory Manager maximizes memory by swapping programs and data between RAM and the hard disk.

Software Compatibility with Legacy Applications

Just because you're running Windows NT 4.0 doesn't mean that all of your software must be written just for Windows NT 4.0. You may not even be able to find updated replacements for your important business applications; Microsoft

thought about that problem. Windows NT Workstation 4.0 can run the following types of software:

- MS-DOS applications
- 16-bit Windows-based applications (written for Windows 3.x)
- 32-bit Windows-based applications (written for Windows 9x and NT 4.0)
- OS/2 version 1.x character-based applications
- OS/2 16-bit Presentation Manager applications (with separate add-in product)
- POSIX1-based applications (POSIX is short for portable operating system interface for computing environments)

Windows Applications and DOS Applications Windows NT 4.0 runs applications in environments called *subsystems*. The “native” applications of Windows NT are 32-bit Windows applications. These applications are written to a specific set of rules, and they run in the Win32 subsystem. DOS applications can run in the Win32 subsystem, with a little help. A DOS application runs, within a virtual DOS machine (VDM), as does any 16-bit Windows applications (written for Windows 3.x).

OS/2 and POSIX Applications Using subsystems, Windows NT 4.0 provides support for the other types of applications by creating simulated environments that look and feel like the OS for which the application was written. Recall OS/2 from Chapter 1? When an OS/2 application is started, Windows NT 4.0 starts an OS/2 subsystem, but it simulates a very old version of OS/2. Finally, the POSIX1 subsystem emulates POSIX1, a special UNIX environment. When one of these programs is launched, Windows NT 4.0 loads the correct subsystem for it.

The Limitations of Windows NT

How can an operating system with a name that stands for “new technology” be obsolete? Easy—in the computer world, nothing is new after six months, and a decade is like a geological era. The Windows NT 4.0 user interface began to show its age when Windows 98 came out two years later with some subtle changes to the GUI. It has really shown its age since Windows 2000 was introduced in 2000, and then Windows XP was introduced in 2001.

Hard Drive Limits

When you install Windows NT 4.0, the Setup program is able to create a hard disk partition with a maximum size of only 4GB—the partition limit of a FAT partition in Windows NT. Even when you tell the Setup program that you want the new partition to be formatted with NTFS, which has a far larger size limit, the Setup program still can create only a 4GB maximum partition. This is because the Windows NT 4.0 Setup program does not have the ability to format a drive as NTFS. Therefore, it formats using FAT and creates a script telling the newly installed OS to perform the NTFS conversion the first time it starts. Once you have Windows NT 4.0 installed and



The difference between how Windows NT 4.0 handles a DOS application and how it handles a 16-bit Windows application is that NT adds a copy of Windows 3.x to the VDM before loading the 16-bit Windows application.



To learn more about POSIX, point your browser to en.wikipedia.org and search on “POSIX.”



Inside Information

Partition Limits Are Beyond NT

A partition is a portion of a hard disk that can be formatted to hold one or more logical drives. When you partition a drive, the maximum partition size is the lesser of two values: the maximum partition size supported by the hardware or the maximum partition size supported by the file system. The FAT16 file system has a 4GB partition size limit in Windows NT 4.0 (a 2GB partition size limit in Windows 9x); the NTFS file system has a partition size limit of 16 exabytes (an exabyte is one billion billion bytes). Now, this is obviously theoretical, because the hardware limit (mostly a BIOS thing) is more like 137GB, although this is changing.

running, you can create additional, larger partitions in unpartitioned free space on the same hard disk or other hard disks in the computer.



As for Neville? He eventually outgrew his old computer and now uses a multi-GHz screamer with Windows XP. He now has stability as well as the latest gadgets.

Windows NT and the Latest Hardware

Remember Hermione and Neville? She used Windows NT 4.0 for several years, whereas Neville used first Windows 95 and then Windows 98. Have you wondered why Neville put up with the instability of those OSs? He never considered putting Windows NT 4.0 on his computer because he needs and uses the latest and greatest hardware on his desktop computer, and Windows NT 4.0 doesn't support a great variety of hardware. Its biggest shortcoming in that area is that it doesn't support plug and play. There are many people like Neville, and for them, stodgy old Windows NT is, well, too stodgy. And realistically, this hardware limit has only become worse as more and newer peripherals continue to become available.

Windows NT and Legacy Software

Although Windows NT 4.0 has built-in support for applications written for several other OSs, some applications, most notoriously some DOS applications and 16-bit Windows applications, won't work in NT's simulated environment. Actually, Windows NT 4.0 can work with some applications, but you need to test each one to see if it will run at all, or if it runs too slowly under Windows NT 4.0 to be useful to you.

Why Is Windows NT 4.0 Still in Use?

Technology does not stand still, and today you're simply not going to select Windows NT 4.0 for your next new desktop PC. However, for the next few years of your career, you are sure to encounter it on the job from time to time. Here are some reasons why.



Installing Windows NT 4.0 on new machines to use existing licenses is a pretty weak reason for continuing to use it. Because of its limited hardware support, you are likely to run into hardware that Windows NT 4.0 simply can't use.

Windows NT 4.0 for Backward Compatibility

We have heard clients and students say that they're still using Windows NT 4.0 on the desktop because of a vertical market application (one specific to their industry) that was designed to run in Windows NT. Or perhaps it would actually run in newer Windows versions, but the vendor will support it only in Windows NT 4.0. Until that application is revised to run on a newer version of Windows, the user will stay with Windows NT. If you work in such an organization, you may have to install Windows NT 4.0 on replacement machines that will run the same application.

Windows NT—When That's All You Have!

Many organizations lease their computer systems and therefore use an OS for the length of the lease. A few years ago, a typical computer lease was for three years, but budget cuts have forced many companies to extend current leases, often to five years. This extends the life of old OSs and application suites, and also extends the length of time you need to stay knowledgeable about older technologies. Similarly, an organization that owns licenses for Windows NT 4.0 may continue to use those licenses when it replaces old computers with new.

Where Can I Find Windows NT 4.0 Today?

Microsoft publishes their Windows product life-cycle guidelines at www.microsoft.com/windows/lifecycle (see Figure 3-3). On this page they describe their policy and provide links to all the Windows products.



Use the link at the bottom of the Windows Life-Cycle Policy to view the Windows Service Pack Roadmap.

The screenshot shows the Microsoft Windows Life-Cycle Policy page. The page has a blue header with the Windows logo and navigation links. A left sidebar contains categories like Products, Technologies, and Resources. The main content area is titled 'Windows Life-Cycle Policy' and includes a publication date of October 15, 2002, and an update date of March 29, 2004. It features an image of a calendar for 2007. The text explains the support life-cycle policy and provides links to product life-cycle information for various Windows products. A table titled 'License Availability Roadmap' lists the end dates for various Windows operating systems. At the bottom, there is a 'Windows Service Pack Roadmap' section and a footer with copyright information.

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Windows XP
Plus!
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Windows Embedded
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Technologies
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DirectX
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Resources
Downloads
Trial Software
Communities
Support
Training & Events
Windows History
Windows Security
Microsoft Worldwide

[Windows Home](#)
Windows Life-Cycle Policy
Published: October 15, 2002 | Updated: March 29, 2004

On October 15, 2002 Microsoft announced a new support life-cycle policy. This consistent and predictable policy is designed to standardize support guidelines across product lines and will cover most products currently available via retail purchase or volume licensing and future release products.

Product life-cycle policies provide advanced notification of planned changes in product availability and support. This information helps customers and partners with product planning and information technology decisions.

The links on this page provide access to specific information about Windows products.

Product Life-Cycle Information for:

- [Consumer Desktops](#)
- [Business Desktops](#)
- [Windows 2000 Server](#)
- [Windows NT Server](#)
- [Internet Explorer](#)
- [Windows Media Player](#)
- [Windows Embedded](#)
- [Windows Lifecycle FAQ](#)

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Windows Desktop License Availability
Under the Support Lifecycle policy Windows desktop licenses are available for four years after general availability in all standard product distribution channels (e.g. direct OEM, System Builders, retail, and Volume Licensing programs via licenses or via downgrade rights). Licenses will continue to be available through downgrade rights available in Volume Licensing programs after end of general availability.

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License Availability Roadmap

Desktop Operating Systems	Date of General Availability	Direct OEM and Retail License Availability (end date)	System Builder License Availability (end date)
MS DOS 6.xx	June 1, 1994	November 31, 2001	November 31, 2001
Windows 95	August 15, 1995	December 31, 2000	December 31, 2001
Windows NT Workstation 4.xx	July 29, 1996	June 30, 2002	June 30, 2003
Windows 98	June 30, 1998	June 30, 2002	November 30, 2003 ¹
Windows 98 SE	June 30, 1999	June 30, 2002	March 31, 2004 ¹
Windows Millennium Edition (Windows Me)	December 31, 2000	December 31, 2003	June 30, 2004
Windows 2000 Professional	March 31, 2000	March 31, 2004	March 31, 2005
Windows XP Professional	December 31, 2001	December 31, 2005	December 31, 2006
Windows XP Home Edition	December 31, 2001	December 31, 2005	December 31, 2006

¹ In the US and Canada only System Builder License Availability end dates are June 30th 2003 for Windows 98 and September 30th 2003 for Windows 98 SE.

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Windows Service Pack Roadmap
Microsoft continually works to improve its software. As part of this effort, we develop updates and fixes to recognized issues and release them for customers. On a regular basis, we combine many of these fixes into a single package and make the package available for installation. These packages are called Service Packs. Based on feedback from customers and partners Microsoft is committed to providing a 12 month roadmap of upcoming service packs and security rollup packages on the [Windows Service Pack Roadmap Web page](#). Visit the [Supported Service Pack list](#) to find the support timelines for a particular product's service pack.

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• **Figure 3-3.** Microsoft has a published policy for availability and support for their products.



Another reason to learn about Windows NT 4.0 Workstation is that Windows 2000 and Windows XP are simply new versions of Windows NT. What you learn here is worthwhile because, although those OSs improved on Windows NT 4.0, they still have many of the same features and characteristics.

Information on this page shows that Direct OEM licenses and System Builder licenses have not been available for Windows NT 4.0 since June 30, 2002, and June 30, 2003, respectively. These types of licenses are for companies that preinstall and bundle the OS with new computers. At this writing, the retail version of NT 4.0 Workstation is still available through online retailers.

According to the Business Desktops link on the Life-Cycle page, support for Windows NT 4.0 Workstation ended June 30, 2004. Microsoft will leave the technical support information for Windows NT 4.0 Workstation at its web site, but can discontinue this with 12 months' notice. Add to that the newer replacements for Windows NT 4.0 Workstation, and your conclusion must be that Windows NT 4.0 Workstation is no longer a viable retail product. However, we urge you to learn about it because it is still used in many organizations.

Hardware and Windows NT Workstation 4.0

When you prepare to install an operating system, you have three concerns regarding the computer hardware:

- What are the minimum requirements for running the OS? How much "horsepower" is required in the processor, how much RAM and hard disk space, what video capabilities, and what input devices?
- What will support the job you want this computer to do? Do you need a more powerful processor? More RAM or disk space? Fancy video?
- What hardware is compatible with this OS?

Let's take a closer look at these concerns.

Requirements

Windows NT 4.0 Workstation can be installed on a computer that complies with the Intel/Microsoft set of standards. Furthermore, NT Workstation 4.0 supports symmetric multiprocessing (SMP) with two processors.

When Windows NT Workstation 4.0 was introduced in 1996, the published minimums included a 486/33 processor, 110MB of free hard disk space, and 12MB of RAM. Microsoft later published slightly more realistic minimum requirements on its web site, but these still seem laughable when you think of the computers you see advertised in your local paper each week. This shows how far the world has moved since 1996. Even then, these minimums would have left you with a computer with too little disk space and RAM to install an office suite of software.

Ideal Hardware Configuration

In the first two years that Windows NT 4.0 was available, if you chose Windows NT Workstation for your desktop over Windows 95, you most likely had a very good reason, such as security and stability. You also were choosing a much more expensive OS than Windows 95. You would not have installed this OS on an underpowered computer.



Inside Information

Symmetric Multiprocessing Support in Windows NT

Most desktop computers are built around a single processor. Symmetric multiprocessing (SMP) computers are built around multiple identical processors. In these systems, the processors have equal access to physical memory, and an OS must be specifically designed to take advantage of the horsepower of these multiple processors. Whereas Windows NT Workstation, Windows 2000, and Windows XP support SMP with two processors, the Windows Server operating systems from Windows NT Server through Windows Server 2003 support more than two processors—up to 32 with the most advanced versions of Windows Server 2003. Hmm...it's a pretty safe bet that your desktop computer has only a single processor.

The ideal hardware configuration varies based on the needs of the applications to be run on the computer, but, for us, the ideal configuration for Windows NT on a desktop computer with a standard set of office applications (word processor, spreadsheet, mail, and so on) installed looks like the following:

- Intel Pentium processor
- 128MB RAM
- 2 to 4GB available hard disk space
- CD-ROM drive
- SVGA or higher-resolution video adapter
- Microsoft mouse

Compatible Products

Although official support has ended for Windows NT, Microsoft maintains a site called the Windows Quality Online Services, where you can download a text file of the last Hardware Compatibility List (HCL) they created for NT. See Figure 3-4. The HCL is a list of hardware that has passed Microsoft's compatibility tests for Windows NT 4.0. You can also check out any driver disk that comes with your hardware to see if it lists an NT driver. Finally, check out the web site of the hardware manufacturer.

If you aren't sure how you would search for compatible hardware products, consider Keisha, who is getting ready to install Windows NT 4.0 on a replacement computer because the previous computer had an application that requires it. Keisha wants to add a device that requires an Institute of Electrical and Electronic Engineers (IEEE) 1394 (FireWire) controller, and her department is converting from a wired Ethernet network to a wireless network. She has heard that Windows NT doesn't support IEEE 1394 controllers or wireless network adapters and so has decided to learn whether NT does, indeed, support these hardware devices. She will start by downloading the HCL.



Cross Check

How Does Windows NT 4.0 Measure Up

as an Operating System?

Consider what you have learned so far about Windows NT 4.0, and look back to the section "Purpose, Types, and Functions of Microcomputer Operating Systems" in Chapter 1. Then answer the following questions:

1. What operating system functions are supported in Windows NT 4.0?
2. Are any functions completely unsupported in Windows NT 4.0?
3. Of the functions supported in Windows NT 4.0, which, in your opinion, need to be improved on? Please elaborate.



A very outdated HCL is on the Windows NT 4.0 CD. Don't use it! The best information is on the Microsoft web site.

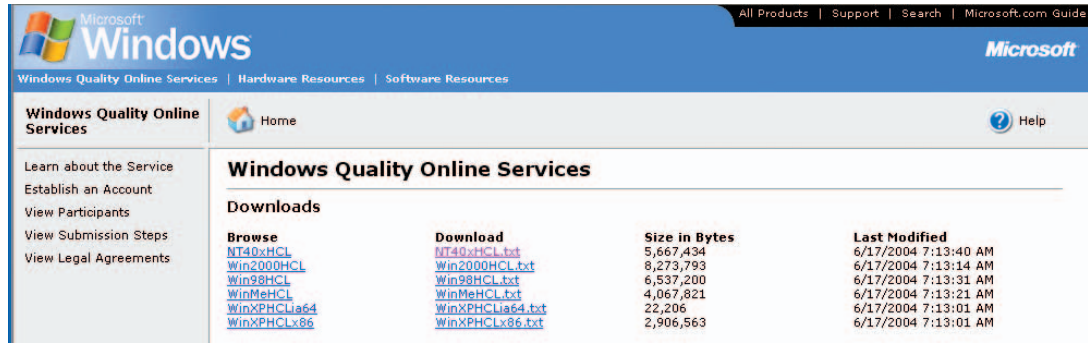


Try This!

Check Out the HCL for Windows NT 4.0

To complete this task, you will need a computer with an Internet connection and a web browser. Try this:

1. Point your web browser at <https://winqual.microsoft.com/download/default.asp>.
2. In the download column, click on NT40xHCL.txt. This will open the Hardware Compatibility List for Windows NT 4.0.
3. Search through the list for "1394 Controller." You will see just one controller listed under this category. Now you would have to research the availability of this controller.
4. Further search of manufacturers' web sites might turn up more controllers that have device drivers for Windows NT 4.0.



• Figure 3-4. Download the Windows NT 4.0 HCL from the Windows Quality Online Services page.

■ Installing Windows NT Workstation 4.0

You've completed an overview of the features and limits of Windows NT, considered the hardware requirements and recommendations for installing NT, and know where to go to find out if your hardware and software is compatible with Windows NT. Now you need to install Windows NT so you can learn how to work with it.

Before you install Windows NT, or any OS, you need to perform the following tasks: choose between an upgrade or clean installation, select and prepare the hardware, determine what service packs and updates are needed, determine the method of installation, and gather the materials (disks, drivers, applications, and so on) you'll need to complete the installation.

Upgrade vs. Clean Installation

An upgrade installation of an operating system involves installing a new operating system on top of an existing operating system. A **clean installation** is an installation onto a completely empty hard disk.

The Reality of Upgrading

The goal of an upgrade is to save work by having the new OS assume all the settings of the previous OS, and to avoid having to reinstall the applications into the new installation. With any version of Windows, you perform an upgrade by installing into the existing Windows installation directory.

But it may not be as simple as you would hope. Some previously installed applications may be incompatible with the new operating system, or need to be uninstalled or disabled before beginning the upgrade. This is especially true of antivirus software. There is also the possibility that an installed device may not be supported in the new operating system. We had this happen with a "name brand" external CD-ROM drive when we upgraded

a laptop from Windows 95 to Windows 2000. So, an upgrade is not as simple as it sounds, requiring research into all the installed applications, utilities, and drivers before you begin the upgrade.

The Reality of Performing a Clean Installation

The goal of a clean installation is to avoid inheriting problems from a previous installation. For this reason, when performing a clean installation, if the hard disk was previously used, you would have the Windows Setup program repartition and format the disk. A partition defines the boundaries of a logical drive, and repartitioning rewrites the partition information in the master boot record (MBR), making the previous logical drive and its contents unavailable. Once you repartition, you must format each logical drive within the partition (one for each primary partition, and one or more for each extended partition).

There are subtle differences in how different OSs partition disks, and some installed utilities (or viruses) may have altered the MBR and boot record on the disk. A repartition and format will truly give you a clean disk.

Now for the bad news: a clean installation is a lot of work when done manually. For this reason, many organizations now use other more advanced methods, such as a hands-free, scripted install, or use of an **image**, which is an exact duplicate of the entire hard drive contents, including the OS and all installed software. But these methods are, for the most part, only employed in large organizations. Even then, it's important to know how to build a desktop, meaning to install an operating system and all appropriate software, as well as to configure it for daily use.

Select and Prepare the Hardware

To install Windows NT on a computer hard disk, you must be sure that the computer is physically ready for the installation. That is, ensure that the computer is a complete system, with at least the minimal hardware recommendations, and that all of the hardware is compatible with Windows NT 4.0. You also need to ensure that all necessary connections are in place for the installed components and that the computer is plugged into a power outlet. The computer hard disk does not have to be specially prepared for Windows NT installation, because the Windows NT Setup program can prepare the hard disk.

Determine the Service Pack and Updates to Use

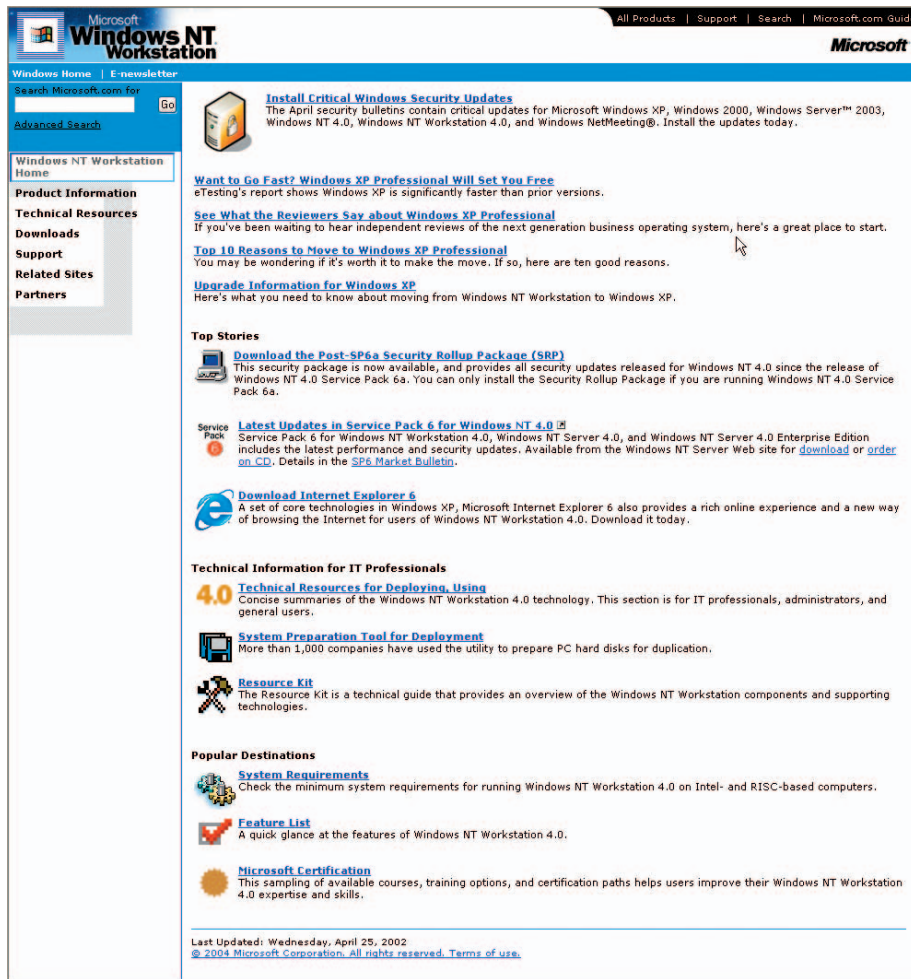
After any software company releases complex software such as Windows NT, the programming staff continues to work on the software. Programmers receive feedback about problems from customers, and they re-create the problems and come up with software fixes called **patches** or updates. Those that solve security problems and/or problems that can potentially cause major failures are now called critical updates.



Inside Information

Images

The use of images is very popular in medium to large organizations that have dozens, hundreds, or thousands of desktop computers. You create a custom image for a large number of users by installing the OS on a reference computer identical to those on which the images will eventually be placed. Then you install all the necessary applications, and finally, you customize the desktop, complete with shortcuts, and add the corporate wallpaper. Next, you use special imaging software, such as Symantec's Ghost (www.ghost.com) to copy the image of the hard drive. It can be copied onto a CD, but it is usually copied to a network server and then distributed from there. Other similar products include Paragon's Hard Disk Manager (<http://www.paragon-gmbh.com/>) and Drive Image by PowerQuest. (At the time of this writing, you could access their web site at www.powerquest.com, but PowerQuest was purchased by Symantec in December 2003, so this URL may change.)



- Windows NT Workstation home page



If you have reason to install NT 4.0 on a PC at school or at work, be sure to check with an administrator to learn the approved service pack level.

What Do I Need and Where Do I Look?

Microsoft releases updates individually, as they are completed, and the company also periodically bundles together a series of accumulated updates into a larger package called a **service pack**. These, in turn, are made available in versions, or levels, such as Service Pack 1 and Service Pack 2. NT 4.0's service packs were numbered through 6a (a post-Service Pack 6 release), which was followed by the post-SP6a Security Rollup Package (SRP). You can find out more about the updates and service packs for Windows NT 4.0 at www.microsoft.com/ntworkstation.

The service pack level in NT 4.0 is critical; you should never install and use Windows NT 4.0 without planning to add a service pack immediately after the installation.

Although service packs that fix problems are a fact of life with today's very complex OSs, Windows NT 4.0 service packs were also renowned not

just for fixing problems with the OS, but for adding new features. However, sometimes the fixes and/or new features actually cause new problems. Therefore, most organizations that exercise standards and control over their desktop computers mandate that a new service pack can't be installed until it has been thoroughly tested on nonproduction PCs in a test lab.

Determine the Method of Installation

To install Windows NT (without using a third-party product), you can choose a manual installation or an automated installation, both of which have variations.

Manual Installation

A manual installation is high maintenance, requiring your attention throughout the entire process to provide information and to respond to messages. You will perform a manual installation in Step-by-Step 3.02. This is the method you would choose for a unique installation, or if the number of computers is too few to warrant the time, effort, and expense that an automated installation requires.

After deciding on a manual installation, you still have choices to make:

- Will the distribution files (those in the i386 directory on the Windows NT 4.0 CD-ROM) be located on the local computer or on the network server? If you don't have a CD-ROM drive in the computer, but it is connected to a network, then you'll have to boot the computer with an operating system that has the network components installed so you can connect to the server where the source files are stored.
- If the computer does have a CD-ROM drive, will it work for the installation—that is, will the Windows NT 4.0 Setup program recognize it, and will the computer boot from the CD-ROM drive? If you can boot from the CD-ROM drive, then your manual installation can be completed as shown in Step-by-Step 3.02.
- If a CD-ROM drive is present and is recognized by Windows NT Setup (which you may be able to determine only by trying), but you can't boot from it, you will need the three Windows NT 4.0 Workstation setup disks, as well as the CD-ROM disk. Place the first disk in the drive, restart, and follow the onscreen instructions.



The OS you use to boot the computer and connect to the network can be DOS or another version of Windows. Once you connect to the source location, you run the NT Setup program using WINNT.EXE (for DOS) or WINNT32.EXE (for Windows).



If your computer won't boot from the CD-ROM drive, a change to the computer's system settings may be required. Don't try to change the settings without expert help, because the wrong changes to the system settings can disable your computer.

Step-by-Step 3.01

Creating the Windows NT 4.0 Setup Disks from Windows or DOS

To create the Windows NT 4.0 setup disks, you can use any version of Windows or MS-DOS, as long as it recognizes the installed CD-ROM drive. The preferred method is to do this from Windows. If you do not have a spare computer with Windows on which to create the Setup Disks, you can use the Windows 98 Startup Disk. Boot up and select CD-ROM support. This startup disk also loads drivers that speed up the copying process. Once you are at an A: prompt, remove the Windows 98 Startup Disk. You will not see the

GUI dialog boxes shown next, but will see equivalent pages in character mode with a blue background.

You will need the following:

- A computer running MS-DOS or Windows 3.x or greater
- The Windows NT CD-ROM
- Three formatted, blank, high-density 3.5-inch floppy disks

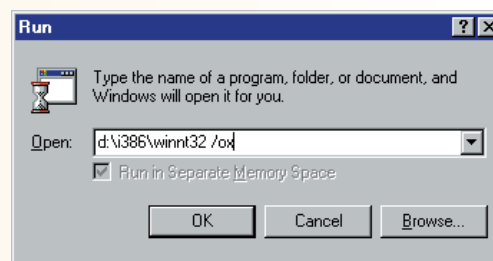
Step 1

Place the Windows NT CD in the drive. If your computer supports AutoPlay for CDs, the Windows NT CD window will appear. Close the window.

In Windows 95 or greater, select Start | Run. In the Open box, type the following:

d:\i386\winnt32 /ox

Replace *d* with the drive letter of your CD-ROM drive; i386 is the directory where the installation program is located, winnt32 is the 32-bit NT installation program used by Windows 95 or greater, and /ox is a switch used to create a set of installation floppy disks.



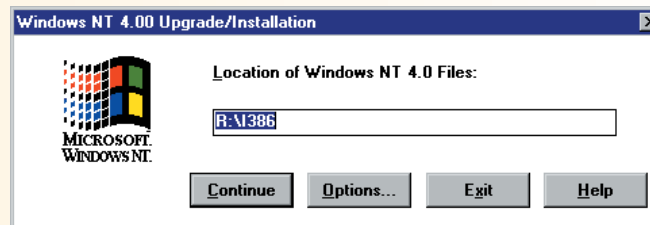
Step 2

In MS-DOS or Windows 3.x, enter the following from a command prompt and click OK:

```
d:\i386\winnt /ox
```

Replace *d* with the drive letter of your CD-ROM drive; i386 is the directory where the installation program is located, winnt is the 16-bit NT installation program used by DOS and Windows 3.x, and /ox is a switch used to create a set of installation floppy disks.

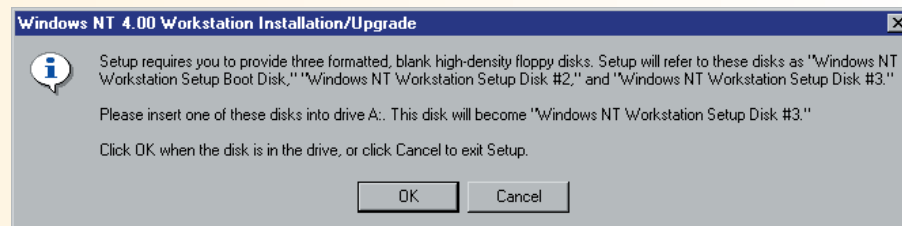
On the Windows NT 4.00 Upgrade/Installation page, verify that the location of the Windows NT 4.0 files includes the drive letter for your CD-ROM drive and also the i386 directory; then click Continue.

**Step 3**

Follow the instructions in the Installation/Upgrade Information box, and label three formatted, blank, high-density 3.5-inch floppy disks. Insert the one labeled "Windows NT Workstation Setup Disk #3" in the floppy drive and click OK or press ENTER.

Step 4

Follow the instructions on the screen; when Disk #3 has been prepared, you will be prompted to replace it with Disk #2. When Disk #2 has been prepared, you will be prompted to replace it with the disk labeled "Windows NT Workstation Setup Boot Disk." When this disk has been prepared, you have your entire set.

**Step 5**

If you are installing NT on the same computer, leave the floppy disk in the drive and re-start the computer. However, if you want to install NT on a different computer, remove the floppy disk and keep all three floppy disks together until you are ready to use them in Step-by-Step 3.02.

Automated Installation You perform an automated installation of Windows NT 4.0 using scripts that someone (often a team of people) has prepared ahead of time. This method is used by organizations with large numbers of desktop computers that need identical applications and desktop configurations. This method requires training and planning by one or more people.

The WINNT and WINNT32 Setup Programs Automated installations and some manual installations may require the use of the WINNT.EXE or WINNT32.EXE program.

- An automated installation using the scripting method for Windows NT 4.0 provided by Microsoft uses either of these programs with appropriate command-line switches to select the scripts.
- A manual installation in which you don't boot from the CD or the setup boot disks requires the use of one of these programs; which one depends on the operating system in control at the time. Did you boot from a DOS disk to install from source files over the network? Then you need to use WINNT.EXE, the version for DOS or Windows 3.x. Are you upgrading from Windows 95 to Windows NT? Then you need to boot into Windows 95 and run WINNT32.EXE.



To learn about the syntax of either the winnt or winnt32 command, open a command prompt and run the command followed by the */?* parameter.

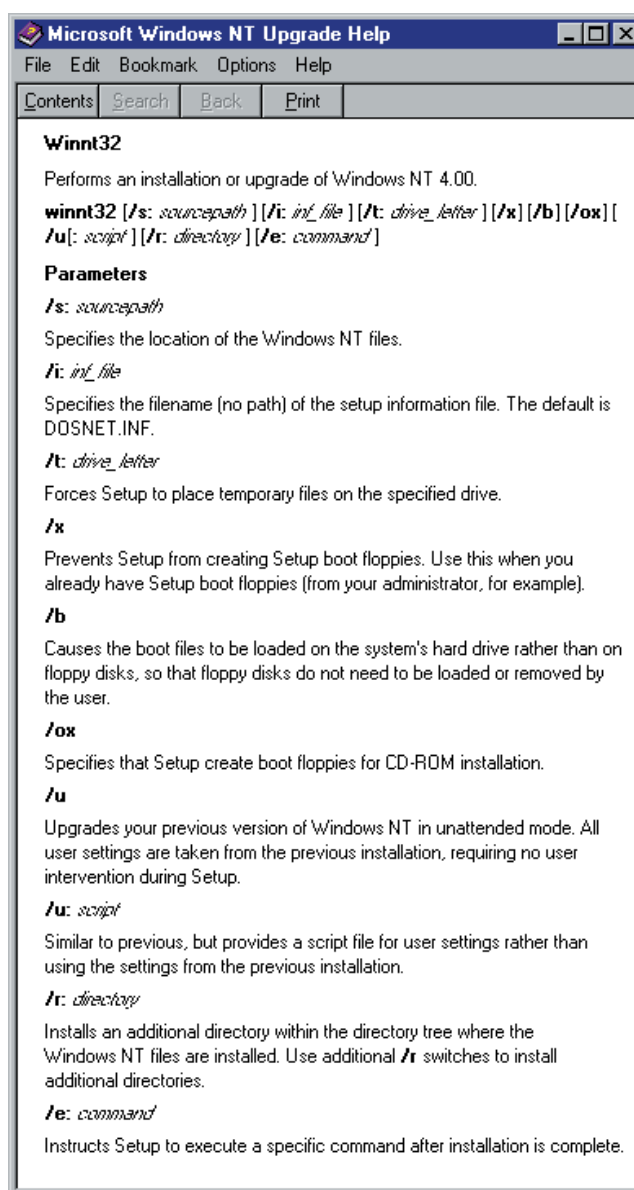
A Windows NT Installation Strategy

Regardless of the method you choose to use for your installation, we strongly suggest a strategy commonly used with Windows NT 4.0: install Windows NT 4.0 using the generic drivers provided with the OS, especially for your video adapter. You will not be able to access all of the capabilities of the adapter right away, but hang in there—we have a reason for this strategy. After you have the OS installed and running with basic drivers, then you should apply service packs. It turns out that some newer drivers do install, but they do not work until you apply service packs. This is because support for such newer technology as the AGP video adapters wasn't included in Windows NT 4.0, but was added in service packs. After applying the appropriate service pack, install the new drivers.

Gather the Materials Needed for Installation

If your computer and its components are newer than 1996 (and we hope they are!), Windows NT 4.0 will not have all of the correct drivers for your system. A driver is a special file containing program code that allows an OS to interact with and control a hardware device. You will need the device drivers for your installed hardware. Driver files are supplied by the manufacturer of the device, so if you can't locate the driver disk that came with the device, contact the manufacturer. Today that's as easy as connecting to the manufacturer's web site and downloading the driver.

If you'll be installing Windows NT 4.0 from source files on a network server, you won't need the CD, but you will need to be able to start your computer with an



- WINNT32.EXE syntax

OS configured with the correct drivers and network client software to access the network and the server.

If your computer will boot from a CD-ROM, you need only the Windows NT 4.0 Workstation CD; if your computer has a CD-ROM drive but can't boot from it, you'll also need the three Windows NT Workstation setup disks. If that's the case, and if you don't have the floppy disks, you can create a new set. Step-by-Step 3.01 has instructions to do this.

You should also have a 3.5-inch floppy disk ready so that you can create an **emergency repair disk (ERD)**. An ERD is important to create and keep up-to-date, because it is needed to recover from damage to the operating system files through the emergency repair process, described in the troubleshooting section of this chapter.

Begin Installation

If you have selected and prepared the hardware, determined your strategy for installation, and checked out the service pack level approved for use at your school or at work, then you are nearly ready to install.

Whenever possible, do a clean installation of a new operating system. We even prefer to start with an unpartitioned hard disk. Unless it is a brand-new hard disk, we remove the old partition and allow the setup program to create a new partition and format it during the installation process.

Step-by-Step 3.02

Installing Windows NT Workstation 4.0

The steps in this exercise assume a clean installation on an unpartitioned hard drive. To complete this exercise, you'll need the following:

- A Microsoft/Intel standard personal computer (desktop or laptop) configured to boot from CD-ROM
- An unpartitioned hard disk (disk 0, the first hard disk)
- The Windows NT Workstation 4.0 CD
- Three Windows NT setup disks, if your computer doesn't boot from CD-ROM
- One 3.5-inch floppy disk to use as an emergency repair disk
- The CD key code from the envelope of your NT CD
- A 15-character (or less) name for your computer, unique on your network
- The name of the workgroup to be used in the class lab
- A 14-character (or less) password for the Administrator account on your computer
- The TCP/IP configuration information for your computer, or confirmation from your instructor that you should configure Windows NT to get an IP address automatically

Step 1

Insert the Windows NT Workstation 4.0 CD and restart the computer. After the computer restarts, you'll briefly see a black screen with a message at the top left: "Setup is inspecting your computer's hardware configuration..." Then a nearly empty blue screen appears, labeled simply "Windows NT Workstation Setup." This is the preparation for text mode of the setup program. When all of the NT Setup files are loaded into memory, the setup program's version of the NT kernel will be loaded and initialized (made active).

Windows NT Workstation Setup

Welcome to Setup.

The Setup program for the Microsoft(R) Windows NT(TM) operating system version 4.0 prepares Windows NT to run on your computer.

- To learn more about Windows NT Setup before continuing, press F1.
- To set up Windows NT now, press ENTER.
- To repair a damaged Windows NT version 4.0 installation, press R.
- To quit Setup without installing Windows NT, press F3.

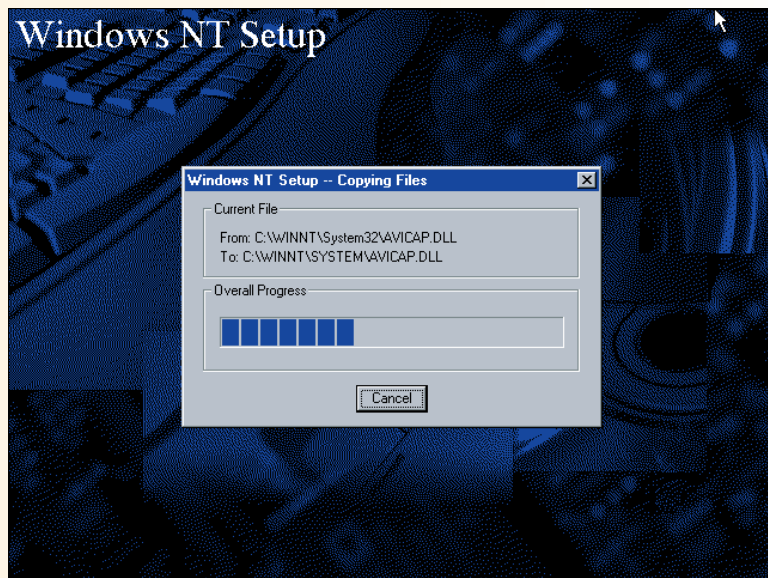
ENTER=Continue R=Repair F1=Help F3=Exit

Step 2

For the next several screens, follow the instructions, responding based on the list at the beginning of this step-by-step. In addition, if your hard disk is unpartitioned, have NT Setup create a partition that is greater than 500MB and that leaves unpartitioned space available for use later. Select NTFS as the file system for the new partition. Accept the default location for the setup program to install the OS. At the conclusion of the text-mode setup, you will be prompted to remove the CD and floppy disk (if present) and your computer will reboot.

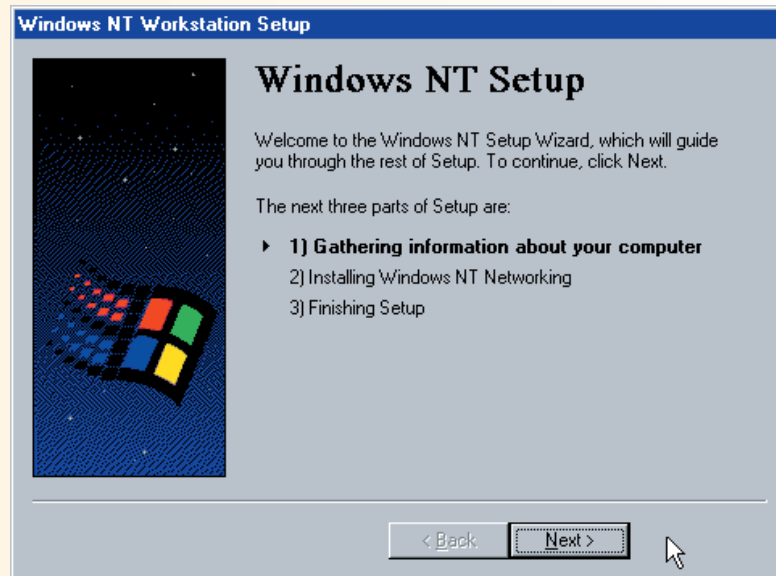
Step 3

After the reboot, NT Setup starts in GUI mode, and the words "Windows NT Setup" appear over blue and black wallpaper. This will be the background for NT Setup until the next reboot. The first message box on this background shows the progress of files being copied. Reinsert your Windows NT 4.0 CD now.



Step 4

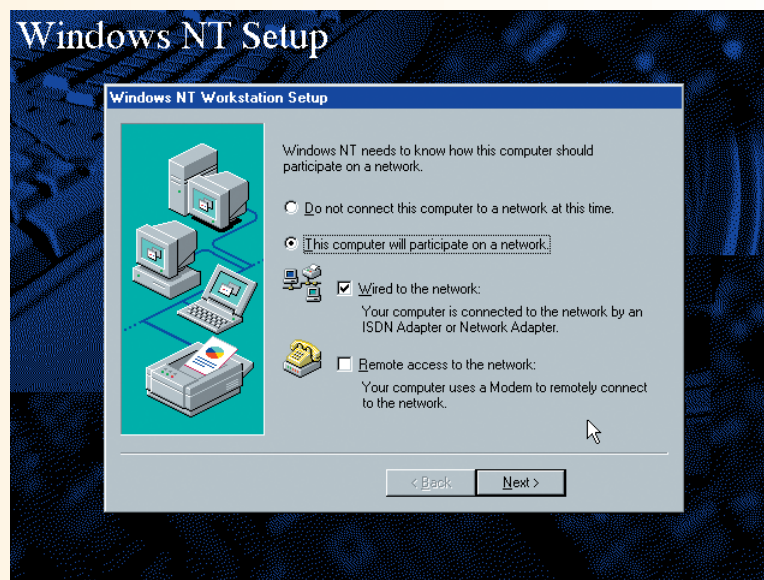
The “Welcome to the Windows NT Setup Wizard” message appears, informing you that it will perform three parts: gathering information about the computer, installing Windows NT networking, and finishing setup. Notice that the first step is highlighted. This message will reappear at the beginning of the next two parts of the setup. To continue, press ENTER or click the Next button.

**Step 5**

The wizard will guide you through the information gathering steps. You will have to make choices and provide more information. Select Typical on the Setup Options page, fill in the Name and Organization page, and have NT Setup install the most common components. Provide the setup program with the information from the list at the beginning of this step-by-step.

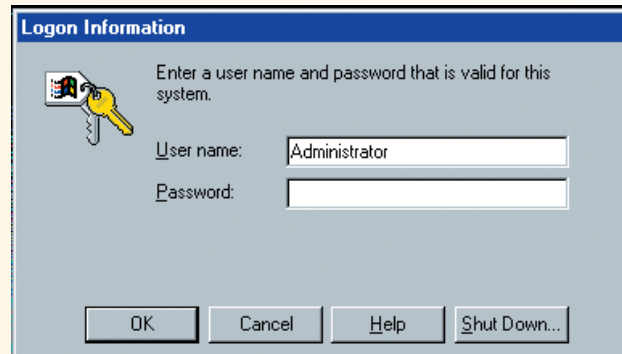
Step 6

During the steps for installing Windows NT networking, use the information about your network settings that you prepared at the beginning of this step-by-step.



Step 7

During the steps for finishing setup, select your time zone and test your display settings; then NT Setup will copy the files necessary to complete the installation and configure the components. When it is finished, you will be prompted to restart the computer. A test of a successful installation is a successful reboot, so remove any floppy disks and CDs, and then click the Restart Computer button. Log on with the Administrator account, using the password you provided during setup.

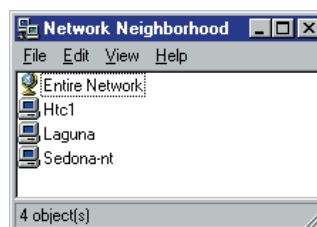
**Performing Post-Installation Tasks**

After Windows NT 4.0 is installed, you have a few necessary post-installation tasks. They include verifying network access (assuming you are connected to a network) and installing the necessary service pack. These tasks should be completed before moving on to customizing the desktop for yourself or another user and performing other desktop management tasks.

Copy Distribution Files Once the operating system is installed, if you have sufficient free hard disk space, it is a good practice to copy the i386 directory from the distribution CD-ROM to the local hard drive. Then, when you add device drivers and other components, you won't have to locate the CD so that the component can be installed; you simply browse to the new location.

Verify Network Access You have successfully installed Windows NT Workstation on a user's desktop. If the user requires access to a LAN and the computer was connected to the LAN during installation, it should have all the right stuff to work on the LAN, but you must verify that the computer can connect to the other computers on the network. We're saving the details of networking for Chapter 10, but right now we'll have you do a simple test of network connectivity, because this is a task normally done immediately after installing an OS.

The simplest test, although it is not entirely reliable, is to use Network Neighborhood to see other computers on your network. In the example here, the list includes an NT Server named HTC1, a Windows XP computer named LAGUNA, and the computer on which we installed Windows NT 4.0 Workstation, SEDONA-NT. If you encounter problems with your network connection in the class lab, ask your instructor to help you solve the problem.



- Network Neighborhood

**Inside Information****What Computers Are Visible in Network Neighborhood?**

Computers are visible in Network Neighborhood only if they have a special service called the Server service turned on, meaning that the computer is capable of sharing its file folders and printers with others on the network. Windows NT Workstation has this service turned on by default. It makes sense that such a service would exist on server operating systems because that is, after all, their reason for being, and those OSs are tuned to support even a high volume of user access. It is available in desktop operating systems so users can share file folders and printers with a small number of other users. This is called peer-to-peer networking. You will learn more about networking in Chapters 9 and 10.



Try This!

Verify Network Access Using Network Neighborhood

Your instructor will tell you what computers should be visible on your network. Try this:

1. On the desktop, locate and double-click the Network Neighborhood icon.
2. When the Network Neighborhood window opens, you will see a listing of the computers visible on your network. If other computers are visible to you, then you are connected to the network, even if you cannot see your own computer listed.

Windows NT 4.0 Service Packs

When you install any software, it is important always to check for the latest updates to the software.

There are several ways to find the version information in Windows NT, but using **WINVER** from Start | Run is our favorite because it's fast. This option displays the About Windows NT message box that contains version and licensing information, as well as the amount of memory available. It also shows the service pack level,

right after the version information, if a service pack has been installed. This is the same message box you see if you select Help | About from the menu in Windows NT Explorer or My Computer.



The Windows NT 4.0 service packs include new support for hardware, such as the AGP video standard, which was added in Service Pack 3 but seemed to work even better with Service Pack 6.



- About Windows NT

Because Windows NT is not a current product, we recently ran into a problem that we solved in two different ways. You decide which way you want to try.

Updating Windows NT—Method 1 After installing the OS, we used Internet Explorer to connect to the Microsoft site and downloaded the latest service pack (6a). Because we were using the version of Internet Explorer that comes with Windows NT, version 2.0, we experienced difficulty viewing web pages. In spite of that, we made it to the Service Pack 6a download page. Our mistake was selecting the button labeled “Start SP6a Express Download.” This downloaded what turned out to be a small program that reconnected to the site to complete the actual download and installation, but when we ran the program and it tried to do just that, an error message popped up stating that Internet Explorer version 3 or greater was required to complete the operation! So, we found the Internet Explorer page (www.microsoft.com/windows/ie) on the Microsoft site and found the download page for Internet Explorer version 6. On a hunch, we read the system

requirements and discovered that it required Windows NT to have Service Pack 6a installed first.

Next, we went searching for a download source for Internet Explorer 3 to install so that we could install Service Pack 6a, and then install Internet Explorer 6. Using another computer with a newer version of Internet Explorer, we found a link to Internet Explorer 3.02 at www.oldversion.com. We downloaded and copied it to a CD.

Armed with the CD containing Internet Explorer 3.02, we returned to our NT Workstation computer and installed IE 3.02. Using this, we connected to the Microsoft site and successfully downloaded and installed SP6a. Finally, we connected to the Internet Explorer page and downloaded and installed IE 6.

Updating Windows NT—Method 2 Once we recovered from Method 1, we went back to the SP6a web page and discovered we had an option for downloading SP6a. Download it by clicking the button labeled “Start SP6a Network Download.” While the first method downloads a small program that is then used to download and install the required components of SP6a for your computer, this button downloads the full service pack (34.5MB). Once it is downloaded, start the service pack installation by running the program file. The benefit of this is that it does not require a newer version of IE to install first. Once the service pack is installed, you can upgrade your Internet Explorer.



Cross Check

Comparing Installations

Now that you have installed Windows NT 4.0 Workstation, compare the installation process with that of MS-DOS 6.22, which you studied in Chapter 2. Then answer the following questions:

1. Overall, how are the setup programs for the two OSs similar?
2. Overall, how are the setup programs for the two OSs different?
3. Compare tasks required after installation of DOS with those required after the installation of Windows NT 4.0.

Step-by-Step 3.03

Installing Service Packs

In this step-by-step, you will use the second method to update Windows NT 4.0 to Service Pack 6a (SP6a).


To complete this exercise, you will need the following:

- The computer on which you successfully installed Windows NT in Step-by-Step 3.02, connected to a LAN, with the correct drivers and protocols for your network
- A user name and password for an account that is a member of the Administrators group
- High-speed Internet access from your lab computer, or a location on the local network or on your hard drive where the instructor has placed the service pack for you to download

Step 1

Log on as an administrator. If your instructor has placed the service pack program on your hard disk or in a network location, skip this step. Otherwise, point your Internet browser to www.Microsoft.com/ntworkstation. On the Windows NT Workstation page, select the link for the latest updates, and on the Windows NT 4.0 Service Pack 6a page choose and click a download version. On the resulting page, locate and click the link

Step 2




Step 3

labeled “Start SP6a Network Download.” In the Confirm File Open dialog box, click the Save As button, and save the file sp6i386.exe to your desktop (or another location, if desired).

After the download is complete (the amount of time it takes depends on the speed of your connection), close the browser. Locate the service pack file, sp6i386.exe, on the desktop (or other location) and double-click it. Follow the instructions on your screen to complete the service pack installation.

Once the service pack is installed, run WINVER.

Confirm File Open




You have chosen to open the file "sp6i386.exe" (Application). Please be aware that some files can contain viruses or otherwise harm your computer.

If you are sure it is safe to open this file, click Open.
If you would prefer to save it to disk, click Save As.
Otherwise, click Cancel.

☒ Always ask before opening this type of file

Open Save As... Cancel

About Windows NT (R)



Microsoft (R) Windows NT (R)
Version 4.0 (Build 1381: Service Pack 6)
Copyright (C) 1981-1996 Microsoft Corp.
Revised Service Pack 6a

This product is licensed to:
Jane Holcombe
Holcombe Training and Consulting

Memory Available to Windows NT: 97,716 KB

OK

■ Customizing and Managing Windows NT Workstation 4.0

Once you’ve installed an OS, you need to configure and manage it for the person who will use it. This can involve a variety of tasks, including creating a new hard disk partition, installing or removing programs, and customizing the desktop. Take some time now to learn about these tasks.

Creating a New Hard Disk Partition

Creation of a disk partition may seem like an advanced task for a survey class, but if you install Windows NT 4.0 Workstation on a new computer, the probability that you will have unpartitioned disk space after the installation is very high because of the small size of the partition that Windows NT Setup creates relative to the very large hard disk systems common today. Therefore, creating a new hard disk partition once in a lab situation is a valuable experience for you.

Windows NT Partitioning Basics

As you learned in Chapter 2, a partition defines the boundaries on a hard disk that can be used as if it were a separate physical disk. The two standard partition types are primary and extended. A primary partition can have a

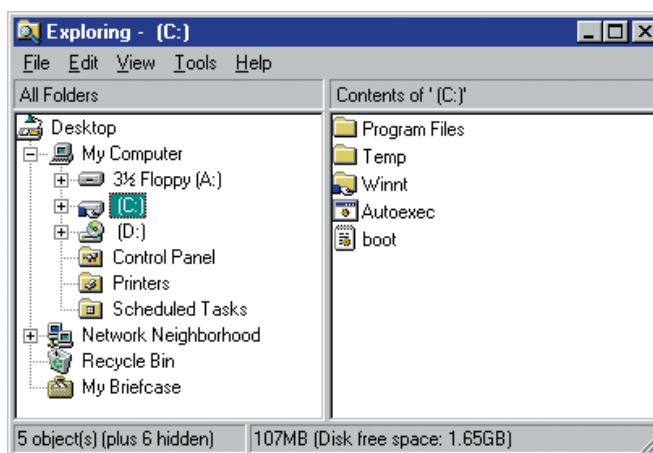
single drive letter assigned to the entire partition. An extended partition can have multiple logical drive letters. Each area that is defined as a drive letter is a **volume**, so a primary partition has a single volume, and an extended partition can contain one or more volumes. A PC will start an OS from a primary partition that is also marked as active. An extended partition cannot be marked as active and therefore cannot be used to start an OS.

Under Windows NT, a hard disk can have a total of four partitions, but never more than one extended partition. Extended partitions came about to get around the limits of the DOS, Windows 3.x, and Windows 9x OSs. You don't need or want an extended partition if you are not using one of these OSs. When you create a new extended partition, you must define the size and number of logical drives. When you create a new primary partition under Windows NT, it is automatically assigned a logical drive letter, but you will have to format it before it can be used to store files and folders.

Windows NT Disk Administrator

The tool you use to manage disks in Windows NT is **Disk Administrator**, which you will use in the following step-by-step. When you use Disk Administrator, you will see that the Partition menu has an option called Create and another called Create Extended. Be sure to select Create. Selecting Create in Disk Administrator will create a new primary partition, and selecting Create Extended will create a new extended partition (you can have no more than one per physical disk). Without going into the boring details of what is wrong with extended partitions, simply remember that an extended partition is not a good thing unless you are dual-booting between Windows NT 4.0 and an OS that cannot use more than one primary partition per physical disk and needs to use the new partition.

If you are dual-booting between NT and a less capable OS, such as DOS, Windows 3.x, or Windows 9x, any drive that the second OS needs must use the FAT file system. Also, the drive can be on only the first primary partition or in a logical drive in an extended partition. All other drives and partitions will be unavailable when one of these other OSs is active.



- Drive letters

Step-by-Step 3.04

Creating a New Partition

In this exercise, you will create a new partition on your hard disk.

To complete this exercise, you will need the following:

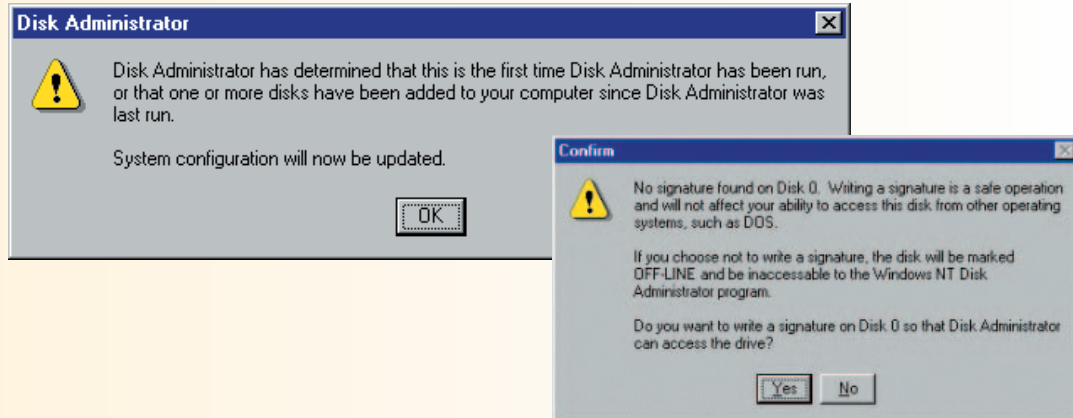
- The computer on which you successfully installed Windows NT in Step-by-Step 3.02
- Unpartitioned hard disk space
- A user name and password for an account that is a member of the Administrators group
- A blank floppy disk

Step 1

Log on as an administrator and launch Disk Administrator by selecting Start | Programs | Administrative Tools | Disk Administrator. The first time you run Disk Administrator, you will see a message box stating that it will update system configuration information.

Step 2

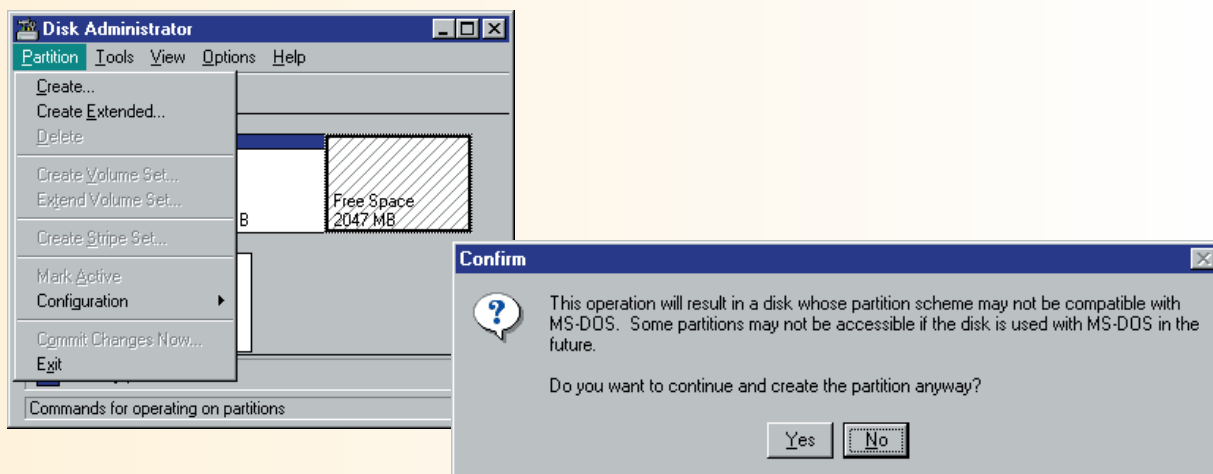
Click OK to close the message box, and Disk Administrator will start. On the first startup screen, you'll also see a message stating that Disk Administrator needs to write information (the signature) on the disk. Click OK to allow it to do this, and then click Yes in the Confirm box. You don't have any choice, but you won't see this message again.

**Step 3**

In Disk Administrator, each physical disk is numbered, beginning with zero. The partitions are defined and labeled in boxes with color-coded bars at the top. The key is in the bottom of the window. If you installed NT according to the instructions in Step-by-Step 3.02, drive C: is a primary partition with the NTFS file system. Drive letters are assigned to hard disk volumes first and then to optical disk drives.

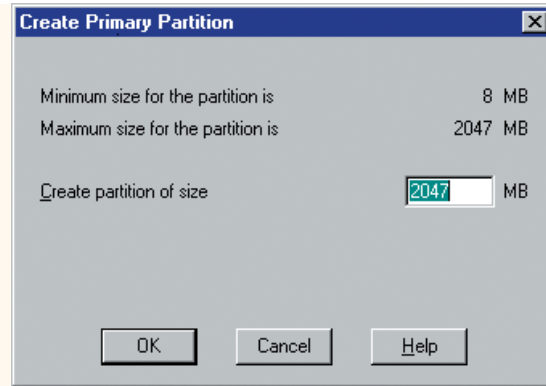
Step 4

To create a new partition in the unpartitioned space, click the area labeled "Free Space," and then go to the menu bar and select Partition | Create. Read the resulting message in the Confirm box, and click Yes to confirm and continue.

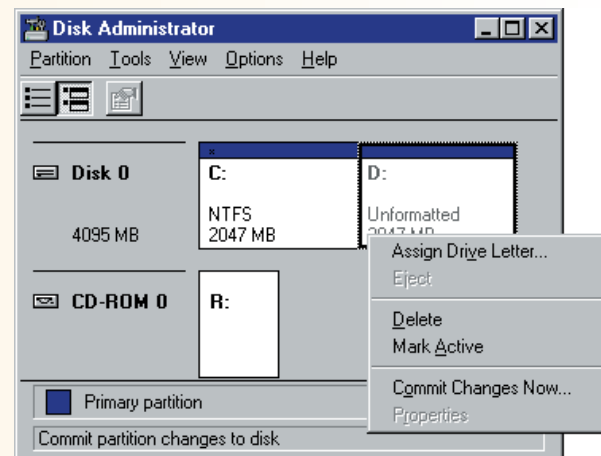


Step 5

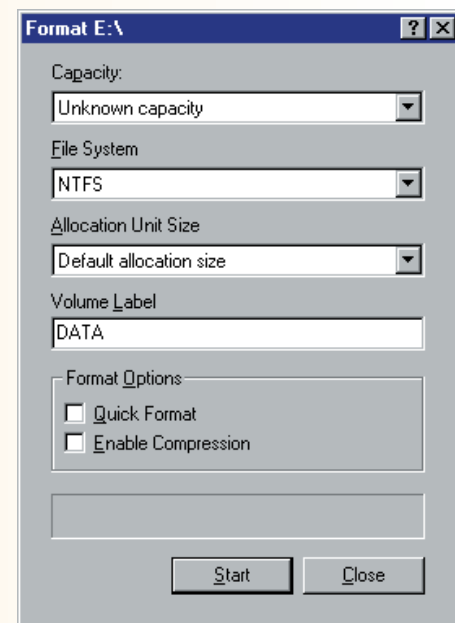
In the Create Primary Partition dialog box, enter a size for the new partition in the entry box or accept the maximum size; then click OK. Ask your instructor for guidance if you are not sure what size to create.

**Step 6**

The new drive will show a drive letter (if you created a new primary partition). Before you can format the new drive, you must commit the changes, which saves the changes in the registry—a huge listing of all of the settings for the OS. To commit the changes, right-click the new partition, select Commit Changes Now, and then click Yes in the Confirm box. An information box labeled “Disk Administrator” reminding you to update the emergency repair configuration will follow this. Click OK.

**Step 7**

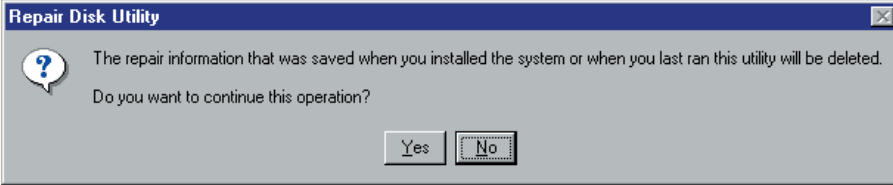
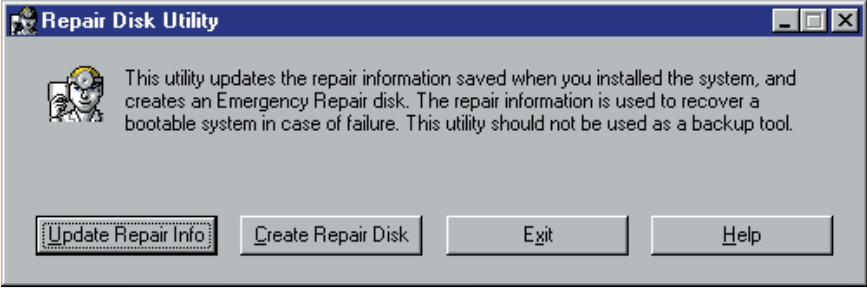
To format the drive, right-click the drive letter and select Format. In the Format box, select the NTFS file system, leave the allocation unit size at the default value, and type **DATA** in the Volume Label box. Do not select either format option; then click Start. In the warning box, click OK. A progress bar will appear in the Formatting box. Click OK when the box pops up with the “Format Complete” message; then click Close in the Format dialog box.

**Step 8**

Confirm that you now have two drives, C: and the new drive, each of which is a primary partition on your hard disk, and then close Disk Administrator.

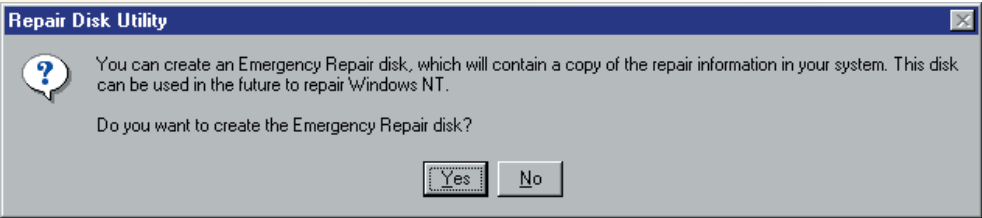
Step 9

Update the emergency repair configuration information in the registry, and create a new emergency repair disk. Select Start | Run. In the Run box, type **RDISK** and press ENTER. Click Update Repair Info. This updates the Repair folder (C:\WINNT\REPAIR if NT is installed in WINNT) with a copy of portions of the registry which now contains information about the new drive.



Step 10

When the repair information has been updated, you will be prompted to create an emergency repair disk. Click Yes and follow the instructions. Disk Administrator will format the disk and then copy the contents of the Repair folder to the disk. When this process is complete, remove the disk and place it in a safe location.



Installing and Removing Applications and Windows Components

After you have installed the OS, you need to install the applications required by the user. Many applications have their own installation programs. In addition, Windows NT has a special Control Panel applet, Add/Remove Programs, which you can use to install and uninstall applications and Windows components.

Step-by-Step 3.05

Using Add/Remove Programs to Install Applications

In this exercise, you will use Add/Remove Programs to verify which programs and Windows components have been installed and to uninstall one of those components. To complete this exercise, you will need the following:

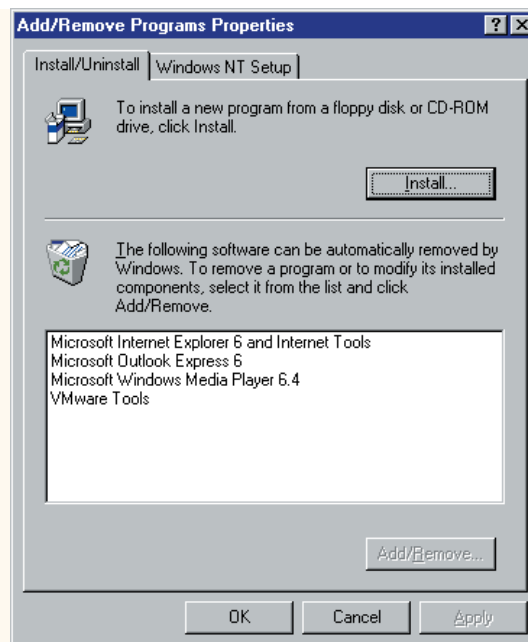
- The computer on which you successfully installed Windows
- A user name and password for an account that is a member of the Administrators group

Step 1

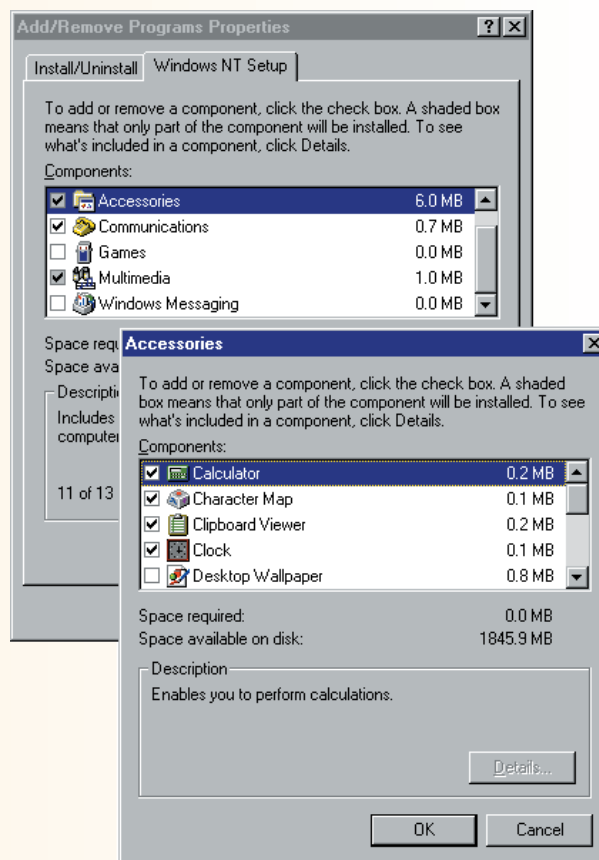
Log on as an administrator and select Start | Settings | Control Panel | Add/Remove Programs. Note the programs listed on the Install/Uninstall page.

Step 2

Click the Windows NT Setup tab, and note the Windows components listed on that page. Be very careful not to click a check box unless you really want to check or uncheck that component. Click each name (not its check box) and note the Details button. This button becomes active when the listed item includes more than one component. Select Accessories; then click the Details button to see all of the Accessories.

**Step 3**

Click Cancel to close the Accessories details box. Back on the Windows NT Setup page, notice that no Games components have been installed. Install a game now. Click Games and then click Details. Click the check box by FreeCell, and then click OK to close the Games box; click OK to close Add/Remove Programs.

**Step 4**

Verify that the FreeCell game was installed by locating it on the Start menu and starting it. You will find it at Start | Programs | Accessories | Games | FreeCell. Exit FreeCell when you are done.



Inside Information

When to Click Apply

Countless times, when Jane (one of the authors) has demonstrated Windows to a class, students have pointed out that she closes dialog boxes without clicking Apply and, therefore, that the changes won't take effect. This isn't true. The Apply button appears in dialog boxes that have multiple tabbed sheets. If you make changes on one tabbed sheet and want to move to another within the same dialog box, click Apply. This applies the changes from that tabbed sheet without closing the dialog box. When you are done working in a dialog box, you don't have to click both Apply and OK to have changes take effect—OK applies all changes and closes the dialog box.



EXPLORER.EXE works behind the scenes as the program that provides your desktop and opens folders.

Preparing the Desktop for Users

After you have installed Windows and tested any required network connectivity, added required service packs, created new partitions, and installed applications, you are ready to customize the desktop. Your goal should be to make the desktop visually pleasant for the user and to make any necessary changes that make using the OS easier.

Users Will Customize the Desktop

One observation many professionals have related to us is that they continue to encounter client users who are new to working with computers and need to be guided through the procedures for turning on the computer, logging on, and performing new tasks. Revisiting the same novice user within a week, they find a customized desktop with a picture of their children or pet poodle as wallpaper. This tells us that they were given a good introduction. Some organizations don't allow such personalization for a variety of reasons, such as corporate image, propriety, and security when computers are in a public area. However, when it is allowed, this type of customization can make the user feel more comfortable with the computer.

Respect the Chair/Keyboard Interface

In two decades of working with users and teaching desktop and server support skills, Jane heard thousands of professed true-life stories about human-computer interactions—many of them hilarious, but that's another book. Many of these stories reflect human nature when confronted with a new situation. It's important always to remember what it is like to be introduced to something very new and strange to you and to be told that you have to master its use for school or work. (You may be going through this right now!) A good desktop support person helps the new user feel comfortable with the computer and the required programs. Beyond the training and one-on-one tutoring of the user you may perform, you need to set up the desktop so that it works for the individual. The chair / keyboard interface is a human being!

Step-by-Step 3.06

Customizing the Desktop

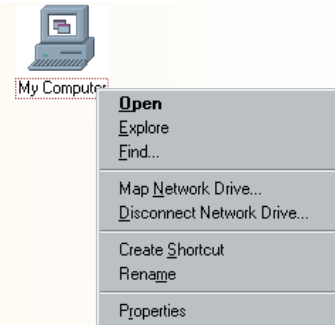
Experience will teach you the best methods for customizing the desktop. In this exercise, you will customize the settings for My Computer and Windows NT Explorer and use the Display applet to modify the desktop. Although the particular changes you make in this exercise may not be appropriate for most users, you will have an opportunity to view many of the settings available to you.

To complete this exercise, you will need the following:

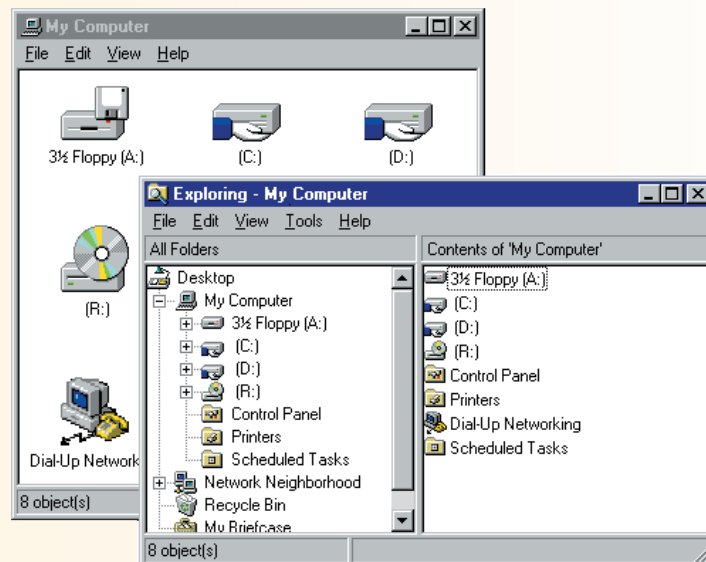
- The computer on which you successfully installed Windows
- A user name and password for an account that is a member of the Administrators group

Step 1

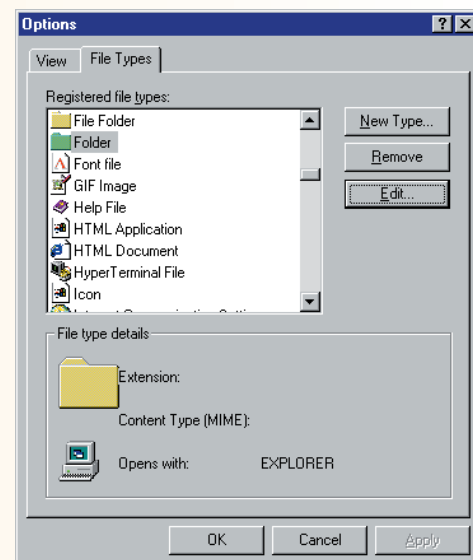
Log on as an administrator and right-click My Computer. This brings up the context menu. Notice that one of the options, Open, is in bold. The bold item in a context menu is the default action that occurs when you double-click an object. You are going to change this default behavior. But first, click an empty portion of the desktop to close the context menu without making a choice (the ESC key also closes open menus and dialog boxes).

**Step 2**

Double-click My Computer. This brings up Folder view. This is what Open means for this object. Leave this window open and go back to the desktop. Right-click My Computer and select Explore to start My Computer in Explorer view. Compare the two views and see which you prefer. Do you like the one-dimensional, single-pane window of Folder view or the double-pane window of Explorer view, with a hierarchy of objects in the left Folder pane and the contents on the right?

**Step 3**

We prefer Explorer view. Therefore, one of the first things we do for our own desktops is to make Explorer view the default, as you will do next. (Let's pretend that this is your preference, too!) Click one of the open My Computer windows and select View | Options. In the Options dialog box, click the File Types tab. In the list of registered file types, scroll down and select Folder (not File Folder).

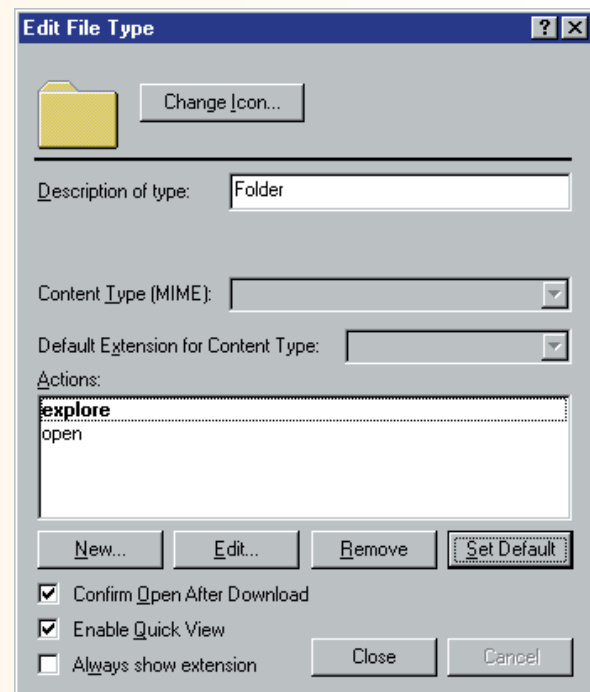
**Step 4**

Notice under File Type Details that Folder opens with Explorer, which opens a folder, whether it is opened in Folder view or Explorer view. With Folder selected, click the Edit button. In the Edit File Type dialog

Step 5

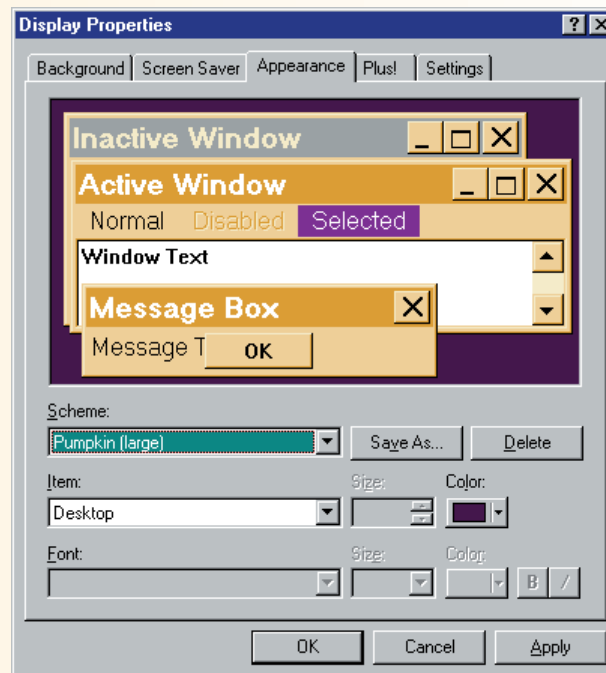
box, the word *Open* in the list of Actions is bold. That indicates that it is the default action. To change the default, click Explore and then click the Set Default button.

Click Close to close the Edit File Type dialog box. Click the OK button to close the Options dialog box and to make the change take effect. Test the change by right-clicking on My Computer. Explore should now be in bold. Test it further by double-clicking the My Computer icon. It should now open in Explorer view.



Step 6

Make a change to your desktop. Right-click the desktop to open the Display Properties dialog box and click the Appearance tab. Select each of the schemes in the drop-down list box, and use the preview box at the top to choose a new scheme. When you find one that suits you, select it; then click OK to close the Display Properties dialog box and to apply the change you made.



Creating and Managing a Local Printer

Before anyone can use a local printer (one connected directly to the PC), an administrator must install the printer driver. After it is installed, users on that computer can print to the printer. Members of the Users, Administrators, and Power Users groups have different rights to the printer for management tasks.

Only the Administrator user or another member of the Administrators group can install a printer driver. NT comes with many printer drivers, but these drivers are of a 1996 vintage. That presents the administrator with two main scenarios: installing a printer driver from the Windows NT CD (only for old printer models), and installing a printer driver that comes with the printer. In Step-by-Step 3.07, you will install a printer driver from the Windows NT CD.

If you need to install a new printer in a Windows NT 4.0 system, you can use the Have Disk button on the Manufacturers page of the Add Printer wizard to point to the location of the drivers for the new printer. Then you continue on through the Add Printer wizard. However, it has been our experience that you almost never need to use the Add Printer wizard if your printer driver is not on the Add Printer wizard list. Every recently manufactured printer that we have installed has come with its own setup program. Recently, we installed a Samsung laser printer in a Windows NT 4.0 system. Following the instructions, we installed the printer driver in five mouse clicks and did not have to enter any information.



Be sure to read the documentation that comes with the printer. Most manufacturers use the Install Shield installation program, which works very well with Windows.

Step-by-Step 3.07

Installing a Printer Driver from the Windows NT CD

In this exercise, you will install a printer driver for a local printer. This is an older printer, and the drivers for it are on the Windows NT CD.

To complete this exercise, you will need the following:

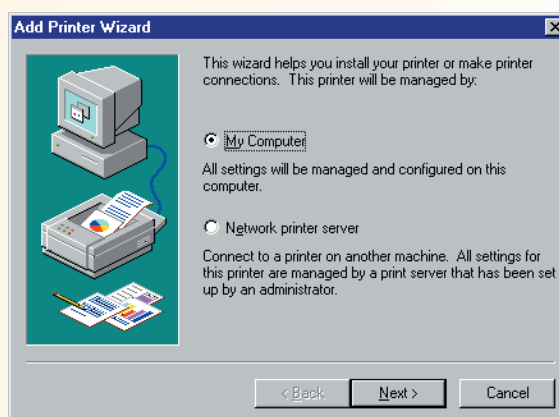
- The computer on which you successfully installed Windows NT

- The Windows NT 4.0 Workstation CD
- A user name and password for an account that is a member of the Administrators group

You do not need a printer connected to your computer.

Step 1

Log on as an administrator and select Start | Settings | Printers. Double-click Add Printer to start the Add Printer wizard.

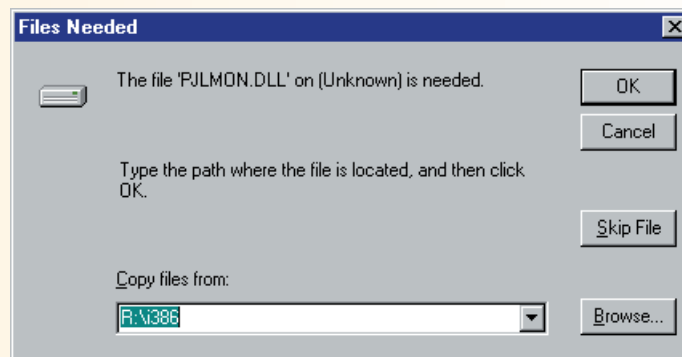


Step 2

Select My Computer and click Next. In the Available Ports list, select LPT1; then click Next. In the Manufacturers list, scroll down and select HP. In the Printers list, select HP LaserJet 5; then click Next. The Printer Name box will default to the model name of the printer, but you can give the printer a friendly name, such as Accounting Printer; then click Next. Leave the printer as unshared. You will learn about sharing printers in Chapter 10. Click Next.

Step 3

Select No on the Printer Test page, unless this specific printer is actually attached. Click Finish. The Add Printer wizard will attempt to find the files it needs. If it doesn't find them, it will prompt you to provide the location. It is looking for the Windows NT CD. Change the drive letter in the Files Needed box if it does not point to your CD drive. Insert the CD and then click OK. A Copying Files box will appear very briefly, and the desktop will be displayed.

**Step 4**

Verify the installation of the printer by selecting Start | Settings | Printers. The new printer should appear in the Printers folder.



■ Troubleshooting Common Windows NT 4.0 Problems

Anyone using a computer eventually runs into a situation where something fails or the computer just sort of behaves differently. For those occasions when no one is handy to solve the problem for you, we have some suggestions. In this section, you'll learn where you can find help and how to perform some simple maintenance tasks, as well as learn some Windows NT 4.0 troubleshooting tips.

Proactive Tasks

There are tasks you can perform on your computer that will either help prevent certain problems, or help you more quickly recover from a problem. Creating backups, having an NT repair disk handy, and becoming familiar with sources of help will make your life easier.

Creating Backups

It is better to be prepared for loss of data than to find a “cure” for it after the data is gone. Prevention is at least a twofold process. First you need a plan for organizing your data so that it can be easily backed up, and then you must perform backups at regular intervals.

Any plan for organizing data should make sense to the user so he or she will actually follow it, it should keep data files separate from the application program files, and it should set up a hierarchical structure to make backup easier. A simple hierarchical structure has a folder at the top level and several subfolders stored within that folder, with the subfolders containing files organized by type of data file or by the names of the projects the user works on or by whatever scheme makes sense to the user. With just one folder at the top of the entire hierarchy, you can point a backup or copy program to the top folder and back up all data files at one time.

Back up all valuable files! Windows NT 4.0 Workstation has a backup program, available through Start | Programs | Administrative Tools | Backup. However, this program works only if you have a tape backup system installed, and it must be a tape backup system that is on the list of tested hardware at the Microsoft site. This makes the NT Backup program almost useless for a desktop computer. If your data files are stored on your local computer and you don't have a tape backup system, find another backup method. This is very important! Use a network server, writeable CD-ROM, or other removable media. Third-party backup programs also are available for Windows NT 4.0. Later versions of Windows include greatly improved backup programs.



If you need an alternative to the Windows NT backup program, you might go to www.dantz.com or www.novastor.com to see what they offer.

The NT Repair Disk and the Repair Process

Repair information saved when you run the emergency repair disk program, RDISK, includes the hardware and software configuration information critical to running your operating system and hardware components. This configuration information is affected by changes made, such as creating new partitions and formatting a drive, and during the installation and configuration of device drivers and other components. Make a habit of updating the repair information and the emergency repair disk (ERD) every time you add a new driver or make other changes, such as when you create or remove a disk partition. Step-by-Step 3.04 includes the steps for running the RDISK program to create an up-to-date ERD.

Finding Sources of Help

Our two favorite places to find help for problems with Windows are the Microsoft web site and the Windows NT Help program. The NT Workstation home page is at www.Microsoft.com/ntworkstation. From there, you can select Technical Resources and look for a topic. The Windows NT

Help program is available on the Start menu. Browse through key topics using the Index tab, or search for a word or phrase using the Find tab, a technique you will use in the following Step-by-Step.

Step-by-Step 3.08

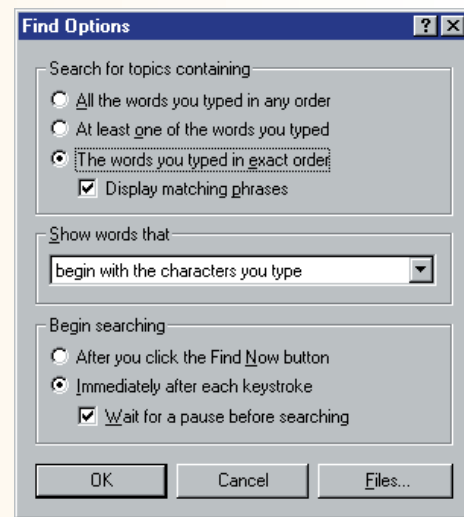
Finding Help in Windows NT

In this step-by-step, you use the Find tab, which is more powerful because you can search for words and terms within topics.

To complete this exercise, you will need the computer on which you successfully installed Windows.

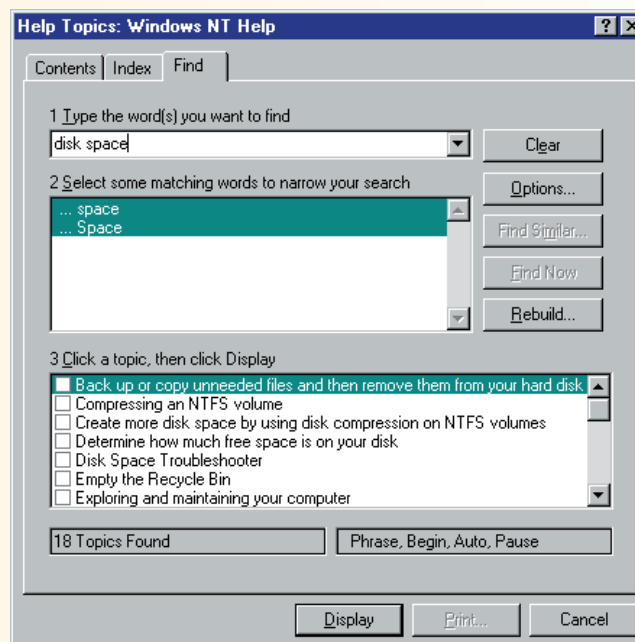
Step 1

Select Start | Help. In the help program, click the Find tab. If this is the first time you have clicked Find, the Find Setup wizard needs to create a search list. Select Maximize Search Capabilities; then click Next twice, and the Find tabbed sheet will appear, and the Help Topics window will open. Click the Options button, and under Search For Topics Containing, select The Words You Typed In Exact Order; then click OK.



Step 2

Let's see what Windows NT Help has to say about disk space. Type the words **disk space** in the top box. The second box shows some matching words, and the bottom box shows the topics related to those words.

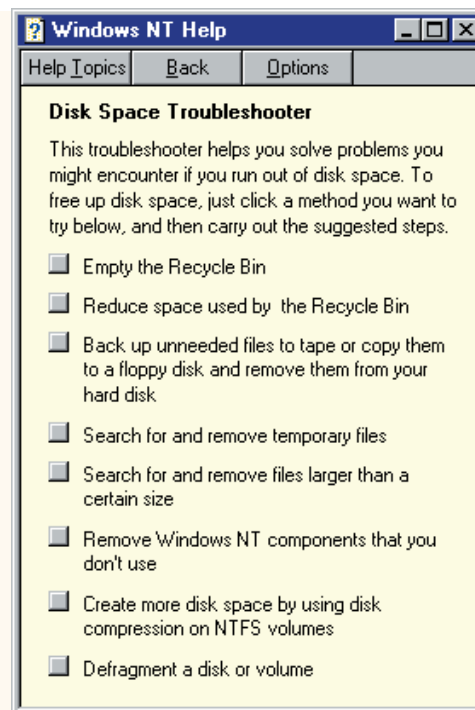


Step 3

In the bottom box, locate Disk Space Troubleshooter and click the check box to select it; then click Display.

In the Disk Space Troubleshooter, click Empty The Recycle Bin. You will see instructions on emptying the Recycle Bin, which holds files that have been deleted from your local hard disk. Follow these instructions; then click the Back button to return to the last box. Back in the Disk Space Troubleshooter, repeat the last two steps for each of the suggested steps shown in the troubleshooter.

In this exercise, you used Windows NT Help to research disk space problems. The suggestion you saw for removing temporary files is a little vague, but the next step-by-step will guide you through this process.



When Problems Sneak Up on You

Have you ever heard of the term “bit-creep”? A friend once said, “Over time, my OS seems to deteriorate through a mysterious process I call bit-creep. Therefore, once a year I back up my data, reformat the hard drive, and reinstall the OS or install a new OS.”

We have heard similar stories countless times from computer professionals and savvy users. Our theory was that this bit-creep phenomenon had something to do with unstable OSs. So in 1996, when we installed NT 4.0 on a desktop computer in our office, we decided to use it as a test of that concept. As advertised, it was a more stable OS than its contemporary, Windows 95, and it stayed fairly stable through daily use for over four years, although that could be because we were conservative about adding new software to the computer, except the occasional service pack. After that, however, it did get weird, and each time it suffered a hardware failure, we were on the verge of removing the OS and replacing it because of the increased frequency of software hang ups (no response to the mouse or keyboard). By the time we were ready to replace it, we did not choose to install a newer OS, but instead replaced the computer with a brand-new faster one on which we installed Windows 2000 Professional, which has since been upgraded to Windows XP Professional.

Possible Cause

Let’s look at some of the possible causes of “bit creep.” If your computer seems to have become slower over time, the cause may be a hard drive issue, but not truly a hardware issue. Data is stored on hard drives in a



When deleting temporary files, be sure to delete only the files, not the temporary folders!

way that can lead to pieces of individual files being stored in widely separated areas of the disk. Then, when reading the files into memory, the system takes longer to gather up all the pieces. This is called disk fragmentation, and at the very least will cause slower file access and program startups. In the extreme, it may cause your computer to hang or produce other errors.

Solution

The solution is to run a program on your hard disk that reorganizes, or defragments, the data on your hard disk. This process is called **defragmentation**, or defragging. Windows NT doesn't come with a defragmentation program, but programs are available from other sources, such as Executive Software, which publishes Diskeeper. Use a disk defragmentation program on FAT and NTFS volumes. At one time, Microsoft stated that NTFS volumes did not require defragmentation. We used Diskeeper to analyze an NTFS drive on an NT 4.0 computer that had been used for just a few days. It found 203 fragmented files, with a total of 1,642 excess fragments.

Before you defragment your hard drive, you should clean up your hard disk. That includes removing unnecessary or obsolete programs and deleting unnecessary files. The biggest offenders in this second category are temporary files. Many applications save temporary files on your hard disk. When such an application is closed, it should remove the temporary files. Some may not get removed, though, if the application isn't closed properly or if it fails to complete the removal process, but other applications purposely don't clean up their temporary files. Your Internet browser may be in this second category.

Temporary files are often stored in a folder named TEMP, and temporary Internet files are stored in a folder named Temporary Internet Files (depending on the version of Internet Explorer). On a regular basis, clean out these locations. You can also check your software to see if it has a setting to manage the temporary files.

Step-by-Step 3.09

Removing Temporary Files

In this exercise, you will look for and delete temporary files and change the settings for temporary Internet files.

To complete this exercise, you will need the following:

- The computer on which you successfully installed Windows NT Workstation 4.0
- Internet Explorer version 6

Step 1

Log on as Administrator. Close any open applications.

Step 2

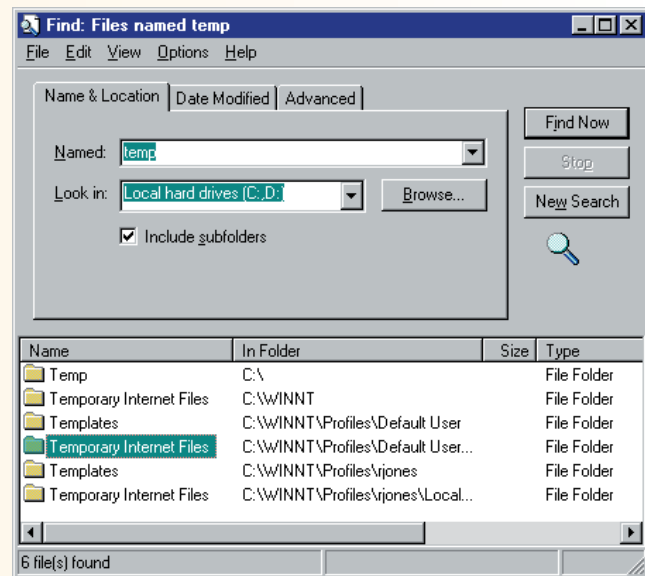
Search for the temporary folders. Select **Start | Find | Files Or Folders**. In the **Find: All Files** dialog box, type **temp** in the **Named** text box, and select **Local Hard Drives** in the **Look In** text box. Be sure that **Include Subfolders** is checked and then click **Find Now**.

Step 3

You should find a single **TEMP** folder on drive **C:**, and perhaps a **Temporary Internet Files** folder for each user. These folders may have few or no temporary files, depending on what applications you have used since installing NT.

Step 4

Double-click the **TEMP** folder to open it; select the **TEMP** folder contents and press **DELETE**. You can do the same with the **Temporary Internet Files** folder.



Using the Emergency Repair Disk

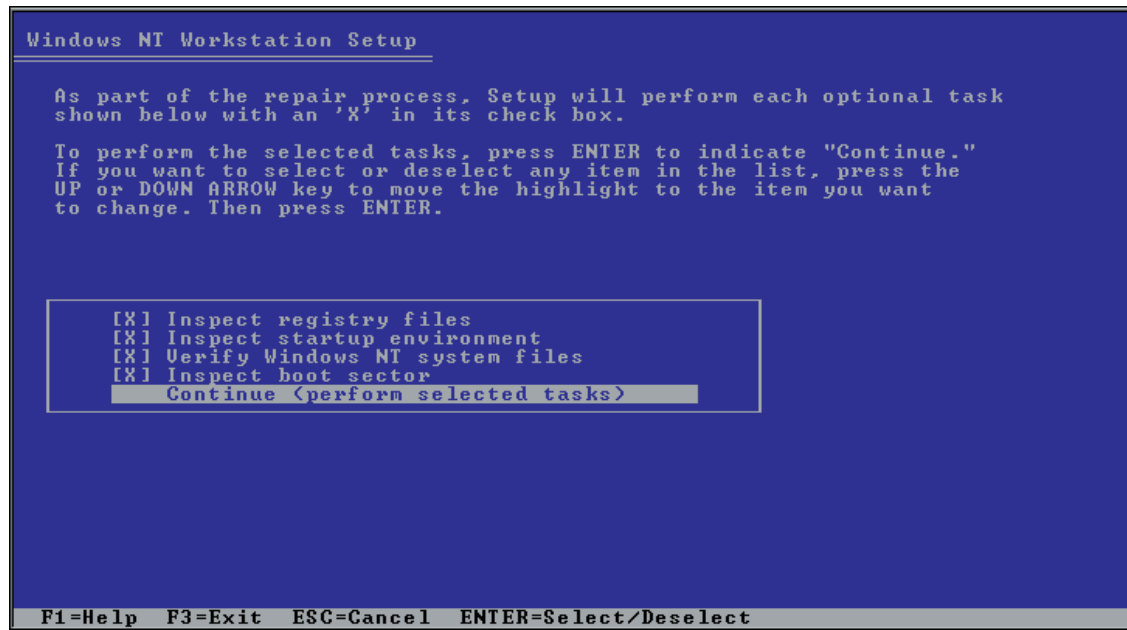
If your Windows NT computer will not boot check out the use of Windows startup disks in Chapter 8. If that method does not solve your problem, you may need to perform an emergency repair. This requires having up-to-date information in the **Repair** folder (**C:\WINNT\REPAIR**). You should also have a backup of this information, in the form of a special floppy disk called an emergency repair disk (ERD). In this chapter, you had two opportunities to create an ERD: once during the installation (Step-by-Step 3.02) and once after creating a new partition (Step-by-Step 3.04).

To perform an emergency repair, you need the Windows NT CD, the ERD, and if your computer will not start from CD-ROM, you will need the three setup disks. See Step-by-Step 3.01, "Creating the Windows NT 4.0 Setup Disks from Windows or DOS." The procedure is as follows:

1. Using the CD-ROM or the setup disks, boot to the Windows NT 4.0 setup program.
2. At the **Welcome To Setup** screen, press **R** to repair a damaged Windows NT version 4.0 installation.
3. On the following screen, select or deselect the desired actions in the box; then press **ENTER** to continue.



Windows NT, Windows 2000, and Windows XP all have the same startup process. You will learn more about this common Windows startup process in Chapter 7, where you will also learn how to solve problems at startup. Can't wait? Then, connect to www.microsoft.com/technet and search for the article titled "What Happens When You Start Your Computer." This is Chapter 19 of the *Windows NT Workstation Resource Kit*.



- Emergency repair menu



Perform an emergency repair only if you are unable to boot up, cannot repair with the startup disk, and have kept the repair information up-to-date. You should also first browse the emergency repair topics at the Microsoft Technet site: www.microsoft.com/technet.

4. On the following screen, press ENTER to continue with detection of mass-storage devices or S to continue after skipping mass-storage device detection. Unless you have tried this and failed previously on this computer, choose the first option.
5. Continue, following the instructions on the screen. When the procedure is complete, remove all disks and restart the computer.

The Blue Screen of Death (BSOD)

The **Blue Screen of Death (BSOD)** strikes horror in the hearts of IT professionals new and old. We actually have yet to hear of someone dying from a blue screen, but it would be fair to say that more than a few important data files have met an untimely demise when a Windows NT computer has crashed and displayed a Stop message on a blue screen. First, we'll answer the question, "What is the BSOD?" and then we'll show you an approach to troubleshooting BSOD problems—and this is well worth learning because both Windows 2000 and Windows XP have similar Stop screens, and the action you take for those OSs is much like what you will learn here.

What Is the BSOD?

The BSOD is actually a feature (rather than a bug) of Windows NT. It's a blue character-mode screen that displays a message that includes the word *Stop* near the top left of the screen, and seemingly nothing else that makes sense. Stop error screens exist by design. The OS stops everything when it detects that something very bad (also known as a Fatal Error) has happened to make it unstable.

Windows NT 4.0 is not the only OS that is designed to behave like this, although others may not produce the infamous BSOD. When something occurs to make an OS unstable, it is assumed that more damage could be done

by allowing things to continue out of control, so the OS stops and displays a blue screen with an error message. Although in-depth study of the handling of stop errors is a more advanced topic for another day, another course, there are several common blue-screen errors that you can learn to decipher just from reading the first few lines of information on the Stop screen.



Inside Information

Stop Error

First, let's have some kind words about this stop error business. The screen appears by design and may keep even worse things from happening. You wouldn't really want to continue driving your car if the oil pan were ruptured and the car were leaking oil by the quart. The oil light shows up on your dash, nice and bright so you can't ignore it. Now if it weren't for the risk of bodily harm to drivers and passengers, we're sure manufacturers would have the car stop itself at the first sign of a major oil leak, so that you wouldn't ruin your engine. A desktop OS is not usually involved in propelling humans at freeway speeds, so stopping is considered a good choice if something has happened to make the OS question its own sanity.

What Can Cause a BSOD?

Some programs can go bad without causing a BSOD. These are programs, like your application programs, that are isolated from the kernel of the operating system and cannot usually cause harm. With these programs, Windows NT can usually maintain enough control to let you remove an offending program through the Task Manager. Other programs, notoriously drivers, are given the same privileges as the OS kernel and can cause a BSOD. A bad driver can cause the BSOD during installation and during startup.

Solving the Problem by Observation and Research

A BSOD is intimidating because most of the screen is filled with geeky-looking hexadecimal numbers, as shown in Figure 3-5. Ignore them and just

```

*** STOP: 0x69696969 (0x00000000,0x00000000,0x00000000,0x00000000)

CPUID: GenuineIntel 7.1.2 irq1:1f SYSVER 0xf0000565

Dll Base Date Stamp Name
00400000 22553a39 ntoskrnl.exe
00400000 22553a39 hal.dll
00000000 00000000 auapi.sys
00000000 00000000 busio.sys
0002270000 1ec6c67a CLASS2.vg.sys
00000000 1ec6c68d Floppy.vg.sys
0000ab8000 1ec6c67d Cdaudio.vg.sys
0000dc9000 1ec6c699 Null.vg.sys
0000dca000 1ec6c678 Beep.vg.sys
0000c6c000 1ec6c697 mouclass.sys
0000ae8000 1f507222 VIDEO.PRT.sys
0000b00000 1ec6c6cb Msfs.vg.sys
0000792000 1eed2362 NDIS.sys
000077c000 1eeeb583 vga.dll
0000480000 1ec6c6e6 TDI.sys
00000000 1f1f30a7 netbt.sys
00000000 1f1f30a7 serial.sys
00000000 1f1f30a7 rdr.sys
00408c0000 2f2131c8 crashdrv.sys

Dll Base Date Stamp Name
80040000 1eeebcc3 hal.dll
80000000 00000000 SCSIPT.SYS
8002230000 1eed2362 Disk.sys
8002210000 1eed2362 Ntfs.sys
00000000 1ec6c6a7 Cdrom.vg.sys
00000000 1ec6c6f7 Fs_Rec.vg.sys
00000000 1ed868b6 KSecDD.vg.sys
00000000 1ec6c690 i8042prt.sys
00000000 1ec6c694 kbdcass.sys
00000000 1ec6c66d vga.sys
00000000 1ec6c6c7 Npfs.sys
00000000 1f1f30a7 win32k.sys
00000000 1ec6c68f Cdafs.sys
00000000 1f1f30a7 tcpip.sys
00000000 1ec6c6b4 amdpcn.sys
00000000 1f1f30a7 netbios.sys
00000000 1f1f30a7 srv.sys
00000000 1f1f30a7 mup.sys

Address dword dump Build [13811] Name
f5d8bfdd0 f5d8c756 f5d8c756 6969696969 - crashdrv.sys
f5d8bfdd8 f5d8c410 f5d8c410 044515f10 808cccd30 - crashdrv.sys
f5d8bfde0 80111139b 80111139b 808cccd30 809bf2c8 - ntoskrnl.exe
f5d8bfde8 80016fa42 80016fa42 044515f10 80165a01 f58bfdec - ntoskrnl.exe
f5d8bfdf0 800165a01 800165a01 f58bfdec 800165a01 809bf2c8 - ntoskrnl.exe
f5d8bfdf8 80016b6d3 80016b6d3 808cccd30 808bf2c8 809bf200 - ntoskrnl.exe
f5d8bfe00 800165a01 800165a01 808bf2c8 800165a01 8012f8c88 - ntoskrnl.exe
f5d8bfe08 80011339b 80011339b 000000000 0012019f 6330bf9c - ntoskrnl.exe
f5d8bfe10 80011339b 80011339b 80141ab0 ffffff f58bfec7 - ntoskrnl.exe
f5d8bfe18 800141ab0 800141ab0 ffffff f58bfec7 800000000 - ntoskrnl.exe
f5d8bfe20 800165a01 800165a01 000000000 000000000 000000000 - ntoskrnl.exe
f5d8bfe28 80013b519 80013b519 000000000 000000000 000000000 - ntoskrnl.exe
f5d8bfe30 f56558c12 f56558c12 000000000 000000001 000000001 - srv.sys
f5d8bfe38 f56551718 f56551718 f56559032 000000000 000000000 - srv.sys
f5d8bfe40 f56559032 f56559032 000000000 000000000 000000000 - srv.sys
f5d8bfe48 80013f9ea 80013f9ea f56559055 f56514f8 000000000 - ntoskrnl.exe
f5d8bfe50 f56559055 f56559055 f56514f8 00000027f - srv.sys

Restart and set the recovery options in the system control panel
or the /CRASHDEBUG system start option. If this message reappears,
contact your system administrator or technical support group.

```

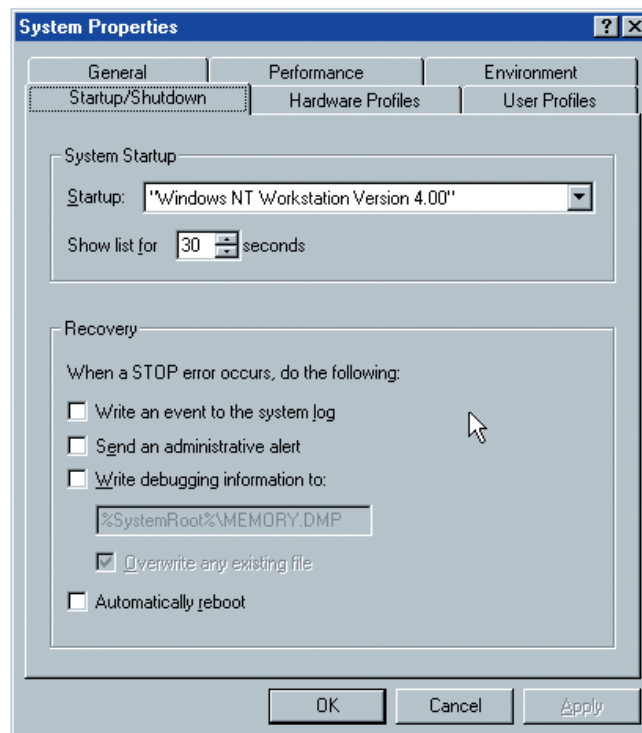
- **Figure 3-5.** A BSOD displays a Stop error code near the top of the screen.

concentrate on the first few lines on your screen. Observe and record what you see on the screen in preparation for either reporting it to a computer support person or researching the cause yourself. Look for the stop code (the first string of characters after the word *Stop*) and write it down (*yes*, the entire string), and then look for a description at the left of the line immediately below the line containing the Stop code and above the line that begins “CPUID.” As Figure 3-5 shows, sometimes there is no description. An example of a description is “IRQL_NOT_LESS_OR_EQUAL.” If a description is present, write it down, also. After displaying a Stop screen, the computer may restart on its own. If not, once you have recorded this information, you should restart it. It is possible that the computer will restart and function normally, but you should still report the problem or research the cause of the Stop screen.

Using just the stop code, search the Microsoft Technet site (www.microsoft.com/technet) for possible causes and solutions (using another computer if this one won’t work). When you find information on this stop code, it may have different solutions based on the description found on the screen.

Preparing for the BSOD

To be prepared for a BSOD, you should decide how you want your computer to behave after a stop error. You do this by modifying the Recovery settings on the Startup/Shutdown tab of the System applet of Control Panel.



- The Recovery settings on the Startup/Shutdown tab
 - **Write An Event To The System Log** will cause NT to write an event to the system log, which is one of several log files that can be viewed using Event Viewer (Start | Programs | Administrative Tools |

Event Viewer). This means that even if the computer reboots after a Stop screen, you can read the stop error information that was on the screen in the system log. We recommend you select this setting, if it is not already selected.

- **Send An Administrative Alert** is a setting that we recommend you select. This sends an alert message to the administrator that will appear on the administrator's screen the next time the administrator logs on.
- **Writing Debugging Information To** is a setting we don't recommend for a desktop computer, because it creates a file containing an image of the contents of memory at the time of the fatal error. This file can be sent to Microsoft for evaluation of a problem, but this amount of effort and cost (Microsoft charges for these services) is normally only expended on a critical computer, such as a network server.
- **Automatically Reboot** is a setting we recommend, as long as you have also selected the first option, which preserves the stop error information.

Stalled Print Job

You have sent a print job to your printer, but it either does not print at all, or only partially prints before stalling. To troubleshoot this, you double-click on the printer icon that appears on the right side of the taskbar while a document is printing. This opens the print queue. The status of the document is "printing" although it is not actually doing so. Now you turn to the printer and check that it has paper, is connected, turned on, and online. Return to your computer and the print queue, select the document, and attempt to cancel it from the queue. The status may change, but the print job never leaves the queue. In fact, if you try to send other print jobs, they will also fail to print. This is a sure sign of a stalled print spooler, and the only solution is to restart the Spooler service. You may do this by restarting your computer, or by stopping and starting just the Spooler service. You can do the latter from the Services applet in Control Panel. From the list of services, select Spooler and click the Stop button. When the status column shows that this service is stopped, restart it by selecting the Start button. Open the print queue from Start | Printers. The problem document is usually



Try This!

Setting Recovery Options

You can set the recovery options on your computer now. To do this, you must be logged on as an administrator. Try this:

1. Right-click My Computer and select Properties. In the Properties dialog box, select the Startup/Shutdown tab.
2. Select Write An Event To The System Log (if it is not already selected), Send An Administrative Alert, and Automatically Reboot. Click OK to close the System Properties dialog box.
3. If the System Control Panel applet message that the Alerter service is not running appears, click OK. Click No when prompted to restart the computer, and perform the next step. Otherwise, skip to step 5.
4. To start the Alerter service, open a command prompt and type **net start alerter** and press ENTER. Then restart your computer and skip step 5.
5. If you did not receive the Alerter message in step 3, click Yes to restart your computer.

deleted when the spooler restarts. If it has not been deleted, you will find that you are able to manually delete it now. Finally, resend the print job.

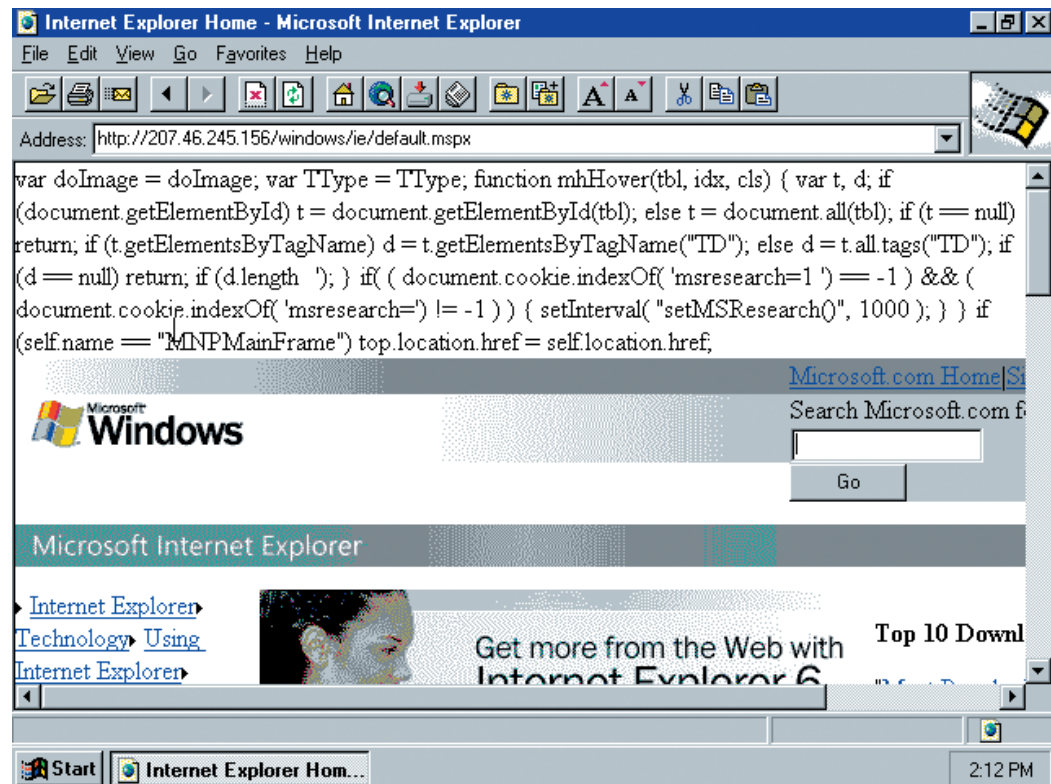
Internet Explorer Displays Junk



Learn about the protocols of the Web in Chapter 10.

Windows NT 4.0 comes with Internet Explorer version 2.0, which does not understand the newer versions of the code used on web sites today. Since much of the code is really text-based instructions to your Internet browser, anything it does not understand is considered to be text and is displayed. The result may look like Figure 3-6.

The solution to a problem like this is to update to a newer version of the browser. This sometimes places you in a Catch-22 situation, because the current version of Internet Explorer will not install without the latest service pack—and you can't use the Express Install for the latest service pack without the latest version of Internet Explorer.



• **Figure 3-6.** An old version of Internet Explorer displays the code it cannot interpret.

Chapter 3 Review

■ Chapter Summary

After reading this chapter and completing the Step-by-Step tutorials and Try This! exercises, you should understand the following facts about Windows NT:

Windows NT 4.0 Workstation Overview

- Windows NT Workstation is a more stable OS than Windows 3.x and Windows 9x.
- Windows NT Workstation provides local security.
- The Windows NT 4.0 Workstation desktop resembles Windows 95.
- Windows NT 4.0 supports the NTFS4 and FAT16 file systems.
- Windows NT 4.0 can run applications written for MS-DOS, Windows 3.x, Windows 9x, and Windows NT.
- Some DOS and Windows 3.x applications will not work in Windows NT 4.0.

Install and Configure Windows NT 4.0 Workstation

- The Windows NT 4.0 Setup program can create a partition with a maximum size of 4GB. If more partitions are desired, create them after installing NT.
- NT requires special software drivers for all hardware.
- You can download the latest Windows NT 4.0 Hardware Compatibility List (HCL) found at winqual.microsoft.com/download/.
- The minimum hardware requirements for NT 4.0 Workstation are a Pentium processor, 16MB of RAM, 120MB of available disk space, CD-ROM drive (or other access to the source files), VGA or higher-resolution video adapter, and Microsoft mouse (or compatible pointing device).
- Don't stop at the minimum hardware requirements when you install NT 4.0; you will need more memory, hard disk space, and perhaps more processing power, depending on the applications you install.
- Microsoft's published recommended minimum hardware included an Intel Pentium processor, 32 to 48MB of RAM, 2GB available hard disk space,

CD-ROM drive, SVGA or higher-resolution video adapter, and Microsoft mouse.

- Before installing NT, prepare your hardware, determine the installation method, and gather the materials needed to complete the installation.
- The Windows NT setup disks are required when you want to install NT from CD-ROM, but the computer cannot boot from the CD drive.
- You can create a set of NT setup disks by running `d:\i386\WINNT32 /OX`. (from Windows) or `d:\i386\WINNT /OX` (from Windows 3.x or DOS).
- You cannot install Windows NT 4.0 without the CD key, a code that appears on the envelope containing your NT CD.
- Service packs are very important for Windows NT 4.0.
- Service packs for Windows NT 4.0 Workstation can be found on the Microsoft NT Workstation page at www.microsoft.com/ntworkstation.
- You can view other computers on the network through Network Neighborhood.
- When uncertain about the service packs installed in Windows NT, run the WINVER program, which will tell you what (if any) service packs are installed.
- By default, Windows Explorer view options hide hidden files and hide most file extensions.
- If you have an NTFS volume, you can assign permissions to folders and files to protect data from unauthorized users.

Customize and Manage Windows NT 4.0 Workstation

- A Windows NT 4.0 Workstation installation must be configured and managed for the person who will use it. This may include creating a new hard disk partition, installing or removing programs, and customizing the desktop.
- Disk Administrator is the program an administrator uses to create and format partitions and to manage drive letters.
- If there is only one hard drive partition and a CD-ROM drive, the NT Setup program will assign

the hard drive partition drive letter C:, and the CD-ROM drive letter D:. If you create more hard drive partitions, they will get drive letters beginning with letter E:. Disk Administrator will allow you to assign a different drive letter to the CD-ROM drive.

- Unless you are dual-booting between NT and a less capable OS, such as DOS, Windows 3.x, or Windows 9x, you should not create extended partitions.
- If you are dual-booting between NT and a less capable OS, such as DOS, Windows 3.x, or Windows 9x, any drive that the second OS needs must use the FAT file system. Also, the drive can be on only the first primary partition or in a logical drive in an extended partition.
- You can remove programs with the Add/Remove Programs Control Panel applet.
- Making the desktop visually pleasant to the user will enhance the user's work experience.

Troubleshooting Common Windows NT 4.0 Problems

- If you do not know how to perform a task in Windows NT, you can search the help program. It has many tutorials with step-by-step instructions.

- Simple maintenance tasks include removing temporary files, uninstalling unneeded software, and running a disk-defragmenting program.
- The infamous Blue Screen of Death (BSOD) is actually caused by the operating system responding to a serious error, called a stop error, which threatens to make the system so unstable that the operating system shuts down rather than continue.
- Observe and record information from a BSOD so that either a support person or you may research the cause.
- A computer may restart on its own, or need to be restarted manually after a BSOD.
- A computer may restart normally after a BSOD, but the cause should still be researched in case there are steps you can take to prevent it from happening again.
- Be prepared for possible Windows NT stop errors by setting recovery options.
- Restart the Spooler service to remove a stalled print job.
- If Internet Explorer displays junk, upgrade to a newer version.

■ Key Terms List

Blue Screen of Death (BSOD) (132)
clean installation (104)
defragmentation (130)
Disk Administrator (117)
emergency repair disk (ERD) (110)
image (105)

long file name (LFN) (96)
NTFS (97)
NT file system version 4 (NTFS4) (95)
patches (105)
service pack (106)

swap file (98)
virtual file allocation table (VFAT) (95)
volume (117)
WINVER (114)

■ Key Terms Quiz

Use the Key Terms list to complete the sentences that follow. Not all the terms will be used.

1. It is important that the most current _____ be installed to fix bugs and add new features.
2. An exact duplicate of the entire hard drive contents, including the OS and all installed software, is called a/an _____.
3. Although the screen seems to be covered with what looks like computer code, careful observation may help you discover the cause of a/an _____.
4. A quick way to show the About Windows NT message box that contains version and licensing information, the amount of memory available, and the service pack level is to run the program _____.

5. Each area in a partition that is assigned a drive letter is a/an _____.
6. The _____ file system has a theoretical partition size limit of 16 exabytes (one billion billion bytes).
7. Programmers at Microsoft create _____, which are software fixes to individual problems discovered in a software product.
8. To perform a/an _____, you begin with a computer with an empty hard disk, or repartition the hard disk during the installation of the OS.
9. Although we don't usually use this term, _____ is the updated version of FAT16 found in Windows NT.
10. _____ of a disk will reorganize a drive so that the pieces of each file are stored contiguously on disk.

■ Multiple-Choice Quiz

1. What security feature sets NTFS apart from the FAT file systems?
 - a. File and folder permissions
 - b. User authentication
 - c. Password policy
 - d. Personal firewall
 - e. Spam filter
2. Which of the following was *not* a graphic element first introduced in Windows 95 and included in Windows NT 4.0?
 - a. Taskbar
 - b. Menus
 - c. My Computer
 - d. Network Neighborhood
 - e. Start button
3. Of the following, which would have been a likely reason for someone to have chosen Windows NT 4.0 Workstation as a desktop OS in 1996 over the popular Windows 95?
 - a. Great screen savers
 - b. Less expensive than Windows 95
 - c. Stability and security
 - d. Hardware support
 - e. Easy to install
4. Which word or phrase that follows describes something that Windows NT 4.0 and Windows 95 have in common?
 - a. NTFS
 - b. Common kernel
 - c. Local user accounts
 - d. GUI features
 - e. Administrator
5. Which of the following will not run in Windows NT 4.0?
 - a. 64-bit UNIX applications
 - b. 16-bit Windows-based applications
 - c. MS-DOS applications
 - d. OS/2 version 1.x applications
 - e. 32-bit Windows-based applications
6. The special environments in which NT runs applications are called:
 - a. Addresses
 - b. Accounts
 - c. Shells
 - d. Subsystems
 - e. Windows
7. The largest partition size you can create with the Windows NT 4.0 setup program is:
 - a. 7.8GB
 - b. 16TB
 - c. 2GB
 - d. 500MB
 - e. 4GB
8. As a new OS in 1996, a major drawback NT 4.0 Workstation had was:
 - a. The GUI
 - b. Security
 - c. Hardware support
 - d. Memory
 - e. Hard disk limits

9. The Windows NT GUI tool for creating and managing hard disk partitions is:
 - a. Windows Explorer
 - b. FDISK
 - c. Disk Defragmenter
 - d. Disk Administrator
 - e. Windows NT Diagnostics
10. Which of the following statements is true of service packs for Windows NT 4.0?
 - a. Remove applications
 - b. Fix file corruption
 - c. Install MS Office
 - d. Upgrade to a new OS
 - e. Fix bugs and sometimes add new features
11. To remove an installed Windows component or application, you would use the following:
 - a. Add/Remove Programs
 - b. My Documents
 - c. My Computer
 - d. Start | Run
 - e. Recycle Bin
12. An operating system that supports this can take full advantage of a computer built around multiple identical processors.
 - a. Protected mode
 - b. Multitasking
 - c. Symmetric multiprocessing (SMP)
 - d. Single-tasking
 - e. Co-processing
13. When preparing to install Windows NT 4.0 on a computer that will not boot from the CD drive, you will need to create a set of Windows NT 4.0 setup disks. How many floppy disks will this require?
 - a. One
 - b. Five
 - c. Four
 - d. Three
 - e. Two
14. The RDisk utility allows you to create one of these:
 - a. Emergency repair disk (ERD)
 - b. NT Boot disk
 - c. MS-DOS boot disk
 - d. Configuration disk
 - e. Data disk
15. When an NT computer fails with the dreaded Blue Screen of Death (BSOD), it displays this piece of information that can be used to find the solution to the problem causing the failure.
 - a. Serial number
 - b. Product ID
 - c. Version number
 - d. Stop error code
 - e. Service pack version

■ Essay Quiz

1. Write a few sentences describing why Windows NT 4.0 Workstation is in use today. Select the one reason you believe to be the most significant and support your viewpoint.
2. Describe the weaknesses of Windows NT 4.0 Workstation. Select the one weakness you believe to be the most compelling reason not to use it. Support your viewpoint.
3. You work for a small accounting firm that has just purchased a new PC from a local company that builds PCs from standard components. That computer will be running a special application that requires Windows NT 4.0 with Service Pack 5 or greater. Without describing the actual installation, describe the steps you'll take before and after you install Windows NT 4.0 and before the installation of the new application.
4. You're a new employee doing computer support in a small manufacturing company that uses Windows NT in a workgroup on a small network. One of the printers is a sophisticated graphics printer that is expensive to run. It is shared on the network, and your boss has asked you to set it up so that only two people can send print jobs to the printer. Describe what you will do.

5. A friend calls you with a problem. He installed Windows NT 4.0 Workstation on a computer that is not connected to the Internet, but he has access to another computer with Internet access and a

writable CD drive. He wants to upgrade NT on the first computer to Service Pack 6a. Write a few sentences describing what steps he should take.

Lab Projects

• Lab Project 3.1

A virus hit your computer, and many critical files were destroyed. The only data you kept on that computer consisted of some files that luckily were copied to a writable CD (CD-RW) the day before the virus hit. You have decided it is easier to reinstall Windows NT 4.0 than to try to repair the damaged files, and you have decided to repartition and format the hard disk to ensure that all traces of the virus and its damage are gone.

You will need the following:

- The lab computer on which you previously installed Windows NT
- The Windows NT 4.0 Workstation CD

- The CD key code from the envelope of your NT CD
- The list of configuration information you used for the first installation

Then do the following:

- 1 Perform the installation.
- 2 Complete any necessary tasks after the installation.
- 3 Record your observations on performing an installation of NT for the second time.

• Lab Project 3.2

You and your boss are the entire IT department for a small company with a very limited budget. He has identified ten computers that should be replaced as slow and obsolete equipment. He has found a nonprofit organization that has agreed to accept the old equipment, with all software removed from the hard drives. The computers presently run Windows NT Workstation 4.0. He plans to build the new computers, with your assistance, out of purchased components. Because of budget constraints, he would like to install NT 4.0 on the new computers and has verified that the components he is purchasing for the new computers are compatible

with NT 4.0. He plans to use NT 4.0 on the new machines for three years. He would like you to investigate the status of Microsoft's support for NT 4.0 Workstation and how this might affect the company's use of this OS. Do the following:

- 1 Determine where you will find the information.
- 2 Do the research your boss requested, and write a report including whether or not Microsoft will discontinue support and what impact this will have on his plans.

• Lab Project 3.3

Your spouse's company is upgrading to all-new computers with new operating systems and has offered to give their existing computers to employees for their personal/family use. The computers will have Windows NT 4.0 Workstation and a full suite of Office products installed on them.

They also will include licenses for the OS and application software, but no peripherals will be included. By sheer coincidence, you have also been offered a functioning laser printer for free by the father of a friend. It's an oldie but a goodie—an HP LaserJet IIID. This big, old, business workhorse is a

duplex printer (which means that it can print on both sides of the paper), and it is ideal for a project you have that requires that capability.

You have decided to accept both offers. To ensure that Windows NT 4.0 Workstation will be reliable and stable, you need to research its current status. You also need to verify that the computer and the printer will function together. There are several steps you should take to accomplish these tasks.

Perform the following tasks:

- 1 Explain how you are going to discover the present status of the OS.
- 2 Describe how you will eliminate any known problems with the OS.
- 3 Explain the steps you will take to learn whether the computer and printer can work together. Then perform those steps and describe the results.