CHAPTER 13

Maintaining Windows

In this chapter, you will learn:

- How to set up and perform scheduled preventive maintenance tasks to keep Windows healthy
- How to prepare for disaster by keeping good backups of user data and Windows system files
- About the directory structures used by Windows and how to manage files and folders
- How to use Windows utilities to manage hard drives

In the last chapter, you learned how to install Windows Vista, XP, and 2000. This chapter takes you to the next step in learning how to support a Windows operating system: maintaining the OS after it is installed. Most Windows problems stem from poor maintenance. If you are a PC support technician responsible for the ongoing support of several computers, you can make your work easier and your users happier by setting up and executing a good maintenance plan for each computer you support. A well-maintained computer gives fewer problems and performs better than one that is not maintained. In this chapter, you will learn how to schedule regular maintenance tasks, how to prepare for disaster by setting up backup routines for user data and system files, how to manage files and folders that users and the system depend on, and how to manage a hard drive.

In this chapter, we use Windows Vista as our primary OS, but, as you read, know that we'll point out any differences between Windows Vista and Windows XP/2000 so that you can use this chapter to study all three operating systems. As you read, you might consider following the steps in the chapter first using a Windows Vista system, and then going through the chapter again using a Windows XP system. Because it is unlikely that you will support many Windows 2000 systems, steps to maintain this OS are kept to a bare minimum.

SCHEDULED PREVENTIVE MAINTENANCE

A+ 220-701 2.5

One of the most common Windows problems creeps up on us over time as we install and uninstall software and use our computers for all sorts of things—Windows just gets tired and slow. Most often, the slow performance caused by all these activities could have been prevented by good maintenance. Regular preventive maintenance includes verifying Windows settings, defragmenting the hard drive, checking the drive for errors, reducing the startup process to essentials, and doing whatever else is necessary to free up enough space on the hard drive for Windows to perform well. All these tasks are discussed next.

Notes When you're responsible for a computer, be sure to keep good records of all that you do to maintain, upgrade, or fix the computer. When performing preventive maintenance, take notes and include those in your documentation.

VERIFY CRITICAL WINDOWS SETTINGS

In the last chapter, you learned how to configure Windows so that updates are downloaded and installed daily. However, users sometimes change these settings without realizing their importance, and some Windows updates, such as installing a service pack, require you to manually start them.

To help out the primary user of a computer, explain to him or her the importance of automatic Windows updates. Also, if appropriate, you need to show the user how to manually check for and install updates. In addition, at least once a month, but preferably more often, verify that all updates and service packs are installed and Windows Updates is configured correctly. Do the following for Windows Vista:

1. Click **Start**, right-click **Computer**, and select **Properties** from the shortcut menu. In the System window, verify that all service packs are installed. For example, in the System window in Figure 13-1, notice that Vista Service Pack 1 is installed. As of the writing of this book, Microsoft has released one service pack for Windows Vista, but is expected to release SP2 soon. Be aware of which service packs have been released for the OS you are supporting and verify that all have been installed.
2. To see how many updates are waiting to be installed, in the System window, click the **Windows Update** link in the left pane. In Figure 13-2, notice that this system has three important updates not yet installed.
3. To view these updates, click **View available updates**. Figure 13-3 shows the three important updates and several optional ones. By default, the important updates are selected. Select the updates you want installed and click **Install**. After the installation, restart the system and check for more updates. Some updates will not show up until other updates are installed. If a service pack shows up, know that it will appear as the only available update and will require that you manually install it by following the directions on-screen. Keep installing updates until Windows reports there are no important updates to install.
4. To verify how Windows installs updates, click **Change settings** in the left pane of the Windows Update window. Note in Figure 13-4 that this system is set so that updates are not automatically installed. For sure, you'll need to manually download and install all updates on this computer, and then ask the user for permission to set updating to install automatically. Make that note in your documentation. (One reason some users

A+ 220-701 2.5

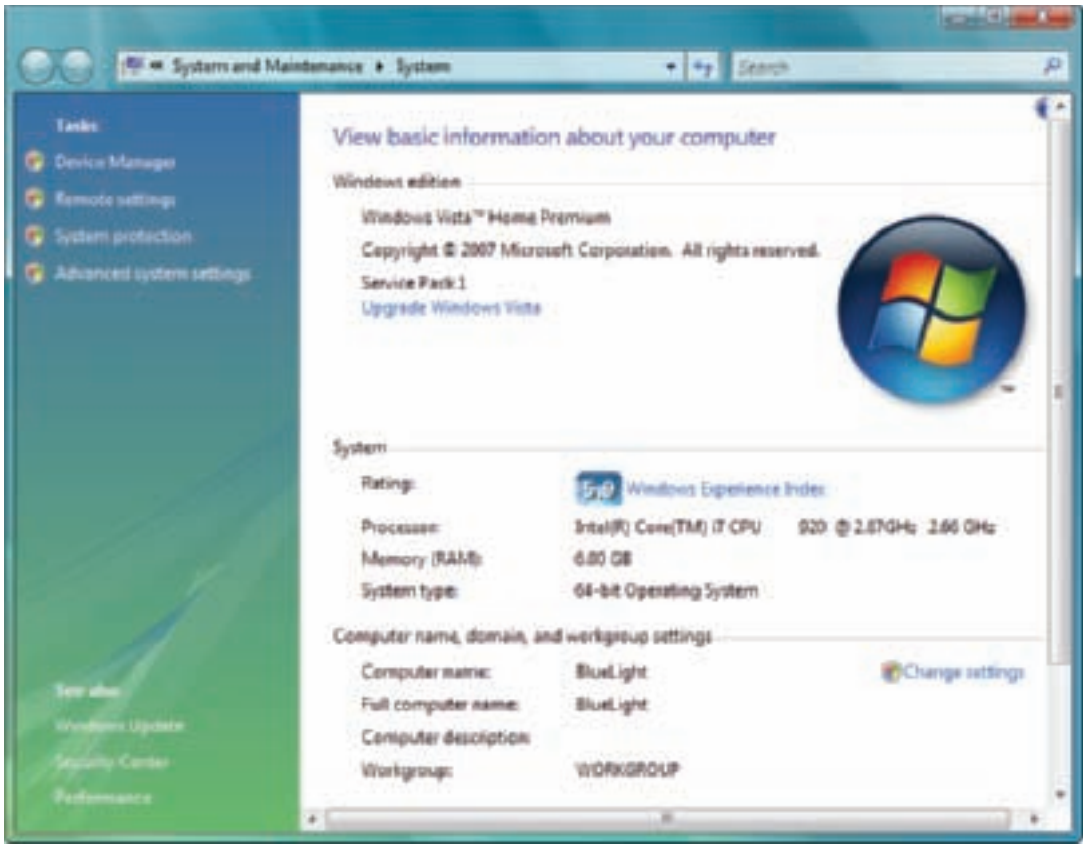

Figure 13-1 The System window gives information about hardware and the currently installed OS, including which service packs are installed
Courtesy: Course Technology/Cengage Learning

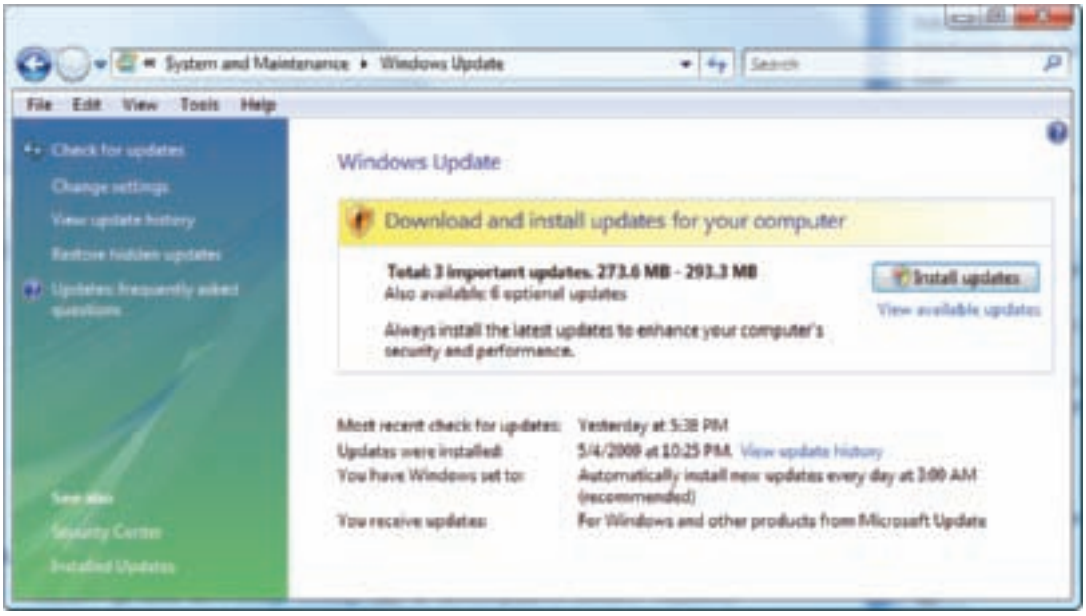

Figure 13-2 Important Windows updates are not installed
Courtesy: Course Technology/Cengage Learning

13 A+ 220-701

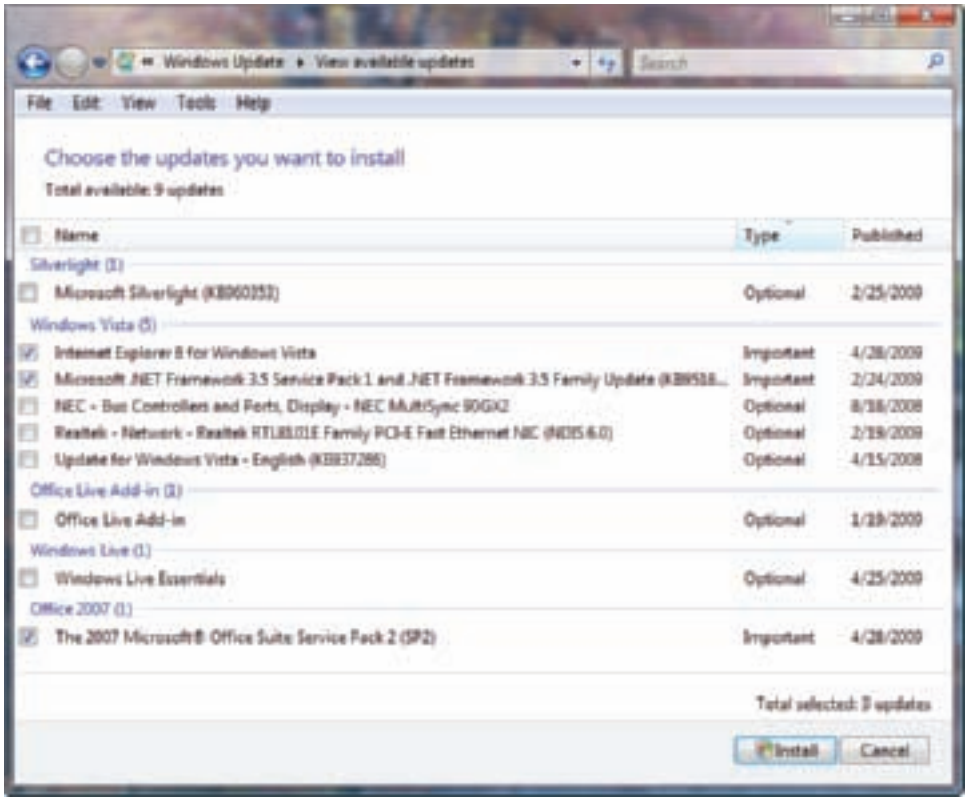

Figure 13-3 Select the updates you want to install
Courtesy: Course Technology/Cengage Learning

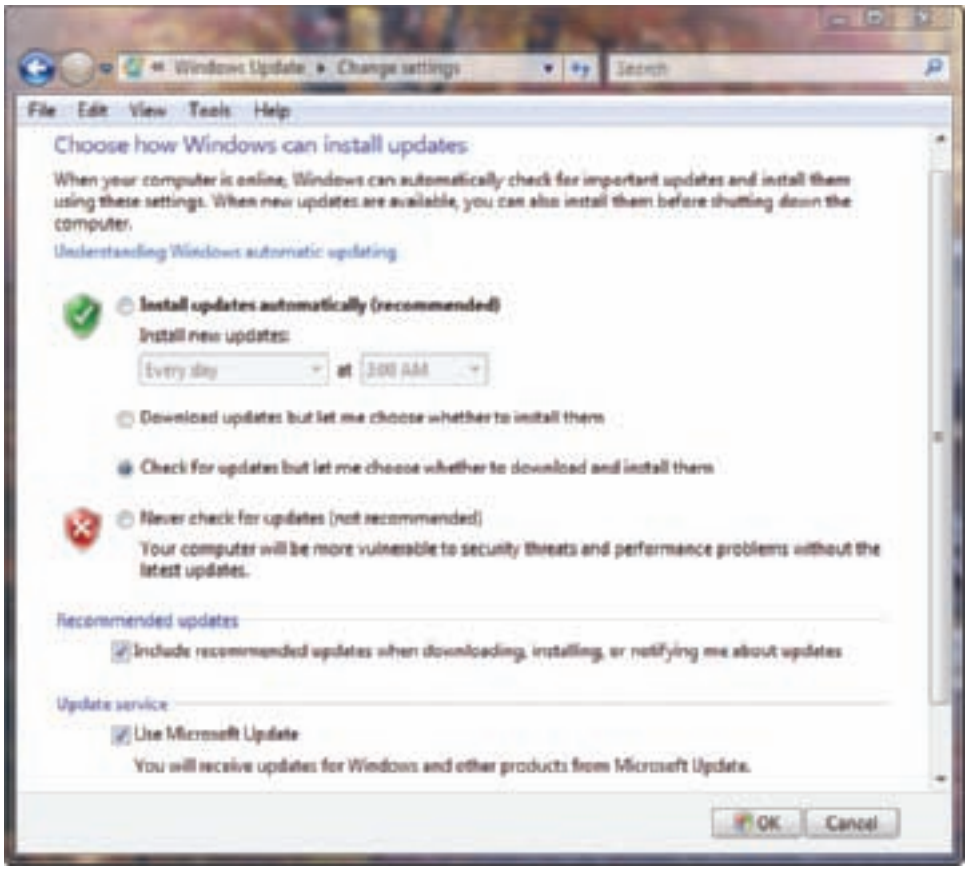

Figure 13-4 Use the Change settings link in the Windows Update window to note how Windows updates are set to be installed
Courtesy: Course Technology/Cengage Learning

A+ 220-701 2.5

would not set updating to automatic is that they have a slow Internet connection that is only connected when working on the PC, and they don't want to be bothered with downloading updates as they work. Also, some more experienced users don't trust all Vista updates and want to read up on them before they are installed, or they know that a particular update does not apply to their system.)

For Windows XP, use the System Properties box to see which service packs are installed (see Figure 13-5). Currently, Microsoft offers three service packs for Windows XP. As you can see from Figure 13-5, this XP computer has only one service pack installed. To view and manually install updates, click **Start**, **All Programs**, and **Windows Updates**, and then follow the directions on-screen. To see how Windows XP installs updates, click **Start**, right-click **My Computer**, and select **Properties** from the shortcut menu. In the System Properties box, click the **Automatic Updates** tab. For Windows 2000, to install updates, click **Start** and **Windows Updates**. Microsoft published four service packs for Windows 2000 before it stopped supporting the OS.

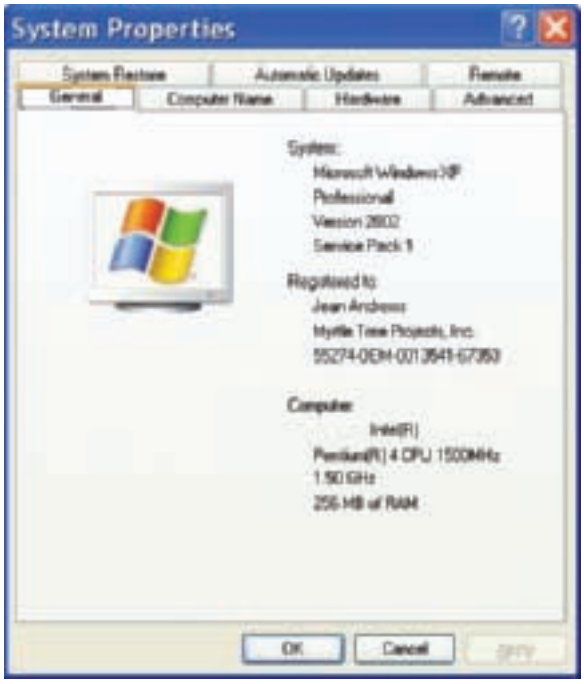

Figure 13-5 Use the System Properties window to find out what Windows XP service packs are installed
Courtesy: Course Technology/Cengage Learning

To protect a system against malicious attack, you also need to verify that antivirus software is configured to scan the system regularly and that it is up-to-date. If you discover it is not scanning regularly, take the time to do a thorough scan for viruses. Also, verify that Windows Firewall is up and configured correctly. How to do all these tasks is covered in Chapter 20.

CLEAN UP THE HARD DRIVE

Windows needs free space on the hard drive for normal operation, for defragmenting the drive, for burning CDs and DVDs, and for a variety of other tasks, so it's important to delete unneeded files occasionally. To find out how much free space is on the hard drive, open Windows Explorer and look at the volume on which Windows is installed. This volume most likely is drive C. Right-click the drive and select **Properties** from the shortcut menu. For example, free space on drive C in Figure 13-6 is only 1.59 GB. Yikes! Even for a small drive, you need at least 3 GB of free space, and you're likely to need much more. As you can see in the figure, the size of the

A+ 220-701 2.5

volume is 71.5 GB, which is a pretty large drive to be so full. Are there other partitions on the drive or other hard drives installed that can hold some of this data? To know for sure, turn to Disk Management. But first use Disk Cleanup to delete temporary files on the drive.

To use Disk Cleanup for Vista, follow these steps. You can also access the utility by entering cleanmgr.exe in the Start Search box. The XP Disk Cleanup utility works about the same as Vista.

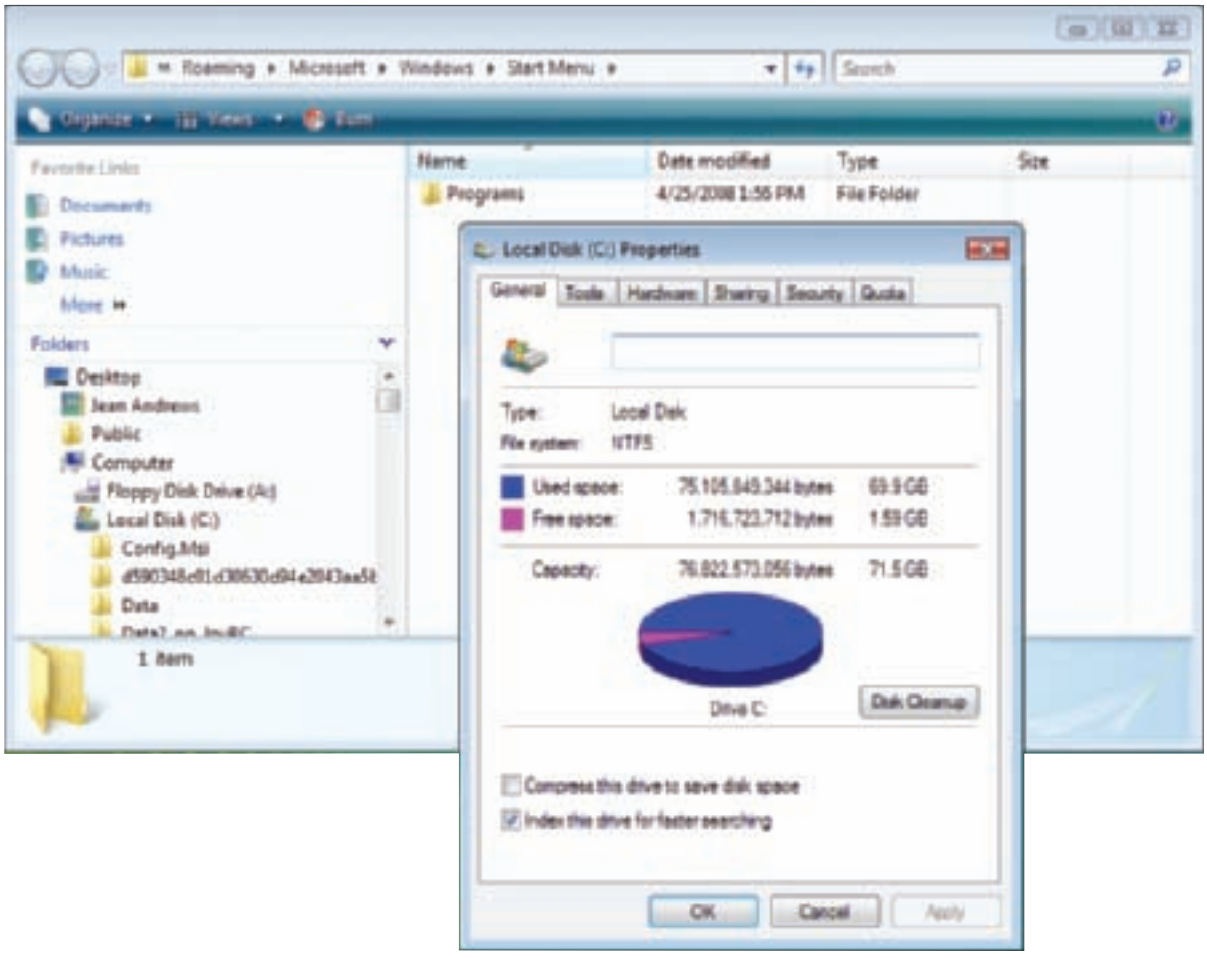

Figure 13-6 Use Windows Explorer to find out how much free space is on drive C
Courtesy: Course Technology/Cengage Learning

1. In Windows Explorer, right-click the drive and select **Properties** from the shortcut menu. The Disk Properties box appears, as shown on the left side of Figure 13-7.
2. On the General tab, click **Disk Cleanup**. A dialog box opens asking if you want to clean up only your files or files from all users on this computer. Click your choice. If you have selected to clean up the files of all users, you'll need to respond to the UAC box. Next, Disk Cleanup calculates how much space can be freed and then displays the Disk Cleanup window, also shown on the right side of Figure 13-7. From this window, you can select nonessential files to delete in order to save drive space.

Notice in Figure 13-7 the option to delete files from a Previous Windows installation(s), which can free up 10.0 GB of hard drive space. This 10 GB is used by the Windows.old folder. When Vista is installed on a system to replace or upgrade a previous Windows installation, it stores the old Windows, Program Files, and Documents and

A+ 220-701 2.5

Settings folders in the Windows.old folder. If the user assures you that no information, data, or settings are needed from the old Windows installation, it's safe to delete these files to free up the 10 GB.

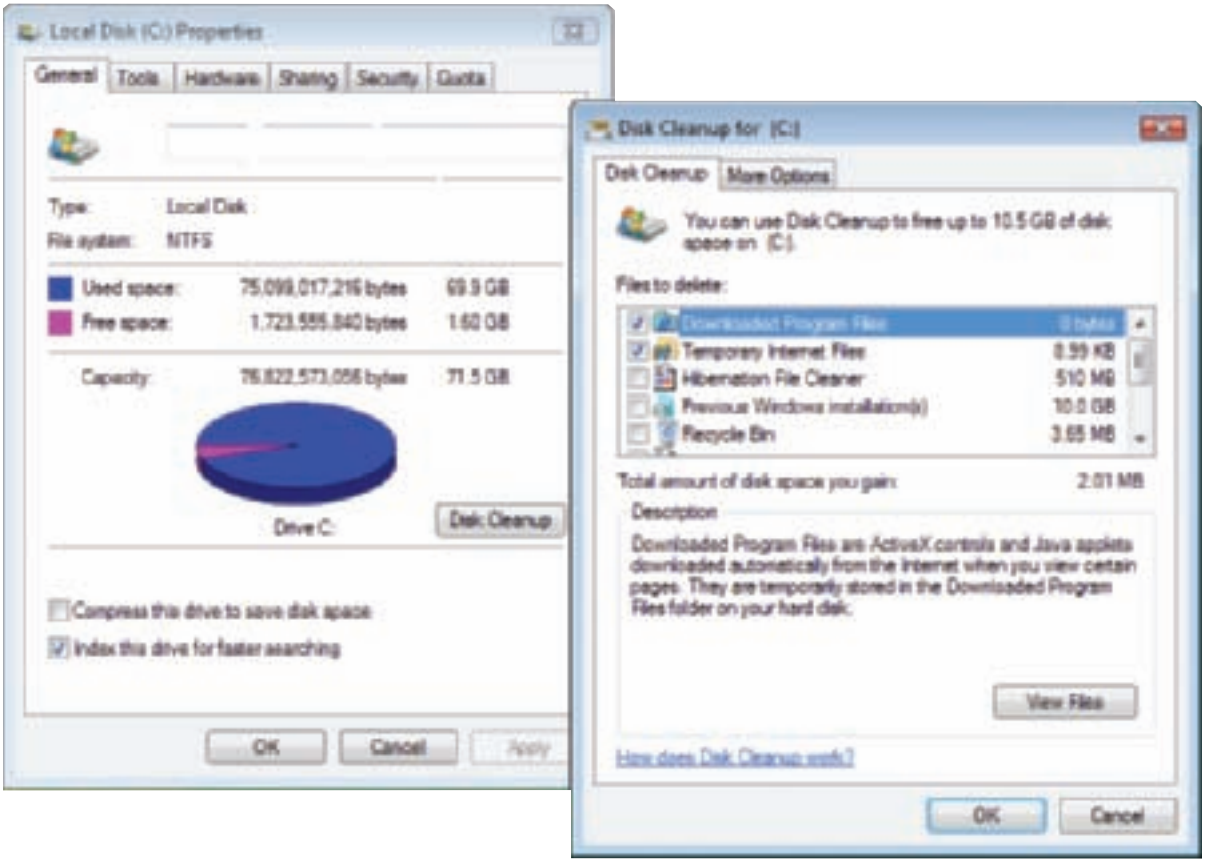

Figure 13-7 The Properties window for a drive provides Disk Cleanup, a quick and easy way to delete temporary files on a hard drive
Courtesy: Course Technology/Cengage Learning

If you still need to free up more disk space on a Windows Vista machine, click the **More Options** tab (see Figure 13-8) on the Disk Cleanup box. In the Programs and Features area, click **Clean up**. You are taken to the Vista Programs and Features window where you can uninstall unneeded software to recover that space. Also on the More Options tab of the Disk Cleanup box, when you click **Clean up** under the System Restore and Shadow Copies area, Windows will delete all but the most recent restore points that are created by System Restore. (You will learn more about System Restore later in the chapter.) In Windows XP, the More Options tab offers a third option to delete installed Windows components that you don't need.

DEFRAG THE HARD DRIVE

Another problem that might slow down a hard drive is fragmentation. Fragmentation happens over time as Windows writes files, deletes files, and writes new files to your drive. Files end up in fragmented segments all over the drive. Then, when Windows reads a fragmented file, the drive must work hard to move its read-write head all over the drive to retrieve the file. Also, if a file becomes corrupted, data-recovery utilities are less likely to be able to find all the pieces to the file if the file is fragmented rather than written on the drive in one

A+
220-701
2.5

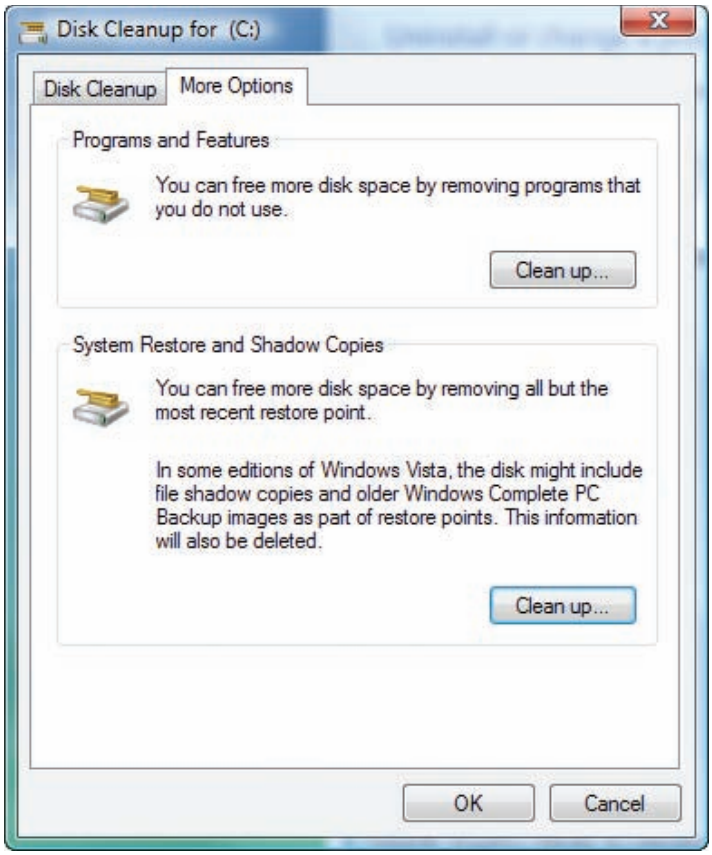

Figure 13-8 More options to free up hard drive space
Courtesy: Course Technology/Cengage Learning

location. For these reasons, you should defragment your hard drive every week as part of a good maintenance plan. Defragmenting rearranges files on the drive into as few segments as possible.

Depending on how fragmented the drive and how large the drive, defragmenting it can take less than an hour or as long as all night. Therefore, it's best to start the defrag utility when you aren't going to be using the PC for a while. By default, Vista automatically defrags a drive every Wednesday at 1:00 AM. To find out if this setting has been changed or to manually defrag the drive, close all open applications and then, using Windows Explorer, open the Properties box for the drive and click the **Tools** tab. Click **Defragment Now** and respond to the UAC box. In the Disk Defragmenter window (see Figure 13-9), verify that Vista is set to automatically defrag. You can also click **Defragment now** to defrag the drive immediately. Later in the chapter, you will learn to use the Defrag command to defrag the drive from a command prompt window.

For Windows XP, first close all open applications, and then using Windows Explorer, open the Properties box for the drive. Click the **Tools** tab and then click **Defragment Now**. In the Disk Defragment window, click **Defragment** to start the process. Figure 13-10 shows XP defragmenting a volume.

Generally, defragmenting a hard drive should be done when the hard drive is healthy; that is, it should be done as part of routine maintenance. To fully defrag the drive, 15 percent of the drive must be free. If there is less than 15 percent free space, Windows will partially defrag the drive. If you get an error message when attempting to defrag, try the utilities discussed next to repair the hard drive and then try to defrag again.

A+ 220-701 2.5

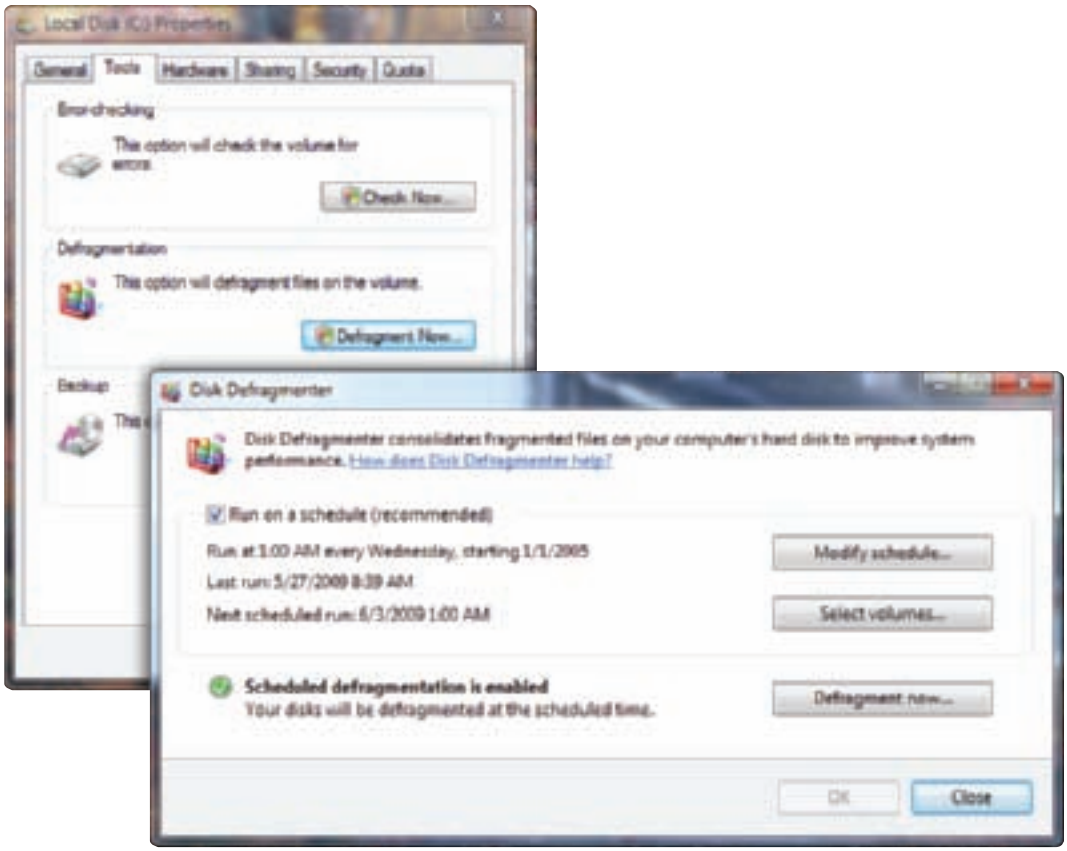

Figure 13-9 The Properties box for a drive allows you to manage the Disk Defragmenter
Courtesy: Course Technology/Cengage Learning

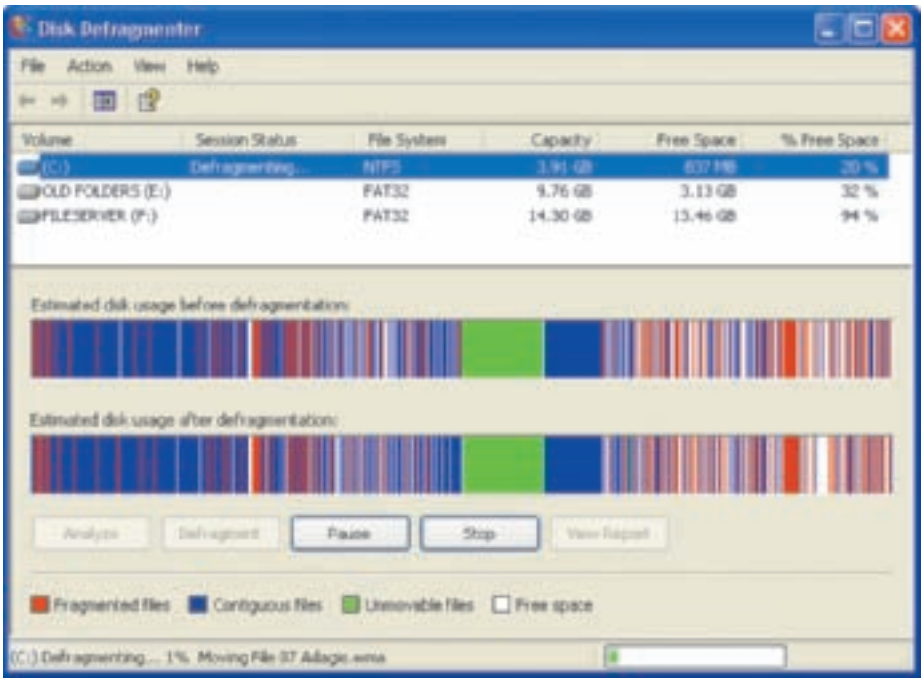

Figure 13-10 Windows XP defragmenting a volume
Courtesy: Course Technology/Cengage Learning

A+ 220-701 2.5

Notes Windows XP Professional offers Task Scheduler that can be used to launch a program to run at scheduled times such as weekly. Using it, you can set XP to automatically defragment the hard drive each week. How to use Task Scheduler is covered in Chapter 14.

CHECK THE HARD DRIVE FOR ERRORS

Next, to make sure the drive is healthy, you need to search for and repair file system errors using the Windows Chkdsk utility. This utility searches for bad sectors on a volume and recovers the data from them if possible. A sector can go bad over time and becomes unreliable. The Chkdsk utility tries to recover the data from these sectors and then marks the sector as bad so that data will no longer be written to it. (In Windows Explorer, the Chkdsk utility is called Error Checking.) As with defragmenting, error checking and repair can take a long time depending on the size of the drive and how many files are present.

To launch the Chkdsk utility in Vista or XP, use one of two methods:

- Using Windows Explorer, right-click the drive, and select **Properties** from the shortcut menu. Click the **Tools** tab, as shown in Figure 13-11, and then click **Check Now**. For Vista, respond to the UAC box. For either OS, the Check Disk dialog box

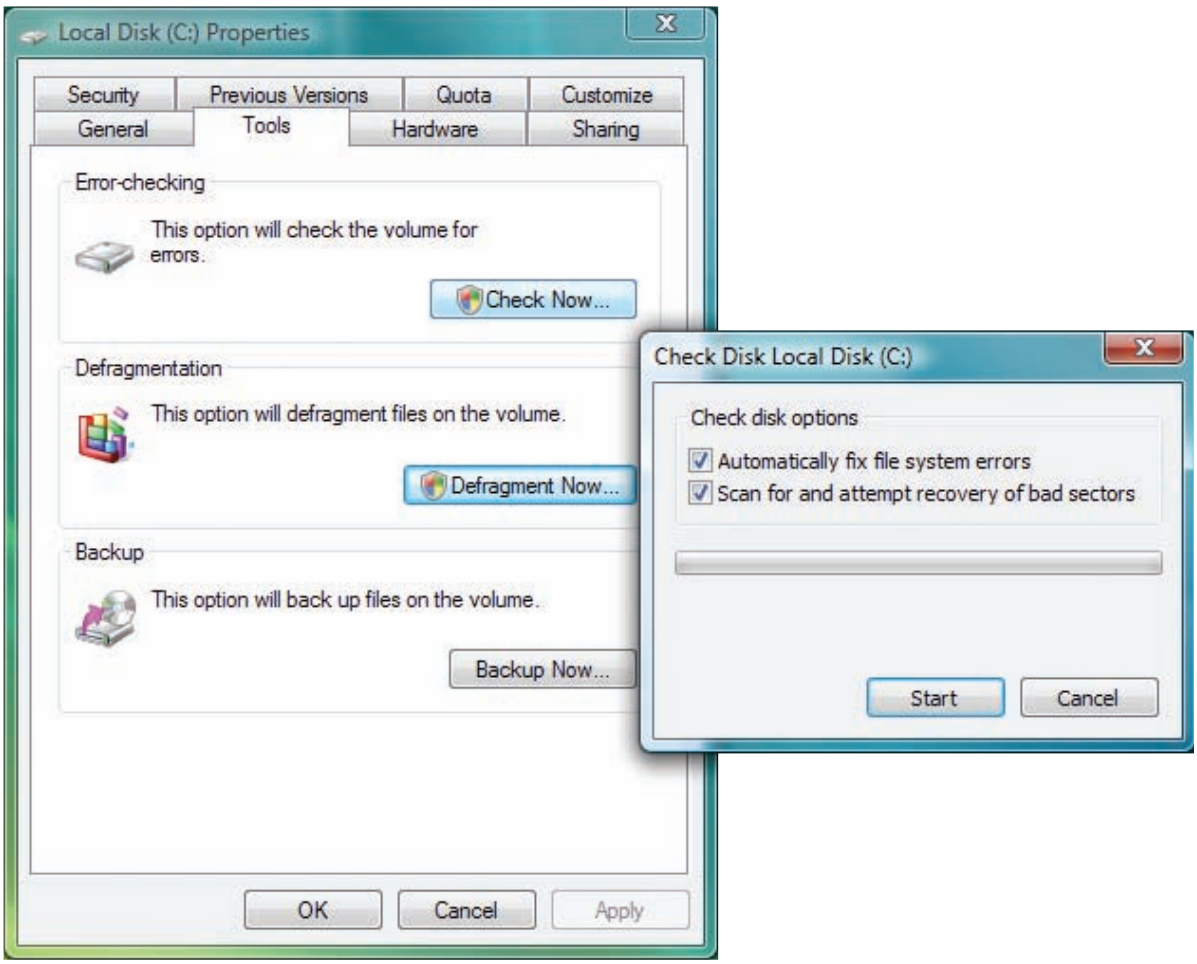

Figure 13-11 Windows repairs hard drive errors under the drive's Properties box using Windows Explorer
Courtesy: Course Technology/Cengage Learning

A+ 220-701 2.5

appears, also shown in Figure 13-11. Check the **Automatically fix file system errors** and **Scan for and attempt recovery of bad sectors** check boxes, and then click **Start**. For the utility to correct errors on the drive, it needs exclusive use of all files on the drive. When Windows has this exclusive use, the drive is called a locked drive. If files are open, a dialog box appears telling you about the problem and asking your permission to scan the drive the next time Windows starts. Reboot the system and let her rip.

- Use the Chkdsk command in a command prompt window. (Vista requires an elevated command prompt window.) For Vista, click **Start**, click **All Programs**, and click **Accessories**. Right-click **Command Prompt**, select **Run as administrator** from the shortcut menu, and respond to the UAC box. For XP, enter **cmd** in the Run dialog box. In the command prompt window for either OS, enter this Chkdsk command:

```
chkdsk c:/r
```

Notes The Chkdsk command is also available from the Windows Vista Recovery Environment and the Windows XP Recovery Console. You will learn to use Chkdsk under both environments later in the book.

A+ Exam Tip The A+ 220-701 Essentials exam expects you to know about the outdated Windows 9x/Me Scandisk command. The Windows 9x/Me command, Scandisk C, is equivalent to Chkdsk C: /R in Windows Vista/XP/2000. Both commands find bad sectors on a hard drive and attempt to recover data from these sectors. Know that neither Scandisk or Chkdsk can actually fix a bad sector.

Before you move on to the next step in cleaning up Windows, reboot the system and verify all is well. If the drive was heavily fragmented with errors and unneeded files, you should now see a marked improvement in performance.

VERIFY STARTUP PROGRAMS

When software is installed, it sometimes adds itself to the list of processes that are automatically launched at startup. Applications are launched at startup by a shortcut or program file in a startup folder, an entry in the registry, or an entry in the Scheduled Task list.

Over time, many startup programs can accumulate on a system, which can cause startup to be slow and the system to become sluggish. Each program loaded at startup uses up some memory and adds to the time needed to start Windows. As a part of good routine maintenance, you need to check the programs launched at startup, and verify that the ones there are actually needed. Examples of programs that you might want to remove from the startup list are chat programs, programs to handle multimedia that you don't use very often, programs that monitor the Internet for updates to software installed on your system, and pop-up blockers.

If you can reduce the list of startup programs, performance might dramatically improve and errors at startup can be eliminated. In this chapter, you will learn about the easy-to-use tools to view and stop startup programs. In the next chapter, you will learn about other advanced tools, such as Msconfig, that you can use to eliminate startup programs that are more difficult to reach.

Let's first look at how to view and temporarily disable startup programs in Vista and then we'll see how to do the same tasks using Windows XP.

A+ 220-701 2.5

STARTUP PROGRAMS IN WINDOWS VISTA

Certain folders are designated as startup folders for all user accounts or a particular user account. Placing a program or a shortcut to a program in one of these folders causes the program to launch at startup. In addition to startup folders, entries in several keys of the registry can cause programs to be launched at startup. The startup folders that Windows Vista uses are:

- **For individual users:** C:\Users*username*\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Startup
- **For all users:** C:\ProgramData\Microsoft\Windows\Start Menu\Program\Startup

Follow these steps to use Software Explorer to view and stop startup programs in Vista:

1. In Control Panel under Programs, click **Change startup programs**. In the Windows Defender Software Explorer window, under the Category drop-down menu, select **Startup Programs** (see Figure 13-12). A list of applications and services that are launched at startup appears.
2. When you select a program on the left, notice on the right side you can see how the program is launched at startup. For example, in Figure 13-12, the selected program is launched by way of a registry entry. To temporarily disable a startup program, click **Disable** at the bottom of the window.
3. You might find startup programs that are launched by way of a program file or shortcut placed in a startup folder. For example, you can see in Figure 13-13 that the Snagit

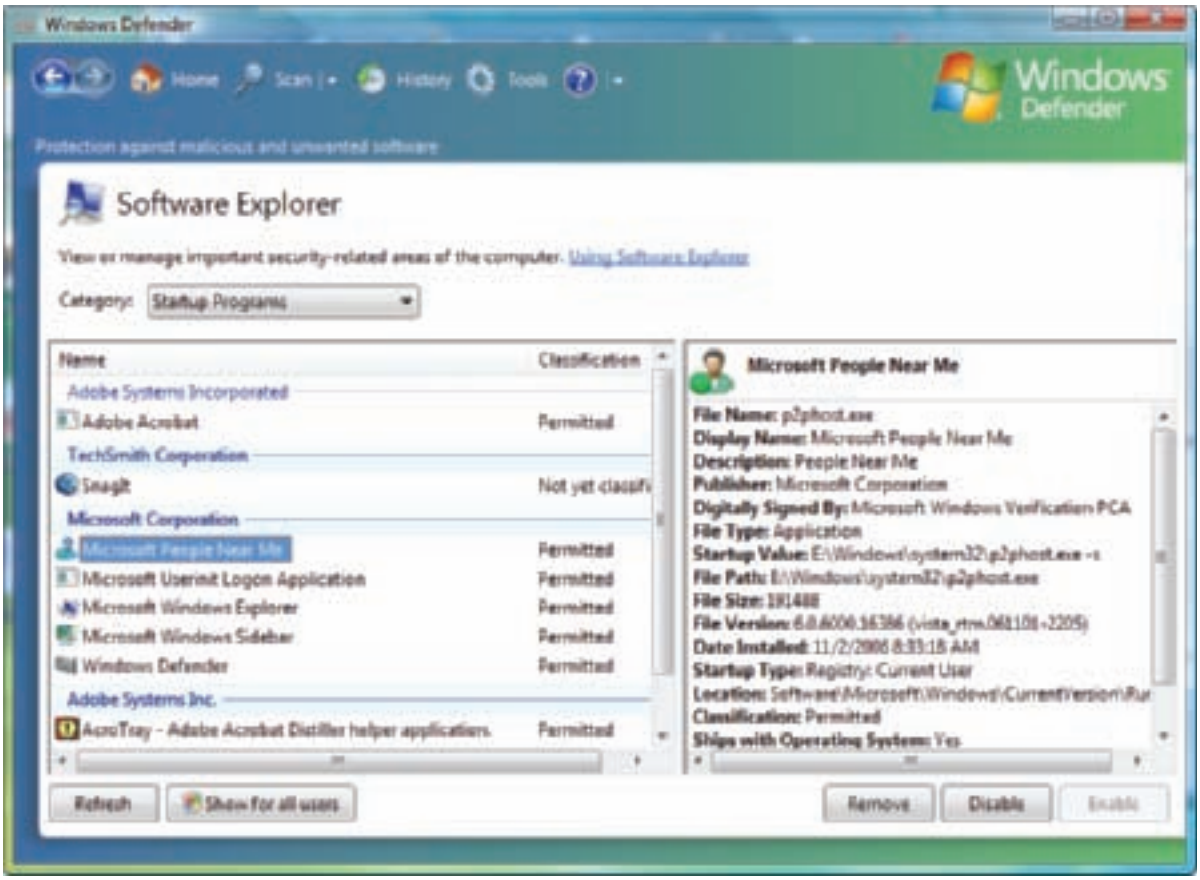

Figure 13-12 Use Software Explorer in Vista to find out what programs are launched at startup
Courtesy: Course Technology/Cengage Learning

A+ 220-701 2.5

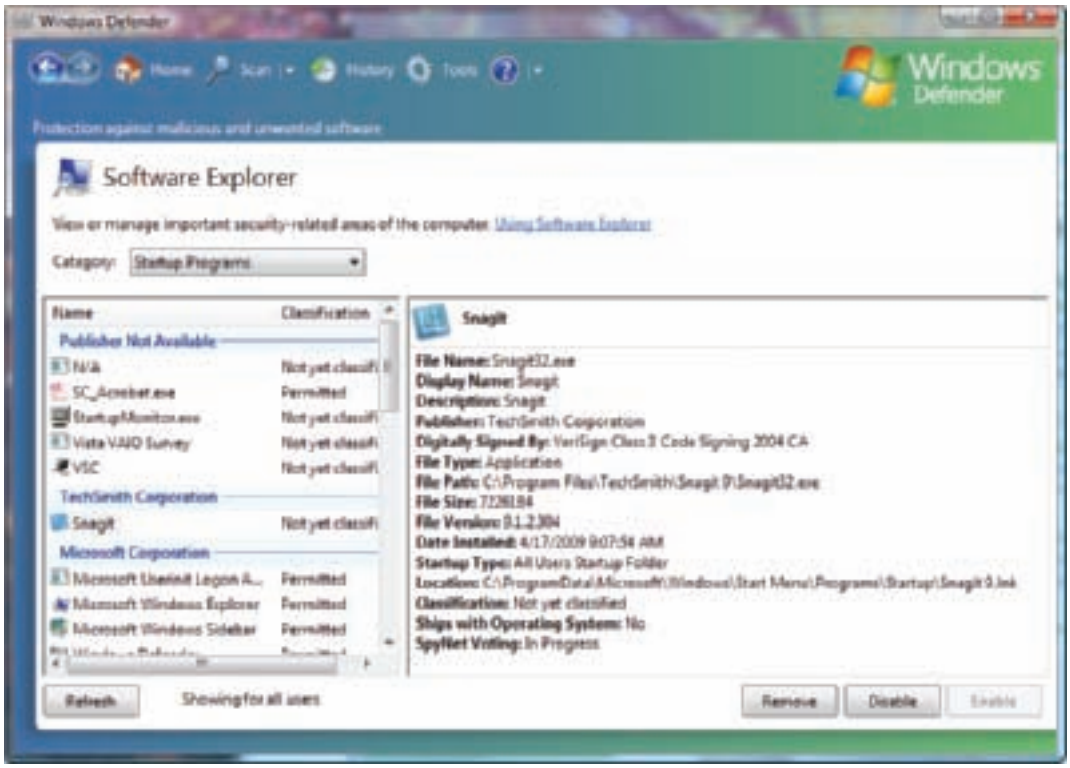

Figure 13-13 A startup program is launched by using a startup folder
Courtesy: Course Technology/Cengage Learning

program starts because of any entry in the all-users startup folder. To stop this startup program you can (a) click **Disable** to temporarily stop it; (b) click **Remove** to delete it from the all-users startup folder; or (c) use the Snagit menus to configure Snagit not to start at startup.

4. As you view startup programs, if you find one that is no longer needed on the system and can be uninstalled, open the Control Panel, and then click **Uninstall a program**. In the Programs and Features window, select the program and click **Uninstall**.

As you smoke out unnecessary or unwanted programs, it helps to know which ones you definitely want to keep. Table 13-1 lists the minimum number of programs that you would find running in a barebones Windows Vista system immediately after startup. Any other programs you find listed in Software Explorer should be considered guilty of unnecessarily using resources until you've checked them out. If you need help identifying a program,

Program	Description	Startup Programs	Currently Running Programs*
userinit.exe	Userinit Logon Application	X	
explorer.exe	Windows Explorer	X	X
MSASCui.exe	Windows Defender	X	X
Dwm.exe	Desktop Window Manager		X
taskeng.exe	Task Scheduler Engine		X

*Programs that continue to run after startup is completed or are launched by other startup programs

Table 13-1 Programs launched at startup on a barebones Vista system

13 A+ 220-701

A+ 220-701 2.5

search the Internet for information about the program using a search engine, such as *www.google.com*. However, be cautious when taking advice from some sites. Many Web sites try to convince you a good program is bad so you will download and use their software to remove it.

STARTUP PROGRAMS IN WINDOWS XP

Windows XP does not offer the convenient Vista Software Explorer tool. For Windows XP, you must manually check the startup folders and delete or move the entries you don't want. (If you're not sure if you want to permanently delete an entry from a startup folder, move it to another folder. If you change your mind, you can later move it back.) The startup folders that Windows XP uses are:

- **For individual users:** C:\Documents and Settings*username*\StartMenu\Programs\Startup
- **For all users:** C:\Documents and Settings\All Users\Start Menu\Program\Startup

Next, look for any software that is no longer needed by the system and can be uninstalled. In the Control Panel, use the Add or Remove Programs applet to uninstall programs.

FREE UP ADDITIONAL HARD DRIVE SPACE

After you have cleaned up all unneeded files on the hard drive, use Windows Explorer to find out how much free space is on the drive. There is no set minimum free space for Vista, because the amount depends on how Vista and its applications are used. A good rule of thumb is to shoot for at least 15 percent of the drive to be free. If you still don't have that much, you can consider the following to get some additional space:

MOVE SOME DATA TO OTHER DRIVES OR DEVICES

Most of us enjoy our digital cameras, and we tend to keep a lot of photos on a hard drive. To free up that space, gather them all up and burn them to a few CDs or DVDs. Home videos or movies installed on a hard drive can take up tons of space. Consider an external hard drive to hold them all, or burn them to DVDs.

CONSIDER DRIVE OR FOLDER COMPRESSION

If a volume is formatted using the NTFS file system, you can compress folders on the drive to save space, even if the drive is the one on which Windows is installed. However, know that drive compression will slow down a system because every file that is opened must be decompressed before it can be used. To avoid this problem, it's better to upgrade to a larger hard drive, or move some data to another media. If you do decide to compress a folder, right-click the folder and select **Properties**. On the General tab, click **Advanced**. In the Advanced Attributes box (see Figure 13-14), click **Compress contents to save disk space** and click **OK** and then click **Apply**. If you decide to compress the entire drive, right-click the drive and click **Properties** from the shortcut menu. On the General tab, click **Compress this drive to save disk space** and click **Apply**.

REORGANIZE FOLDERS AND VOLUMES

Does the drive have more than one volume, such as drive C and drive D? If so, you can move some data or applications to another volume. To move applications from one volume or hard drive to another, you'll first have to uninstall the application. Most applications install their program files in the C:\Program Files folder, but during installation, they suggest

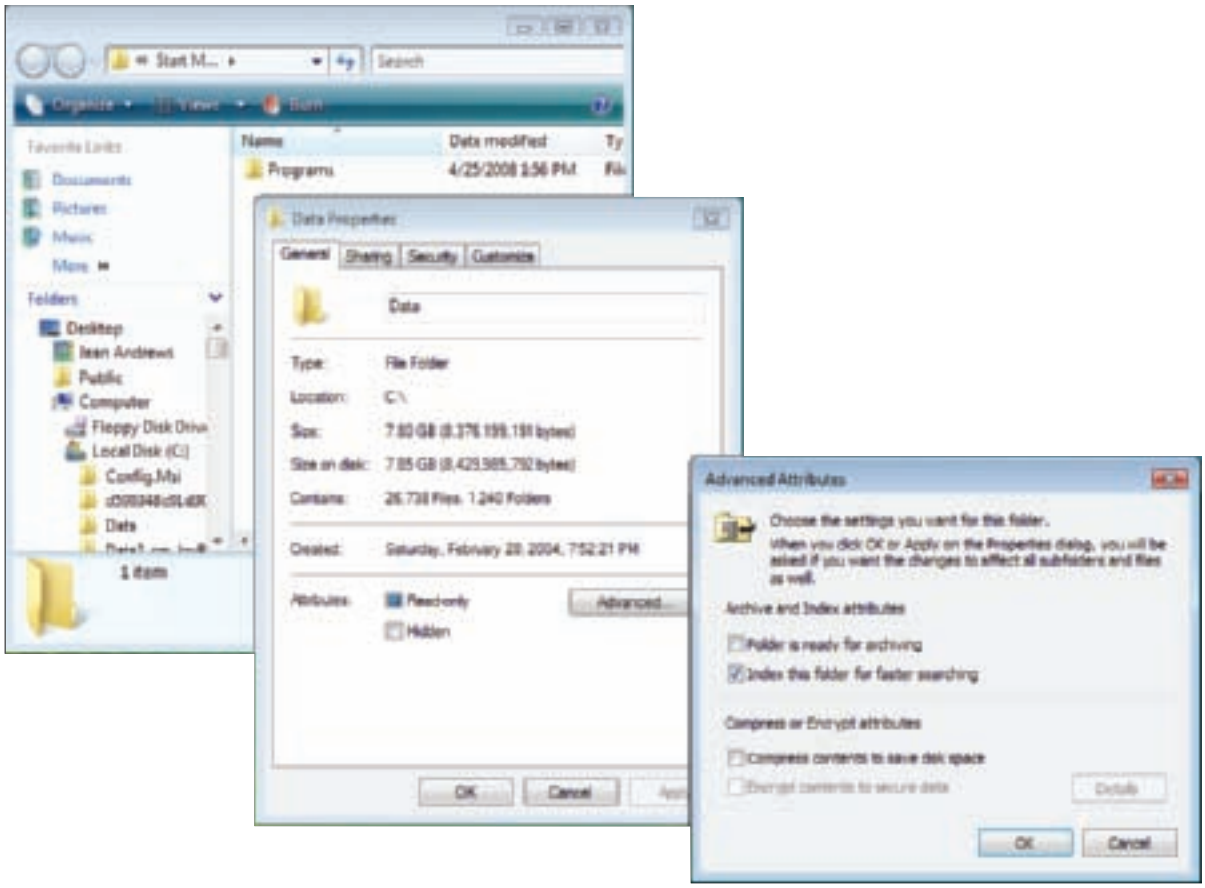

Figure 13-14 Compress folders or files to save disk space
Courtesy: Course Technology/Cengage Learning

this location and give you the opportunity to change it. You can then point to a different volume in the system to hold the application. Later in the chapter, you will learn how to use Disk Management to extend the size of a volume or to expand the usable space on a volume by mounting a drive to the volume.

Notes Vista installs on an NTFS volume, but if a second volume on the drive is formatted using the FAT32 file system, you can convert the volume to NTFS. For large drives, NTFS is more efficient and converting might improve performance. NTFS also offers better security and file and folder compression. For two Microsoft Knowledge Base articles about converting from FAT to NTFS, go to *support.microsoft*.com and search for articles 314097 and 156560.

A+ 220-701 3.3

MOVE THE VIRTUAL MEMORY PAGING FILE

Windows uses a file, Pagefile.sys, in the same way it uses memory. This file is called **virtual memory** and is used to enhance the amount of RAM in a system. Normally, the file, **Pagefile.sys**, is a hidden file stored in the root directory of drive C. To save space on drive C, you can move Pagefile.sys to another partition on the same hard drive or to a different hard drive, but don't move it to a different hard drive unless you know the other hard drive is at least as fast as this drive. If the drive is at least as fast as the drive on which Windows is installed, performance should improve. Also, make sure the new volume has plenty of free space to hold the file—at least three times the amount of installed RAM.

A+ 220-701 3.3

To change the location of Pagefile.sys using Vista, follow these steps:

1. Click **Start**, right-click **Computer**, and click **Properties**. The System window appears.
2. Click **Advanced system settings** and respond to the UAC box. The System Properties box appears (see Figure 13-15).

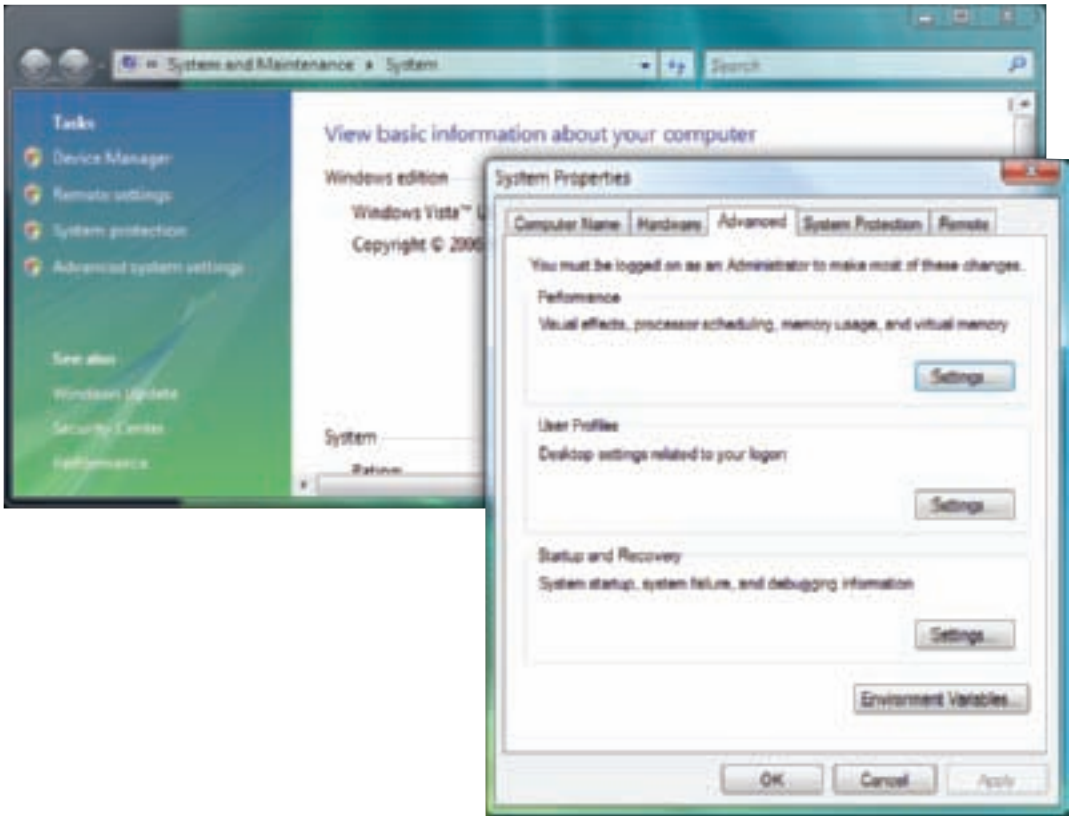

Figure 13-15 Manage virtual memory using the System Properties box
Courtesy: Course Technology/Cengage Learning

3. On the Advanced tab in the Performance section, click **Settings**. In the Performance Options box, select the **Advanced** tab and click **Change**. The Virtual Memory dialog box appears.
4. Uncheck **Automatically manage paging file size on all drives** (see Figure 13-16). Select the drive. For best performance, allow Windows to manage the size of the paging file. Select **System managed size** and click **Set**.
5. Click **OK**. Windows informs you that you must restart the system for the change to take effect. Click **OK** to close the warning box.
6. Click **Apply** and **OK** to close the Performance Options box. Click **OK** to close the System Properties box and then restart the system.

For Windows XP, click **Start**, right-click **My Computer**, select **Properties**, and then click the **Advanced** tab. In the Performance section, click **Settings**, click the **Advanced** tab, and then click **Change**. The Virtual Memory box that appears looks and works similarly to the Vista Virtual Memory box in Figure 13-16.

A+ 220-701 3.3

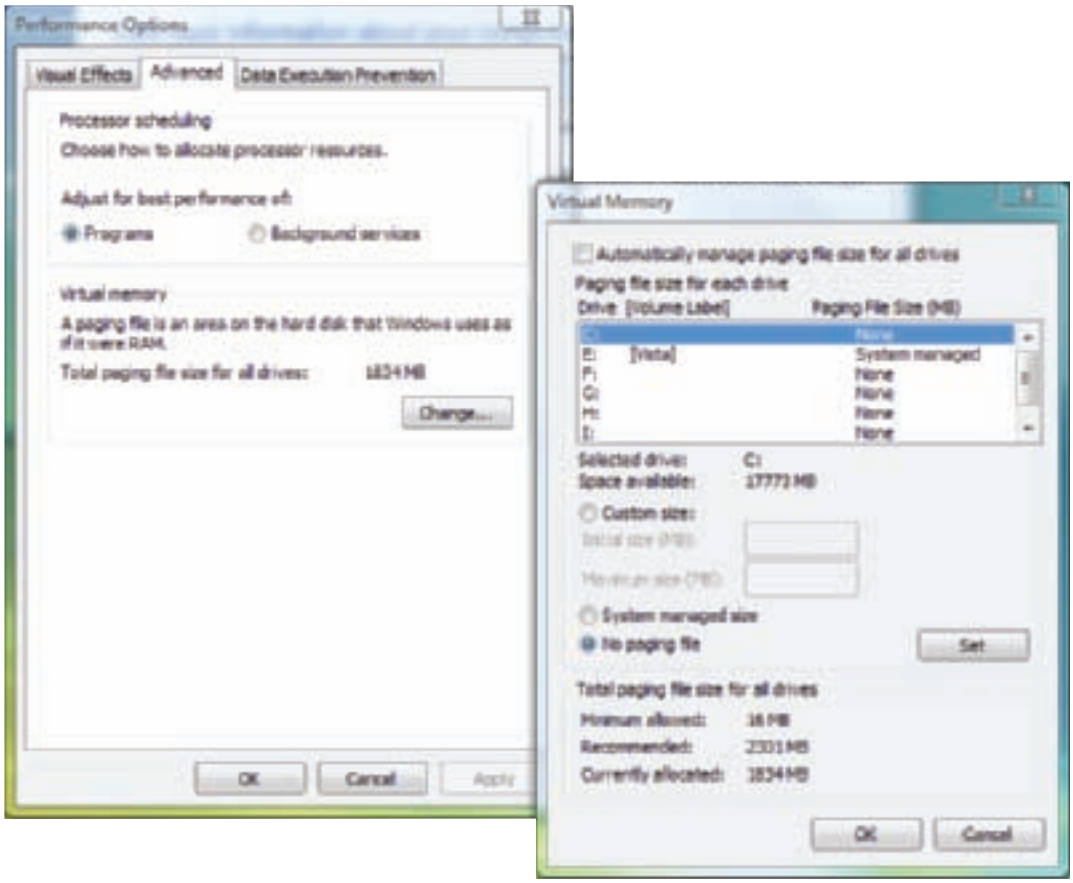

Figure 13-16 Move Pagefile.sys to a different drive
Courtesy: Course Technology/Cengage Learning

LIMIT SPACE USED BY INTERNET EXPLORER

Here are some things you can do to save space on your Windows volume that is normally used by Internet Explorer:

- *Suggestion 1:* Reduce the amount of space Internet Explorer is allowed to use to cache files. In Internet Explorer, click **Tools**, then **Internet Options**. The Internet Options window opens. On the General tab under Browsing history, click **Settings**. In the Temporary Internet Files and History Settings dialog box, change the amount of disk space to use (see Figure 13-17). Microsoft recommends that you not reduce the size below 50 MB.
- *Suggestion 2:* If you have some room on a second volume, you can move the Internet Explorer cache folder to that volume. Normally, this Vista folder is C:\Users*username*\AppData\Local\Microsoft\Windows\Temporary Internet Files. To move it somewhere else, on the General tab of the Internet Options window under Browsing history, click **Settings**. In the settings dialog box, click **Move folder**. In the Browse for Folder box, select the destination folder and click **OK** three times to close all boxes.
- *Suggestion 3:* You can also set IE to empty the cache folder each time you close the browser. To do that, on the Internet Options window, click the **Advanced** tab. Scroll down to the Security section, check **Empty Temporary Internet Files folder when**

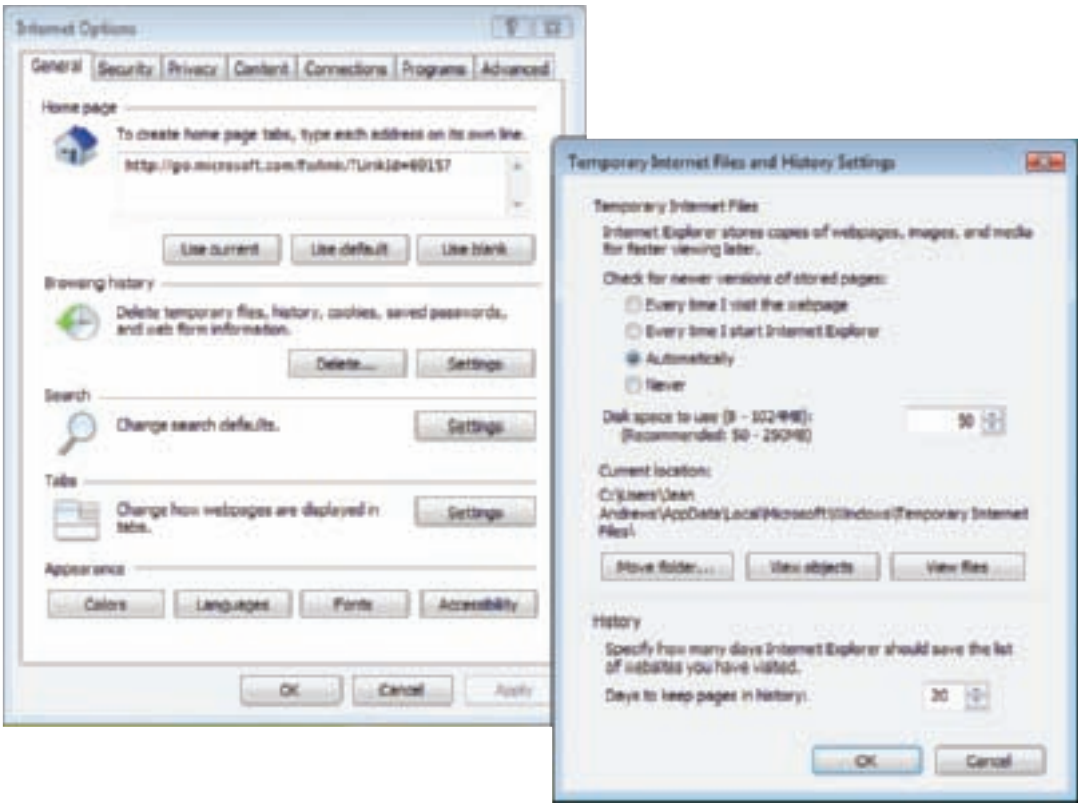

Figure 13-17 Allocate hard drive space to be used for temporary Internet files
Courtesy: Course Technology/Cengage Learning

browser is closed (see Figure 13-18) and click **Apply**. This setting is also good to use when you're using a public computer and want to make sure you don't leave tracks about your private surfing habits.

If you still don't have enough free space on the Windows volume, consider adding a second hard drive to the system. In fact, if you install a second hard drive that is faster than the Windows hard drive, know that reinstalling Windows on the faster hard drive will improve performance. You can then use the slower and older hard drive for data.

Now let's look at how to perform on-demand backups and routine scheduled backups of user data and Windows system files.

BACKUP PROCEDURES

A+ 220-701 2.5

A backup is an extra copy of a data or software file that you can use if the original file becomes damaged or destroyed. Losing data due to system failure, a virus, file corruption, or some other problem really makes you appreciate the importance of having backups.

Notes With data and software, here's a good rule of thumb: If you can't get along without it, back it up.

A+ 220-701 2.5

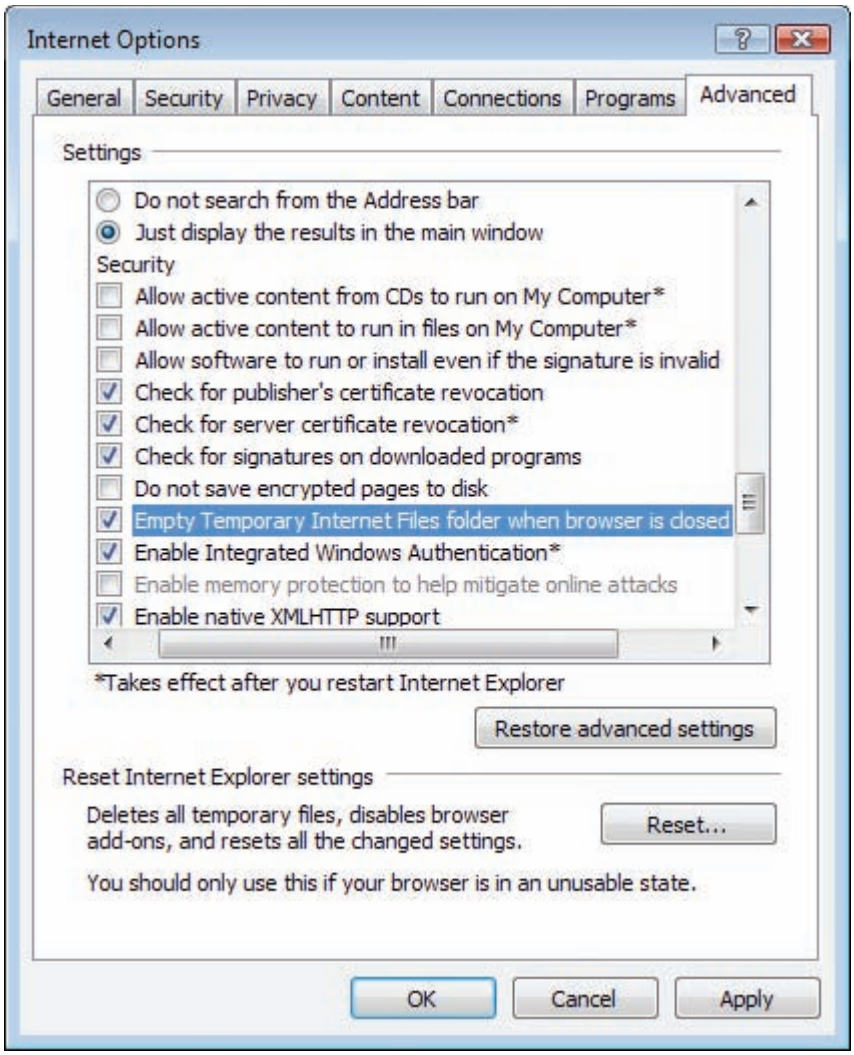

Figure 13-18 Set Internet Explorer not to keep a cache after the browser is closed
Courtesy: Course Technology/Cengage Learning

APPLYING CONCEPTS Dave was well on his way to building a successful career as a PC repair technician. His PC repair shop was doing well, and he was excited about his future. But one bad decision changed everything. He was called to repair a server at a small accounting firm. The call was on the weekend when he was normally off, so he was in a hurry to get the job done. He arrived at the accounting firm and saw that the problem was an easy one to fix, so he decided not to do a backup before working on the system. During his repairs, the hard drive crashed and all data on the drive was lost—four million dollars worth! The firm sued, Dave's business license was stripped, and he was ordered to pay the money the company lost.
A little extra time to back up the system would have saved his whole future. True story!

Because most of us routinely write data to the hard drive, in this section, we focus on backing up from the hard drive to another media. However, when you store important data on any media—such as a flash drive, external hard drive, or CD—always keep a copy of the data on another media. Never trust important data to only one media.

A+
220-701
2.5

In this part of the chapter, you'll see how to make a disaster recovery plan and then learn how to back up user data, critical system files, and the entire hard drive.

PLANNING FOR DISASTER RECOVERY

The time to prepare for disaster is before it occurs. If you have not prepared, the damage from a disaster will most likely be greater than if you had made and followed disaster plans. Suppose the hard drive on your PC stopped working and you lost all its data. What would be the impact? Are you prepared for this to happen? Consider these points and tips when making your backup and recovery plans:

- *Point 1*. Decide on the backup media (tape, CD, DVD, flash drive, another hard drive, or other media). Even though it's easy to do, don't make the mistake of backing up your data to another partition or folder on your same hard drive. When a hard drive crashes, most likely all partitions go down together and you will have lost your data and your backup. Back up to another media and, for extra safety, store it at an off-site location.
- *Point 2*. Windows XP/2000 offers the Ntbackup.exe program to back up files and folders, and Vista offers a similar utility. However, you can purchase third-party backup software that might be easier to use and offer more features. For example, in Chapter 10, you saw an external hard drive by Maxtor (see Figure 13-19) that comes bundled with a backup utility. Recall that you can select folders and file types (identified by the file extension) to back up and the days and times to back up. At scheduled times, the utility copies the files and folders to the external hard drive, keeping 10 levels of backups. At any time, if you push the button on the front of the drive, a backup is created on the spot. Many backup devices have similar features. However, before you decide to use an all-in-one backup system such as this one, be certain you understand the risks of not keeping backups at an off-site location and keeping all your backups on a single media.

Figure 13-19 This external hard drive by Maxtor uses a USB port and comes bundled with backup software
Courtesy: Course Technology/Cengage Learning

A+ 220-701 2.5

- *Point 3*. Because backing up data takes time and backup media is expensive, you can use a selective backup plan where you only back up data that changes often. For example, you might ask users to store all their data in certain folders and then you only maintain current backups of these folders rather than back up an entire hard drive. Also, note that scheduled backups that run during the night are the least disruptive for users.
- *Point 4*. Data should be backed up after about every four to ten hours of data entry. This might mean you back up once a day, once a week, or once a month.
- *Point 5*. So that you'll have the right information when you need to recover data from your backups, always record your regular backups in a log with the following information:
  - Folders or drives backed up
  - Date of the backup
  - Type of backup
  - Label identifying the tape, disk, or other media

  If you discover that data has been lost days or weeks ago, you can use this backup log or table to help you recover the data. Keep the records in a notebook. You can also store the records in a log file (a file where events are logged or recorded) each time you back up. Store the file on a flash drive or another PC. Figure 13-20 shows one example of a backup log table.

Folder Backup Up	Date	Type of Backup	Tape Label
C:\Payroll	2010-06-04	Full	June, First Friday
C:\Payroll	2010-06-07	Incremental	Monday
C:\Payroll	2010-06-08	Incremental	Tuesday
C:\Payroll	2010-06-09	Incremental	Wednesday
C:\Payroll	2010-06-10	Incremental	Thursday
C:\Payroll	2010-06-11	Full	June, Second Friday
C:\Payroll	2010-06-14	Incremental	Monday

Figure 13-20 Keeping backup logs can help you when recovering data
Courtesy: Course Technology/Cengage Learning

- *Point 6*. When you perform a backup for the first time or set up a scheduled backup, verify that you can use the backup tape or disks to successfully recover the data. This is a very important step in preparing to recover lost data. After you create a backup, erase a file on the hard drive, and use the recovery procedures to verify that you can re-create the file from the backup. This verifies that the backup medium works, that the recovery software is effective, and that you know how to use it. After you are convinced that the recovery works, document how to perform it.
- *Point 7*. Keep your backups in a safe place and routinely test them. Don't leave a backup tape or drive lying around for someone to steal. Backups of important and sensitive data should be kept under lock and key. In case of fire, keep enough backups off-site so that you can recover data even when the entire building is destroyed. Routinely verify that your backups are good by performing a test recovery of a backed-up file or folder. Backups are useless if the data on the backup is corrupted.

Notes If you travel a lot and your organization doesn't provide online backup, keeping good backups of data on your notebook computer might be a problem. Several Internet companies have solved this backup-on-the-go problem by providing remote backup services over the Internet. In a hotel room or other remote location, connect to the Internet and back up your data to a Web site's file server. If data is lost, you can easily recover it by connecting to the Internet and logging into your backup service Web site. If security is a concern, be sure you understand the security guarantees of the site. Two online backup services are Norton Online Backup (*www.backup.com*) and Remote Backup Systems (*www.remote-backup.com*).

A+
220-701
2.5

BACK UP USER DATA

In this part of the chapter, you'll see how to back up user data using Windows Vista and Windows XP/2000.

WINDOWS VISTA BACKUP UTILITY

The Windows Vista backup utility, called the Backup and Restore Center, limits your decisions about which user files and folders on a Vista system you can back up. You are forced to back up data for all users. Follow these steps to back up files and folders:

1. Connect your backup device to your PC. If you are using an external hard drive, use Windows Explorer to verify you can access the drive.
2. From Control Panel, under System and Maintenance, click **Back up your computer**. The Backup and Restore Center window appears, as shown in Figure 13-21.

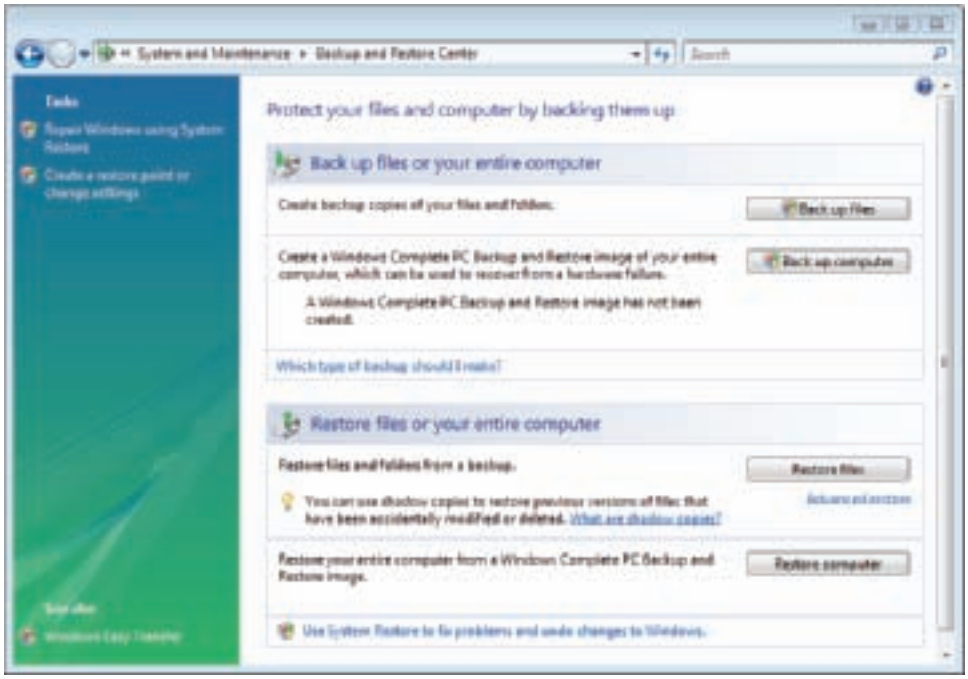

Figure 13-21 Windows Vista Backup and Restore Center
Courtesy: Course Technology/Cengage Learning

Caution Before starting a backup on a laptop, plug the laptop into an AC outlet so that the process will not be interrupted by a failed battery.

3. Click **Back up files** and respond to the UAC box. On the next window (see Figure 13-22) select where you want to save your backup and click **Next**.
4. On the next window, select the volumes on your computer that contain folders or files you want to back up and click **Next**.
5. On the next window, shown in Figure 13-23, select the type of files you want to back up and click **Next**.

A+ 220-701 2.5

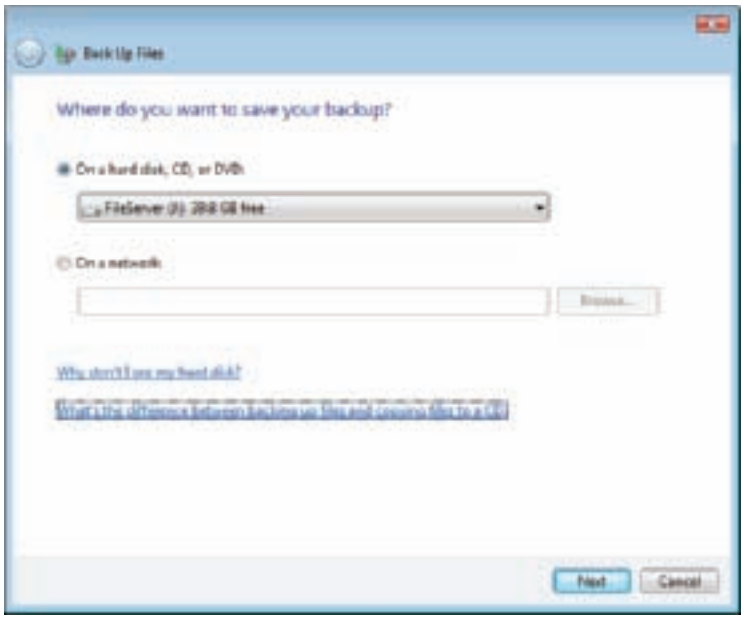

Figure 13-22 Select your backup location for files and folders
Courtesy: Course Technology/Cengage Learning

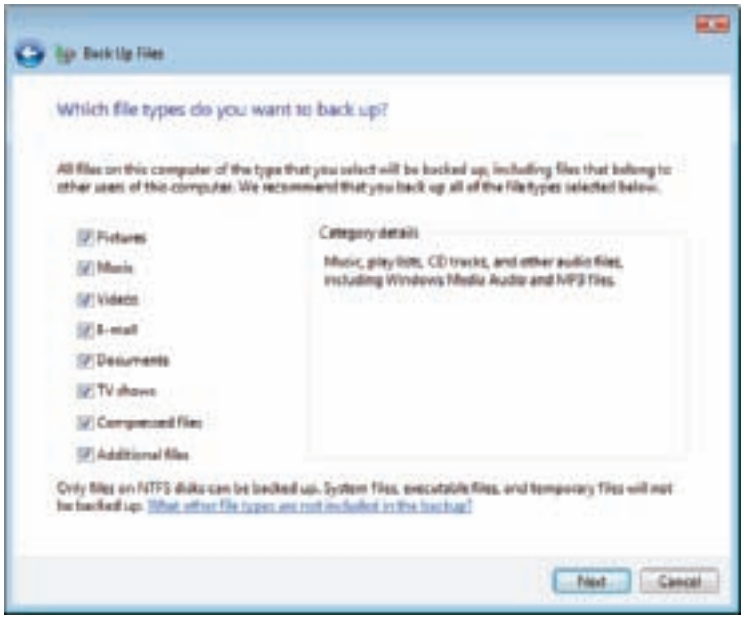

Figure 13-23 Select the type of files to back up
Courtesy: Course Technology/Cengage Learning

6. The next window lets you select how often (daily, weekly, or monthly), what day (day of week or day of month), and what time of day to schedule automatic incremental backups of today's full backup. (An incremental backup backs up only files that have changed since the last full backup or the last incremental backup.) Make your selections and click **Save settings and start backup**.

To see the status of the last backup, click **Start, All Programs, Accessories, System Tools, Backup Status and Configuration**. The Backup Status and Configuration window opens, as shown in Figure 13-24. Using this window, you can change the backup settings. When you change the settings, a new, full backup is created.

A+ 220-701 2.5

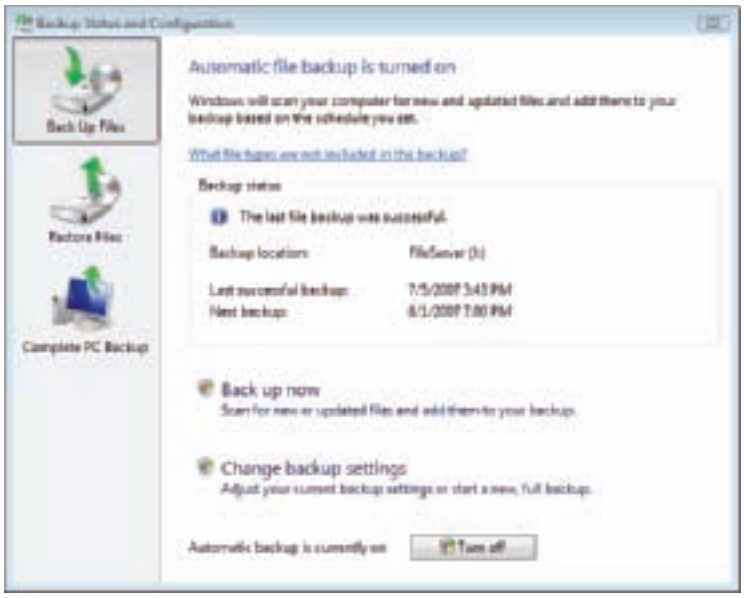

Figure 13-24 Backup Status and Configuration window
Courtesy: Course Technology/Cengage Learning

To restore files from backup, on the Backup Status and Configuration window, click **Restore Files** and follow the directions on-screen to select a specific backup and specific folders or files to restore.

Because Windows Vista backup gives you so little control over the folders you choose to back up, many people turn to third-party backup utilities. If you use one of these utilities, besides the folders that contain your documents, spreadsheets, databases, and other data files, you also might want to back up these folders:

- *Your e-mail messages and address book*. For Windows Mail, back up this folder: C:\Users*username*\AppData\Local\Microsoft\Windows Mail.
- *Your Internet Explorer favorites list*. To back up your IE favorites list, back up this folder: C:\Users*username*\Favorites.

BACK UP USER DATA WITH WINDOWS 2000/XP

To perform a backup using Ntbackup.exe under Windows 2000/XP, follow these steps:

1. Click **Start**, point to **All Programs** (**Programs** for Windows 2000), point to **Accessories**, point to **System Tools**, and then click **Backup**. The Backup Wizard appears (see Figure 13-25). Click **Advanced Mode**.
2. The Backup utility opens. Click the **Backup** tab. Your screen should look like Figure 13-26. If you want to perform a backup immediately, check the drive and subfolders to back up.
3. In the lower-left corner of the Backup Utility window, note the text box labeled Backup media or file name, which specifies where to back up to. To change this location, click the **Browse** button. The Save As dialog box appears. Navigate to the drive and path where you'd like to save the backup file and enter a name for the file. Click **Save**. The new path and name for the backup file appear in the text box.

A+ 220-701 2.5

Figure 13-25 Backup or Restore Wizard
Courtesy: Course Technology/Cengage Learning

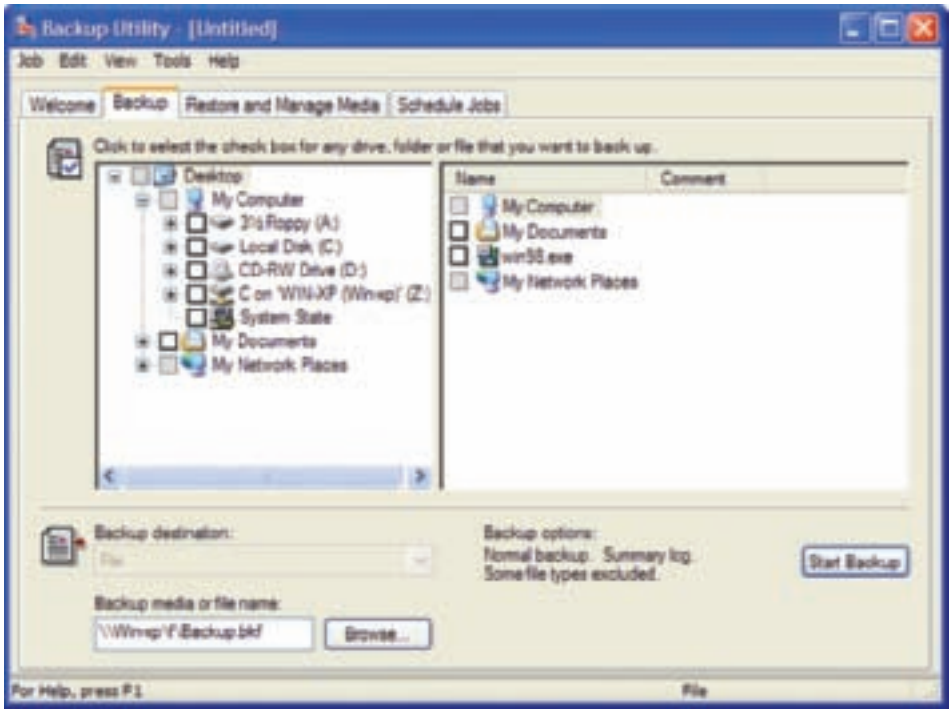

Figure 13-26 You can perform an immediate backup from the Backup tab
Courtesy: Course Technology/Cengage Learning

4. Click the **Start Backup** button in the lower-right corner. The Backup Job Information box appears. If you want to replace an existing backup, select **Replace the data on the media with this backup**. To append the data, select **Append the backup to the media**. Then click **Start Backup**.

A+ 220-701 2.5

You can schedule a single backup to be done at a later time or repeated on a schedule until you terminate the schedule. When planning routinely scheduled backups, you have some options so that you don't have to back up everything at each backup. It's a lot less expensive and less time-consuming to only back up what's changed since the last backup. Windows 2000/XP offers these options for scheduled backups:

- *Full backup (also called a normal backup)*. All files selected for backup are copied to the backup media. Each file is marked as backed up by clearing its archive attribute. Later, if you need to recover data, this full backup is all you need. (After the backup, if a file is changed, its archive attribute is turned on to indicate the file has changed since its last backup.)
- *Copy backup*. All files selected for backup are copied to the backup media, but files are not marked as backed up (meaning file archive attributes are not cleared). A Copy backup is useful if you want to make a backup apart from your regularly scheduled backups.
- *Incremental backup*. All files that have been created or changed since the last backup are backed up, and all files are marked as backed up (meaning file archive attributes are cleared). Later, if you need to recover data, you'll need the last full backup and all the incremental backups since this last full backup.
- *Differential backup*. All files that have been created or changed since the last full or incremental backup are backed up, and files are not marked as backed up. Later, if you need to recover data, you'll need the last full backup and the last differential backup.
- *Daily backup*. All files that have been created or changed on this day are backed up. Files are not marked as backed up. Later, if you need to recover data, you'll need the last full backup and all daily backups since this last full backup.

The two best ways to schedule backups are a combination of full backups and incremental backups, or a combination of full backups and differential backups. When using incremental backups, because they are smaller than differential backups, you save time and money when backing up. On the other hand, recovering data is less time-consuming when using differential backups because you only need two backups to perform a full recovery (the last full backup and the last differential backup).

For a business with heavy data entry, suppose you decide you need to back up every night at 11:55 PM. To implement this backup plan, you might decide to schedule two backups: a full backup each Friday at 11:55 PM, and a differential backup each Monday, Tuesday, Wednesday, and Thursday at 11:55 PM. In a project at the end of this chapter, you'll learn how you can reuse tapes on a rotating basis for a backup plan similar to this one.

Notes When making your backup plan, for extra protection, take into account that you might want to keep several generations of backups on hand. If you always overwrite the backup with a new backup, you only have one generation of backups. However, sometimes a file gets corrupted or accidentally deleted and you don't discover the problem for several weeks. If you don't keep several generations of backups, you will have no chance of recovering the data. On the other hand, if you back up weekly and keep the last 10 weeks of backups, you can go back and search previous backups to recover the file.

To schedule a backup, do the following:

1. Open the backup utility and click the **Schedule Jobs** tab, as shown in Figure 13-27. Select a date on which you want to schedule a backup, and then click the **Add Job** button.

A+ 220-701 2.5

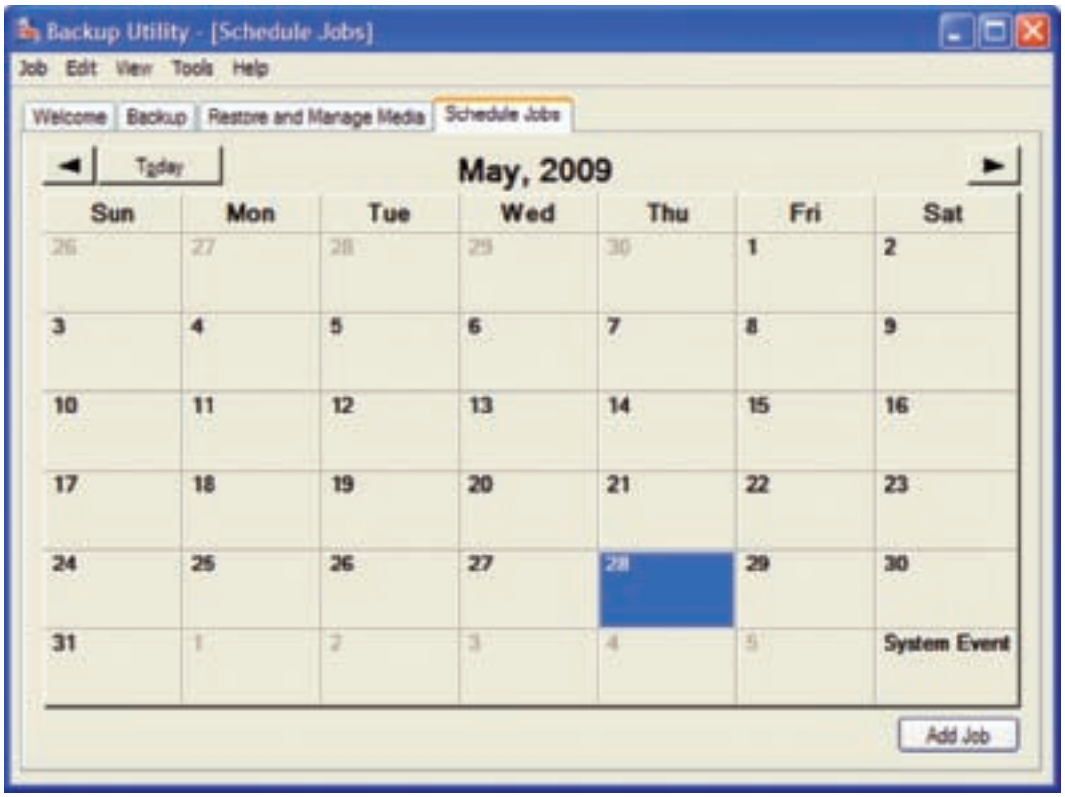

Figure 13-27 The Schedule Jobs tab of the Windows 2000/XP Backup Utility window
Courtesy: Course Technology/Cengage Learning

2. The Backup Wizard opens. On the first screen, click **Next**. Select **Back up selected files, drives, or network data**, and then click **Next**.
3. On the next screen, select the drives, folders, or files you want to back up, and then click **Next**.
4. Follow the steps through the wizard to choose where you want to save your backup, give a name to the backup, and select the type of backup (Normal, Copy, Incremental, Differential, or Daily). Note that a Normal backup is a full backup.
5. Then you are asked if you want to verify the data after backup and compress the data. Next, you must decide if you want to append the data to an existing backup or replace an existing backup. Your decision largely depends on how much space you have available for backups.
6. When asked if you want to perform the backup now or later, select **Later** and give the backup a name, as shown on the left side of Figure 13-28. Click the **Set Schedule** button.
7. The Schedule Job window appears, as shown on the right side of Figure 13-28. Schedule how often the backup is to occur, and then click **OK**. Notice in the figure that a backup is scheduled for each Monday, Tuesday, Wednesday, and Thursday at 11:55 PM.
8. Click **Next** in the wizard, and follow the remaining instructions to complete the backup. At the end of the process, the wizard gives you an on-screen report summarizing information about the backup.

A+ 220-701 2.5

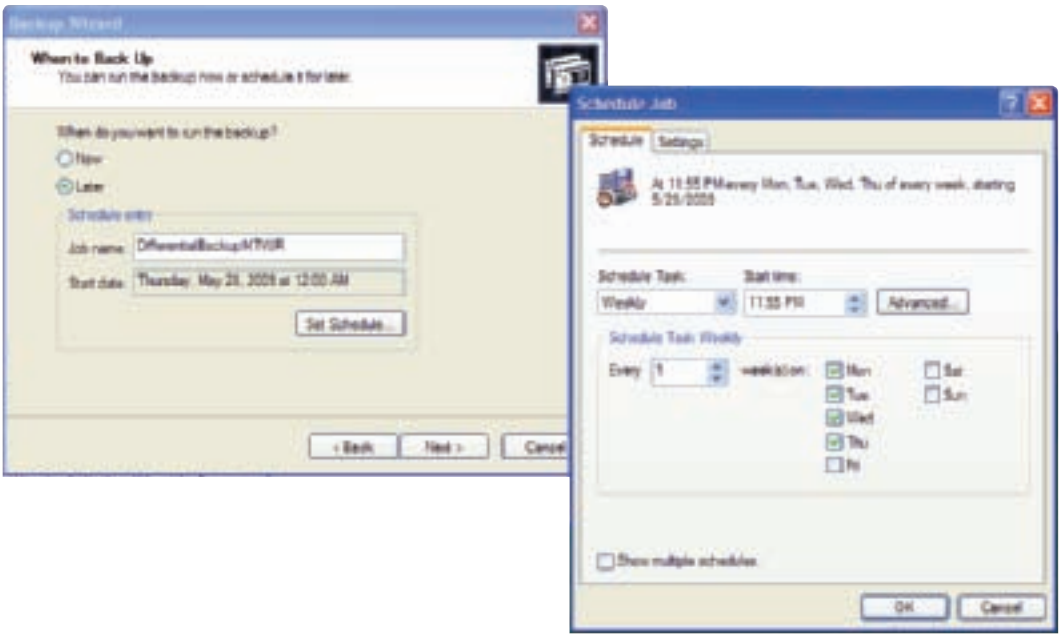

Figure 13-28 Schedule repeated backups
Courtesy: Course Technology/Cengage Learning

Besides the folders that contain documents, spreadsheets, databases, and other data files, you also might want to back up these folders:

- *E-mail messages and address book*. For Outlook and Outlook Express, back up this folder: C:\Documents and Settings*username*\Local Settings\Application Data\Microsoft\Outlook.
- *Internet Explorer favorites list*. To back up an IE favorites list, back up this folder: C:\Documents and Settings*username*\Favorites.

To recover files, folders, or the entire drive from backup using the Windows 2000/XP Backup utility, click the **Restore and Manage Media** tab on the Backup Utility window, and then select the backup job to use for the restore. The Backup utility displays the folders and files that were backed up with this job. You can select the ones that you want to restore. When you restore from backup, you'll lose all the data you've entered in restored files since the backup, so be sure to use the most recent backup and then re-enter the data that's missing.

Notes By default, Windows XP Home Edition does not automatically install the Backup utility. To install it manually, go to the \VALUEADD\MSFT\NTBACKUP folder on your Windows XP setup CD and double-click **Ntbackup.msi**. The installation wizard will complete the installation.

BACK UP SYSTEM FILES

Windows Vista and XP use System Restore to keep backups of critical system files. In addition, Windows XP and Windows 2000 allow you to use the Backup utility to back up the **system state data**, which are the files critical to a successful operating system load. This backup includes all files necessary to boot the OS, the Windows 2000/XP registry, and all system files in the %*SystemRoot*% folder (the folder in which Windows 2000/XP is installed). Let's first see how to use Windows Vista/XP System Restore and then we'll look at how to back up the system state.

A+ 220-701 2.5

HOW TO USE VISTA AND XP SYSTEM RESTORE

System Restore restores the system to its condition at the time a snapshot was taken of the system settings and configuration. These snapshots are called **restore points**. If System Restore is turned on, Windows automatically creates a restore point before you install new software or hardware or make other changes to the system. You can also manually create a restore point at any time. In this part of the chapter, you will learn how to create a restore point, how to make sure restore points are being created automatically, and how to use these restore points.

Manually Create a Restore Point

To manually create a restore point using Windows Vista, follow these steps:

1. Click **Start**, right-click **Computer**, and select **Properties** from the shortcut menu. The System window opens.
2. Click **Advanced system settings** and respond to the UAC box. The System Properties box opens.
3. Click the **System Protection** tab (see the left side of Figure 13-29). Click **Create**.

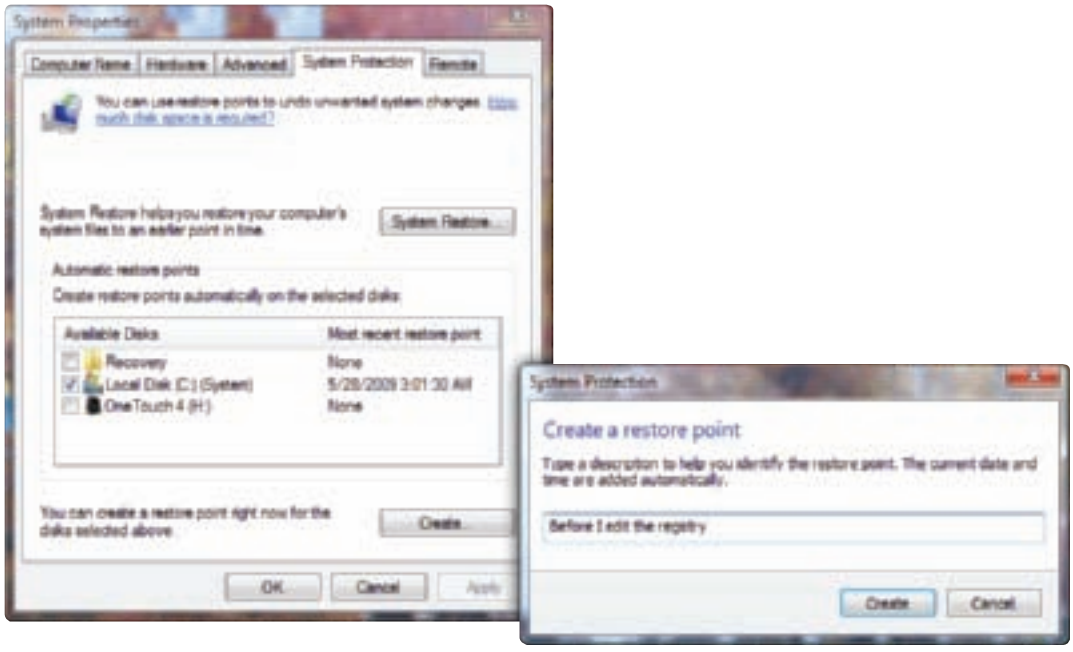

Figure 13-29 Manually create a restore point
Courtesy: Course Technology/Cengage Learning

4. In the System Protection box (right side of Figure 13-29), enter a description of the restore point and click **Create**.
5. Click **OK** twice to close both boxes. Close the System window.

To create a restore point using Windows XP, click **Start**, **All Programs**, **Accessories**, **System Tools**, and **System Restore**. In the System Restore dialog box, select **Create a restore point** and click **Next**. In the next box, enter a description and click **Create**.

A+ 220-701 2.5

Keep System Protection Turned On

System Protection creates restore points at regular intervals and just before you install software or hardware. However, to make sure System Protection has not been turned off, click **Start**, right-click **Computer**, and select **Properties** from the shortcut menu. In the System window, click **System protection** and respond to the UAC box. The System Protection tab of the System Properties box appears (see Figure 13-30). Make sure the drive on which Windows is installed is checked, indicating that restore points are created automatically. If you make a change to this window, click **Apply** and then click **OK**.

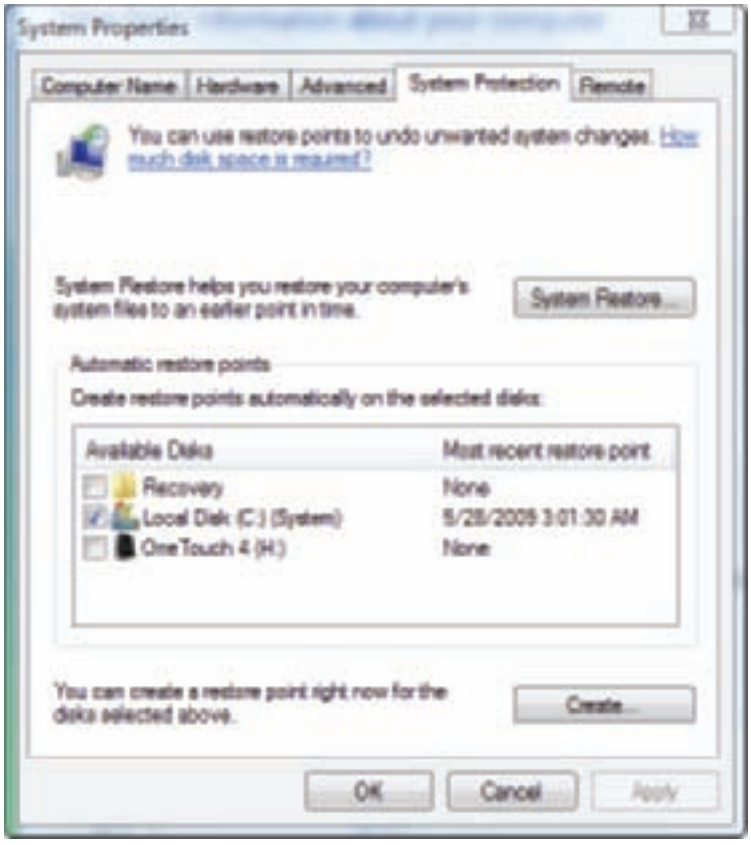

Figure 13-30 Make sure System Protection is turned on
Courtesy: Course Technology/Cengage Learning

Here is some useful information about how and when restore points are made: Restore points are normally kept in the folder C:\System Volume Information, which is not accessible to the user. Restore points are taken at least every 24 hours, and they can use up to 15 percent of disk space. If disk space gets very low, restore points are no longer made, which is one more good reason to keep about 15 percent or more of the hard drive free.

How to Apply a Restore Point

If you restore the system to a previous restore point, user data on the hard drive will not be altered, but you can affect installed software and hardware, user settings, and OS configuration settings. When you use System Restore to roll back the system to a restore point, any changes made to these settings after the restore point was created are lost; therefore, always use the most recent restore point that can fix the problem so that you make the least intrusive changes to the system.

A+ 220-701 2.5

If Vista will not boot, you can launch System Restore from the Vista Recovery Environment, which you will learn to use in Chapter 15. From the Windows Vista or Windows XP desktop, to return the system to a previous restore point, do the following:

1. Click **Start**, **All Programs**, **Accessories**, **System Tools**, **System Restore** and respond to the UAC box. The System Restore box opens (see Figure 13-31).

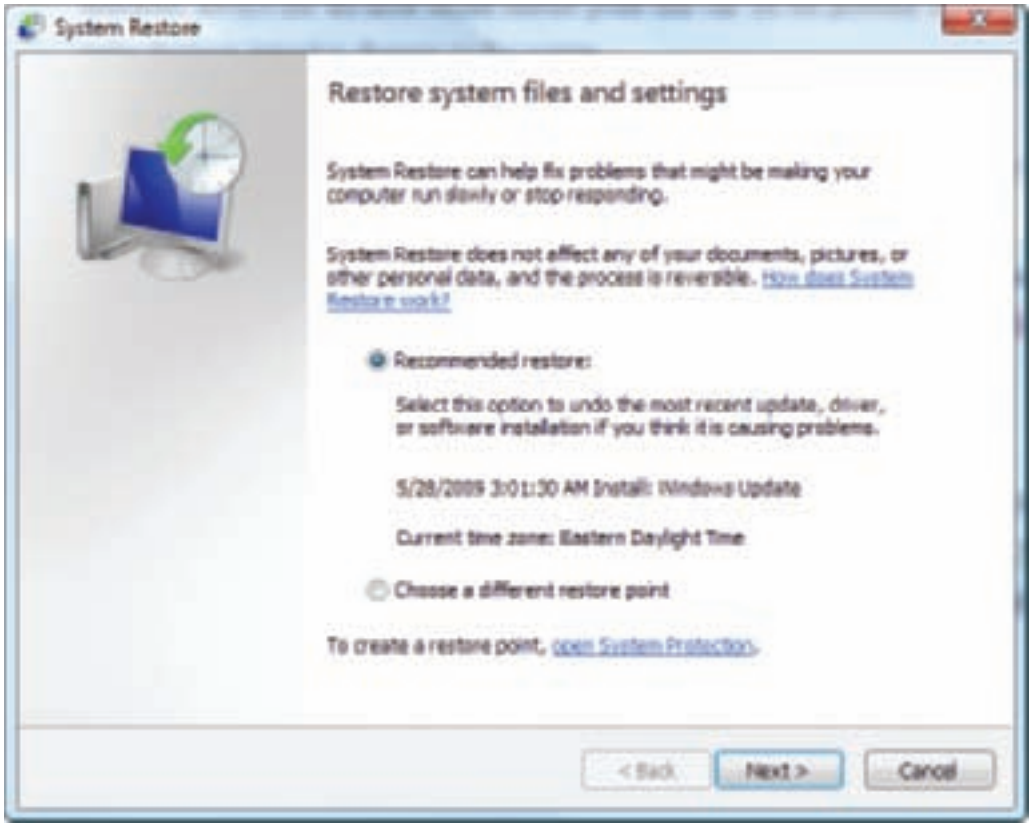

Figure 13-31 System Restore utility opening window
Courtesy: Course Technology/Cengage Learning

2. If multiple restore points exist, the box displays two options. Click **Next** to use the recommended restore point. If you don't want to use the recommended restore point, select **Choose a different restore point**, click **Next**, and select a restore point from a list (see Figure 13-32) and click **Next**. Click **Finish**. The system restarts and the restore point is applied.

Points to Remember About System Restore

System Restore is a great tool to try to fix a device that is not working, restore Windows settings that are giving problems, or solve problems with applications. Although it's a great tool in some situations, it does have its limitations. Keep these points in mind:

- *Point 1:* Restore points replace certain keys in the registry but cannot completely rebuild a totally corrupted registry. Therefore, System Restore can recover from errors only if the registry is somewhat intact.

A+ 220-701 2.5

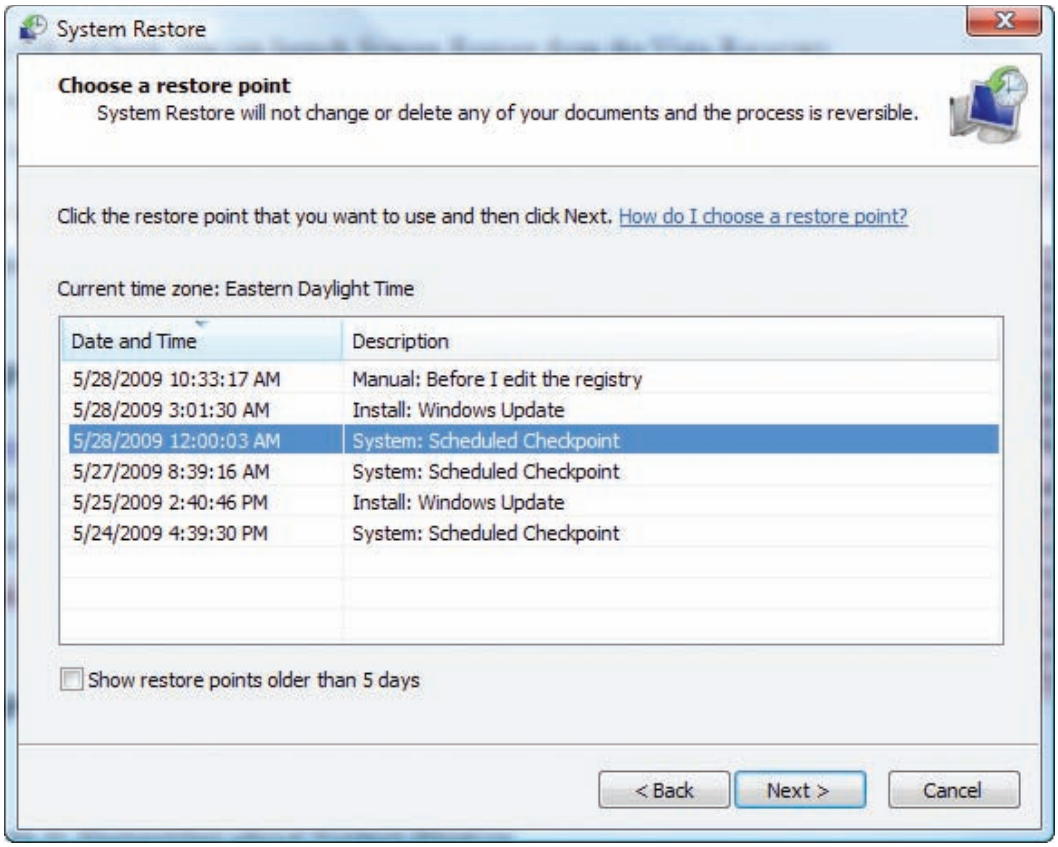

Figure 13-32 Select a restore point
Courtesy: Course Technology/Cengage Learning

- *Point 2:* The restore process cannot remove a virus or worm infection. However, it might help you start a system that is infected with a virus that launches at startup. After Windows has started, you can then use antivirus software to remove the infection.
- *Point 3:* System Restore might create a new problem. I've discovered that whenever I use a restore point, my antivirus software gets all out of whack and sometimes even needs reinstalling. Therefore, use restore points sparingly.
- *Point 4:* System Restore might make many changes to a system. If you know which change caused a problem, try to undo that particular change first. The idea is to use the least invasive solution first. For example, if updating a driver has caused a problem, first try Driver Rollback to undo that change. Driver Rollback is performed using Device Manager.
- *Point 5:* System Restore won't help you if you don't have restore points to use. System Protection must be turned on so that restore points are automatically created.
- *Point 6:* Restore points are kept in a hidden folder on the hard drive. If that area of the drive is corrupted, the restore points are lost. Also, if a user turns System Protection off, all restore points are lost.
- *Point 7:* Viruses and other malware sometimes hide in restore points. To completely clean an infected system, you need to delete all restore points by turning System Protection off and back on.

In Chapters 15 and 16, you will learn about other tools and methods to use when recovering from a corrupted Vista installation.

A+ 220-701 2.5

HOW TO BACK UP THE SYSTEM STATE USING WINDOWS XP AND 2000

When you back up the system state data, you cannot select which files you want to back up because Windows 2000/XP always backs up all of them. A typical system state backup includes over 2,500 files and 500 MB of data. Here is the process for backing up the system state:

1. Click **Start**, point to **All Programs** (**Programs** in Windows 2000), **Accessories, System Tools**, and then click **Backup**. (Or you can enter **Ntbackup.exe** in the Run dialog box.) Depending on how the utility is configured, the Backup Utility window opens or the Backup or Restore Wizard launches (refer back to Figure 13-25). If the wizard launches, click **Advanced Mode** to see the Backup Utility window.
2. On the Backup Utility window, click the **Backup** tab (see Figure 13-33).

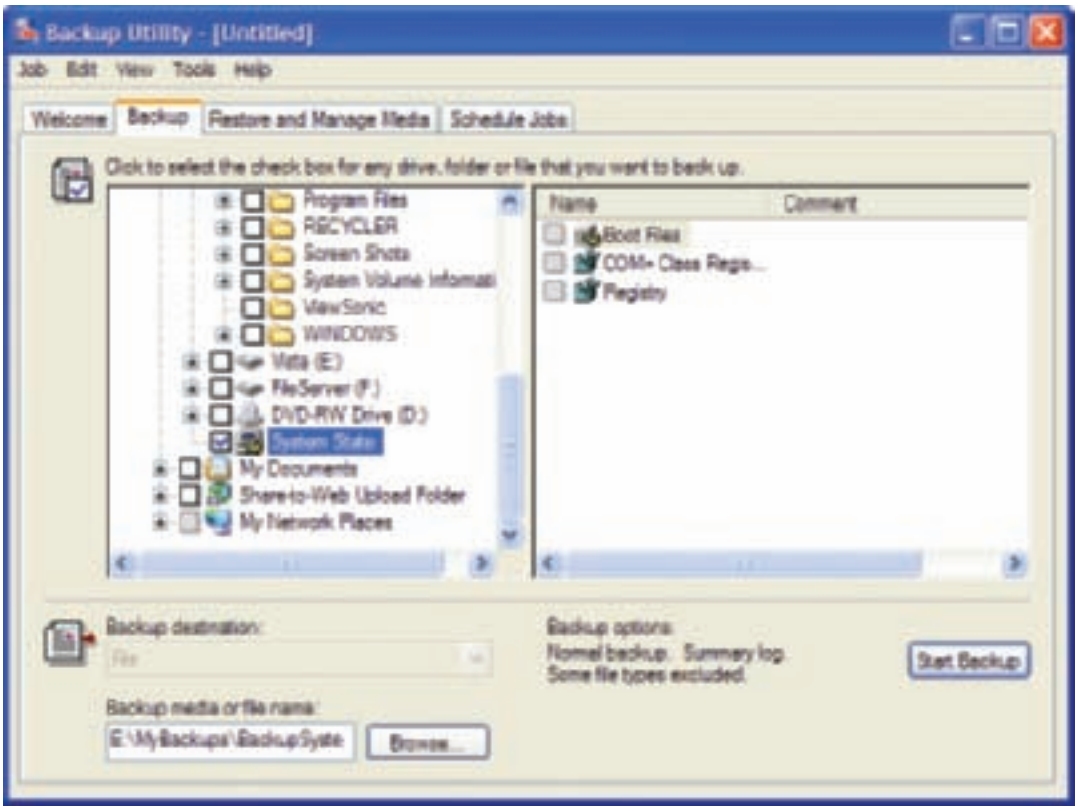

Figure 13-33 Back up the Windows XP/2000 system state
Courtesy: Course Technology/Cengage Learning

3. Check the **System State** box in the list of items you can back up. Notice in Figure 13-33 that the system state includes the boot files and the registry. It also includes the COM+(Component Object Model) Registration Database, which contains information about applications and includes files in the Windows folders.
4. Click **Browse** to point to where you want the backup saved. You can back up to any media, including a folder on the hard drive, USB drive, tape drive, or network drive. For better protection, back up to another media than your hard drive, such as another hard drive on the network. Click **Start Backup** to begin the process. A dialog box appears. Click **Start Backup** again.

A+ 220-701 2.5

Notes When you back up the system state, the registry is also backed up to the folder *%SystemRoot%*\repair\RegBack. If you later have a corrupted registry, you can copy files from this folder to the registry folder, which is *%SystemRoot%*\System32\Config.

If Windows gives errors or the registry gets corrupted, you can restore the system to the state it was in when the last System State backup was made. To do that, following the instructions given in Step 1 at the beginning of this section, open the Backup Utility window. Then click the **Restore and Manage Media** tab (**Restore** tab in Windows 2000), which is shown in Figure 13-34.

A+ Exam Tip The A+ 220-701 Essentials exam expects you to know how to use Ntbackup.exe to back up the system state.

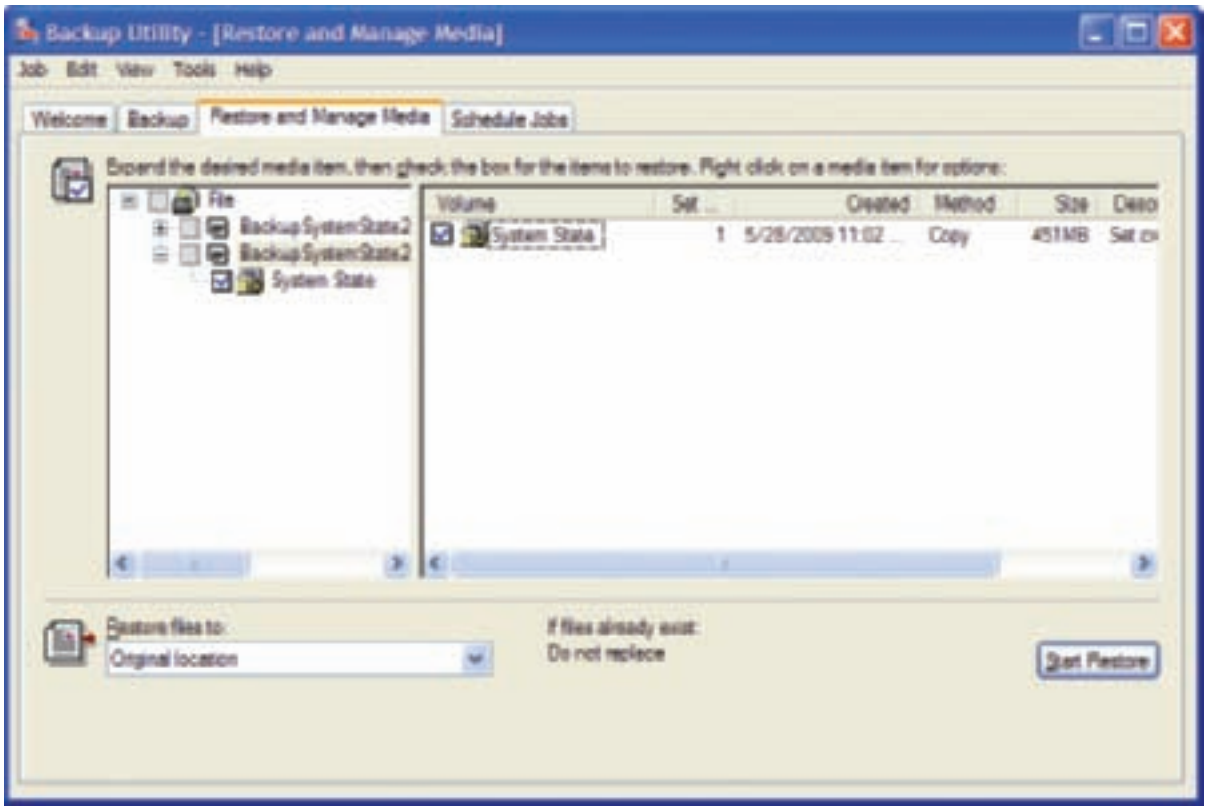

Figure 13-34 Restore the system state from the Restore and Manage Media tab of the Backup dialog box
Courtesy: Course Technology/Cengage Learning

From the Restore and Manage Media tab, first select the backup you want to restore. Then, in the list box in the lower-left corner, select the location to which the backup is to be restored. To restore the system state, select **Original location**. Click the **Start Restore** button in the lower-right corner. A warning box appears stating that you will overwrite the existing state. Click **OK** to start the process. Remember that you can restore the system state as a way of restoring the registry.

The biggest limitation to using the Backup utility to restore the system state is that, in order to use the utility, you must be able to boot to the Windows desktop. How to deal with problems when you can't boot to the Windows desktop is covered in Chapters 15 and 16.

A+ 220-701 2.5

BACK UP THE ENTIRE HARD DRIVE

Besides backing up user data or system files, you can also back up the entire hard drive using Windows Vista **Complete PC Backup** or Windows XP **Automated System Recovery**. How to use both tools is covered next.

WINDOWS VISTA COMPLETE PC BACKUP

A Complete PC backup makes a backup of the entire volume on which Vista is installed and can also back up other volumes. The best practice to protect a Windows Vista system is to make a Complete PC backup after you have installed Vista, all hardware devices, and all applications. This backup works similarly to recovery CDs or DVDs that come with a brand-name computer. Recall that these recovery CDs or DVDs can be used to recover from a failed hard drive. The process returns a system to its original state at the time of purchase.

Notes Complete PC backup is not available in Vista Starter or Vista Home editions.

The Complete PC backup must be saved to a local device such as an external hard drive or to DVDs. Don't back up the volume to another partition on the same hard drive. After the initial backup is made, Vista will automatically keep this backup current by making incremental backups. Vista does not keep multiple copies of backups made using the Complete PC backup method, as it does when backing up files and folders.

Follow these steps to create the initial Complete PC backup:

1. Connect your backup device to your PC. If you're using an external hard drive, use Windows Explorer to verify you can access the drive.
2. From Control Panel, under System and Maintenance, click **Back up your computer**. The Backup and Restore Center window appears as shown earlier in Figure 13-21.
3. Click **Back up computer** and respond to the UAC dialog box. Vista searches for available backup devices and then displays the list. Select the backup media and click **Next**.
4. In the next window, Vista Backup shows you the Vista volume it will back up and gives you the opportunity to select other volumes it finds to include in the backup. Make your selections and click **Next**.
5. In the next window (see Figure 13-35), the backup tells you the maximum amount of space expected for the backup, assuming no compression and room for housekeeping data about the backup. If you are backing up to DVDs, the backup tells you about how many DVDs are required. Click **Start backup** to begin the backup.

In the event your hard drive fails or Vista is so corrupted you cannot recover it, you can restore the volume or volumes from your Complete PC backup. Because the entire Vista volume will be overwritten, you must perform the operation from the Vista setup DVD using the Windows Recovery Environment (Windows RE).

Follow these steps to recover the system from backup:

1. Because this process will erase everything on the Vista volume and any other volumes included in the Complete PC backup, make every attempt to save any important data on these volumes before you continue with these steps.

A+
220-701
2.5

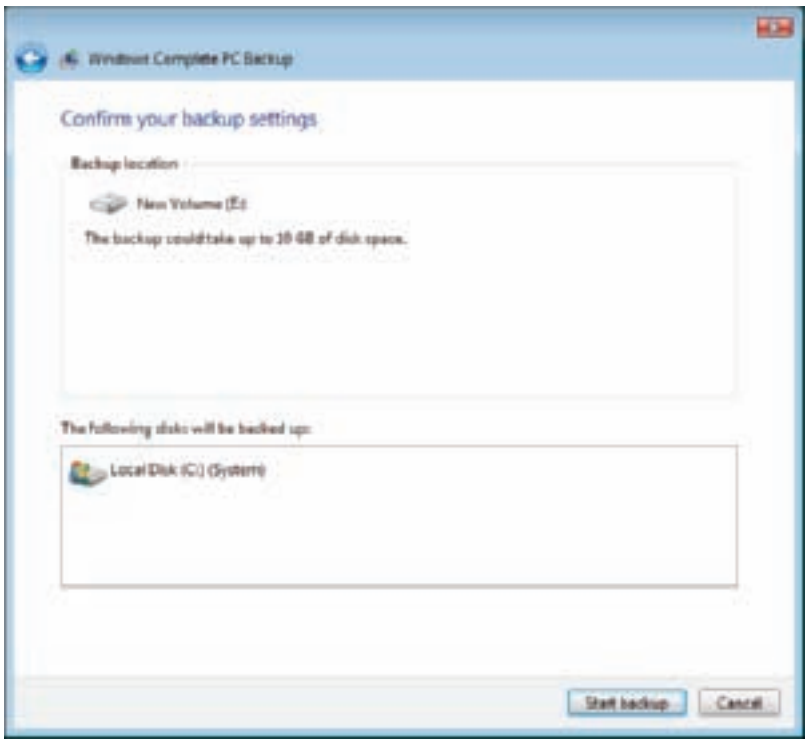

Figure 13-35 Confirm your backup settings and begin the backup
Courtesy: Course Technology/Cengage Learning

2. Connect the backup device to your computer.
3. Boot from the Vista DVD and select your language and keyboard layout preferences, as shown in Figure 13-36. Click **Next**.
4. The Install Windows screen appears. Click **Repair your computer** (see Figure 13-37).

Figure 13-36 Select language and keyboard preferences
Courtesy: Course Technology/Cengage Learning

A+ 220-701 2.5

Figure 13-37 Opening menu when you boot from the Vista DVD
Courtesy: Course Technology/Cengage Learning

5. System Recovery searches for an installed OS. If it finds one, select it and click **Next**. If it does not find an installed OS, just click **Next**.
6. If System Recovery presents a logon dialog box, log onto the system using an administrator account and password.
7. The System Recovery Options window shown in Figure 13-38 appears. Click **Windows Complete PC Restore**, and follow the directions on-screen to restore the system from backup.

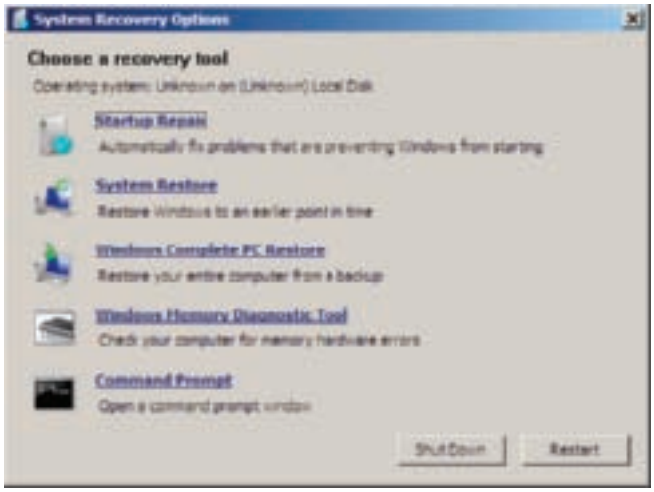

Figure 13-38 Restore the system to previous Complete PC backup
Courtesy: Course Technology/Cengage Learning

In Chapter 15, you'll learn more about the Windows Recovery Environment, including how to use all the options shown in Figure 13-38, and what you can do to recover a failed Vista system without having to revert to the last Complete PC backup.

A+
220-701
2.5
3.4

WINDOWS XP AUTOMATED SYSTEM RECOVERY

You can use the Windows XP Automated System Recovery (ASR) tool to back up the entire volume on which Windows is installed (most likely drive C). Later, if Windows gets corrupted, you can recover the system from the last time you made an ASR backup. Keep in mind, however, that everything on the volume since the ASR backup was made is lost, including installed software and device drivers, user data, and any changes to the system configuration.

In this section, you will learn how to make the ASR backup and how to restore the system from the backup. You'll also learn about the best practices for using the ASR tool.

Creating the ASR Backup and ASR Disk

The ASR backup process creates two items: a full backup of the drive on which Windows is installed and an ASR floppy disk on which information that will help Windows use Automated System Recovery is stored. The ASR backup process places the location of the backup file on the floppy. The backup file will be just as large as the contents of the hard drive volume, so you will need a massive backup medium, such as a partition on a different hard drive, a tape drive, or a writeable CD-R or CD-RW drive.

Caution Do not back up drive C to a folder on drive C. The ASR backup process allows you to do this, but restoring later from this backup does not work. In addition, when a hard drive partition fails, most likely other partitions on the drive will also be lost, and so will your backup if you've put it on one of these other partitions. Therefore, to better protect your installation, back up to a different hard drive or other media.

Follow these directions to create the backup and the ASR floppy disk:

Notes To use Automated System Recovery in Windows XP Home Edition, the Backup utility must first be installed.

1. Click **Start, All Programs, Accessories, System Tools**, and **Backup**. The Backup or Restore Wizard appears (refer back to Figure 13-25).
2. Click the **Advanced Mode** link. The Backup Utility window appears. On the Welcome tab, click **Automated System Recovery Wizard**. On the following window, click **Next**.
3. The Backup Destination window appears. Select the location of the medium to receive the backup and insert a disk into the floppy disk drive. This disk will become the ASR disk. Click **Next**.

Notes The ASR process assumes you have a floppy disk drive. If your computer does not have this drive, you can use an external floppy drive. If you don't have either, it's possible to skip the step of making the ASR disk at the time you make the ASR backup. However, you must make the ASR disk later before you can perform the ASR restore. And, a floppy disk drive is required to perform an ASR restore. You will learn how to create an ASR disk in a project at the end of this chapter.

4. Click **Finish**. The backup process shows its progress, as seen in Figure 13-39.
5. When the backup is finished, label the disk with the name "ASR Disk," the date it was created, and the computer's name, and put the disk in a safe place.

A+ 220-701 2.5 3.4

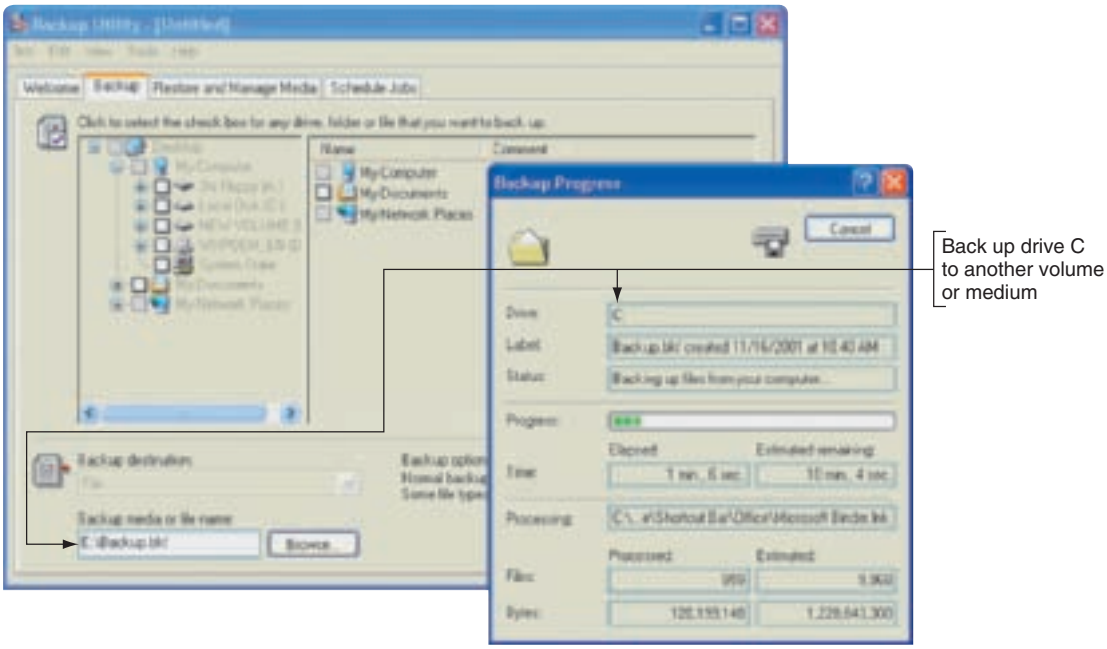

Figure 13-39 The Backup utility can create a backup of drive C and an ASR disk to be used later for the Automated System Recovery utility
Courtesy: Course Technology/Cengage Learning

Restoring the System Using an ASR Backup

To restore the Windows volume to its state when the last ASR backup was made, do the following:

1. Insert the Windows XP CD in the CD-ROM drive, and hard boot the PC.
2. You will see a message that says "Press any key to boot from CD." Press any key.
3. A blue screen appears with the message "Press F6 to load RAID or SCSI drivers." If your system uses RAID, SCSI, or some SATA drives, press **F6**. If your system does not use these drives, ignore the message.
4. At the bottom of the blue screen, a message says, "Press F2 to run the Automated System Recovery process." Press **F2**.
5. The screen shown in Figure 13-40 appears, instructing you to insert the ASR floppy disk. Insert the disk and then press **Enter**.

Windows XP Setup then does the following:

1. Loads files it needs to run
2. Repartitions and reformats the drive
3. Installs Windows from the Windows XP CD
4. Launches the Automatic System Recovery Wizard to restore the Windows system state, applications, and data to what they were at the time of the last ASR backup

As the ASR recovery process progresses, it erases everything on the volume being restored and reformats the volume just before the Windows XP installation process begins. After the process is finished, restart the system and then restore data from recent backups of user data.

A+ 220-701 2.5 3.4

Figure 13-40 Automatic System Recovery process must have the ASR floppy disk
Courtesy: Course Technology/Cengage Learning

A+ Exam Tip Content on the A+ 220-701 Essentials exam ends here and content on the A+ 220-702 Practical Application exam begins.

MANAGING FILES, FOLDERS, AND HARD DRIVES

A+ 220-702 2.2

If you are a PC support technician, users are likely to ask you to help them manage their data, configure Windows, set up network resources, and help them keep the PC in good working order. All this requires that you know how to manage folders and files and understand the directory structures used by Windows Vista, XP, and 2000 so that you will know where to look on the hard drive to find the folders and files you need. In this part of the chapter, you will learn about these directory structures and to use several commands useful for managing files and folders. Then you'll learn how to manage hard drives and their partitions.

DIRECTORY STRUCTURES

Directory locations you need to be aware of include those for user files, system files, fonts, temporary files, program files, and offline files and folders. When a user first logs onto Windows Vista, a user profile is created that consists of two general items:

- A user folder together with its subfolders. These items are created under the %*SystemDrive*%\Users folder, for example, C:\Users\Jean Andrews.
- A file named Ntuser.dat in the user's folder. The file contains user settings. Each time the user logs on, the contents of this file are copied to a location in the registry.

The user folder for an account (for example, C:\Users\Jean Andrews) contains a group of subfolders organized as shown in Figure 13-41. This group of folders and subfolders is called the **user profile namespace**.

A+ 220-702 2.2

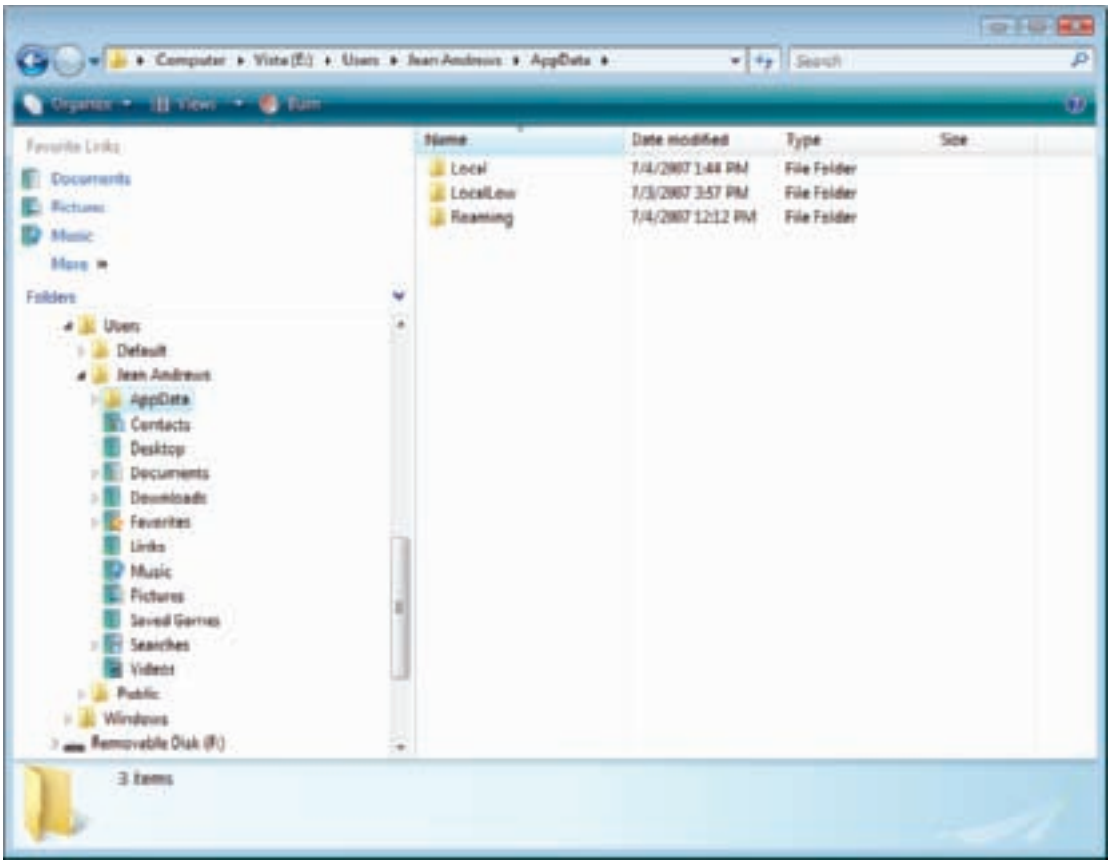

Figure 13-41 A user profile namespace contains a folder and subfolders to hold user data and application data
Courtesy: Course Technology/Cengage Learning

Also notice in Figure 13-41 the \Users\Public folder. Microsoft encourages you to put files in this Public folder that will be shared on the network so that your private user data folders are better protected.

In Windows XP, the folder for a user account is stored in the C:\Documents and Settings folder. The folders in the user accounts folder for Windows XP are organized as shown in Figure 13-42.

Windows Vista and XP are normally installed in the C:\Windows folder. Windows 2000 is installed in C:\Windows or C:\Winnt. Here are some other important folder locations:

- The Windows registry is stored in the \Windows\system32\config folder.
- A backup of the registry is stored in the \Windows\system32\config\RegBack folder.
- Fonts are stored in the \Windows\Fonts folder.
- Program files are stored in C:\Program Files for 32-bit versions of Windows.
- In 64-bit versions of Vista and XP, 64-bit programs are stored in the C:\Program Files folder and 32-bit programs are stored in C:\Program Files (x86) folder.
- Temporary files used by Windows when it is installing software and performing other maintenance tasks are stored in the \Windows\Temp folder.
- For Windows Vista, temporary files used by Internet Explorer are stored in C:\Users*username*\AppData\Local\Microsoft\Windows\Temporary Internet Files. This folder holds cookies, cached Web page content, and Internet Explorer history.
- For Windows XP, temporary files used by Internet Explorer are stored in C:\Documents and Settings*username*\Local Settings\Temporary Internet Files.

A+ 220-702 2.2

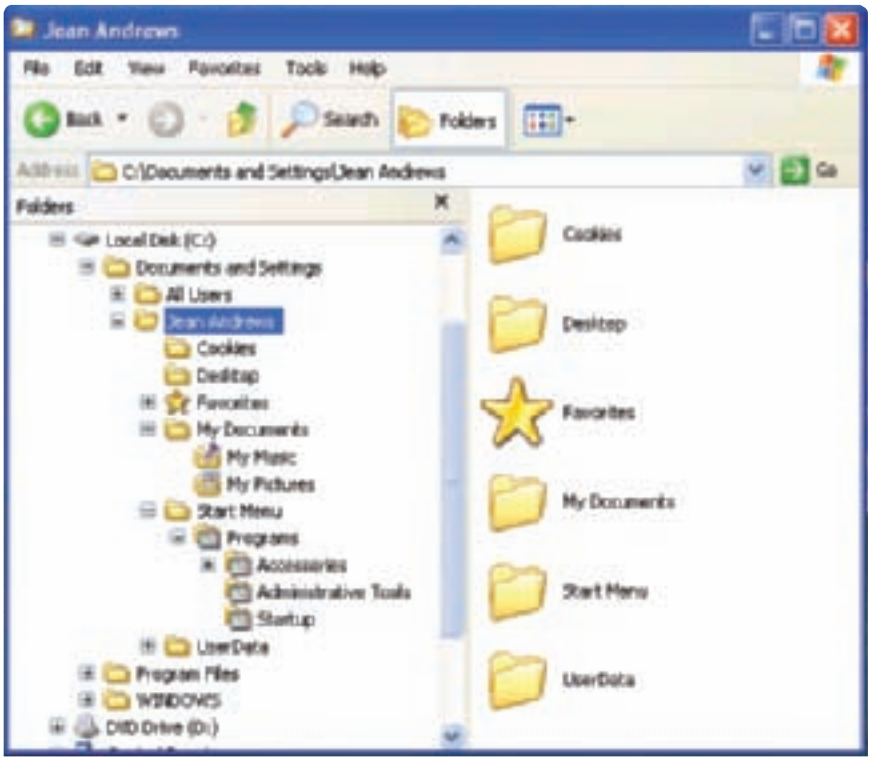

Figure 13-42 Directory structure for an XP user
Courtesy: Course Technology/Cengage Learning

- The client-side caching (CSC) folder used to store offline files and folders is C:\Windows\CSC. This folder is created and managed by the Windows Offline Files utility. The utility makes it possible for a user to work with a copy of folders and files stored on the local network when his computer is not connected to the network. Later, when a connection happens, Windows syncs up the offline files and folders stored in the C:\Windows\CSC folder with those on the network.

A+ 220-702 2.1

COMMANDS TO MANAGE FILES AND FOLDERS

Remember from Chapter 2 that you open a command prompt window that provides a Command Line Interface (CLI). Using this window, you can enter command lines to perform a variety of tasks, such as deleting a file or running the System Information Utility (msinfo32.exe) utility. Recall from Chapter 2 that you can enter **cmd.exe** in the Vista Start Search box or the XP Run box to open a command prompt window (see Figure 13-43).

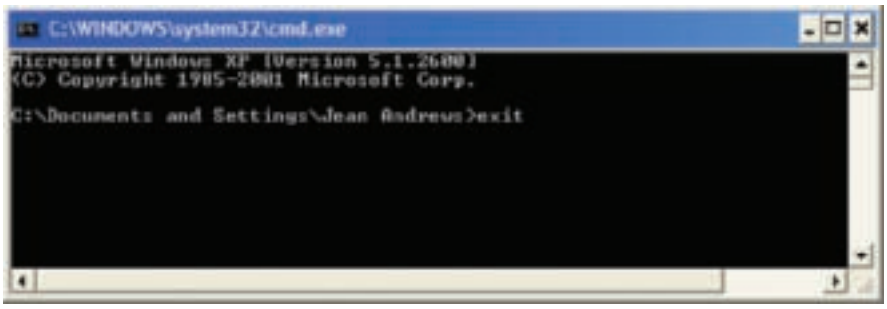

Figure 13-43 Use the exit command to close the command prompt window
Courtesy: Course Technology/Cengage Learning

A+ 220-702 2.1

This method works for both 32-bit and 64-bit versions of Windows. If you need an elevated command prompt window in Vista, click **Start**, **All Programs**, and **Accessories** and right-click **Command Prompt**. Then select **Run as administrator** from the shortcut window. When you're working in a command prompt window, type **cls** and press **Enter** to clear the window. To retrieve the last command you entered, press the up arrow. To retrieve the last command line one character at a time, press the right arrow. To close the window, type **exit** (see Figure 13-43) and press **Enter**.

Many of the commands you will learn about in this section can also be used from the Vista Recovery Environment or the Windows 2000/XP Recovery Console. These operating systems can be loaded from the Windows setup CD or DVD to troubleshoot a system when the Windows desktop refuses to load. How to use the Recovery Environment and the Recovery Console is covered in Chapters 15 and 16.

Notes As you work through the commands in this part of the chapter, keep in mind that if you enter a command and want to terminate its execution before it is finished, you can press Ctrl+Break to do so.

If the command you are using applies to files or folders, the path to these files or folders is assumed to be the default drive and directory. The default drive and directory, also called the current drive and directory, shows in the command prompt. It is the drive and directory that the command will use if you don't give a drive and directory in the command line. For example, in Figure 13-43, the default drive is C: and the default path is C:\Documents and Settings\Jean Andrews. If you use a different path in the command line, the path you use overrides the default path. Also know that Windows makes no distinction between uppercase and lowercase in command lines.

Now let's look at the file naming conventions you will need to follow when creating files, wildcard characters you can use in command lines, and several commands useful for managing files and folders. Only the most common parameters are included with the commands; know that additional parameters might be available.

FILE NAMING CONVENTIONS

When using the command prompt window to create a file, keep in mind that filename and file extension characters can be the letters a through z, the numbers 0 through 9, and the following characters:

```
_ ^ $ ~ ! # % & - { } ( ) @ ' `
```

In a command prompt window, if a filename has spaces in it, it is sometimes necessary to enclose the filename in double quotation marks.

WILDCARD CHARACTERS IN COMMAND LINES

As you work at the command prompt, you can use **wildcard** characters in a filename to say that the command applies to a group of files or to abbreviate a filename if you do not know the entire name. The question mark (?) is a wildcard for one character, and the asterisk (*) is a wildcard for one or more characters. For example, if you want to find all files in a directory that start with A and have a three-letter file extension, you would use the following command:

```
dir a*.???
```

A+ 220-702 2.1

A+ Exam Tip The A+ 220-702 Practical Application exam expects you to know how to use the Dir, Edit, Copy, Xcopy, Format, MD, CD, RD, Defrag, Chkdsk, and Help commands, which are all covered in this section.

Notes Many commands can use parameters in the command line to affect how the command will work. Parameters often begin with a slash followed by a single character. In this chapter, you will learn about the basic parameters used by a command for the most common tasks. For a full listing of the parameters available for a command, use the Help command. Another way to learn about commands is to follow this link on the Microsoft Web site: *http://technet.microsoft.com/en-us/library/cc772390(WS.10).aspx*.

Help or <command name> /?

Use this command to get help about any command. You can enter help followed by the command name or enter the command name followed by /?. Table 13-2 lists some sample applications of this command:

Command	Result
`help xcopy xcopy /?`	Gets help about the Xcopy command
`help`	Lists all commands
`help xcopy |more`	Lists information one screen at a time

Table 13-2 Sample help commands

Dir [<filename>] [/p] [/s] [/w]

Use this command to list files and directories. In Microsoft documentation about a command (also called the command syntax), the brackets [ ] in a command line indicate the parameter is optional. In addition, the parameter included in < >, such as <filename>, indicates that you can substitute any filename in the command. This filename can include a path or file extension. Table 13-3 lists some examples of the Dir command.

Command	Result
`dir /p`	Lists one screen at a time
`dir /w`	Presents information using wide format, where details are omitted and files and folders are listed in columns on the screen
`dir *.txt`	Lists all files with a .txt file extension in the default path
`dir d:\data\*.txt`	Lists all files with a .txt file extension in the D:\data folder
`dir myfile.txt`	Checks that a single file, such as myfile.txt, is present
`dir /s`	Include subdirectory entries

Table 13-3 Sample dir commands

Del or Erase <filename>

The Del or Erase command erases files or groups of files. Note that in the command lines in this section, the command prompt is not bolded, but the typed command is in bold.

To erase all files in the E:\Docs directory, use the following command:

```
C:\> erase e:\docs\*.*
```

To erase all files in the current default directory, use the following command:

```
E:\Docs> del *.*
```

To erase all files that are in the current directory and that have no file extensions, use the following command:

```
E:\Docs> del *.
```

To erase the file named Myfile.txt, use the following command:

```
E:\> del myfile.txt
```

A+ 220-702 2.1

copy <*source*> [<*destination*>] [/A] [/V] [/Y]

The Copy command copies a single file or group of files. The original files are not altered. To copy a file from one drive to another, use a command similar to this one:

```
E:\> copy C:\Data\Myfile.txt E:\mydata\Newfile.txt
```

The drive, path, and filename of the source file immediately follow the Copy command. The drive, path, and filename of the destination file follow the source filename. If you do not specify the filename of the destination file, the OS assigns the file's original name to this copy. If you omit the drive or path of the source or the destination, then the OS uses the current default drive and path.

To copy the file Myfile.txt from the root directory of drive C to drive E, use the following command:

```
C:\> copy myfile.txt E:
```

Because the command does not include a drive or path before the filename Myfile.txt, the OS assumes that the file is in the default drive and path. Also, because there is no destination filename specified, the file written to drive E will be named Myfile.txt.

To copy all files in the C:\Docs directory to the USB flash drive designated drive E, use the following command:

```
C:\> copy c:\docs\*.* E:
```

To make a backup file named System.bak of the System file in the \Windows\system32\config directory of the hard drive, use the following command:

```
C:\Windows\system32\config> copy system system.bak
```

If you use the Copy command to duplicate multiple files, the files are assigned the names of the original files. When you duplicate multiple files, the destination portion of the command line cannot include a filename.

A+ 220-702 2.1

Three switches or parameters that are useful with the Copy command are the following:

- **/A.** When the /A switch is used at the end of the command line, only files that have the archive attribute on are copied. The attribute is not changed by the copying process. Recall from earlier in the chapter that the archive attribute is used to determine if a file has changed since the last backup. When a backup is made, the attribute is turned off. Later, when the file changes, Windows turns the archive attribute on to indicate the file needs backing up again.
- **/V.** When the /V switch is used, the size of each new file is compared to the size of the original file. This slows down the copying, but verifies that the copy is done without errors.
- **/Y.** When the /Y switch is used, a confirmation message does not appear asking you to confirm before overwriting a file.

Notes When trying to recover a corrupted file, you can sometimes use the Copy command to copy the file to new media, such as from the hard drive to a USB drive. During the copying process, if the Copy command reports a bad or missing sector, choose the option to ignore that sector. The copying process then continues to the next sector. The corrupted sector will be lost, but others can likely be recovered. The Recover command can be used to accomplish the same thing.

Recover <filename>

Use the Recover command to attempt to recover a file when parts of the file are corrupted. The command is best used from the Vista Recovery Environment or the XP Recovery Console (discussed in Chapters 15 and 16). To use it, you must specify the name of a single file in the command line, like so:

```
C:\Data> Recover Myfile.doc
```

A+ 220-702 2.1

Xcopy <source> [<destination>] *[/S] [/C] [/Y] [/D:*date]

The Xcopy command is more powerful than the Copy command. It follows the same general command-source-destination format as the Copy command, but it offers several more options. Table 13-4 shows some of these options.

Command	Result
`xcopy C:\docs\*.* E:/S`	Use the /S switch to include subdirectories in the copy. This command copies all files in the directory C:\docs, as well as all subdirectories under \Docs and their files, to drive E.
`xcopy C:\docs\*.* E:/D:03/14/10`	The /D switch examines the date. This command copies all files from the directory C:\Docs created or modified on or after March 14, 2010.
`xcopy C:\docs\*.* E:/Y`	Use the /Y switch to overwrite existing files without prompting.
`xcopy C:\docs\*.* E:/C`	Use the /C switch to keep copying even when an error occurs.

Table 13-4 Xcopy commands and results

Robocopy <source> [<destination>] [*/S*] [*/E*] [*/LOG:*filename] [*/LOG+:*filename] [*/move*] [*/purge*]

The Robocopy (Robust File Copy) command is new with Windows Vista and is similar to the Xcopy command. It offers more options than Xcopy and is intended to replace Xcopy. A few options for Robocopy are listed in Table 13-5.

Command	Result
`robocopy C:\docs\*.* E:/S`	The /S switch includes subdirectories in the copy, but does not include empty directories.
`robocopy C:\docs\*.* E:/E`	The /E switch includes subdirectories, even the empty ones.
`robocopy C:\docs\*.* E:/LOG:Mylog.txt`	Records activity to a log file.
`robocopy C:\docs\*.* E:/LOG+:Mylog.txt`	Appends a record of all activity to an existing log file.
`robocopy C:\docs\*.* E:/move`	Moves files and directories, deleting them from the source.
`robocopy C:\docs\*.* E:/purge`	Deletes files and directories at the destination that no longer exist at the source.

Table 13-5 Robocopy commands and results

A+ 220-702 2.1

MD [drive:]path

The MD command (make directory) creates a subdirectory under a directory. To create a directory named \Game on drive C, you can use this command:

```
C:\> MD C:\game
```

The backslash indicates that the directory is under the root directory. If a path is not given, the default path is assumed. This command also creates the C:\game directory:

```
C:\> MD game
```

To create a directory named chess under the \game directory, you can use this command:

```
C:\> MD C:\game\chess
```

Figure 13-44 shows the result of the Dir command on the directory \game. Note the two initial entries in the directory table: . (dot) and . . (dot, dot). The MD command creates these two entries when the OS initially sets up the directory. You cannot edit these entries with normal OS commands, and they must remain in the directory for the directory's lifetime. The . entry points to the subdirectory itself, and the .. entry points to the parent directory, which, in this case, is the root directory.

CD [drive:]path *or CD..*

The CD command (for "change directory") changes the current default directory. You enter CD followed by the drive and the entire path that you want to be current, like so:

```
D:\> CD C:\game\chess
```

A+
220-702
2.1

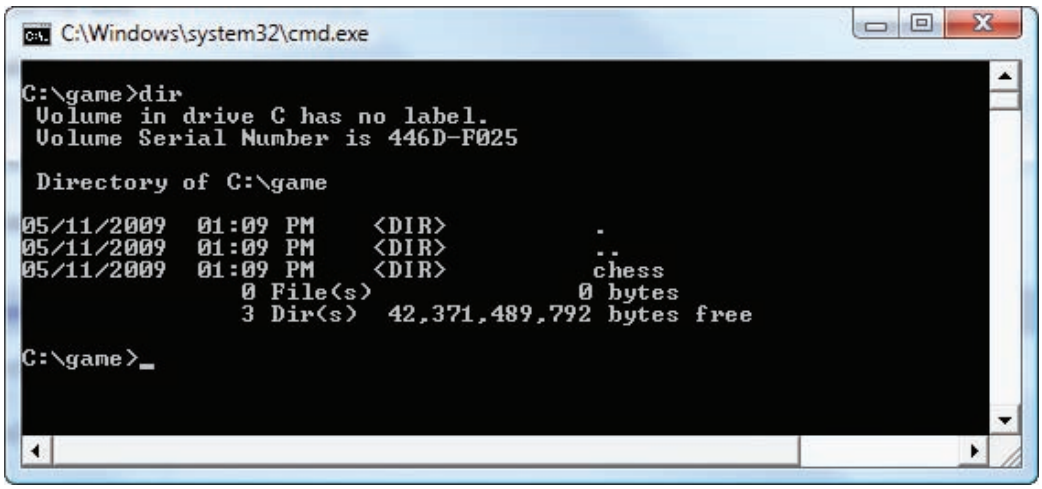

Figure 13-44 Results of the Dir command on the \Game directory
Courtesy: Course Technology/Cengage Learning

The command prompt now looks like this:

```
C:\game\chess>
```

To move from a child directory to its parent directory, use the .. variation of the command:

```
C:\game\chess> CD..
```

The command prompt now looks like this:

```
C:\game>
```

Remember that .. always means the parent directory. You can move from a parent directory to one of its child directories simply by stating the name of the child directory:

```
C:\game> CD chess
```

The command prompt now looks like this:

```
C:\game\chess>
```

Remember not to put a backslash in front of the child directory name; doing so tells the OS to go to a directory named Chess that is directly under the root directory.

RD [drive:]path

The RD command (remove directory) removes a subdirectory. Before you can use the RD command, three things must be true:

- The directory must contain no files.
- The directory must contain no subdirectories.
- The directory must not be the current directory.

A+ 220-702 2.1

A directory is ready for removal when only the . and .. entries are present. For example, to remove the \game directory when it contains the chess directory, the chess directory must first be removed, like so:

```
C:\> RD C:\game\chess
```

Or, if the \game directory is the current directory, you can use this command:

```
C:\game> RD chess
```

After you remove the chess directory, you can remove the \game directory. However, it's not good to attempt to saw off a branch while you're sitting on it; therefore, you must first leave the \game directory like so:

```
C:\game> CD..
C:\> RD \game
```

A+ 220-702 2.1 2.3

chkdsk [drive:] *[/f] [/r]*

The Chkdsk command (check disk) fixes file system errors and recovers data from bad sectors. Earlier in the chapter, you learned to use Chkdsk from the drive properties box. Recall that a file is stored on the hard drive as a group of clusters (also called allocation units). The FAT or MFT is responsible for keeping a record of each cluster that belongs to a file. In Figure 13-45, you can see that each cell in the FAT represents one cluster and contains a pointer to the next cluster in a file.

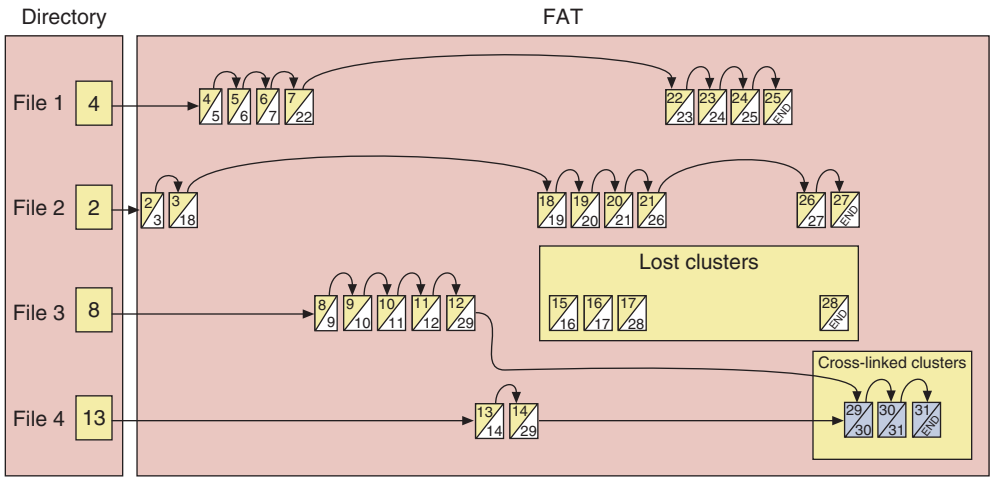

Figure 13-45 Lost and cross-linked clusters
Courtesy: Course Technology/Cengage Learning

Used with the /F parameter, Chkdsk searches for and fixes two types of file system errors made by the FAT or MFT:

- *Lost clusters (also called lost allocation units)*. Lost clusters are clusters that are marked as used clusters in the FAT or MFT, but the cluster does not belong to any file. In effect, the data in these clusters is lost.
- *Cross-linked clusters*. Cross-linked clusters are clusters that are marked in the FAT or MFT as belonging to more than one file.

A+ 220-702 2.1 2.3

Used with the /R parameter, Chkdsk checks for lost clusters and cross-linked clusters and also checks for bad sectors on the drive. The FAT and MFT keep a table of bad sectors that they normally do not use. However, over time, a sector might become unreliable. If Chkdsk determines that a sector is unreliable, it attempts to recover the data from the sector and also marks the sector as bad so that the FAT or MFT will not use it again.

Used without any parameters, the Chkdsk command only reports information about a drive and does not make any repairs.

In the sample commands following, we're not showing the command prompt; the default drive and directory are not important. To check the hard drive for file system errors and repair them, use this command:

```
chkdsk C:/F
```

To redirect a report of the findings of the Chkdsk command to a file that you can later print, use this command:

```
chkdsk C:>Myfile.txt
```

Use the /R parameter of the Chkdsk command to fix file system errors and also examine each sector of the drive for bad sectors, like so:

```
chkdsk C:/R
```

If Chkdsk finds data that it can recover, it asks you for permission to do so. If you give permission, it saves the recovered data in files that it stores in the root directory of the drive.

The Chkdsk command will not fix anything unless the drive is locked, which means the drive has no open files. If you attempt to use Chkdsk with the /F or /R parameter when files are open, Chkdsk tells you of the problem and asks permission to run the next time Windows is restarted. Know that the process will take plenty of time. For Windows Vista, you must use an elevated command prompt window to run Chkdsk.

A+ 220-702 2.3

Defrag [drive:] *[-C]*

The Defrag command examines a hard drive or disk for **fragmented files** (files written to a disk in noncontiguous clusters) and rewrites these files to the disk or drive in contiguous clusters. You use this command to optimize a hard drive's performance. Table 13-6 shows two examples of the command.

Command	Result
`defrag C:`	Defrag drive C
`defrag –c`	Defrag all volumes on the computer including drive C

Table 13-6 Defrag commands and results

The Defrag command requires an elevated command prompt window in Windows Vista. It is not available under the Windows Vista Recovery Environment. It is not available from the Windows 2000/XP Recovery Console, and the command is not included with Windows 2000. Earlier in the chapter, you learned to defrag a drive using the Windows drive properties box.

A+ 220-702 2.1

Edit [drive:path] <filename>

The Edit program (Edit.com) is a handy, "quick and dirty" way to create and edit text files while working at a command prompt. For example, to create a file named Mybatch.bat in the C:\Data folder, use this command (a discussion of .bat files is coming up):

```
C:\> EDIT C:\Data\Mybatch.bat
```

If the file does not already exist, Edit creates an empty file. Later, when you exit the Edit editor, changes you made are saved to the newly created file. Figure 13-46 shows the Mybatch.bat file being edited.

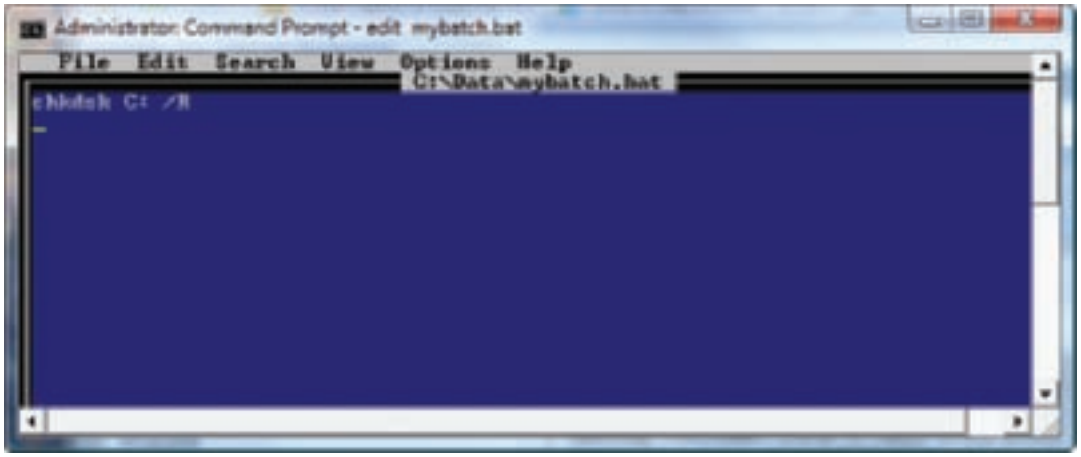

Figure 13-46 Using the Edit editor to create and edit the Mybatch.bat file
Courtesy: Course Technology/Cengage Learning

After you have made changes in this window, you can exit the Edit editor this way: Press the **Alt** key to activate the menus, select the **File** menu, and then choose **Exit**. When asked if you want to save your changes, respond **Yes** to exit the editor and save changes. (You can also use your mouse to point to menu options.)

A file with a .bat file extension is called a **batch file**. You can use a batch file to execute a group of commands from a command prompt. To execute the commands stored in the Mybatch.bat file, enter the command Mybatch.bat at a command prompt, as shown in Figure 13-47. Notice in the figure that the Chkdsk command could not run because the system is currently in use.

Notes Do not use word-processing software, such as Word or WordPerfect, to edit a batch file, unless you save the file as a text (ASCII) file. Word-processing applications use control characters in their document files. These characters keep the OS from interpreting commands in a batch file correctly.

Format <drive:> *[/v:*label*] [/q] [fs:*<filesystem>*]*

You can format a floppy disk using Windows Explorer, and you can format a hard drive using Disk Management. In addition, you can use the Format command from a command prompt window and from the Vista Recovery Environment and the Windows 2000/XP Recovery Console. Table 13-7 lists various sample uses of the Format command.

A+ 220-702 2.1

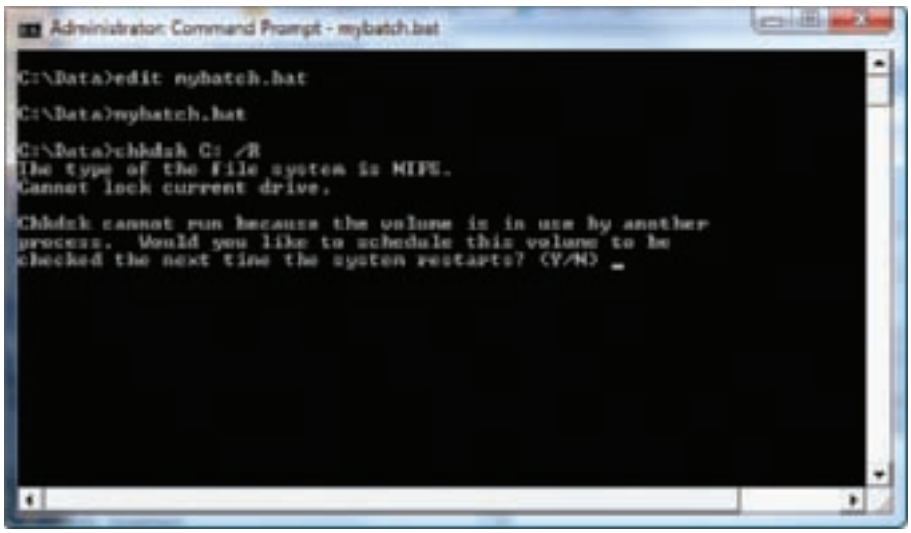

Figure 13-47 Executing the batch file
Courtesy: Course Technology/Cengage Learning

Command	Description
`Format A:/V:mylabel`	Allows you to enter a volume label only once when formatting several disks. The same volume label is used for all disks. A volume label appears at the top of the directory list to help you identify the disk.
`Format A:/Q`	Re-creates the root directory and FAT to quickly format a previously formatted disk that is in good condition. /Q does not read or write to any other part of the disk.
`Format D:/FS:NTFS`	Formats drive D using the NTFS file system.
`Format D:/FS:FAT32`	Formats drive D using the FAT32 file system.
`Format D:/FS:EXFAT`	Formats drive D using the extended FAT file system.

Table 13-7 Format commands and results

A+ 220-702 2.3

USE DISK MANAGEMENT TO MANAGE HARD DRIVES

The primary tool for managing hard drives is Disk Management. You first learned to use the tool in Chapter 8 to partition and format a new hard drive after it was installed. In this chapter, you will learn to use Disk Management to manage partitions, mount a drive, and troubleshoot problems with the hard drive. Before you tackle this part of the chapter, you need to be aware of the following terms, some of which were introduced in Chapter 8.

- A partition is a division of a hard drive. Windows can track up to four partitions on a drive and keeps this tracking information in a partition table that is written in the first 512-byte sector of the drive.
- A drive can have one, two, or three primary partitions, also called volumes. One of these primary partitions can be designated the active partition, which is the partition that startup BIOS turns to for an OS to load. A hard drive can also have one extended partition which can hold one or more logical drives. For XP, this one extended partition can be the second, third, or fourth partition on the drive. For Vista, the extended partition must be the fourth partition. A logical drive is sometimes called a logical partition. Partitions are created during the Windows installation, by using the Disk

A+ 220-702 2.3

Management utility from within Windows, or by using the Diskpart command in the Vista Recovery Environment or the XP Recovery Console.

- A file system is used to manage files and folders on the volume or logical drive. A cluster is a group of sectors used to hold a file, and the number of sectors in a cluster is determined by the file system used and the size of the drive. A file is stored in one or more clusters. The last cluster might have sectors that go unused, and this wasted space is called slack.
- File systems supported by Windows include NTFS, FAT32, and exFAT. Recall from Chapter 12 that unless the drive is very small, the best file system to use is NTFS. Installing a file system on a volume or logical drive is called formatting. Formatting can be done using Disk Management, Windows Explorer, or the Format command.

Notes Windows Vista allows you to resize partitions, but Windows XP does not. For XP, you can use third-party software such as PartitionMagic by Symantec (*www.symantec.com*) to create, resize, move, split, or combine partitions without erasing data. It can also convert one file system to another without losing data.

Now let's see how to manage volumes on a drive.

MANAGING HARD DRIVE VOLUMES

Recall from Chapter 8 that when a new hard drive is first installed in a system, you must first initialize the disk. Do the following:

1. To open Disk Management using Vista, click **Start**, right-click **Computer** (for Windows XP, right-click **My Computer**), and select **Manage** from the shortcut menu. Respond to the UAC box. In the Computer Management window, click **Disk Management**. (Alternately, you can enter **diskmgmt.msc** in the Start Search box.) The Disk Management window opens. Right-click the disk and select **Initialize Disk** from the shortcut menu (see Figure 13-48).

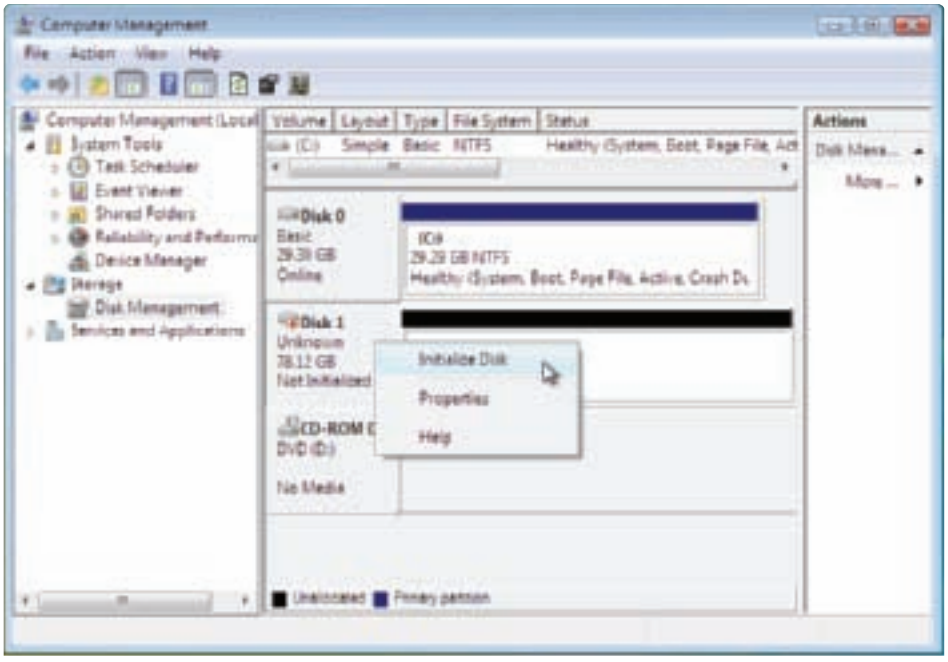

Figure 13-48 Use Disk Management to partition a new hard drive
Courtesy: Course Technology/Cengage Learning

A+ 220-702 2.3

2. To create a new volume on a drive, right-click in the unallocated space, select **New Simple Volume** from the shortcut menu, and follow the directions on-screen to select the size of the volume, assign a drive letter and name to the volume, and select the file system.

In Windows Vista, you can use Disk Management to resize volumes. Right-click a partition, and the shortcut menu shown in Figure 13-49 appears. Using this menu, you can shrink a volume, delete a volume, or use unallocated space on the drive to extend the size of the volume. Also notice on the menu the ability to mark the partition as the one active partition on the drive (the one the OS will boot from). Note that any primary partition can be the active partition. You can also change the drive letter for the volume and format the volume, which erases all data on it.

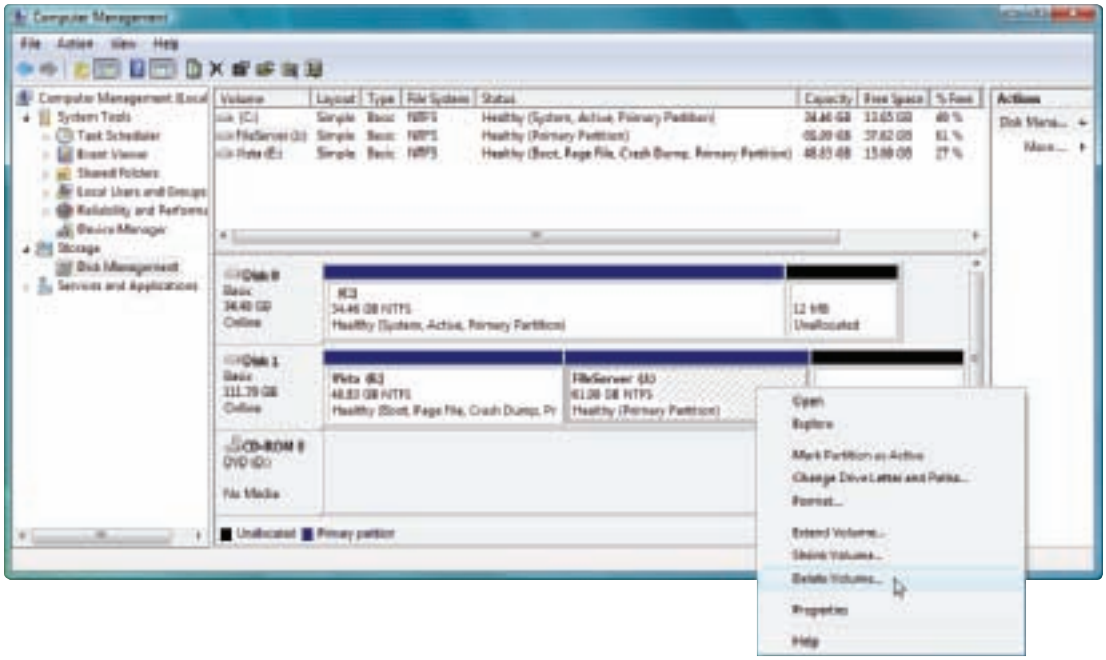

Figure 13-49 Use the Vista Disk Management window to manage hard drive partitions
Courtesy: Course Technology/Cengage Learning

In Windows XP, the size of a partition or volume cannot be changed unless you use third-party software. You can use Disk Management to delete a partition. To do so, right-click the partition and select **Delete Partition** from the shortcut menu (see Figure 13-50).

HOW TO MOUNT A DRIVE

A **mounted drive** is a volume that can be accessed by way of a folder on another volume so that the folder has more available space. In Figure 13-51, the mounted drive gives the C:\Data folder a capacity of 700 GB. The C:\Data folder is called the **mount point** for the mounted drive.

A+ 220-702 2.3

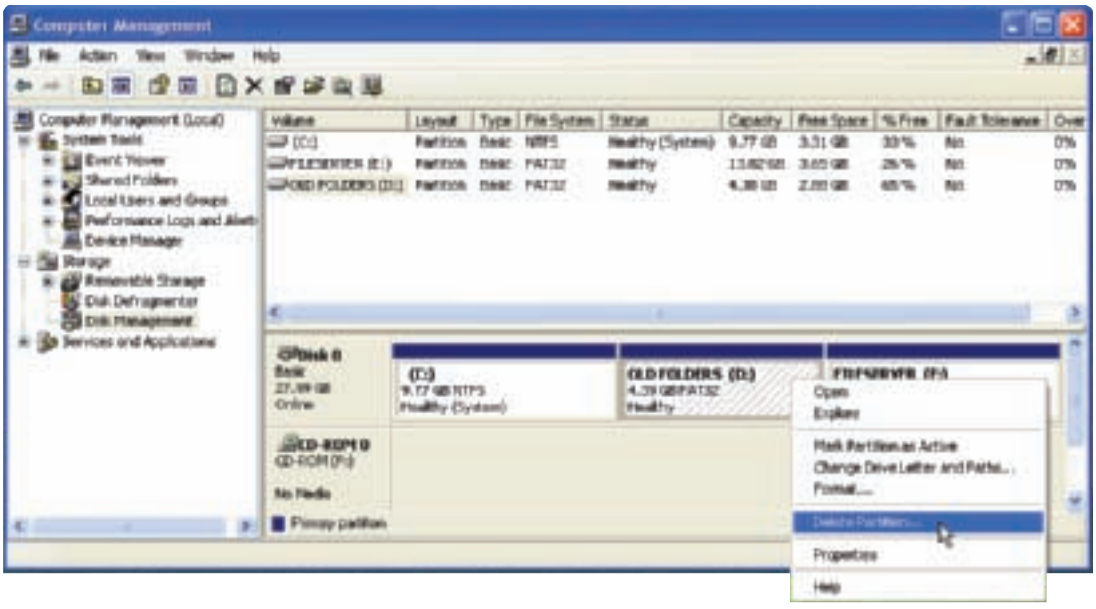

Figure 13-50 Use the Disk Management window in Windows XP to delete a partition
Courtesy: Course Technology/Cengage Learning

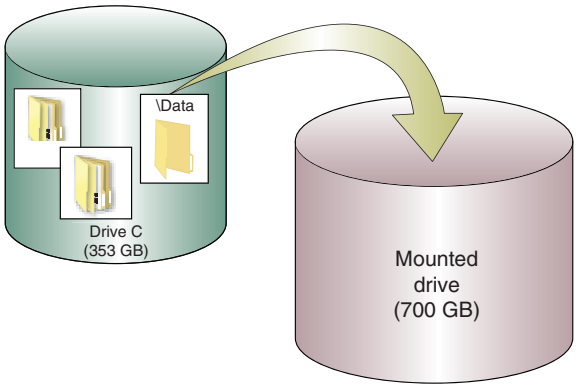

Figure 13-51 The C:\Data folder is the mount point for the mounted drive
Courtesy: Course Technology/Cengage Learning

Follow these steps to mount a drive using Windows Vista or XP:

1. Make sure the volume that is to host the mounted drive uses the NTFS file system. The folder on this volume, called the mount point, must be empty. Use Windows Explorer to create a new folder or empty an existing folder. In our example, we are mounting a drive to the C:\Data folder.
2. Open Disk Management. Right-click in the unallocated space of Disk 1 (the second hard drive) and select **New Simple Volume** from the shortcut menu (see Figure 13-52). The New Simple Volume Wizard launches. Click **Next**.
3. On the next window (see Figure 13-53), specify the amount of unallocated space you want to devote to the volume and click **Next**.

A+ 220-702 2.3

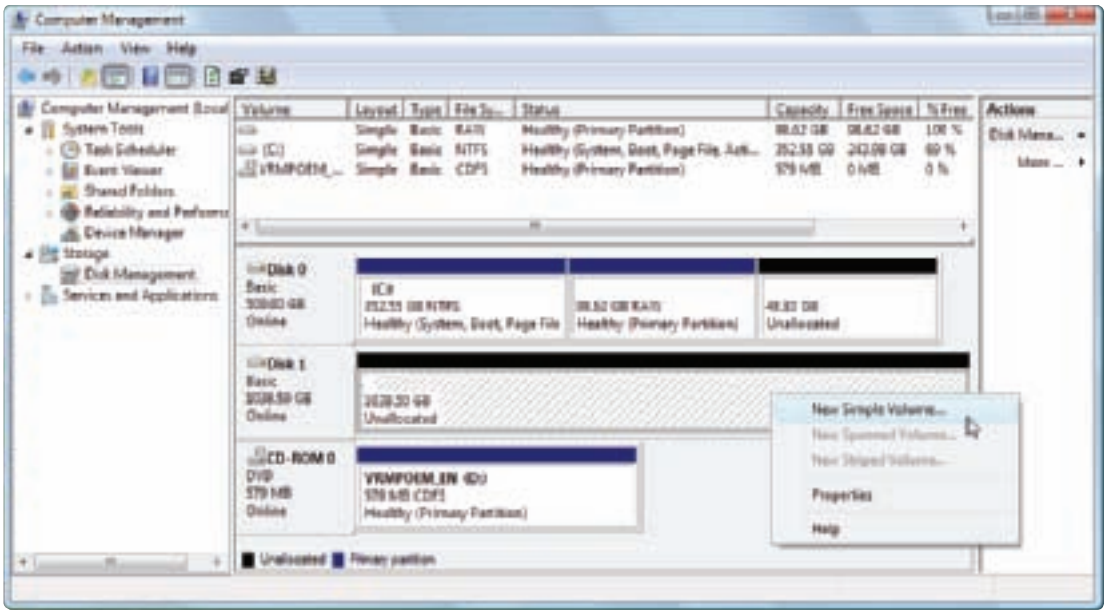

Figure 13-52 Shortcut menu for unallocated space on a drive
Courtesy: Course Technology/Cengage Learning

4. On the next window (see Figure 13-54), select **Mount in the following empty NTFS folder**. Then click **Browse** to locate the C:\Data folder or enter the path to the folder. Click **Next** to continue.
5. The next window (see Figure 13-55) gives you choices for the Allocation unit size (this is the cluster size). It's best to leave the size at the Default value. You can also enter a volume label if you like. Click **Next** to continue.

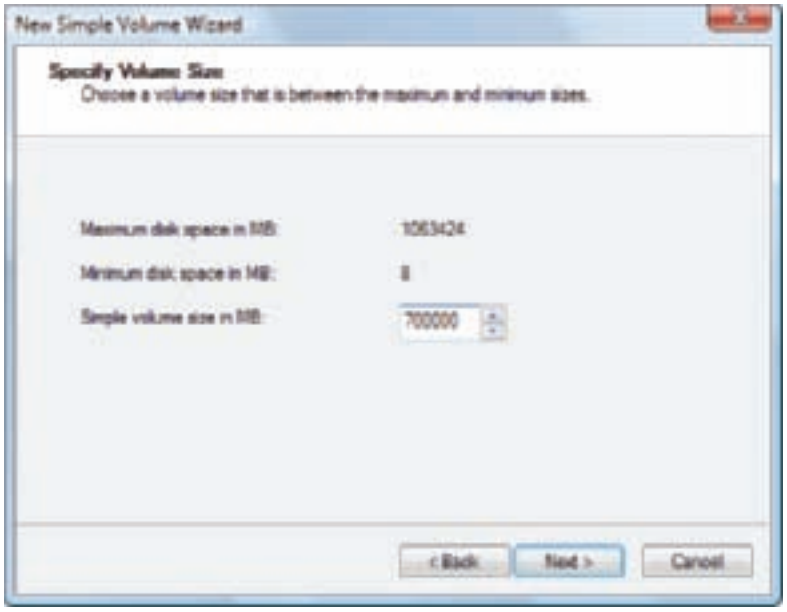

Figure 13-53 Enter the size of the new volume
Courtesy: Course Technology/Cengage Learning

A+ 220-702 2.3

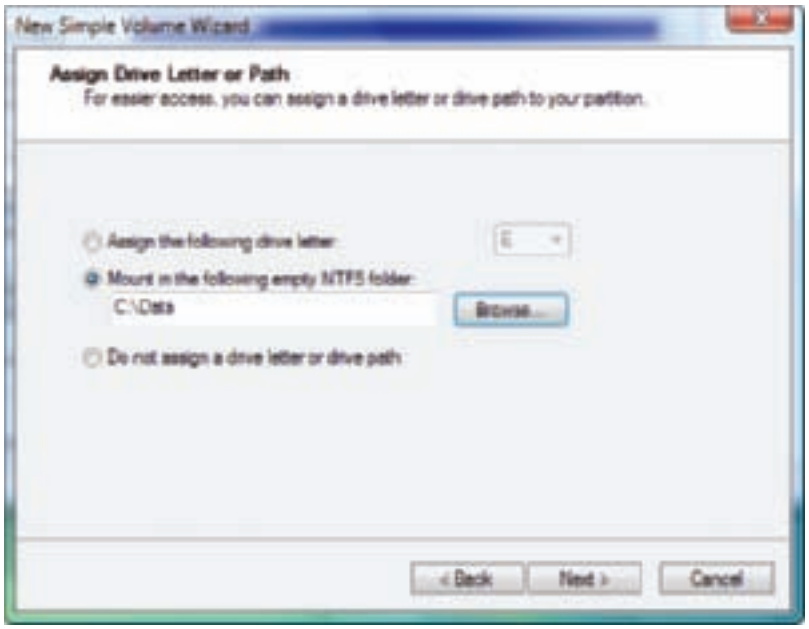

Figure 13-54 Select the mount point for the new volume
Courtesy: Course Technology/Cengage Learning

6. The wizard reports your decisions on the final window (see Figure 13-56). Click **Finish** to create the mounted drive. The status of the drive is reported as Formatting until the format is complete.

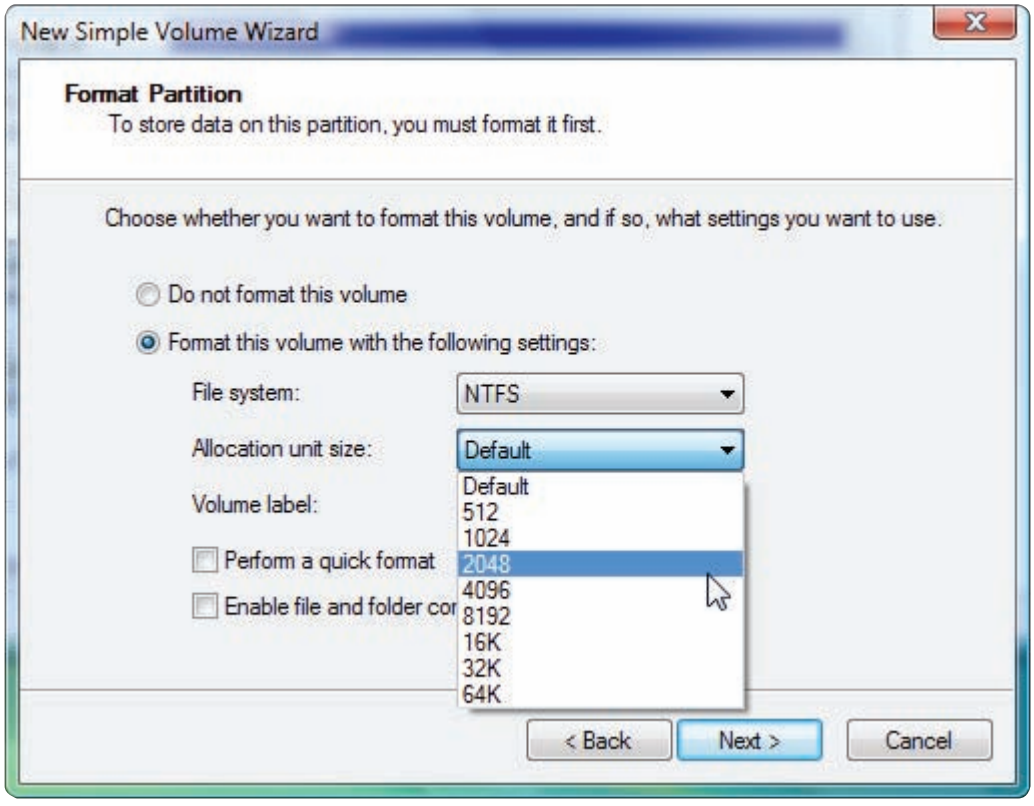

Figure 13-55 You can change the default cluster size for the volume
Courtesy: Course Technology/Cengage Learning

A+
220-702
2.3

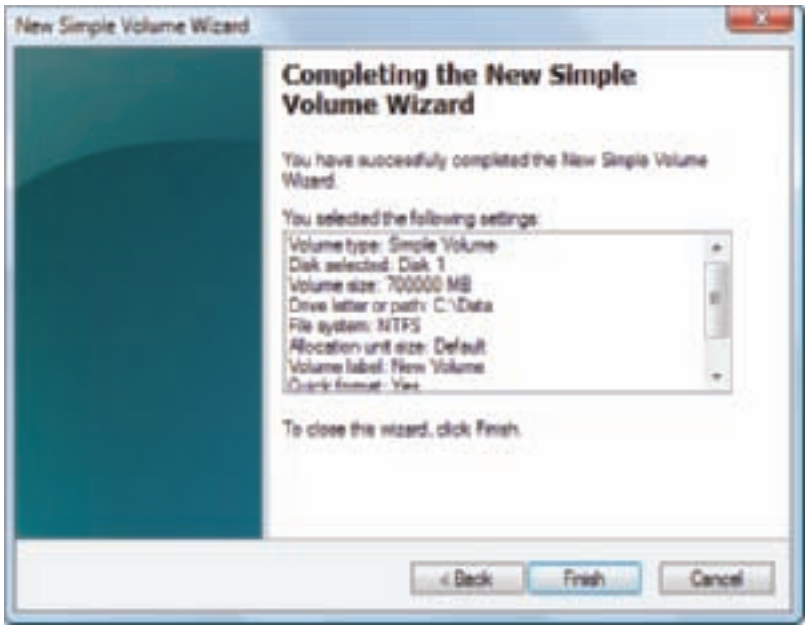

Figure 13-56 The wizard reports settings for the volume
Courtesy: Course Technology/Cengage Learning

7. Close the Disk Management window and open Windows Explorer. Right-click the C:\Data folder and select **Properties** from the shortcut menu. The Properties box opens and shows that the folder Type is a Mounted Volume (see Figure 13-57). When you click **Properties** in the properties box, you can see that the capacity of the folder is 683 GB, which is the size of the mounted volume less overhead.

In the above example, it's interesting to note that drive C still reports a capacity of 353 GB, while the C:\Data folder reports a capacity of 683 GB. The inside appears bigger than the outside! You can think of a mount point, such as C:\Data, as a shortcut to the second drive. If you look closely at the left window in Figure 13-57, you can see the shortcut icon beside the \Data folder.

A mounted drive is useful in these sample situations: (a) You need to expand the space on a drive, such as when drive C is too small and you want to enhance that space using space on another volume; (b) you want to put all user data on another volume or hard drive other than the Windows volume (the C:\Users folder is the mount point in this situation); or (c) you have run out of drive letters A through Z.

In the previous example, the C:\Data folder was empty. If we had wanted to mount the drive in a folder that had data in it, such as the C:\Users folder, we would first have had to move the contents of this folder to another location. Then, after the drive was mounted, we could copy the contents back to the C:\Users folder, which would now be greatly expanded and physically located on a different volume.

WINDOWS DYNAMIC DISKS

Recall from Chapter 8 that hard drives are normally configured as a basic disk, which uses the MBR partition table. Windows Vista Business, Enterprise, and Ultimate editions and Windows XP Professional can use a second type of organization called a dynamic disk.

A+ 220-702 2.3

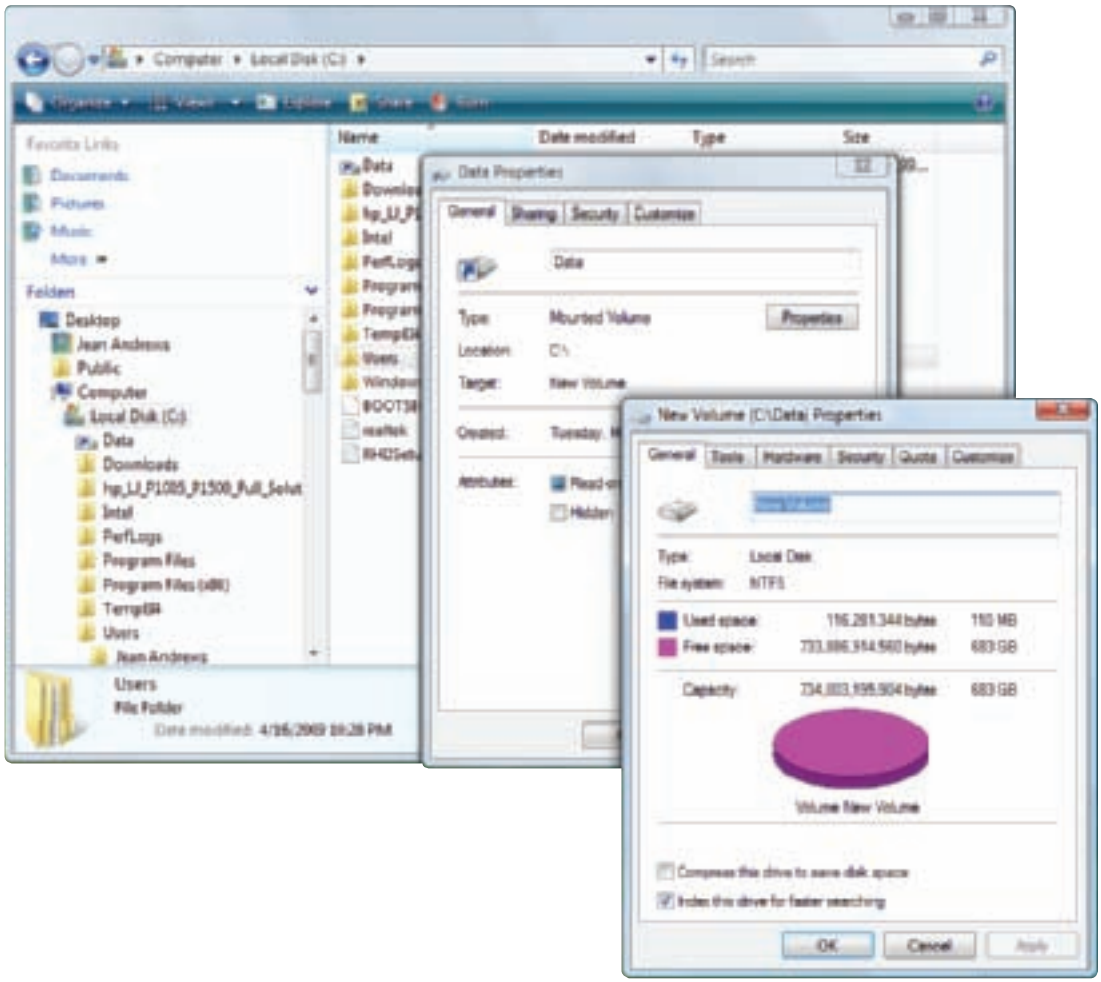

Figure 13-57 The mounted drive shows as a very large folder
Courtesy: Course Technology/Cengage Learning

(Windows Vista Home editions and Windows XP Home editions do not support dynamic disks.) Basic disks use MBR partitions, volumes, and logical drives. **Dynamic disks** use **dynamic volumes**, and these volumes can span more than one hard drive. Data to configure each hard drive is stored in a disk management database that resides in the last 1 MB of storage space at the end of a hard drive. Because of the way the database works, it is considered more reliable than the MBR method. Here are four uses of dynamic disks:

- For better reliability, you can configure a hard drive as a dynamic disk and allocate the space as a simple dynamic volume. This is the best reason to use dynamic disks and is a recommended best practice.
- You can implement dynamic disks on multiple hard drives to extend a volume across these drives (called spanning).
- Dynamic disks can be used to piece data across multiple hard drives (called stripping or RAID 0) to improve performance.
- For Windows XP, you can use dynamic disks to mirror two hard drives for fault tolerance (called mirroring or RAID 1). This feature is not available in Windows Vista.

Figure 13-58 shows the difference between basic disks and dynamic disks and how dynamic disks are used to span or stripe across multiple drives.

A+ 220-702 2.3

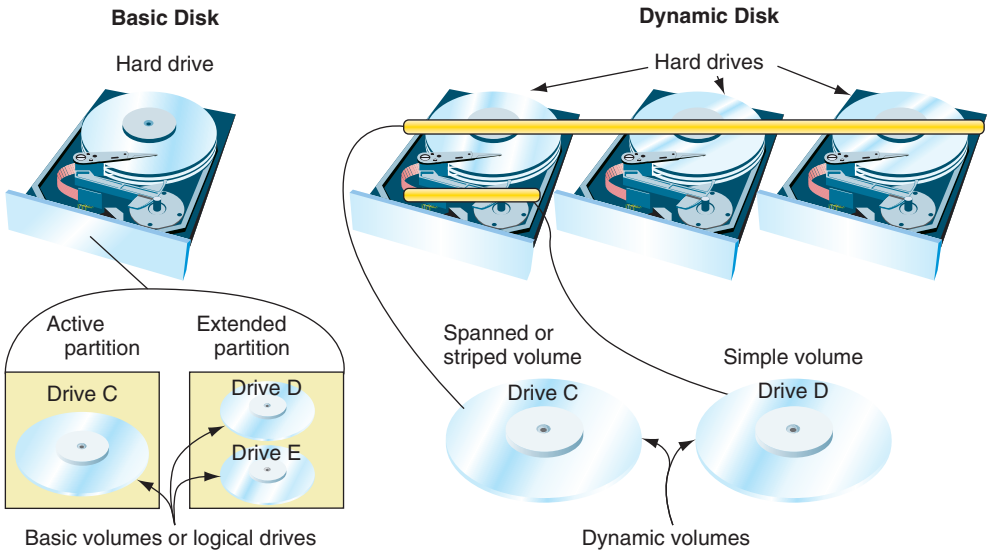

Figure 13-58 Basic disks use partitions to organize a hard drive, and dynamic disks use dynamic volumes to organize multiple hard drives
Courtesy: Course Technology/Cengage Learning

Notes A dynamic disk requires 1 MB of storage for the disk management database. If you are partitioning a basic disk and expect that one day you might want to convert it to a dynamic disk, leave 1 MB of space on the drive unpartitioned. Later, this space can be used for the disk management database.

You can use Disk Management to convert two or more basic disks to dynamic disks. Then you can use unallocated space on these disks to create a spanned or striped volume. To convert a basic disk to dynamic, right-click the disk and select **Convert to Dynamic Disk** from the shortcut menu (see Figure 13-59). Then right-click free space on the disk and select **New Spanned Volume** or **New Striped Volume** (see Figure 13-60).

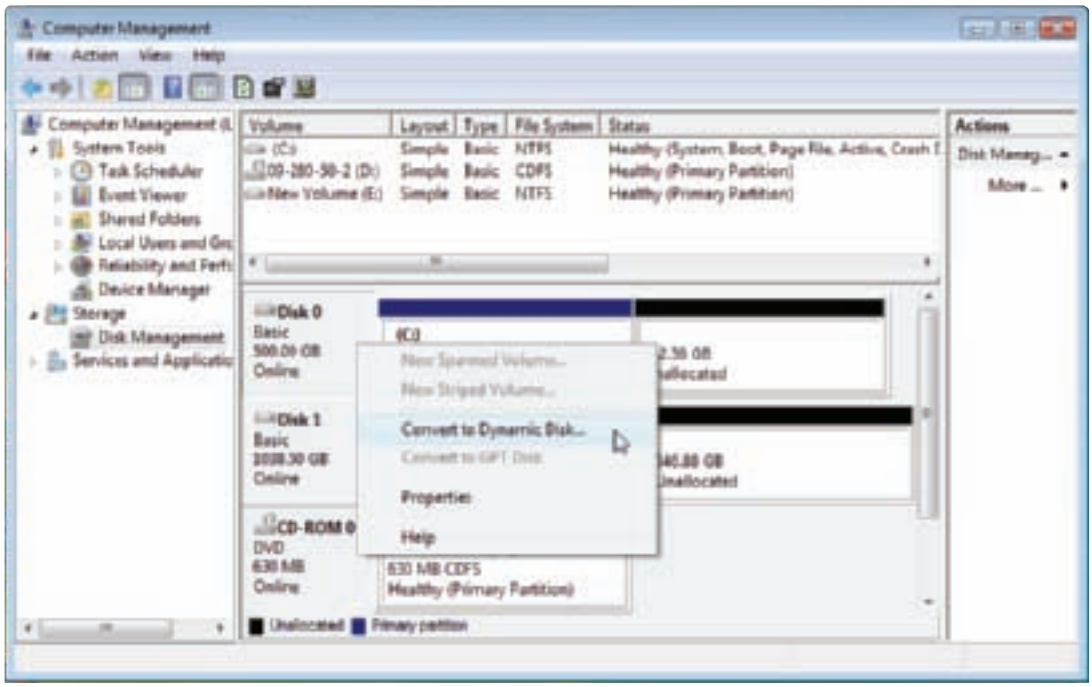

Figure 13-59 Convert a basic disk to a dynamic disk
Courtesy: Course Technology/Cengage Learning

A+ 220-702 2.3

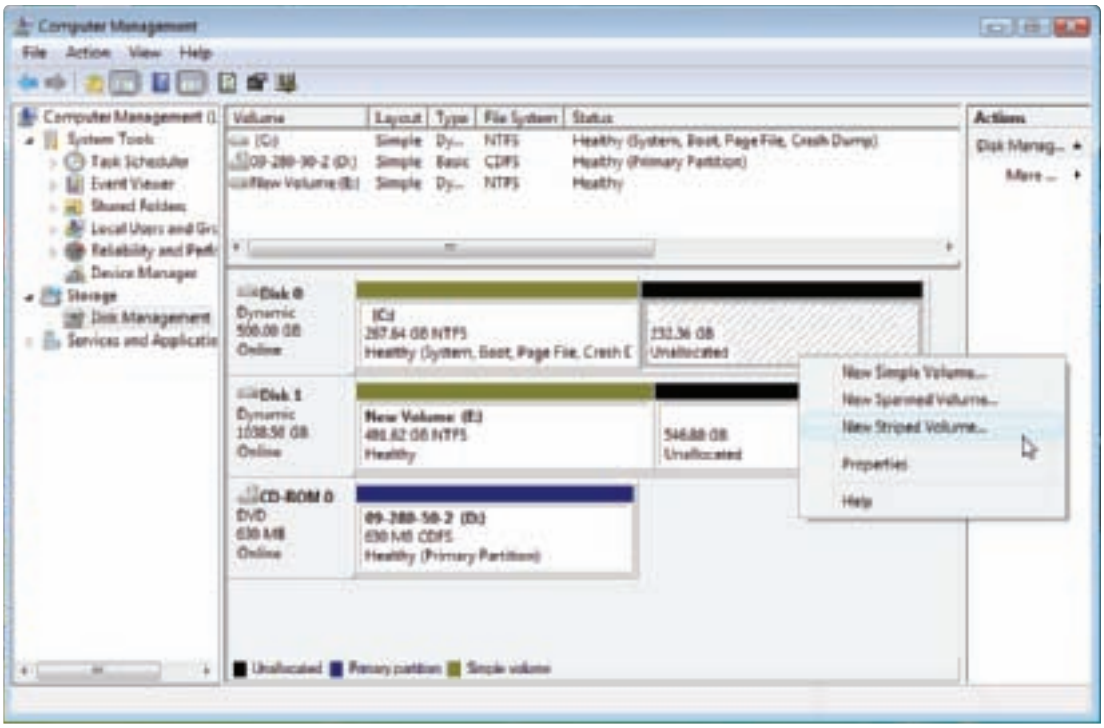

Figure 13-60 Create a spanned or striped volume
Courtesy: Course Technology/Cengage Learning

13 A+ 220-702

Now for some serious cautions about software RAID: Microsoft warns that when dynamic disks are used for spanning or RAID, the risk of catastrophic failure increases and can lead to data loss. Microsoft suggests you only use spanning or RAID with dynamic disks when you have no other option and recommends that RAID be implemented using hardware RAID rather than using dynamic disks. In other words, spanning and software RAID aren't very safe—use hardware RAID instead.

Notes When Windows implements RAID, know that you cannot install an OS on a spanned or striped volume that uses software RAID. You can, however, install Windows on a hardware RAID drive.

Also, after you have converted a basic disk to a dynamic disk, you cannot revert it to a basic disk without losing all data on the drive.

USING DISK MANAGEMENT TO TROUBLESHOOT HARD DRIVE PROBLEMS

Notice in Figure 13-60 that this system has two hard drives, Disk 0 and Disk 1, and information about the disk and volumes is shown in the window. When you are having a problem with a hard drive, it helps to know what the information in the Disk Management window means. Here are the drive and volume statuses you might see in this window:

- *Healthy*. The healthy volume status shown in Figure 13-60 indicates that the volume is formatted with a file system and that the file system is working without errors.
- *Failed*. A failed volume status indicates a problem with the hard drive or the file system has become corrupted. To try to fix the problem, make sure the hard drive data cable and power cable are secure. Data on a failed volume is likely to be lost. For

A+ 220-702 2.3

dynamic disks, if the disk status is Offline, try bringing the disk back online (how to do that is coming up).

- *Online*. An online disk status indicates the disk has been sensed by Windows and can be accessed by either reading or writing to the disk.
- *Active*. One volume on the system will be marked as Active. This is the volume that startup BIOS looks to in order to load an OS. The OS boot record is located at the beginning of the active partition.
- *Unallocated*. Space on the disk is marked as unallocated if it has not yet been partitioned. To create a partition using some of this unallocated space, right-click in it and select **New Simple Volume** from the shortcut menu.
- *Formatting*. This volume status appears while a volume is being formatted.
- *Basic*. When a hard drive is first sensed by Windows, it is assigned the Basic disk status. A basic disk can be partitioned and formatted as a stand-alone hard drive.
- *Dynamic*. A disk marked as dynamic can be used with other dynamic disks in a spanned or striped volume. When this dynamic volume is set up, the disks work together. The following status indicators apply only to dynamic disks:
  - *Offline*. An offline disk status indicates a dynamic disk has become corrupted or is unavailable. The problem can be caused by a corrupted file system, the drive cables are loose, the hard drive has failed, or another hardware problem. If you believe the problem is corrected, right-click the disk and select **Reactivate Disk** from the shortcut menu to bring the disk back online.
  - *Foreign drive*. If you move a hard drive that has been configured as a dynamic disk on another computer to this computer, this computer will report the disk as a foreign drive. To fix the problem, you need to import the foreign drive. To do that, right-click the disk and select **Import Foreign Disks** from the shortcut menu. You should then be able to see the volumes on the disk.
  - *Healthy (At Risk)*. The dynamic disk can be accessed, but I/O errors have occurred. Try returning the disk to online status. If the volume status does not return to healthy, back up all data and replace the drive.

If you are still having problems with a hard drive, volume, or mounted drive, check Event Viewer for events about the drive that might have been recorded there. These events might help you understand the nature of the problem and what to do about it. How to use Event Viewer is covered in the next chapter.

REGIONAL AND LANGUAGE SETTINGS

One more task you might be called on to do as a part of maintaining a computer is to help a user configure a computer to use a different language. Suppose a user needs to see Windows messages in Spanish and wants to use a Spanish keyboard, such as the one in Figure 13-61. Configuring a computer for another language involves downloading and installing the language pack, changing the Windows display language, changing how numbers are formatted, and changing the language used for keyboard input.

A+
220-702
2.3

Figure 13-61 Spanish keyboard
Courtesy: Course Technology/Cengage Learning

Using Windows Vista Ultimate, follow these steps to configure the computer to use Spanish for the display and keyboard:

1. Windows Vista Ultimate offers Language Interface Packs (LIP) for many languages. You first need to download the Spanish LIP using Windows Update. Click **Start**, **All Programs**, and **Windows Update**. In the Windows Update window, click **View available updates**.
2. In the View available updates window (see Figure 13-62), under the list of Windows Vista Ultimate Language Packs, select the **Spanish Language Pack**. Make sure other updates that you don't want are not selected. Click **Install** and respond to the UAC box.
3. You are now ready to configure the computer to use the new language. Open Control Panel and click **Clock, Language, and Region**. In the Clock, Language, and Region window, click **Regional and Language Options**. The Regional and Language Options dialog box opens (see Figure 13-63).

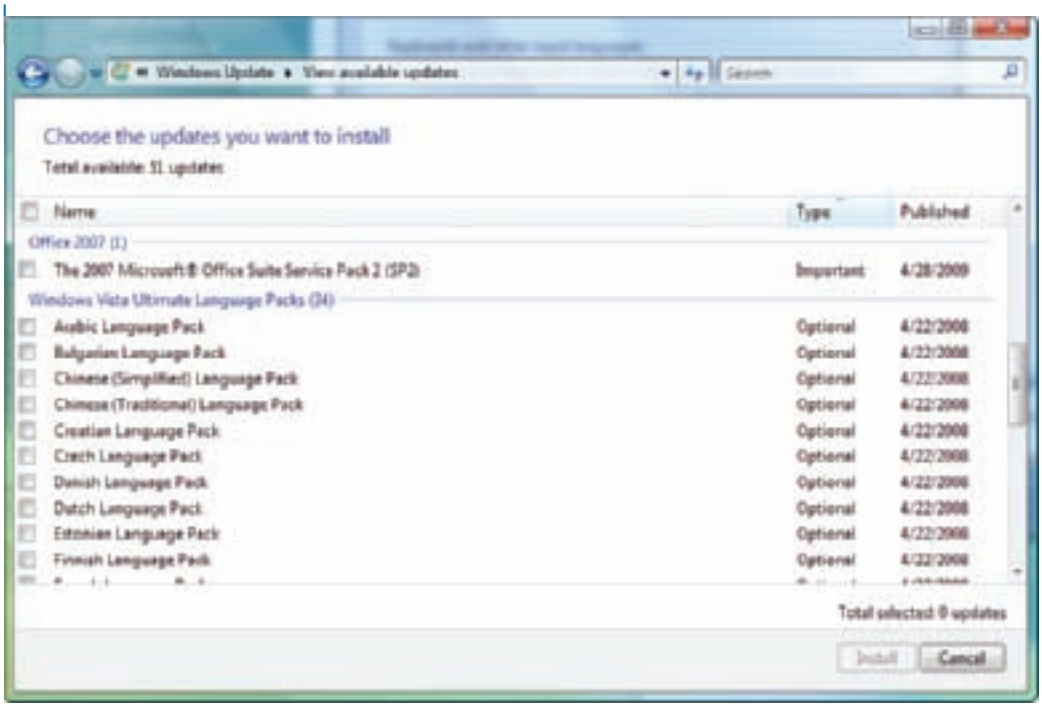

Figure 13-62 Select the language to download and install
Courtesy: Course Technology/Cengage Learning

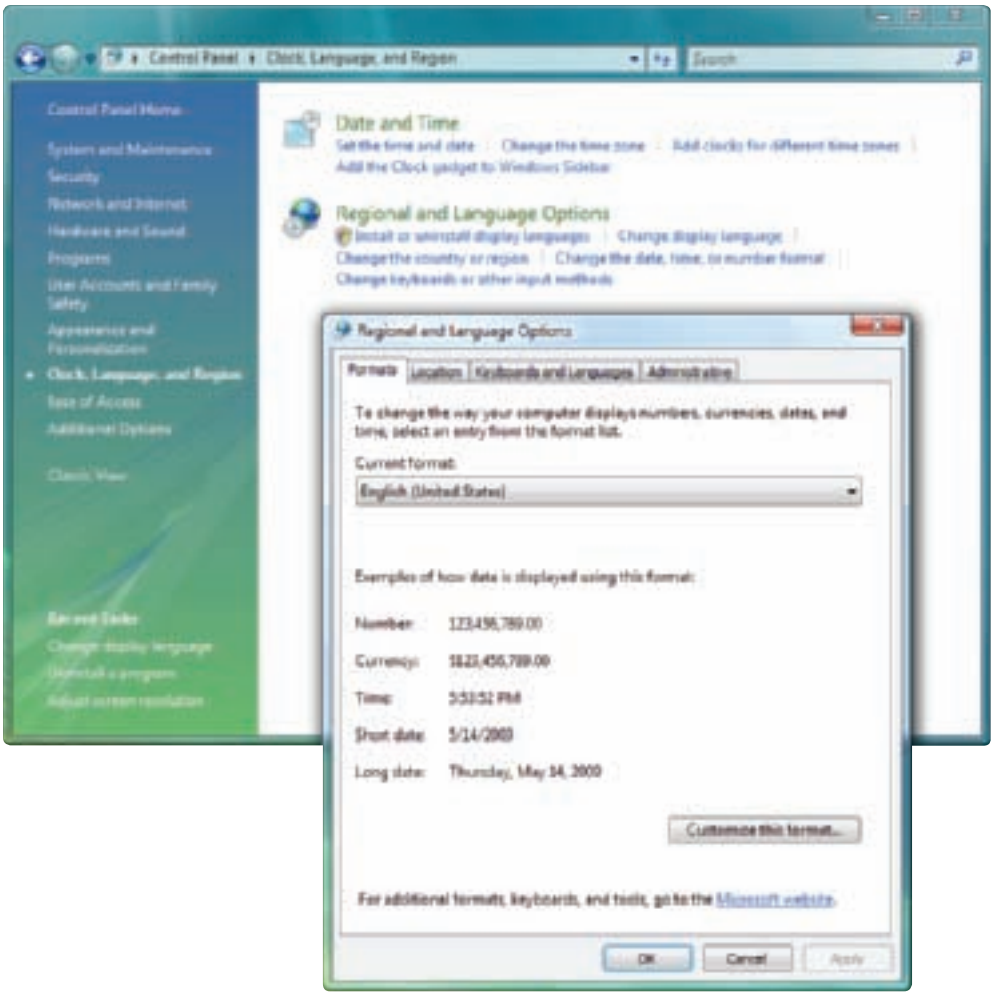

Figure 13-63 Use the Regional and Language Options box to change language settings
Courtesy: Course Technology/Cengage Learning

A+ 220-702 2.3

4. To change the format used to display numbers, currencies, dates, and time, select the language from the drop-down list under Current format (see Figure 13-64).

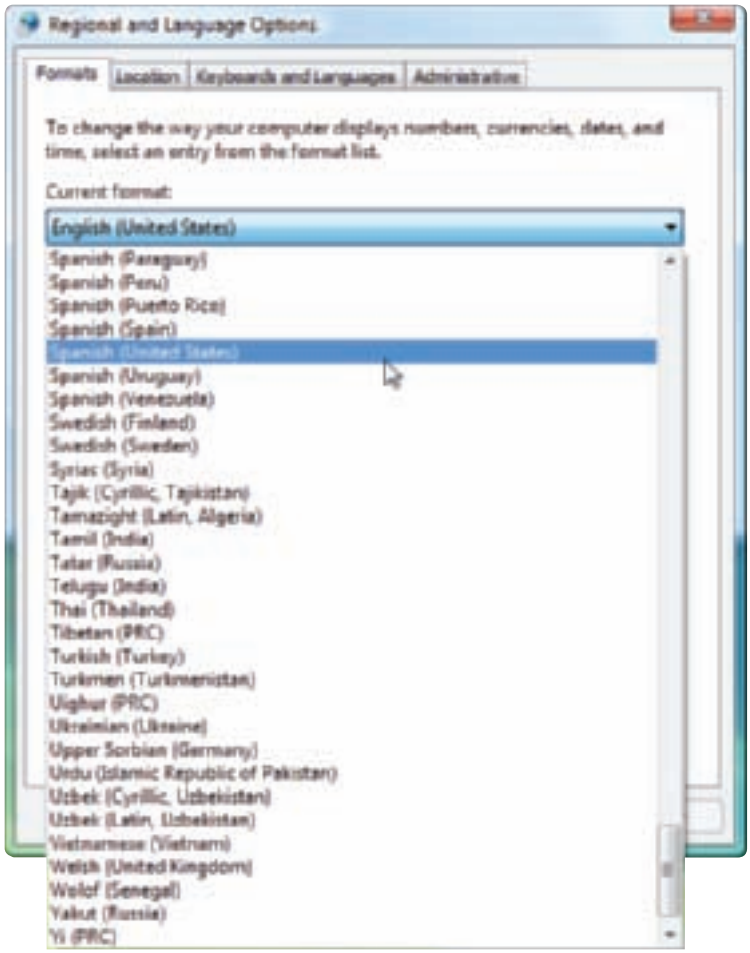

Figure 13-64 Select how to format numbers
Courtesy: Course Technology/Cengage Learning

5. To change the display language, click the Keyboards and Language tab. Select **español** from the drop-down menu (see Figure 13-65). The language appears in the list of installed languages because the Spanish language was installed in Step 2.
6. To change the keyboard layout, click **Change keyboards**. On the General tab of the Text Services and Input Languages box, click **Add** (see the left side of Figure 13-66). In the Add Input Language box, select a Spanish keyboard, as shown on the right side of Figure 13-66. Click **OK**.
7. The Spanish keyboard is now added to the list of input languages. Under Default input language, select the Spanish language and click **Apply**. Click **OK** to close the dialog box.

A+
220-702
2.3

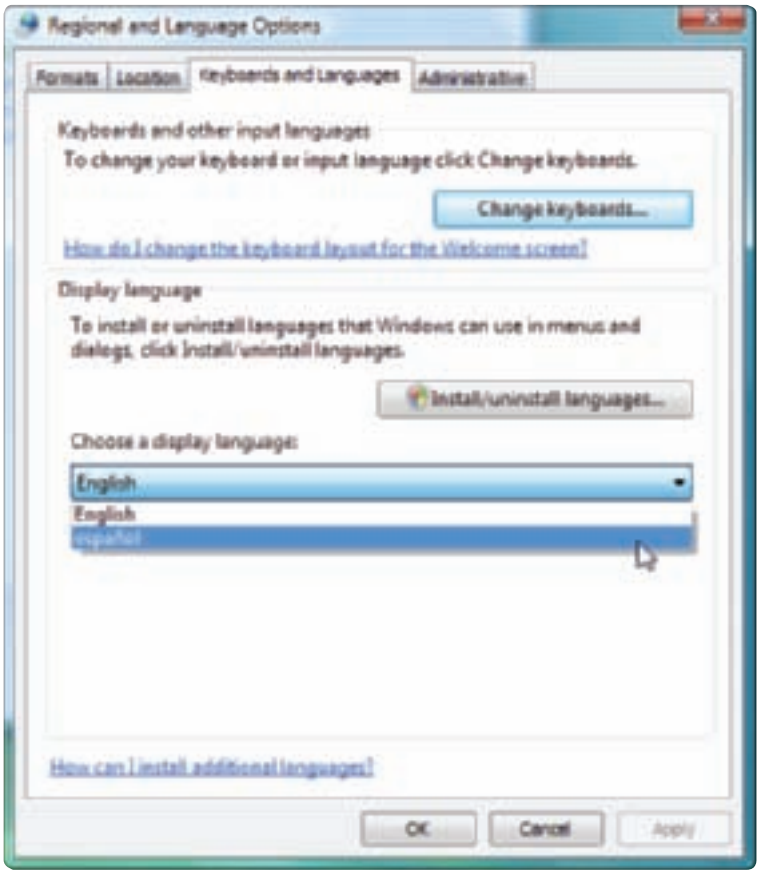

Figure 13-65 Select the display language
Courtesy: Course Technology/Cengage Learning

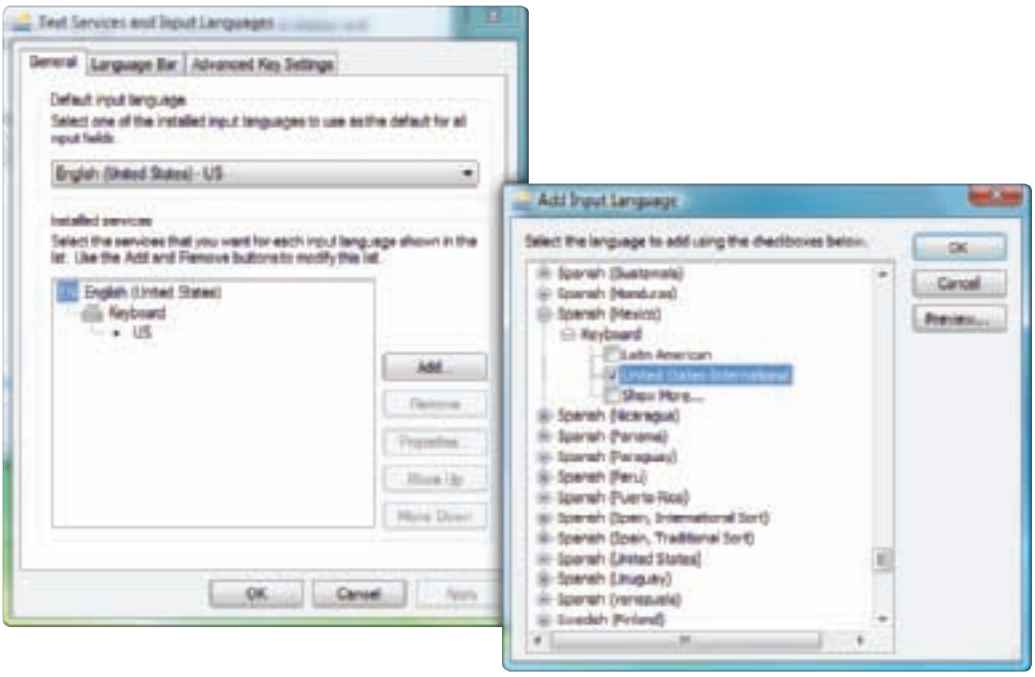

Figure 13-66 Add an input language
Courtesy: Course Technology/Cengage Learning

A+ 220-702 2.3

8. On the Regional and Language Options box, click **Apply** and then click **OK** to close the box. A message appears that says you must log off before changes will take effect (see Figure 13-67). Click **Log off now**.

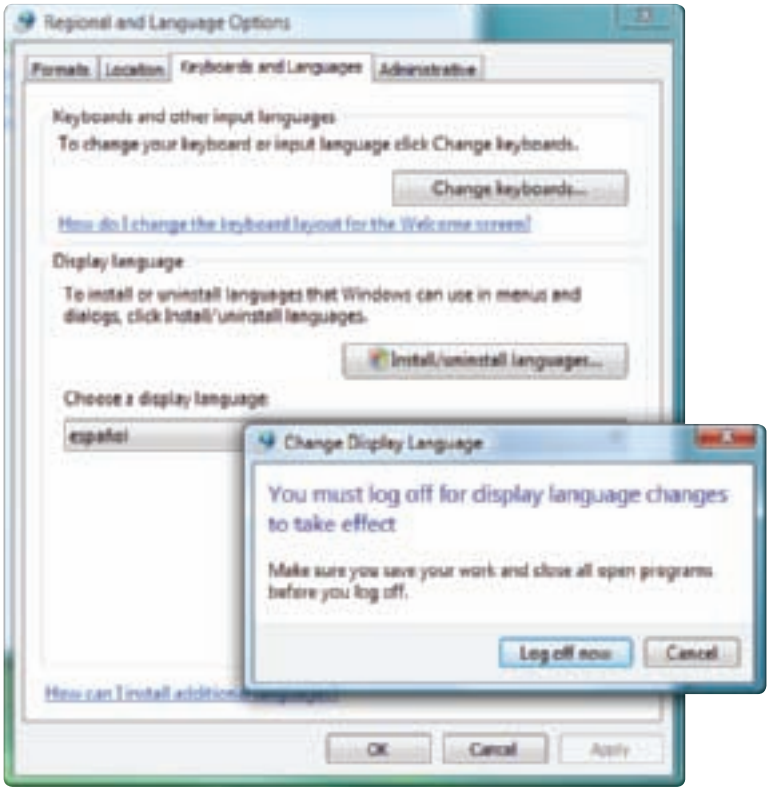

Figure 13-67 Log off before language changes will take effect
Courtesy: Course Technology/Cengage Learning

9. After logging back on the system, you will see the Start menu in Español, as shown in Figure 13-68.

Windows Vista Ultimate offers language packs through Windows Update. For other Vista editions, you can go to the Microsoft Web site (*www.microsoft.com*) and download the Language Interface Pack (LIP). Then double-click the downloaded file to install the language. After the language pack is installed, use Control Panel to change the Windows display for the installed language. You also need to change the format used for numbers, currencies, dates, and time. And, if a special keyboard is to be used, you need to change the input language.

A+
220-702
2.3

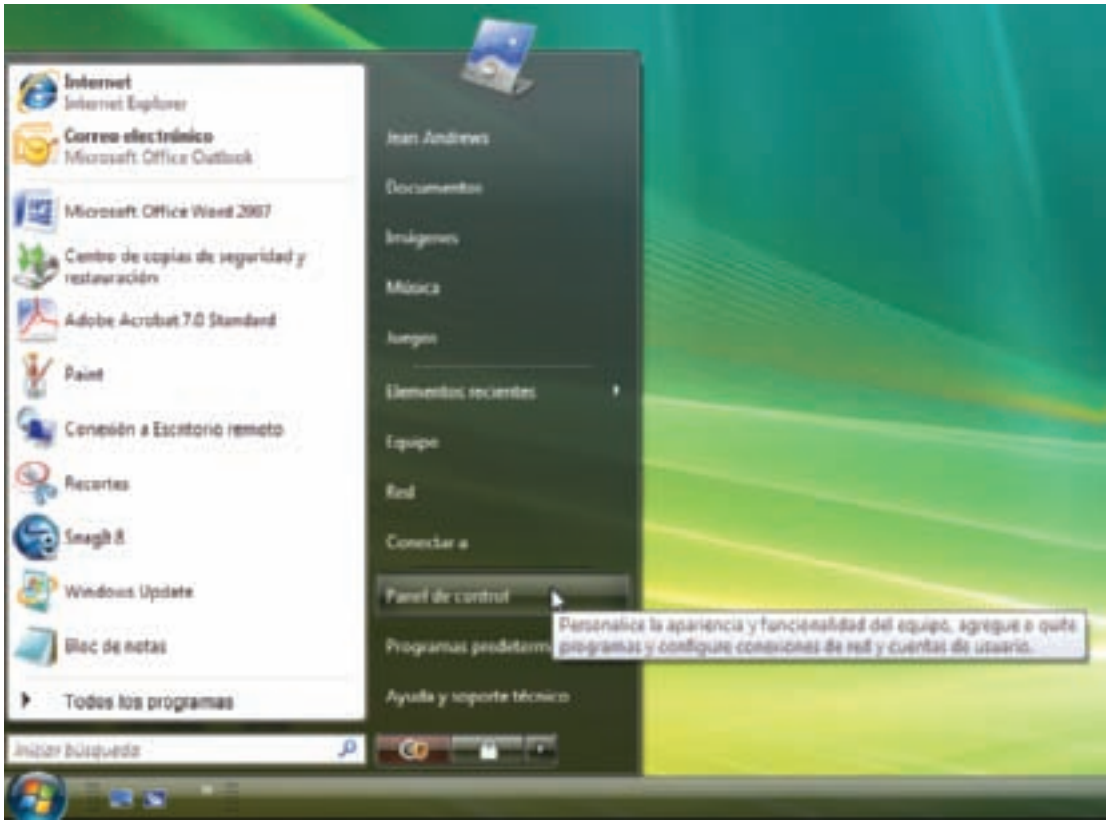

Figure 13-68 Display language in Spanish
Courtesy: Course Technology/Cengage Learning

>> CHAPTER SUMMARY

- Regular preventive maintenance includes verifying Windows settings, defragmenting the hard drive, checking the drive for errors, reducing the startup process to essentials, and doing whatever else is necessary to free up enough space on the hard drive for Windows to perform well.
- The easiest way to clean up temporary files is to use the Disk Cleanup utility on the drive properties box.
- By default, Vista automatically defrags weekly. With XP and Vista, you can also defrag the hard drive at any time by using the drive properties box or the Defrag command.
- Use the Chkdsk utility to check the drive for errors and recover data. The utility can be accessed from a command prompt or the drive properties box.
- Windows uses startup folders to hold shortcuts to programs or program files that are launched at startup.
- The Vista Defender Software Explorer window is used to control startup programs.
- Vista uses the Programs and Features window to uninstall software, and XP uses the Add and Remove Programs window for the same purpose.
- For best performance, allow at least 15 percent free space on the Windows volume. If you need more free space on this volume, you can move data to other media, compress folders,

reinstall software on a different volume, move the virtual memory paging file to another volume or drive, and limit the space on the volume used by Internet Explorer.

- Virtual memory uses hard drive space as memory to increase the total amount of memory available. Virtual memory is stored in a paging file named Pagefile.sys.
- You need a plan for disaster recovery in the event the hard drive fails. This plan needs to include routine backups of data and system files.
- The Windows Vista Backup and Restore Center and the Windows 2000/XP Ntbackup utility can be used to schedule routine backups of user data files.
- Vista backup uses a full or incremental backup method. Choices for backups available under Ntbackup include full, copy, incremental, differential, and daily backups.
- Vista and XP back up system files using restore points created by System Protection. Later, you can use System Restore to restore the system to one of these restore points.
- You can back up and restore the system state using the Windows 2000/XP Ntbackup utility.
- Windows Vista Complete PC Backup or Windows XP Automated System Recovery can back up the entire hard drive.
- Commands useful to manage files, folders, and storage media include Help, Dir, Del, Copy, Recover, Xcopy, Robocopy, MD, CD, RD, Chkdsk, Defrag, Edit, and Format.
- Use Disk Management to manage hard drives and partitions. Use it to create, delete, and resize (Vista only) partitions, mount a drive, manage dynamic disks, and solve problems with hard drives.
- Change the display and input language and the format used for numbers, currencies, dates, and times using the Regional and Language Options dialog box accessed from Control Panel.

>> KEY TERMS

For explanations of key terms, see the Glossary near the end of the book.

Automated System Recovery
batch file
Chkdsk
Complete PC Backup
Defrag
dynamic disks
dynamic volumes
fragmented files
mount point
mounted drive
Pagefile.sys
restore points
System Restore
system state data
user profile namespace
virtual memory
wildcard

>> REVIEWING THE BASICS

1. What is the purpose of the Windows.old folder?
2. How can you delete the Windows.old folder?
3. By default, when does Vista automatically defrag a drive?

4. Using Vista, what type of command prompt window is needed to run the Chkdsk command?
5. What is the path to the startup folder for each user in Windows Vista?
6. What is the path to the startup folder for all users in Windows Vista?
7. What utility does Vista use to manage startup programs?
8. What Vista window is used to uninstall software?
9. What is the path to the Windows XP startup folder for each user?
10. What is the path to the Windows XP startup folder for all users?
11. What is the normal path of the Windows paging file used for virtual memory?
12. What is the path to the Internet Explorer cache folder in Windows Vista?
13. Why is it important to not store a backup of drive C on another partition on the same hard drive?
14. What is the program filename of the Windows XP backup utility?
15. What program file must you execute to install the Backup utility in Windows XP Home Edition?
16. What is the %*SystemRoot*% folder as used in Microsoft documentation?
17. What Vista utility creates restore points?
18. How can you delete all restore points?
19. Where are restore points kept?
20. In what folder does Windows XP store a backup of the registry when backing up the system state?
21. Which editions of Vista don't include Complete PC backup?
22. What two components are created when you back up an XP system using the Automated System Recovery process?
23. What file in the user account folder stores user settings?
24. In what folder is the registry stored?
25. In what folder are 32-bit programs stored by a 64-bit edition of Windows Vista?
26. What is the purpose of the C:\Windows\CSC folder?
27. In a command line, what is the purpose of the ? in a filename?
28. What is the purpose of the |more parameter at the end of a command line?
29. What is the command to list all files and subdirectories in a directory?
30. What command is replacing Xcopy?
31. Which is more stable, RAID implemented by Windows or RAID implemented by hardware?
32. When you move a dynamic disk to a new computer, what status will Disk Management first assign the drive?
33. Which edition of Vista allows you to install a language pack by using Windows Update?

>> THINKING CRITICALLY

1. Write and test commands to do the following:
   (Answers can vary)
   a. Create a folder named C:\data
   b. Create a folder named C:\data\test1 and a folder named C:\data\test2
   c. Copy Notepad.exe to the Test1 folders.
   d. Move Notepad.exe from the Test1 folder to the Test2 folder.
   e. Make C:\ the default folder.
   f. Without changing the default folder, list all files in the Test2 folder.
   g. Delete the Test2 folder.
   h. Delete the C:\data folder.
2. You are trying to clean up a slow Windows Vista system and discover that the 75 GB hard drive has only 5 GB free space. The entire drive is taken up by drive C. What is the best way to free up some space?
   a. Compress the entire hard drive.
   b. Move the \Program Files folder to an external hard drive.
   c. Delete the Windows.old folder.
   d. Reduce the size of the paging file.
3. Which is the best first step to protect important data on your hard drive?
   a. Use dynamic disks to set up a striped volume so that the data has redundancy.
   b. Back the data up to another media.
   c. Compress the folder that holds the data.
   d. Put password protection on the data folder.

>> HANDS-ON PROJECTS

PROJECT 13-1: Using System Restore

Do the following to find out how System Restore works and how it can affect a system:

1. Create a restore point.
2. Make a change to the display settings.
3. Change the desktop background.
4. Restore the system using System Restore.

Are the changes still in effect? Why or why not?

PROJECT 13-2: Cleaning Up Your Hard Drive

Log onto Vista using an account with Administrator rights. Open **Windows Explorer** and right-click drive **C**. On the shortcut menu, click **Properties** and then click **Disk Cleanup** in the properties box. Clean up files for all users. In the Disk Cleanup box, select **Downloaded Program Files**, **Temporary Internet Files**, **Recycle Bin**, and **Temporary files** and click **OK**.

Next, log onto the system using an account that does not have Administrator rights. How are you limited in the way you can perform a Disk Cleanup? Why do you think this limitation exists?

PROJECT 13-3: Problem-Solving Using the Microsoft Knowledge Base

Your hard drive has been attacked by a malicious virus, and you have decided to restore your hard drive from the last backup made by the ASR backup process. You cannot find the ASR floppy disk required for the restore process. Search the Microsoft Knowledge Base for the steps to re-create the ASR floppy disk when the ASR backup is available. Print the Knowledge Base article.

PROJECT 13-4: Restoring the System State

Understanding the importance of making backups is essential to learning to support Windows. Do the following to examine the power and limitations of backing up the system state data:

1. Back up the Windows 2000/XP system state to a folder on your network or hard drive. What is the path to your backup?
2. Make several changes to the Windows environment: Using the Display Properties window, change the wallpaper background of the desktop, the screen resolution, and the Windows Theme. What are these new settings?
3. Using the Add or Remove Programs applet in Control Panel, remove and add a Windows component. Which component did you remove? Which component did you add?
4. Reboot your system and verify your changes were all implemented.
5. Now restore the system state from the backup you made. Which of your changes were undone and which (if any) were left untouched?

PROJECT 13-5: Using CCleaner to Optimize and Clean a System

CCleaner by Piriform (*www.ccleaner.com*) is freeware that can be used to optimize and clean a Windows system. It removes files that are no longer needed and can clean the registry of unused keys. Go to the *www.ccleaner.com* Web site, investigate the software, and download the latest version. Install and run it and then answer the following questions:

1. What is the version of CCleaner that you installed?
2. Will CCleaner work on a 64-bit installation of Windows?

3. Did CCleaner attempt to add a program to your startup programs?
4. How much space on the hard drive did CCleaner offer to free?
5. List up to four registry keys that CCleaner offered to remove.
6. List up to three programs CCleaner offered to uninstall.
7. Do you think you would like to keep CCleaner installed on your system? Why or why not?

>> REAL PROBLEMS, REAL SOLUTIONS

REAL PROBLEM 13-1: Using Microsoft SyncToy

You own a small computer service company and have several clients who work out of a home office. Jason is one of them. Jason uses Windows XP on his desktop and Vista on his laptop. He travels with his laptop but uses his desktop computer when he's at home. He keeps all his important data files in a folder, C:\Data, on his desktop computer. When he leaves for a business trip, he copies only the files from the \Data folder to his laptop that he expects to use on the trip. On the trip, some of these files are edited or deleted, and some new files are created. When he gets back home, he copies one file at a time from the laptop to the desktop using his home network. However, he has told you that occasionally he forgets to copy the files from the laptop to the desktop before he makes changes in the desktop files. Therefore, he's concerned that if he copied the entire \Data folder from the laptop to the desktop, he might lose an important change.

He has asked you to help him find a better method to synchronize his \Data folders on these two computers. After a little research, you find the free Microsoft SyncToy utility on the Microsoft Web site and decide you need to test it to see if it will meet Jason's needs. Set up a testing situation and then answer the following questions:

1. List the high-level steps (not the keystrokes) you used to test the utility.
2. What test files did you use to test it?
3. What problems, if any, did you encounter in the testing process?
4. Do you think the utility is a good fit for Jason? Why or why not?

REAL PROBLEM 13-2: Problems Starting Windows XP

Tim, a coworker who uses many different applications on his Windows XP system, complains to you that his system is very slow starting up and responding when he loads and unloads applications. You suspect the system is loading too many services and programs during startup that are sucking up system resources. What do you do to check for startup processes and eliminate the unnecessary ones? If you have access to a Windows system that needs this type of service, test your answers on this system. Write down at least 10 things you should do or try that were discussed in the chapter to speed up a sluggish Windows XP installation.

REAL PROBLEM 13-3: Cleaning Up a Sluggish Windows Vista System

Using all the tools and techniques presented in this chapter, clean up a sluggish Windows Vista system. Take detailed notes as you go, showing what you checked before you started to solve the problems, what you did to solve the problems, and what the results were of your efforts. What questions did you have along the way? Bring these questions to class for discussion.