

chapter  
**17**

# Maintaining and Optimizing Windows

*“Chaos is inherent in all compounded things. Strive on with diligence.”*

—BUDDHA



**In this chapter, you will learn how to**

- **Perform maintenance tasks in Windows**
- **Optimize Windows**
- **Prepare Windows for problems**

**E**very computer running a Windows operating system requires both occasional optimization to keep the system running snappily and ongoing maintenance to make sure nothing goes wrong. Microsoft uses its decades of experience with operating systems to search for ways to make the tasks of maintaining and optimizing surprisingly easy and very automatic, but there's still plenty to do to keep things humming along.

The chapter covers maintenance and optimization, so let's make sure you know what these two terms mean. *Maintenance* means jobs you do from time to time to keep Windows running well, such as running hard drive utilities. CompTIA sees *optimization* as jobs you do to your Windows system to make it better—a good example is updating drivers to make hardware perform better. This chapter covers the standard maintenance and optimization activities performed on Windows and the tools techs use to perform them.

Even the best maintained, most perfectly optimized computer is going to run into trouble. Hard drives crash, naïve coworkers delete files, and those great new video card drivers sometimes fail. The secret isn't to try to avoid trouble, because trouble will find you, but rather to make sure you're ready to deal with problems when they arise. This is one area that very few users do well, and it's our jobs as techs to make recovery from trouble as painless as possible. Microsoft gives us plenty of tools to prep for problems—we just need to make sure we use them.

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## ■ Maintaining Windows

Maintaining Windows can be compared to maintaining a new automobile. Of course, a new automobile comes with a warranty, so most of us just take it to the dealer to get work done. In this case, however, *you* are the mechanic, so you need to think as an auto mechanic would think. First, an auto mechanic needs to apply recalls when the automaker finds a serious problem. For a PC tech, that means installing the latest system patches released by Microsoft. You also need to check on the parts that wear down over time. On a car, that might mean changing the oil or rotating the tires. In a Windows system, that includes keeping the hard drive and Registry organized and uncluttered.

### Windows Patch Management

There's no such thing as a perfect operating system, and Windows is no exception. From the moment Microsoft releases a new version of Windows, malware attacks, code errors, new hardware, new features, and many other issues compel Microsoft to provide updates, known more generically as *patches* in the computing world, to the operating system. The process of keeping software updated in a safe and timely fashion is known as *patch management*. Microsoft has been a leader in the process of patch management for decades. Microsoft's primary distribution tool for handling patch management is a Web site and a Control Panel applet called Windows Update.

Windows Update separates the available fixes into distinct types: updates and service packs. **Updates** are individual fixes that come out fairly often, on the order of once a week or so. Individual updates are usually fairly small, rarely more than a few megabytes. A **service pack** is a large bundle of updates plus anything else Microsoft might choose to add. Service packs are invariably large (hundreds of megabytes) and are often packaged with Windows, as shown in Figure 17.1.

**Windows Update** checks your system, grabs the updates, and patches your system automatically. Even if you don't want to allow Windows Update to run automatically, it'll nag you about updates until you patch your system. Microsoft provides the Windows Update service for all versions of Windows.



You might be asked about installing service packs and updates on the CompTIA A+ exams. Pay attention to the steps listed here.



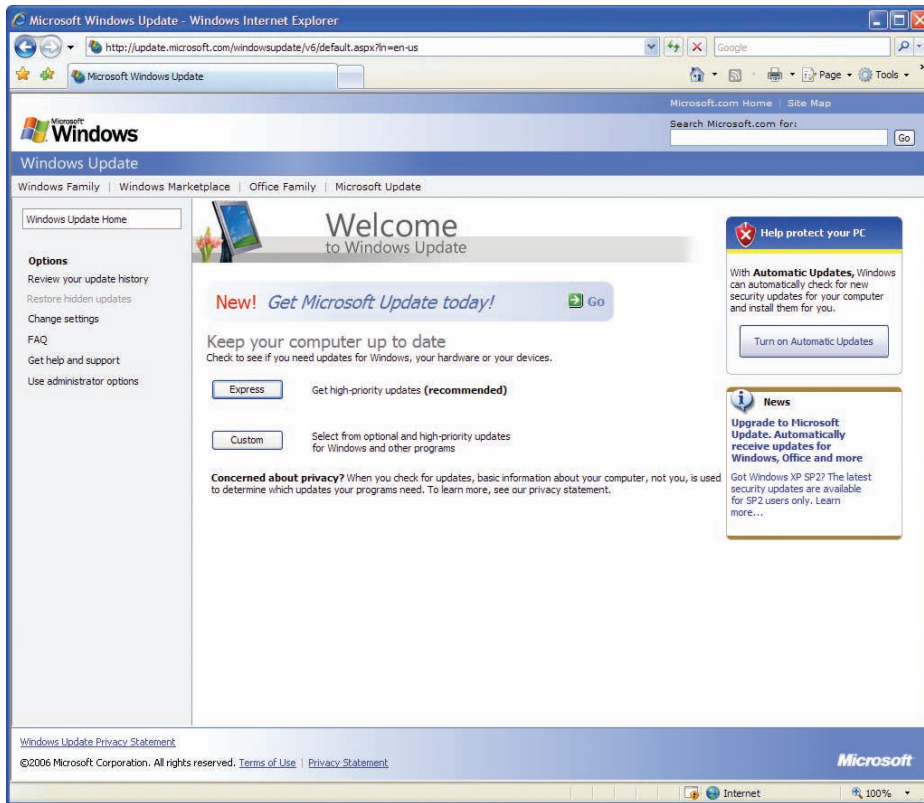
• **Figure 17.1** Windows 7 with Service Pack 1

## Windows Update in Windows XP

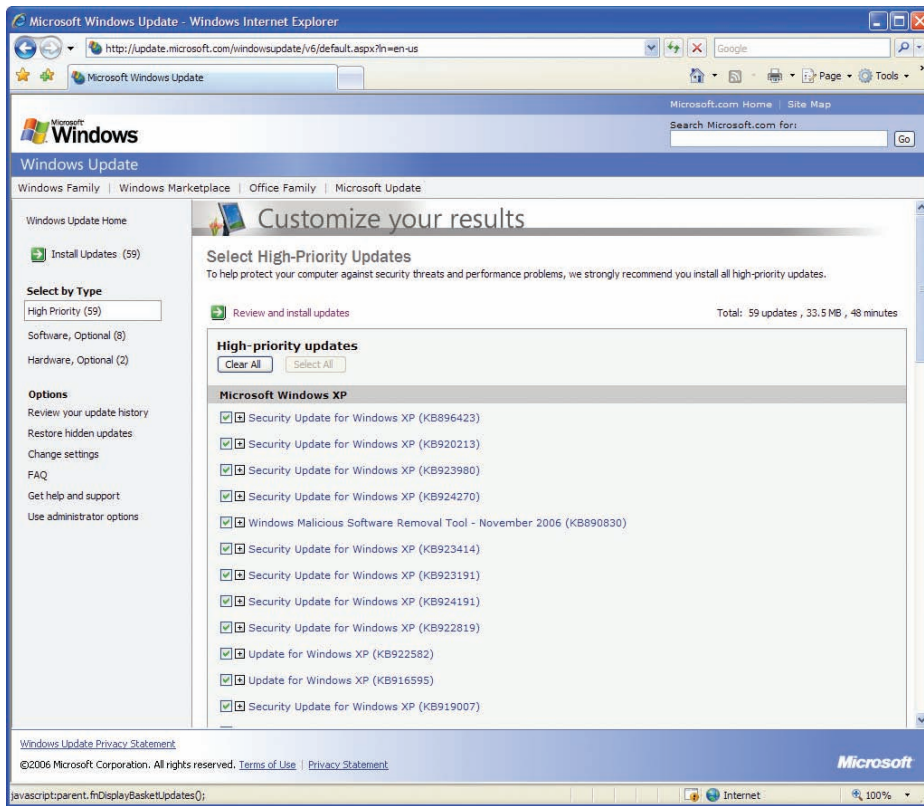
You can start Windows Update when your computer is connected to the Internet. Start the utility at Start | All Programs | Windows Update. When you run Windows Update manually, the software connects to the Microsoft Web site and scans your computer to determine which updates you may need. Within a few seconds or minutes, depending on your connection speed, you'll get a straightforward screen like the one shown in Figure 17.2.

You have several choices here, although two are most obvious. If you click the Express button, Windows Update will grab any high-priority updates—these are security patches—and install them on your computer. If you click the Custom button, you can select from a list of optional updates.

Figure 17.3 shows the updater with a list of patches and security updates. You can scroll through the list and review the description of each update. You can deselect the checkbox next to a patch or update, and Windows Update will not download or install it. If you click the Clear All button, as you might suspect, all the updates will be unchecked and not installed. When you click Install Updates, all the updates remaining in the list will be installed.

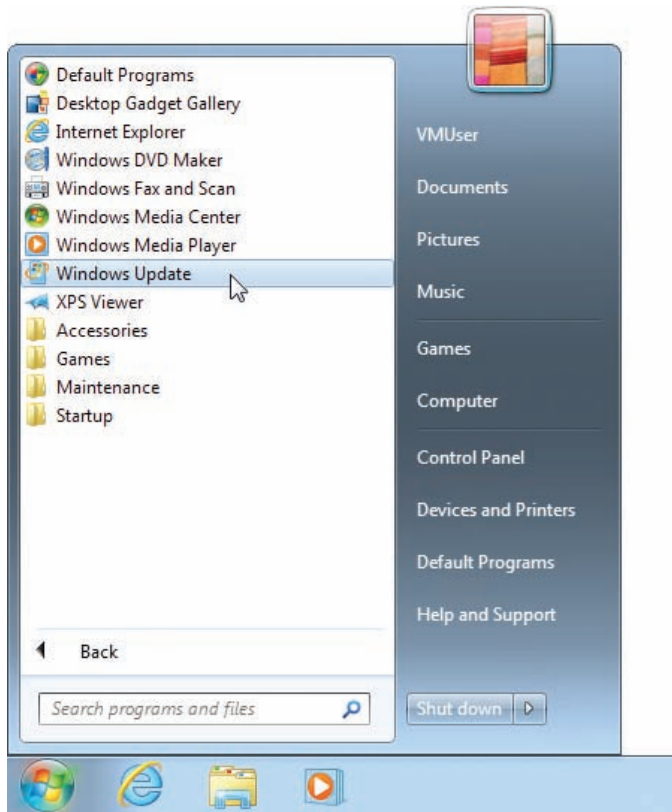


• **Figure 17.2** Microsoft Windows Update page



• **Figure 17.3** Choose updates to be installed.





• Figure 17.4 Accessing Windows Update in Windows 7

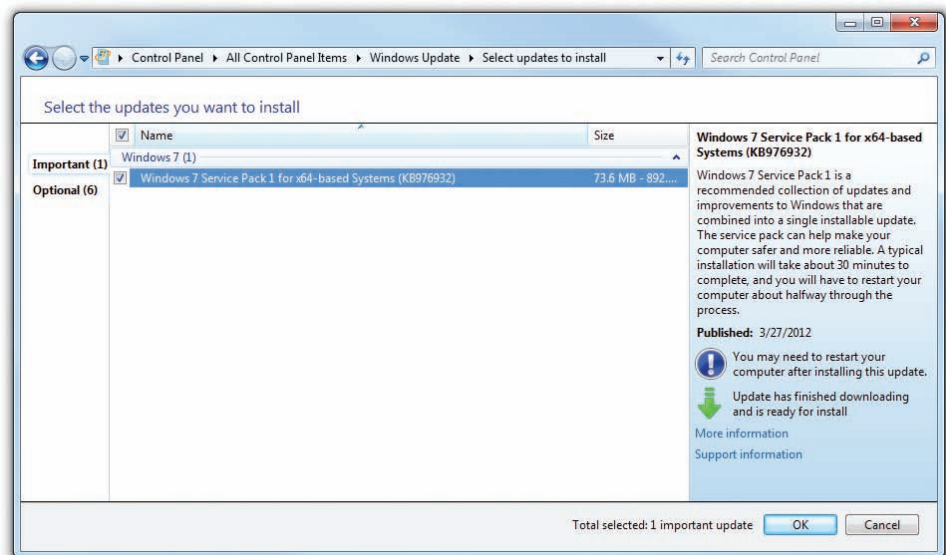
## Windows Update in Windows Vista and Windows 7

Starting with Windows Vista, Microsoft changed Windows Update from a Web page to a Control Panel applet called—surprise!—Windows Update. Windows Update is virtually identical in both Windows Vista and Windows 7, so I'll just show it to you in Windows 7. Microsoft thoughtfully placed a shortcut to the applet in the Start menu, as shown in Figure 17.4.

Windows Update can run automatically (we'll cover that next), so you'll probably see new updates to install every time you open the applet. There are three common types of updates:

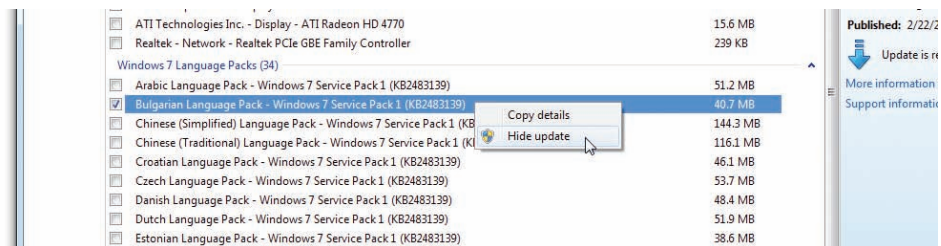
- **Important** These updates address critical security or stability issues and are the most critical. You can configure Windows Update to install these updates automatically.
- **Recommended** A recommended update is an added feature or enhancement that is not critical. You can configure Windows Update to install these updates automatically.
- **Optional** These include device drivers, language packs, and other nonessential updates. You must install these updates manually.

Figure 17.5 shows you what Windows Update looks like in Windows 7. Note that the Important update is Windows 7 Service Pack 1.



• Figure 17.5 Windows Update in Windows 7

Installing an update is as easy as selecting the updates you want to install and clicking OK. If you don't want to install a specific update, and don't want to look at it every time you open Windows Update, you can hide it. To hide an update, right-click on the update you wish to hide and select Hide update (see Figure 17.6).



• **Figure 17.6** Hiding an update

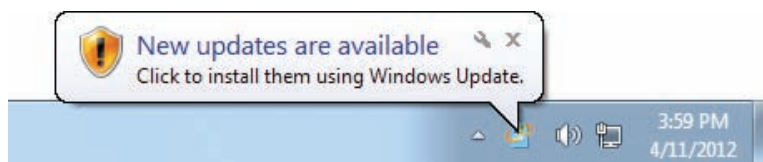
Installing updates is only one part of this applet. You can find more options listed on the left side of the applet.

- **Control Panel Home** Returns you to the Control Panel
- **Check for updates** Manually checks for new updates
- **Change settings** Enables you to configure automatic updating
- **View update history** Shows you every update applied to the system and any that failed to install properly
- **Restore hidden updates** Reveals hidden updates

## Automatic Updates in Windows XP

Updates are so important that Microsoft gives you the option to update Windows automatically through the **Automatic Updates** feature. Actually, it nags you about it! Soon after installing Windows XP (a day or two, in my experience), a message balloon will pop up from the taskbar suggesting that you automate updates (see Figure 17.7).

If you click this balloon, the Automatic Updates Setup Wizard runs, with which you can configure the update program. You say you've never seen this message balloon but would like to automate the update process? No problem. Right-click My Computer (on the Start menu), select Properties, click the Automatic Updates tab, and select Automatic Update options. Or, open the Control Panel and double-click the Automatic Updates icon. Whenever your computer connects to the Web, it checks the Windows Update page.



• **Figure 17.7** Windows Update balloon message in Windows XP

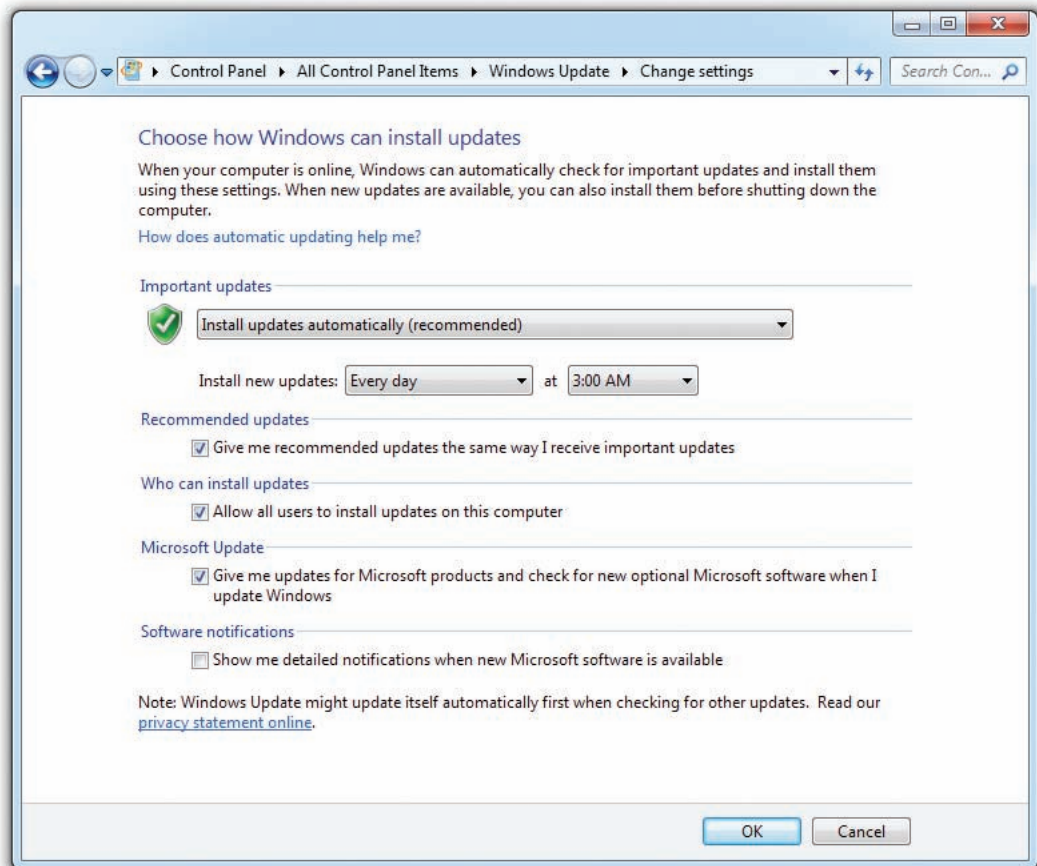
What happens next depends on the setting you choose. You have four choices:

- **Automatic (recommended)** Windows Update will simply keep your computer patched up and ready to go. This is the best option for most users, although it's not necessarily good for users of portable computers. Nobody wants to log into a slow hotel Wi-Fi connection and have most of your bandwidth sucked away by Automatic Updates downloading hot fixes!

- **Download updates for me, but let me choose when to install them** Windows Update downloads all patches in the background and then, when complete, tells you about them. You have the option at that point to install or not install.
- **Notify me but don't automatically download or install them** Windows Update simply flashes a dialog box that tells you updates are available but does not download anything until you say go. This is the best option for users of portable computers. You can download files when it's convenient for you, such as when you're home and not traveling on business.
- **Turn off Automatic Updates** This does precisely what is advertised. You get neither automatic patches nor notification that patches are available. Only use this option on a system that does not or cannot connect to the Internet. If you're online, your computer needs to be patched!

### Automatic Updates in Windows Vista and Windows 7

Windows Vista and Windows 7 take automatic updates to a much higher level. Click on Change settings in the Windows Update dialog box to see the available options, listed next (see Figure 17.8).



• **Figure 17.8** Windows Update Change settings

- **Important updates** The choices in this drop-down list are almost identical to the four radio button options in Windows XP:
  - Install updates automatically (recommended)
  - Download updates but let me choose whether to install them
  - Check for updates but let me choose whether to download and install them
  - Never check for updates (not recommended)
- **Recommended updates** This option is enabled by default, but you can turn off the automatic installation of recommended updates. Most users leave it on, but paranoid admins like to turn this off.
- **Who can install updates** By default, all users can install updates. Uncheck this box to restrict installing updates to users with administrative privileges.
- **Microsoft Update** By default, the automatic update process includes updates for other Microsoft products, such as Microsoft Office. Unchecking this box disables these updates.
- **Software notifications** When enabled, you'll receive detailed information about any new Microsoft software. These show up as moderately obnoxious pop-ups in the system tray.

You need to decide whether or not you want to automatically install updates. Microsoft has a good track record for providing relatively fast, robust, and safe updates, but there have been a few rather infamous exceptions. As a result, there are always a few nerdier techs (like your humble author) who prefer to download the update and wait to see if there's any problems before installing it.

## Managing Temporary Files with Disk Cleanup

You should run the **Disk Cleanup** utility regularly to make sure you've cleared out the junk files that accumulate from daily use. All that late-night Web surfing doesn't just use up time; it also uses up disk space, leaving behind hundreds of temporary Internet files. Those, and other bits and pieces (such as those "deleted" files still hanging around in your Recycle Bin), can add up to a lot of wasted disk space if you don't periodically clean them out.

You can reach this tool through the Start menu (Start | All Programs | Accessories | System Tools), or you can open My Computer or Computer, right-click the drive you want to clean up, and select Properties. You'll find the Disk Cleanup button in the middle of the General tab.

When you click the Disk Cleanup button, the application first calculates the space you can free up and then displays the Disk Cleanup dialog box, which tells you how much disk space it can free up—the total amount possible as well as the amount you'll get from each category of files it checks. Windows Vista and Windows 7 also ask if you want to clean up all the files on the computer or just your files. In Figure 17.9, the list of files to delete only has a few categories checked, and the actual amount of disk space to be gained by allowing Disk Cleanup to delete these files is much smaller than the estimate. As you select and deselect choices, watch this value change.

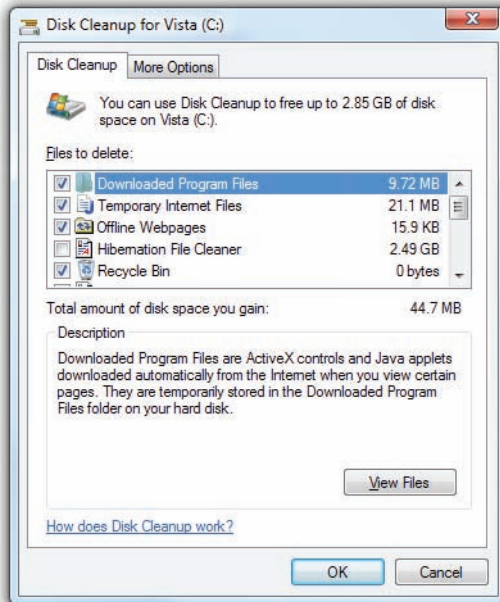




## Try This!

### Running Disk Cleanup

Your computer will thank you if you get rid of a bunch of unnecessary files and clean things up, so try this! Follow the instructions in the text and run Disk Cleanup. Is your computer noticeably snappier afterwards?

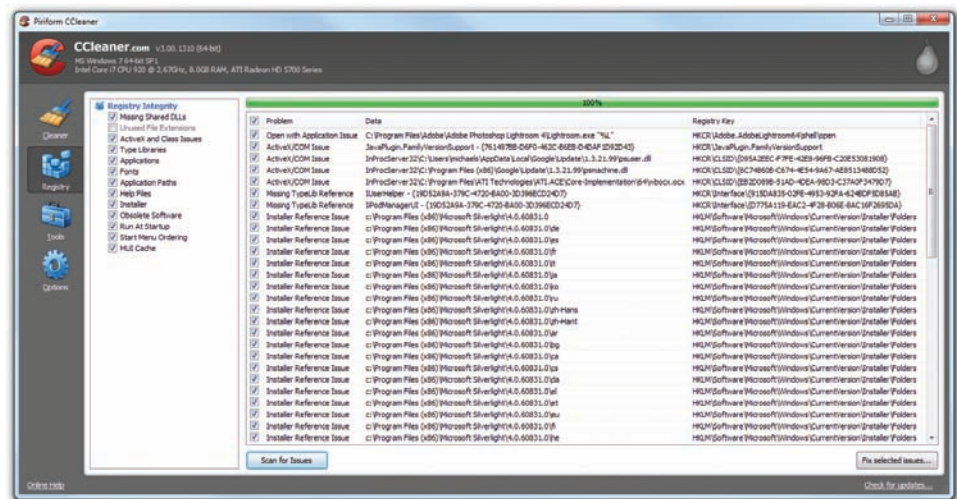


• Figure 17.9 Disk Cleanup dialog box

If you scroll down through the list, you will see a choice to compress old files. What do you know—Disk Cleanup does more than just delete files! In fact, this file compression trick is where Disk Cleanup really, uh, cleans up. This is one of the few choices where you will gain the most space. The other big heavyweight category is Temporary Internet Files, which Disk Cleanup will delete. Try Disk Cleanup on a computer that gets hours of Internet use every day and you'll be pleased with the results.

## Registry Maintenance

Your Registry is a huge database that Windows updates every time you add a new application or hardware or make changes to existing applications or hardware. As a result, the Registry tends to be clogged with entries that are no longer valid. These usually don't cause any problems directly, but they can slow down your system. Interestingly, Microsoft does not provide a utility to clean up the Registry. To clean your Registry, you need to turn to a third-party utility. Quite a few Registry cleaner programs are out there, but my favorite, as you might recall from Chapter 14, is the freeware CCleaner by Piriform (see Figure 17.10). You can download the latest copy at [www.piriform.com/ccleaner/](http://www.piriform.com/ccleaner/).



• Figure 17.10 CCleaner

Before you start cleaning your Registry with wild abandon, keep in mind that all Registry cleaners are risky in that they may delete something you want in the Registry. Because Microsoft makes changes to the Registry for every version of Windows, make sure your utility supports the Windows version you're running. This is especially true for any 64-bit version of Windows! I've used CCleaner for a while and it has worked well for me—your experience may differ.



CCleaner also helps clean all of the most common Web browsers and a number of popular applications.

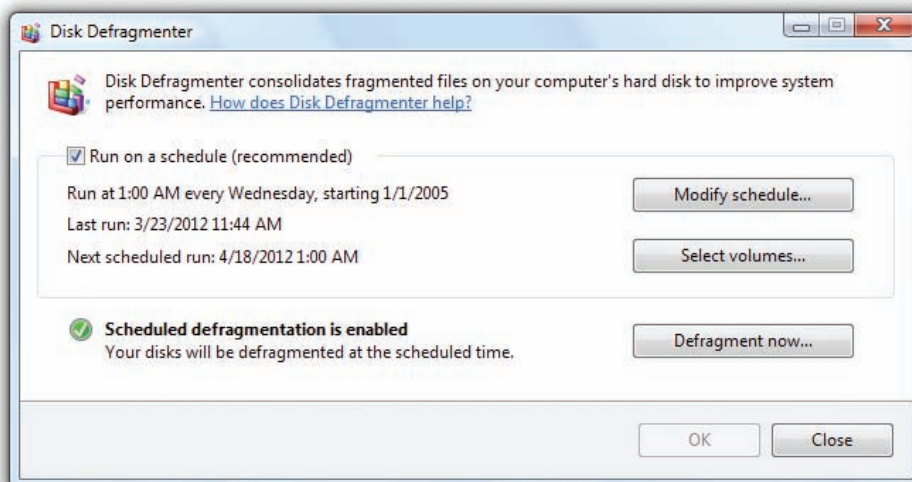
## Error-Checking and Disk Defragmentation

Keeping drives healthy and happy is a key task for every tech. Error-checking and Disk Defragmenter, discussed way back in Chapter 12, are the key Windows maintenance tools used to accomplish this task.

When you can't find a software reason (and there are many possible ones) for a problem such as a system freezing on shutdown, the problem might be the actual physical hard drive. The tool to investigate that is Error-checking. You can run Error-checking by using the `chkdsk` command from a command line, from the Start | Run dialog box, or from the Start | Search bar. You can also access the tool through the GUI by opening My Computer or Computer, right-clicking on the drive you want to check, selecting Properties, and then clicking the Tools tab. Click *Check now* to have Error-checking scan the drive for bad sectors, lost clusters, and similar problems, and repair them if possible.

Run Disk Defragmenter (see Figure 17.11) on a regular basis to keep your system from slowing down due to files being scattered in pieces on your hard drive. Before you click the Defragment button in Windows XP/7, click the Analyze button to have Windows analyze the disk and determine if defragmentation is actually necessary. (The Analyze button was removed from the Windows Vista disk defragmenter.) If you use Windows Vista/7, your system is defragged automatically.

Error-checking and Disk Defragmenter are such critical maintenance features that you really should have them run automatically. Read on to see how to schedule these and other critical jobs.



• **Figure 17.11** Vista Disk Defragmenter

## Scheduling Maintenance

Maintenance only works properly when you do it at regular intervals. Depending on the version of Windows installed, you can schedule maintenance jobs to run automatically. The CompTIA 220-802 exam objectives define three areas for you to consider for scheduled maintenance: backups, defragmentation, and check disks (Error-checking). For the most part, we use Task Scheduler, although this depends on the task and the version of Windows.

### Task Scheduler/Scheduled Tasks

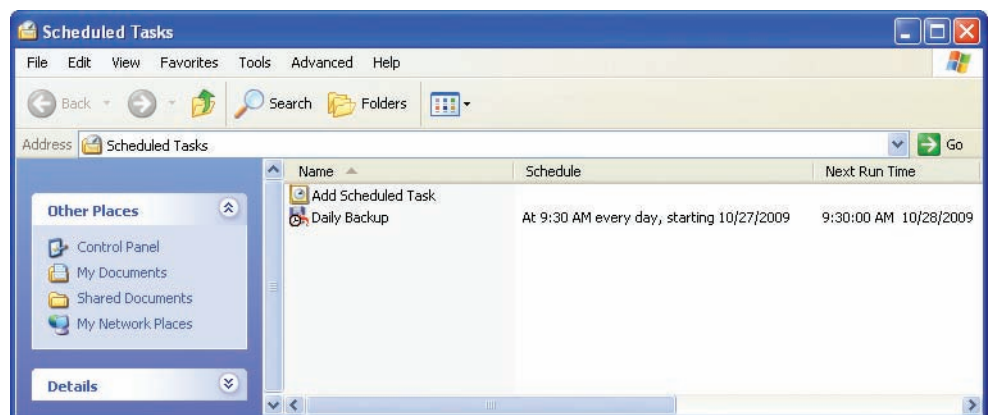
Two versions of Task Scheduler are available: Windows XP runs Version 1.0, and Windows Vista and Windows 7 run Version 2.0. Microsoft calls it **Scheduled Tasks** in Windows XP, and **Task Scheduler** in Windows Vista/7. To open Scheduled Tasks in Windows XP, go to Start | Programs | Accessories | System Tools | Scheduled Tasks. To open Task Scheduler in Windows Vista and Windows 7, open the Administrative Tools applet and double-click Task Scheduler. You can also access it via Start | All Programs | Accessories | System Tools | Task Scheduler. In both versions, you can choose an executable program and define when you want that program to run. The key to running scheduled maintenance is to know the names of the executable programs and any special switches you may need to enter. Figures 17.12 and 17.13 show Scheduled Tasks running a backup at a certain time of day.

Version 2.0 is much more powerful and flexible than Windows XP's Version 1.0, dividing tasks into triggers, actions, and conditions. *Triggers* are actions or schedules that start a program. *Actions* are steps that define both the program to run and how it is to run. *Conditions* are extra criteria that must be met for the program to run. (Is the system idle? Is it connected to the Internet?) Figure 17.14 shows the Conditions tab for a sample task. To create a basic task in Windows Vista/7, all you need to do is name it, set how often it should run, and decide what it should do.

As you'll see in the following sections, many Windows utilities include built-in scheduling options. Here's the twist, though: they're still using Schedule Tasks/Task Scheduler. If you set up an automated defragmentation



The CompTIA A+ exams may use either name for the utility for scheduling maintenance in Windows. Remember that Windows XP labels the tool *Scheduled Tasks*; Windows Vista and Windows 7 label it *Task Scheduler*.



• **Figure 17.12** Windows XP Scheduled Tasks (Version 1.0)

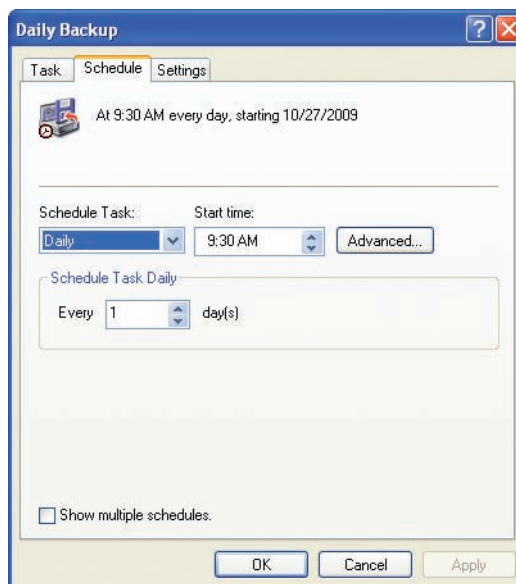
from within Disk Defragmenter, for example, you can open up Task Scheduler and see it listed as a scheduled task. Neat!

## Scheduling Backups

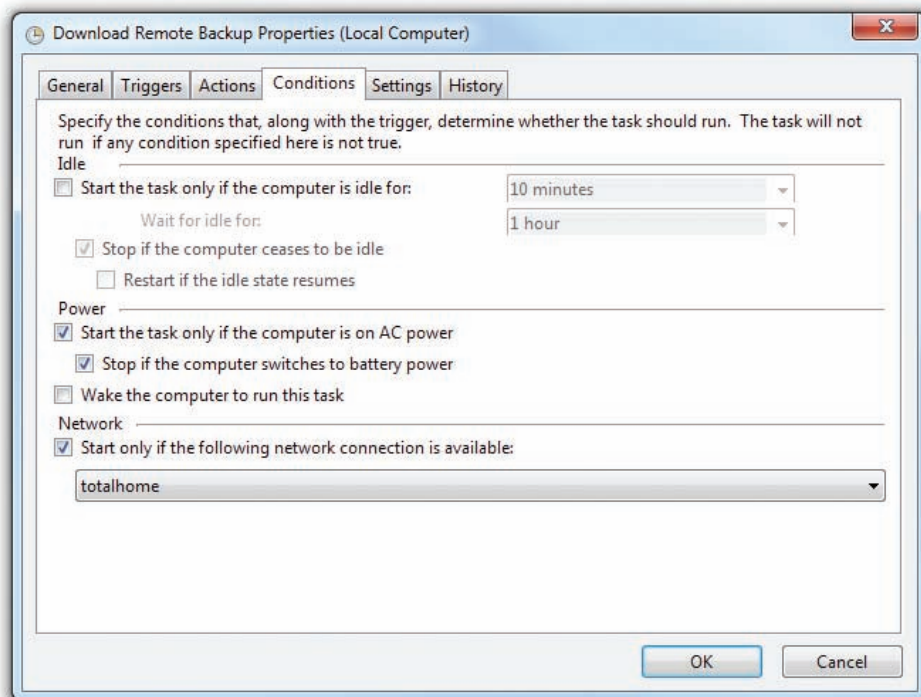
The backup utility varies depending on your version of Windows: in Windows XP, it's the Backup Utility (ntbackup); in Windows Vista, it's called the Backup and Restore Center, and in Windows 7, it's called Backup and Restore. You'll learn more about each of these tools later in the chapter, but right now, let's talk about scheduling regular backups of your data.

The fastest way to schedule a backup using the Backup Utility in Windows XP is to use the Backup or Restore Wizard (which I'll explain later in detail). After you configure which files to back up, where to store them, and all of that, you'll arrive at the Completing the Backup or Restore Wizard screen. Click the Advanced button to open a second set of options. The last of the advanced options you can set in the Backup or Restore Wizard is when you want the backup to run. You can set it to run now, later at a specified time, or use the Set Schedule button to configure regular backups at a time and frequency of your choosing.

Windows Vista/7's Backup and Restore Center/Backup and Restore applet includes a scheduler, too. Near the end of the Set Up Backup Wizard, after you've selected which folders to back up, you can click on *Change schedule* to set when and how often you want Windows to create the backup, just like in Windows XP (though Windows Vista/7 don't bury it under multiple buttons this time). It's that easy.



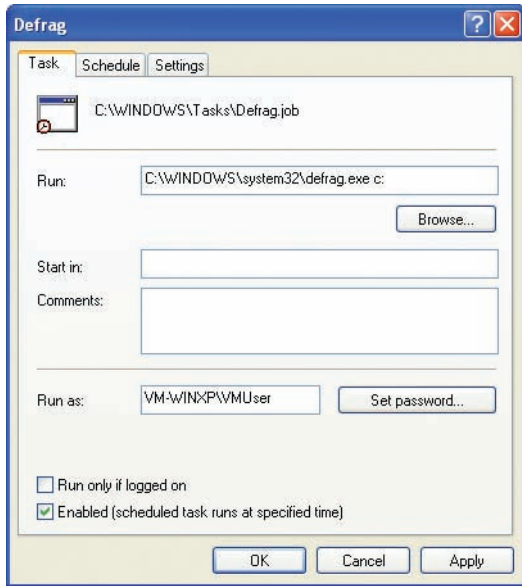
• **Figure 17.13** Daily Backup Schedule in Windows XP



• **Figure 17.14** Conditions tab in Windows 7 Task Scheduler (Version 2.0)



How often should you back up your files? If you're creating new documents, downloading music, and taking lots of digital photos, you'll want to back up your files weekly. If you're a casual, Internet-browsing, Solitaire-playing PC user, you're probably safe making a new backup once a month.



• **Figure 17.15** Scheduling a disk defragmentation in Windows XP

### Scheduling Defragmentation

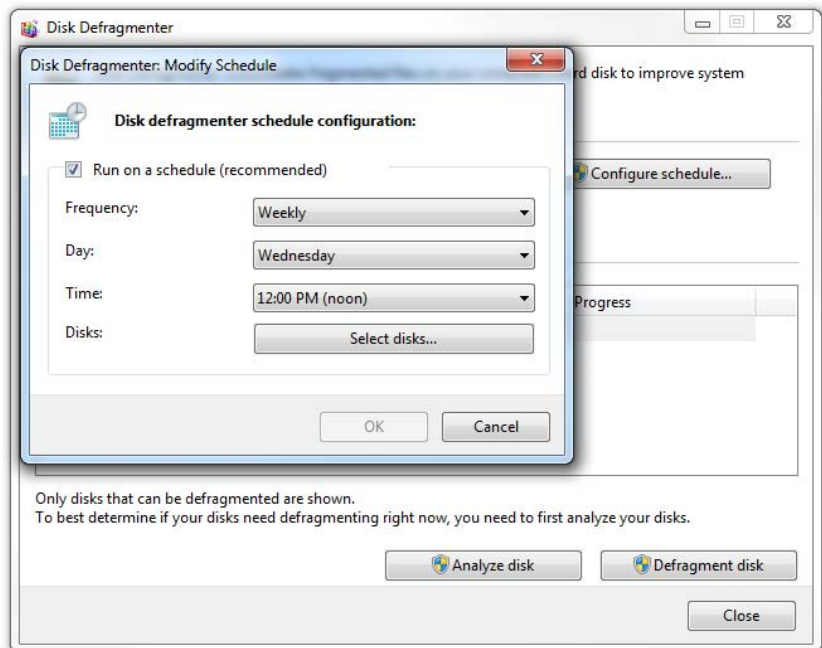
You can schedule Disk Defragmenter to run automatically using the Task Scheduler in Windows XP and from inside the utility itself in Windows Vista/7.

To defragment your hard drive on a schedule using Windows XP's Task Scheduler, double-click on Add Scheduled Task, which opens the Scheduled Task Wizard. Click Next. A list of default programs appears, but Disk Defragmenter doesn't make the cut. Click the Browse button and find the Disk Defragmenter executable, called `defrag.exe`, in the System32 folder. Click Open. You'll then name the task, set how often Task Scheduler should perform the task, and set the time and days it should run. You'll also be asked to enter a user name and password—the task runs as if it were run from that user's account. Once you complete the Wizard, a dialog box appears showing you all the information you configured. To set the Disk Defragmenter to defragment the C: drive, type `C:` at the end of the Run box, next to `C:\Windows\System32\defrag.exe`, as shown in Figure 17.15.



The CompTIA exams call the Disk Defragmenter program "Defrag," the common tech slang term for it.

Windows Vista/7's version of Disk Defragmenter includes a scheduler, just like Backup and Restore. To access Disk Defragmenter's scheduler, open the Start menu, type **defrag**, and press ENTER. You can start defragging right away or modify/disable the task in the Disk Defragmenter: Modify Schedule dialog box (see Figure 17.16).



• **Figure 17.16** Windows 7 Disk Defragmenter scheduler

It's best to run Disk Defragmenter every evening if possible. If you're using Vista/7, take advantage of the "only run when idle" condition to keep Disk Defragmenter from interrupting possibly more important tasks.

### Scheduling Error-checking (Check Disk)

The tool you know and love as Error-checking appears on the CompTIA A+ 220-802 exam objectives as *Check disk* and *chkdsk* (the command-line version of the tool). Regardless of what you call Error-checking, setting up Task Scheduler to run it automatically is a good thing.

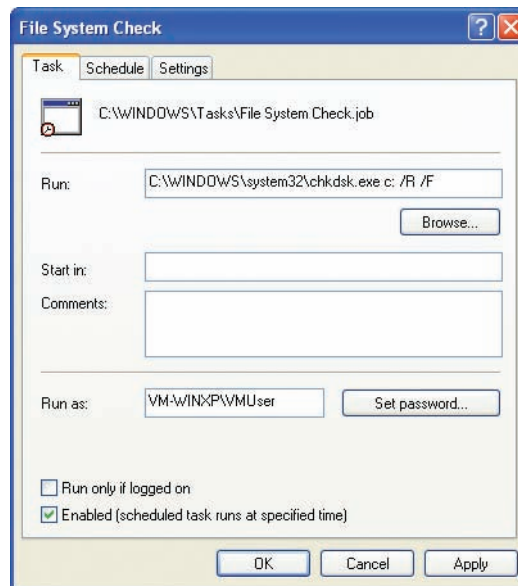
Using the technique you just learned to set up a scheduled task with Disk Defragmenter, create another scheduled task to run Error-checking. Its executable is called *chkdsk.exe* (see Figure 17.17). There are two switches you should use: */F* to repair sectors and */R* to tell Error-checking to attempt to recover data on known bad sectors.

Opinions vary on how often you should run Error-checking as a scheduled task. For the CompTIA exams, a monthly check is a good idea. For the real world, you should run Error-checking when you suspect a problem with your drives.

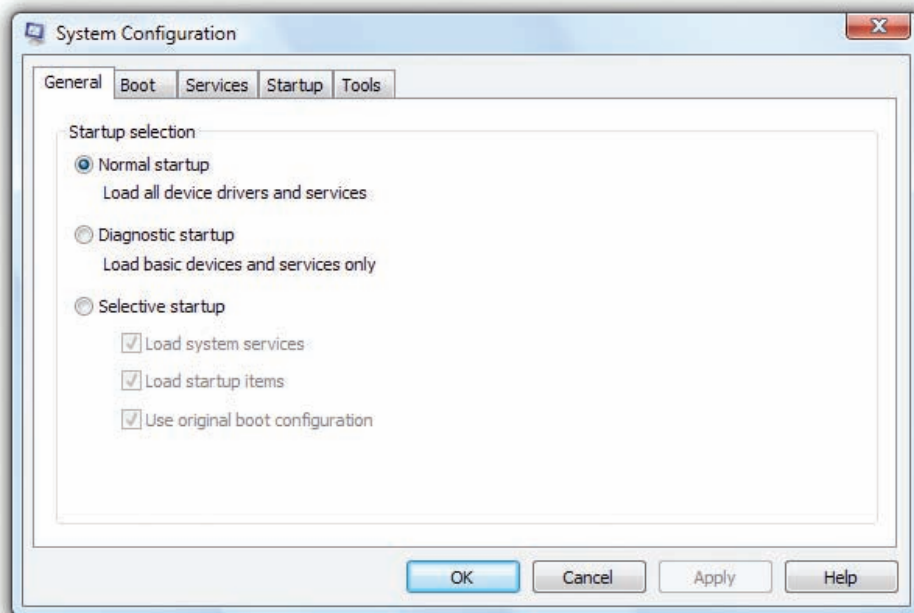
## System Configuration

Techs use the **System Configuration utility** (also known by its executable name, **msconfig**) to edit and troubleshoot operating system and program startup processes and services. To start the System Configuration utility, go to the Start | Run dialog box or the Start | Search bar, enter **msconfig**, and click OK or press ENTER (see Figure 17.18). The program runs automatically in Windows XP; in

No versions of Windows run Error-checking automatically, so you'll need to set up a task on the computer if you wish to do so.



• **Figure 17.17** Scheduling Error-checking in Windows XP



• **Figure 17.18** The Windows Vista System Configuration utility

Vista/7, you need to provide the necessary credentials, depending on the User Account Control (UAC) setup.

The System Configuration utility in Windows XP offers quick access to troubleshoot and edit the boot.ini file. System Configuration in Windows Vista and Windows 7 no longer has that ability, but it still offers a number of handy features, distributed across the following tabs:

- **General** Select the type of startup you would like to use for the next boot. You can perform a normal startup with all programs and services launching normally, a diagnostic startup with only basic devices and services, or a custom boot.
- **Boot** This tab contains advanced boot features. Here you can see every copy of Windows you have installed, set a default OS, or delete an OS from the boot menu. You can set up a safe boot, or adjust advanced options like the number of cores or amount of memory to use.
- **Services** This tab is identical to the Services tab in the Task Manager. You can enable or disable any or all services running on your PC.
- **Startup** This tab enables you to enable or disable any startup programs (programs that load when you launch Windows). This is perhaps the most useful tab, especially if Windows is slow to load on your PC.
- **Tools** This tab lists many of the tools and utilities available in Windows, including Event Viewer, Performance Monitor, Command Prompt, and so on. There's nothing here that you can't find elsewhere in Windows, but it's a handy list all the same.

## System Information

Windows comes with a handy built-in utility known as the **System Information tool** (see Figure 17.19) that collects information about hardware resources, components, and the software environment. When it finishes doing that, it provides a nice and tidy little report, enabling you to troubleshoot and diagnose any issues and conflicts. As with many other tools you can access from the Start | Run dialog box or Start | Search bar, the CompTIA A+ exams refer to System Information by its executable, **msinfo32**.

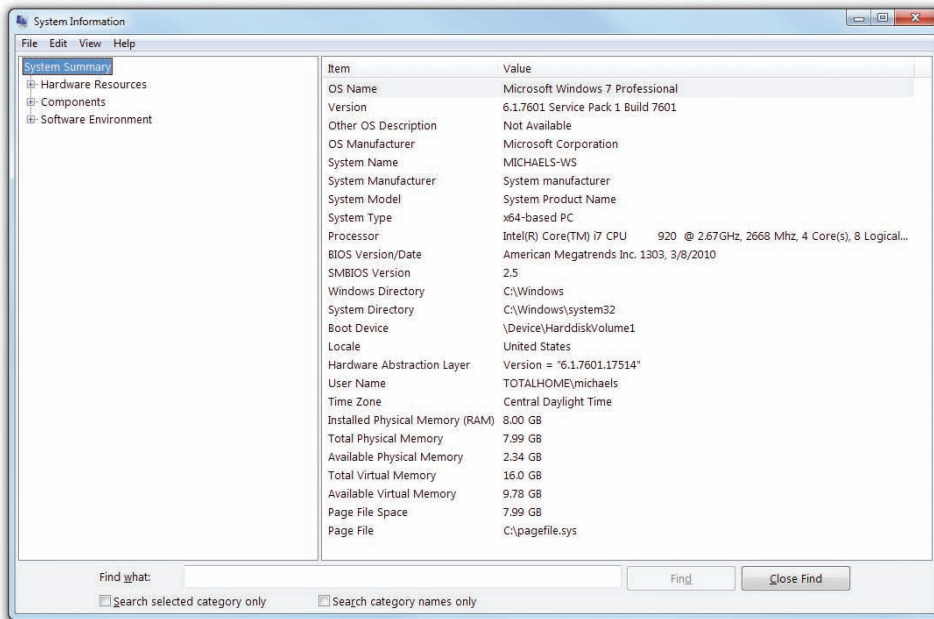
You can start System Information in one of the following ways:

- Choose Start | Programs or All Programs | Accessories | System Tools | System Information.
- In Windows XP, choose Start | Run, then type **msinfo32**, and click OK. In Windows Vista/7, go to Start | Search bar, type **msinfo32**, and press ENTER.

It is also important to note that you can use System Information to gather information about remote computers by selecting View | Remote Computer and then entering the remote computer's network machine name. Under Tools, you even get quick access to System Restore and the DirectX Diagnostic Tool, a tool for checking your video card that Chapter 21 discusses.



You simply cannot run a computer today without a large number of security programs to protect you from malicious attacks from spyware, malware, viruses, and hacking. In fact, the installation, monitoring, and updating of these programs (and possibly even hardware) is so important that they get their own chapter. Head to Chapter 29 for a complete discussion of how to keep your computer safe!



• Figure 17.19 System Information

## ■ Optimizing Windows

Maintenance is about keeping Windows' performance from degrading with time and use. Of course, you don't just want to keep trouble at bay—you want to make your systems better, stronger, faster! Anything you do that makes Windows better than it was before, such as adding a piece of software or hardware to make something run better, is an optimization.

## Installing and Removing Software

Probably the most common optimization performed on any PC is adding and removing applications. Installing and removing software is part of the normal life of any PC. Each time you add or remove software, you are making changes and decisions that can affect the system beyond whatever the program does, so it pays to know how to do it right.

### Installing Software

Most application programs are distributed on optical discs (although this is slowly changing). Windows supports **Autorun**, a feature that enables the operating system to look for and read a special file called—wait for it—`autorun.inf`. Immediately after a removable media device (optical disc or thumb drive) is inserted into your computer, whatever program is listed in `autorun.inf` runs automatically. Most application programs distributed on removable media have an `autorun` file that calls up the installation program.

Sometimes, however, you need to institute the installation sequence yourself. Perhaps the installation disc lacks an Autorun installation program, or perhaps Windows is configured so that you must start programs



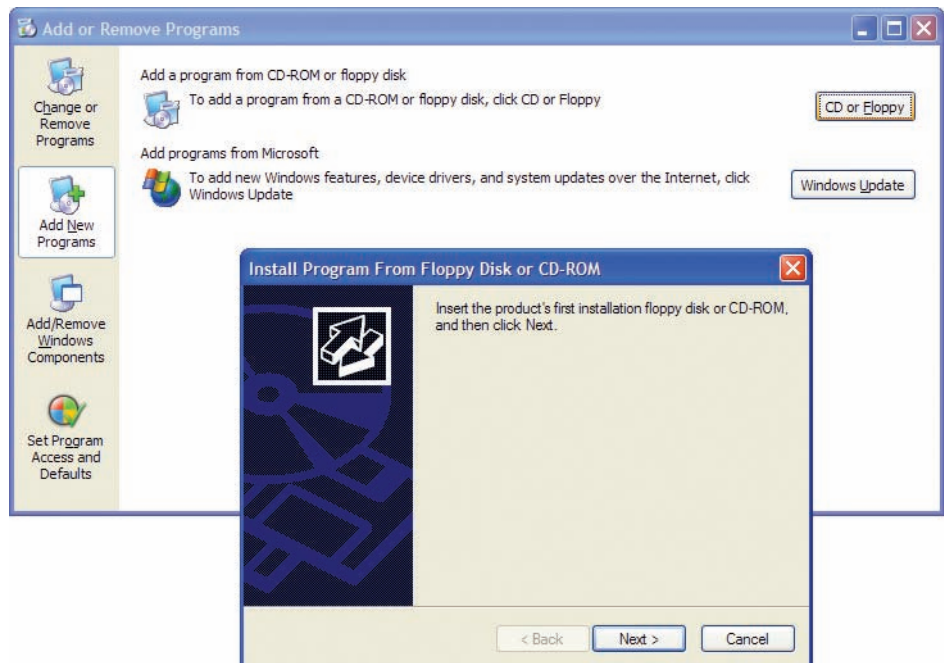


CompTIA uses a slash symbol when describing the Windows XP Add or Remove Programs applet, even though Microsoft uses a word, so expect *Add/Remove Programs* on the 220-802 exam.

on optical discs manually. In some cases, a disc may contain more than one program, and you must choose which of them to install. Regardless of the reason, you can begin the installation manually by using the **Add or Remove Programs** applet in the Control Panel in Windows XP. Click the Add New Programs button (see Figure 17.20), follow the prompts, and provide the media or location of the files. In Windows Vista and 7, Microsoft has replaced the Add or Remove Programs applet with **Programs and Features**, which does not have the Add New Programs feature.

With Windows Vista/7, UAC complicates the installation process a bit. You will most likely be prompted by UAC when installing an application, giving you time to review what is happening to your system in case you did not approve of the program being installed. If you are using an administrator account, you can simply click Continue and finish the installation. Should you be logged in with a less privileged account, you will need to enter a user name and password of an account with administrative privileges. Some installers have trouble letting UAC know that they need more privileges and simply fail no matter what account you are logged in with. In those cases, it is best to right-click the installer icon and select *Run as administrator* to give the installer the access it expects from the start.

Assuming all is well, you typically must accept the terms of a software license before you can install an application. These steps are not optional; the installation simply won't proceed until you accept all terms the software manufacturer requires and, in many cases, enter a correct code. You may also be asked to make several decisions during the installation process. For example, you may be asked where you would like to install the program and if you would like certain optional components installed. Generally speaking, it is best to accept the suggested settings unless you have a very specific reason for changing the defaults.



• **Figure 17.20** Result of clicking the Add New Programs button

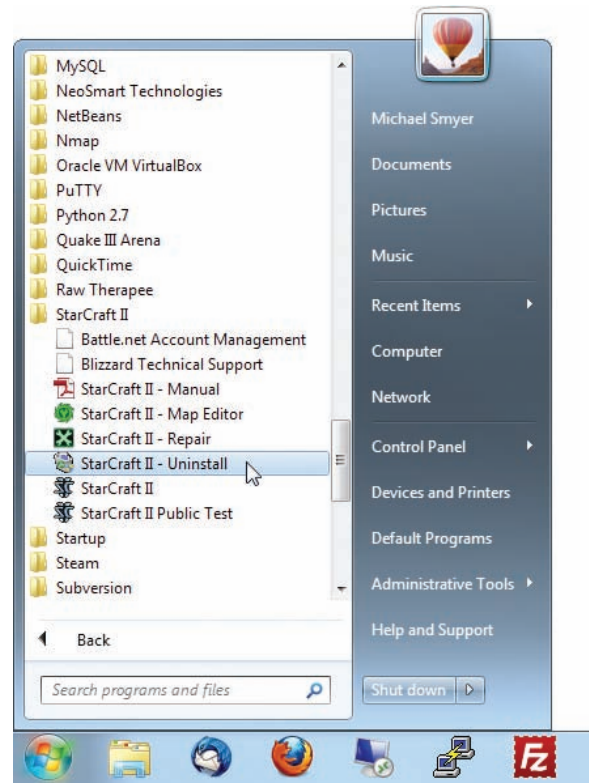
## Removing Software

Each installed application program takes up space on your computer's hard drive, and programs that you no longer need waste space that could be used for other purposes. Removing unnecessary programs can be an important piece of optimization.

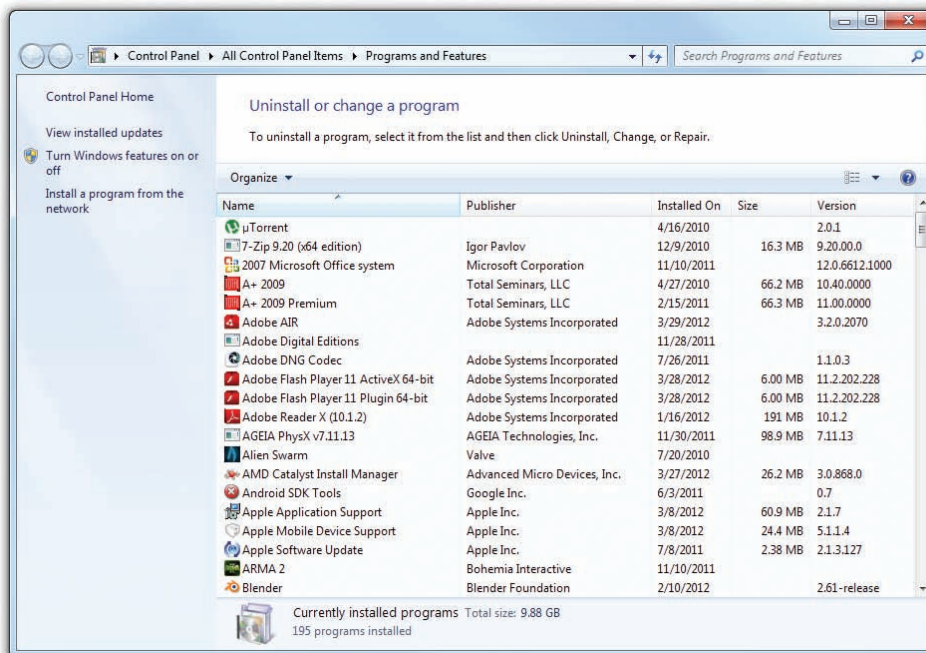
You remove a program from a Windows PC in much the same manner as you install it. That is, you use the application's own uninstall program, when possible. You normally find the uninstall program listed in the application's folder in the All Programs section of the Start menu, as shown in Figure 17.21.

If an uninstall program is not available, use the appropriate Windows Control Panel applet you learned about earlier to remove the software. Figure 17.22 shows this applet in Windows 7. You select the program you want to remove and click the Uninstall/Change button or Change/Remove button. Windows displays a message warning you that the program will be permanently removed from your PC. If you're certain you want to continue, click Yes.

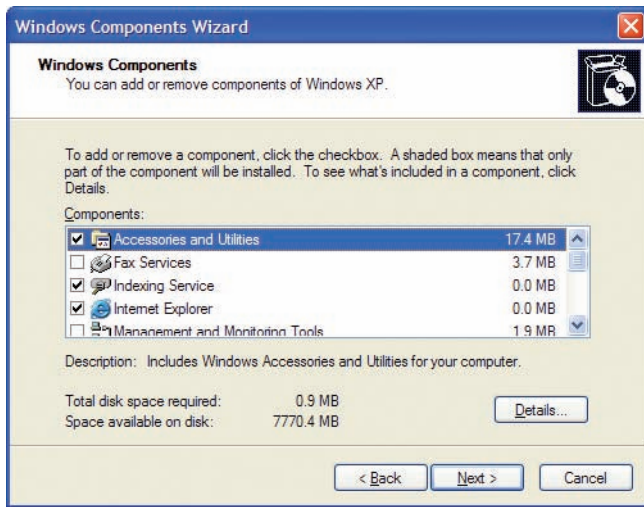
You may then see a message telling you that a shared file that appears to no longer be in use is about to be deleted, and asking your approval. Generally speaking, it's safe to delete such files. If you do not delete them, they will likely be orphaned and remain unused on your hard disk forever. In some cases, clicking the Uninstall/Change or Change/Remove button starts the application's install program (the one you couldn't find before) so you can modify the installed features. This is a function of



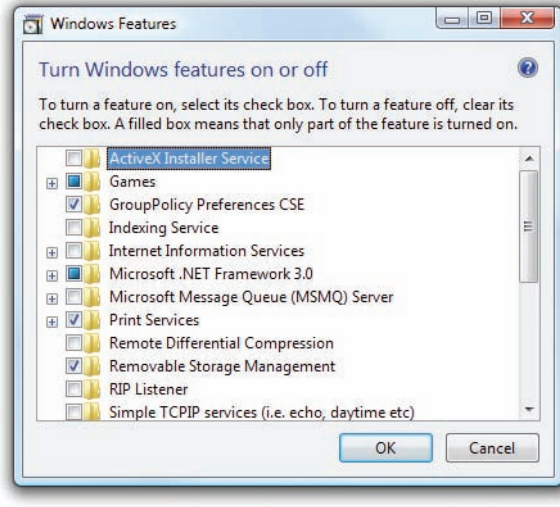
• Figure 17.21 Uninstall me!



• Figure 17.22 Programs and Features applet



• **Figure 17.23** Windows Components Wizard



• **Figure 17.24** Windows Features dialog box in Vista



The Uninstall/Change and Change/Remove buttons change depending on the program. Not all programs can be changed.

the program you're attempting to remove. The end result should be the removal of the application and all of its pieces and parts, including files and Registry entries.

### Adding or Removing Windows Components/Features

When you installed Windows, it included certain features by default. It installed Notepad, modem support, and games on your computer. You can remove these Windows components from your system if you like, and add other components as well. If you're adding components in Windows XP, you'll need a copy of your installation disc, or another location where the Windows source files are stored. This task really hasn't changed from previous versions of Windows.

To add or remove a Windows component in Windows XP, open the Add/Remove Programs applet in the Control Panel. From here, select Add/Remove Windows Components, which opens the Windows Components Wizard (see Figure 17.23). You can select an installed program here. You can see how frequently it is used, how much disk space it uses, and (sometimes) the last time it was used.

In Windows Vista/7, open the Programs and Features applet in the Control Panel, and then click the *Turn Windows features on or off* option on the Tasks list. Click Continue if prompted by UAC and you will be presented with the Windows Features dialog box (see Figure 17.24). To toggle a feature on or off, simply click its checkbox. Unlike Windows XP, you no longer need to have the installation disc to turn on features.



### Try This!

#### Adding and Removing Windows Components

You owe it to yourself to master the skills on adding and removing Windows components, so try this! Follow the instructions in the text and add something to a Windows PC. Check to make sure it works. Then go through the process to remove it afterward. Better?

# Installing/Optimizing a Device

The processes for optimizing hardware in Windows are absolutely identical between the versions, even down to the troubleshooting utilities, and are very similar to the steps for installing a new device. The installation process is covered in every chapter of this book that deals with one type of device or another, so this section concentrates on the issues that fit best under optimization.

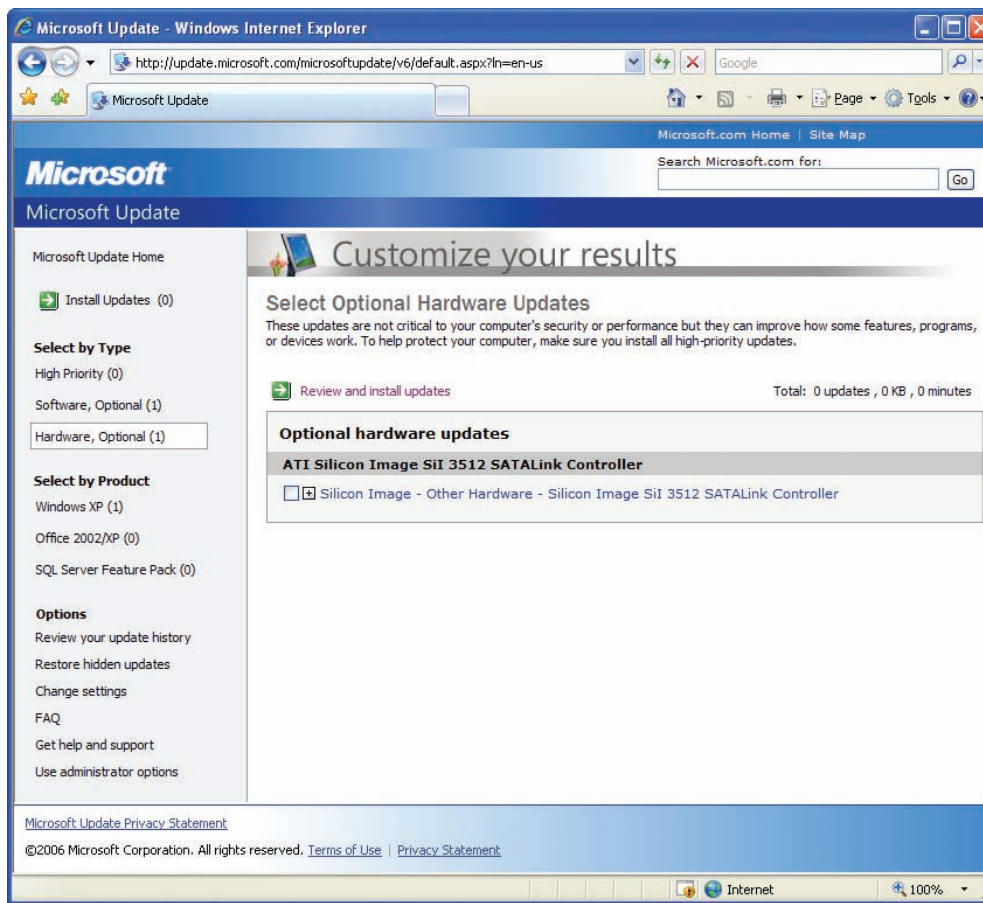


Both CompTIA A+ exams test you on installing and optimizing devices.

## Updating Drivers

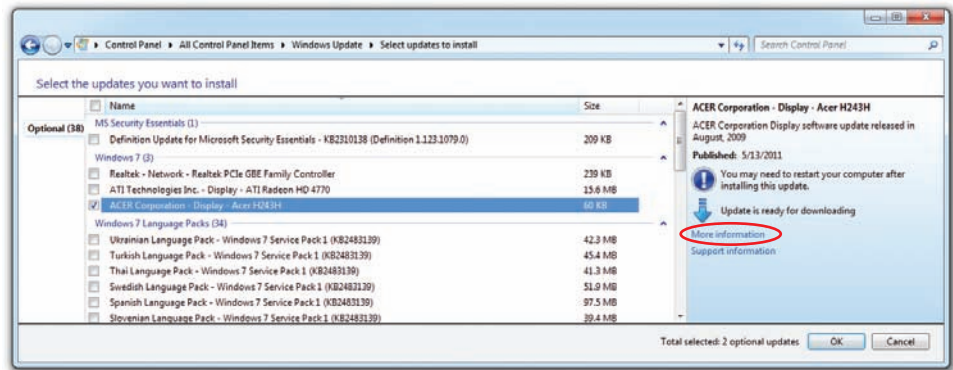
Device manufacturers occasionally update their drivers. Most of these updates fix problems, but many updates incorporate new features. Whatever the case, when one of your devices gets an updated driver, it's your job to install it. Windows Update provides an easy method to update drivers from manufacturers that take advantage of the service. If you are using Windows XP, you usually need to select the Custom option to see these updates because the Express option only installs high-priority updates. When you click on the Custom option, look under Hardware, Optional (on the left) to see if Windows has any driver updates (see Figure 17.25).

If you are using Vista/7, you will need to click *View available updates* to see if any drivers are available for your system. No matter which version of Windows you have, you should research all driver updates before



• **Figure 17.25** Optional Hardware updates





• **Figure 17.26** The More information link—don't trust it.

you install them. In theory, the best way to do this research is to click on the More information button next to the driver (see Figure 17.26) to get the details on what's new with a particular driver, but this rarely seems to produce good information. Instead, go to the manufacturer's Web site and read up on what that driver provides, and then download the latest driver there.

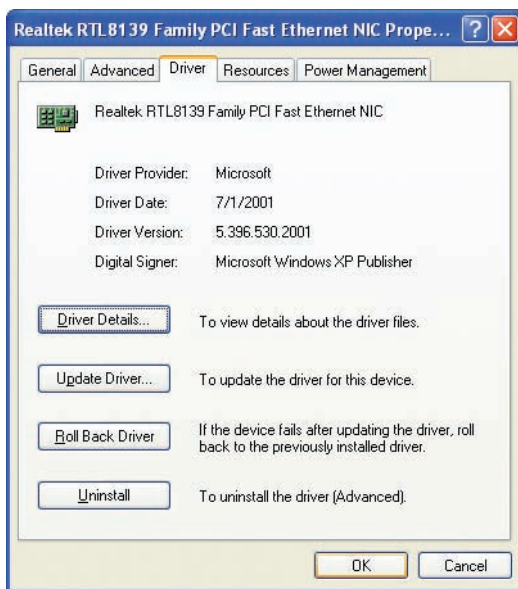
If Windows does not put a driver update in the Windows Update tool, how do you know a device needs updating? The trick is to know your devices. Video card manufacturers update drivers quite often. Get in the habit of registering your video card with the manufacturer to stay up to date. Any very new device is also a good candidate for an update. When you buy that new cool toy for your system, make a point to head over to the manufacturer's Web site and see if any updates have come out since it was packaged for sale. That happens more often than you might think!

Once a driver is installed, test it hard. Use the new features or capabilities that motivated you to install the new driver in the first place. Make the hardware that the driver supports do everything, and look for any problems. If anything goes wrong, you can roll back a bad driver in Device Manager, as described a bit later in the chapter.

### Driver Signing

Device drivers become part of the operating system and thus have the potential to cause lots of problems if they're written poorly. To protect Windows systems from bad device drivers, Microsoft uses **driver signing**, which means that each driver has a digital signature. Any drivers included on the Windows installation media or Windows Update are digitally signed. Once you have installed a driver, you can look at its Properties dialog box to confirm that it was digitally signed. Figure 17.27 shows a digitally signed network card driver.

When an unsigned driver is detected during hardware installation in Windows XP, you'll see the message in Figure 17.28 offering you the choice to stop or continue the installation. Signed drivers are more or less a sure thing, but that doesn't mean unsigned ones are a problem—just consider the source of the driver and ensure that your device works properly after installation.



• **Figure 17.27** A digitally signed driver



## Cross Check

### Driver Signing

You learned about signed and unsigned drivers way back in Chapter 9, so turn there now and see if you can answer these questions. What does the *Designed for Windows* logo do for devices? Are all unsigned drivers dangerous? What does a manufacturer get for participating successfully in the Windows Certification Program?

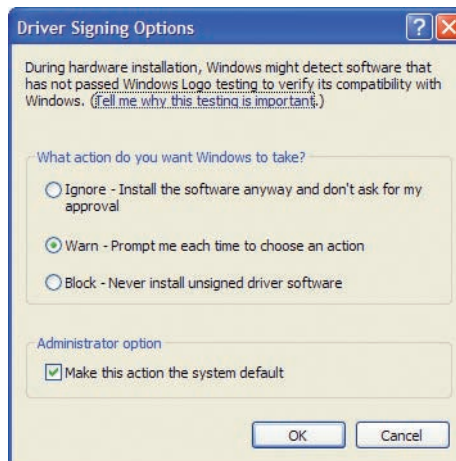
You can control how Windows XP behaves when drivers are being installed. Click the Driver Signing button on the Hardware tab of the System Properties dialog box to display the Driver Signing Options dialog box shown in Figure 17.29. If you select Ignore, Windows will install an unsigned driver without warning you. If you select Warn, you will be prompted when Windows detects an unsigned driver during driver installation, and you will be given the opportunity to either stop or continue the installation. Choosing Block will prevent the installation of unsigned drivers.

The default Driver Signing setting is Warn. This is also the default setting during installation, so you will always be warned when Windows detects an unsigned driver during Windows installation. This is no problem for a standard installation, when you are sitting at the computer, responding to all prompts—but it is a problem for automated, unattended installations. This is a good reason to check out all your device drivers before installing Windows.

Windows Vista and Windows 7 have eliminated the driver signing options. With these versions of Windows, all installed drivers are inspected for a digital signature and you are prompted with a warning if the driver is unsigned (see Figure 17.30). In 64-bit versions of Windows, all drivers must be signed. No exceptions. Microsoft wants to keep tight controls on the drivers to improve stability.



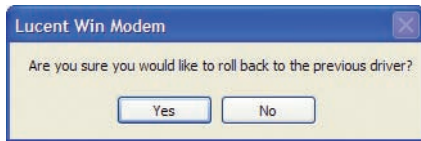
• **Figure 17.28** Stop or continue installation of an unsigned driver



• **Figure 17.29** Driver Signing Options dialog box



• **Figure 17.30** Unsigned driver in Windows 7



• **Figure 17.31** Rolling back to the previous driver

Remember from Chapter 9 that you can also use the Add Hardware Wizard in Windows 7 using the `hdwwiz.exe` program.

## Device Manager

You've worked with **Device Manager** in other chapters when installing and troubleshooting devices; it's also the tool to use when optimizing device drivers. Right-click on a device in Device Manager to display the context menu. From here you can update or uninstall the driver, disable the device, scan for hardware changes, or display the Properties dialog box. When you open the Properties dialog box, you'll see several tabs that vary according to the specific device. Most have General, Driver, Details, and Resources. The tab that matters most for optimization is the Driver tab.

The Driver tab has buttons labeled Driver Details, Update Driver, Roll Back Driver, and Uninstall. Windows Vista/7 also include a Disable option, which does exactly what you think it does. Driver Details lists the driver files and their locations on disk. Update Driver opens the Hard-

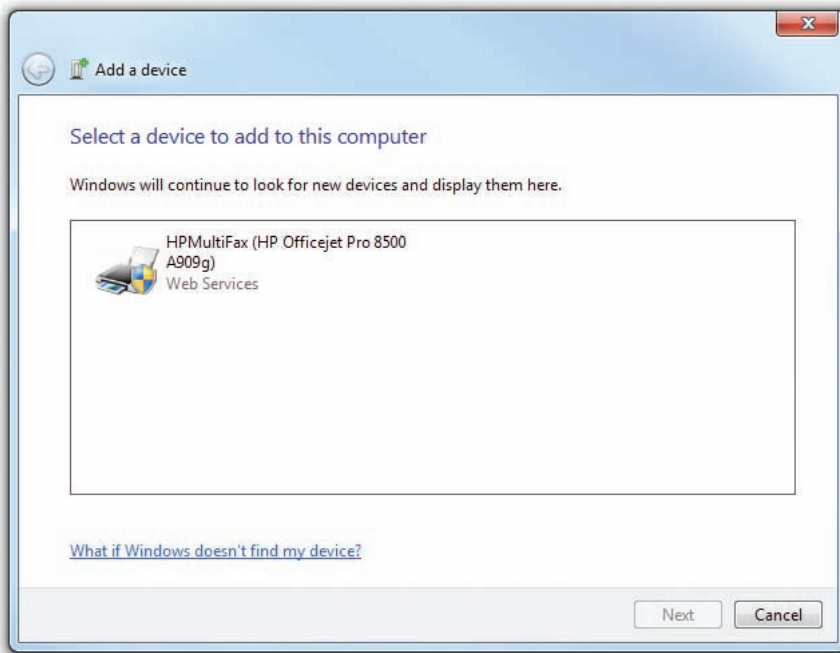
ware Update Wizard—not very useful given that the installation programs for almost all drivers do this automatically. The Roll Back Driver option is a different story. It enables you to remove an updated driver, thus rolling back to the previous driver version. Roll Back Driver (see Figure 17.31) is a lifesaver when you install a new driver and suddenly discover it's worse than the driver it replaced! Uninstall removes the driver.

## Adding a New Device

Windows should automatically detect any new device you install in your system. If Windows does not detect a newly connected device, use Windows XP's or Windows Vista's Add Hardware Wizard, which you can find in the Add Hardware applet, or use Windows 7's *Add a device* option in the Devices and Printers applet to get the device recognized and drivers installed (see Figure 17.32).

Windows Vista/7 almost completely automated the Add Hardware/Add a Device Wizards. The wizards present you with a list of detected hardware. Windows XP behaves a bit differently; it requires you to click Next on the Welcome screen to get started. The wizard searches for hardware that has been connected but does not yet have a driver installed. If it detects the device, select it, and the wizard installs the driver. You may have to point to the source location for the driver files. If it does not detect the device, which is very likely, it will ask you if the hardware is connected. When you answer yes and click Next, it gives you a list of installed hardware, similar to Figure 17.33.

If the device is in the list, select it and click Next. If not, scroll to the bottom and select *Add a new hardware device*, and then click Next. If the device is a printer, network card, or modem, select *Search for and install the hardware automatically* and click Next. In that case, once the wizard detects the device and installs the driver, you're finished. If you do see your device on the list, your best hope is to select *Install the hardware that I manually select from a list*. In the subsequent screens, select the appropriate device category,



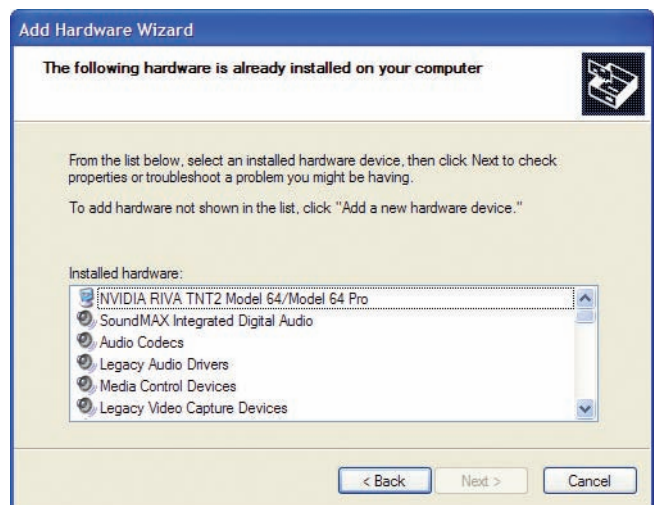
• **Figure 17.32** Adding a device in Windows 7

select the device manufacturer and the correct model, and respond to the prompts from the Add Hardware Wizard to complete the installation.

## Performance Options

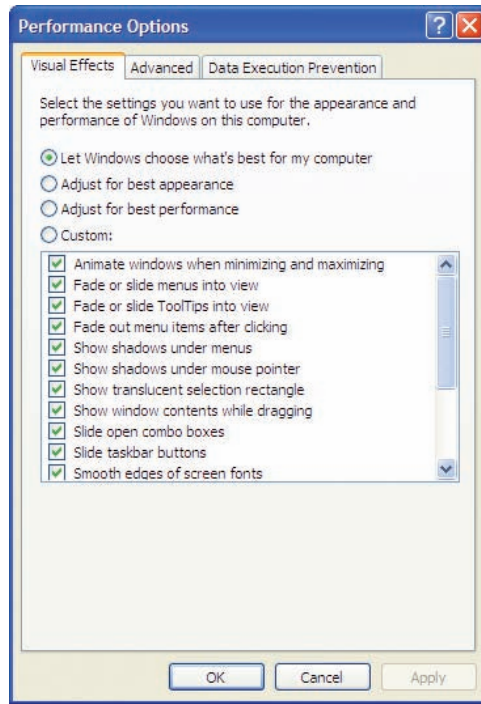
One optimization you can perform on all Windows versions is setting Performance Options. **Performance Options** are used to configure CPU, RAM, and virtual memory (page file) settings. To access these options in Windows XP, right-click My Computer and select Properties, click the Advanced tab, and click the Settings button in the Performance section of that tab. In Windows Vista/7, right-click Computer and select Properties, and then click the *Advanced system settings* link in the Tasks list. On the Advanced tab, click the Settings button in the Performance section.

The Performance Options dialog box has three tabs: Visual Effects, Advanced, and Data Execution Prevention (see Figure 17.34). The Visual Effects tab enables you to adjust visual effects that impact performance, such as animations, thumbnails, and transparencies. Try clicking the top three choices in turn and watch the list of settings. Notice the tiny difference between the first two choices (*Let Windows choose what's best for my computer* and *Adjust for best appearance*). The third choice, *Adjust for best performance*, turns off all visual effects, and the fourth option is an invitation to make your own adjustments. If you're on a computer that barely supports Windows, turning off visual effects can make a

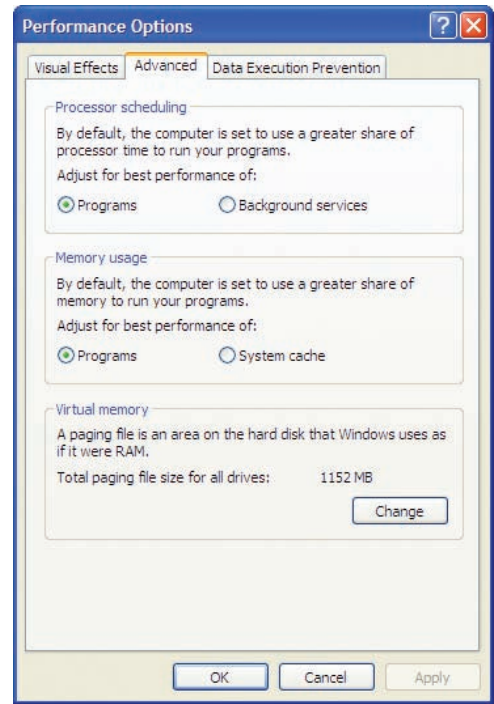


• **Figure 17.33** List of installed hardware in Windows XP





• **Figure 17.34** Windows XP Performance Options dialog box



• **Figure 17.35** Advanced tab of Performance Options dialog box

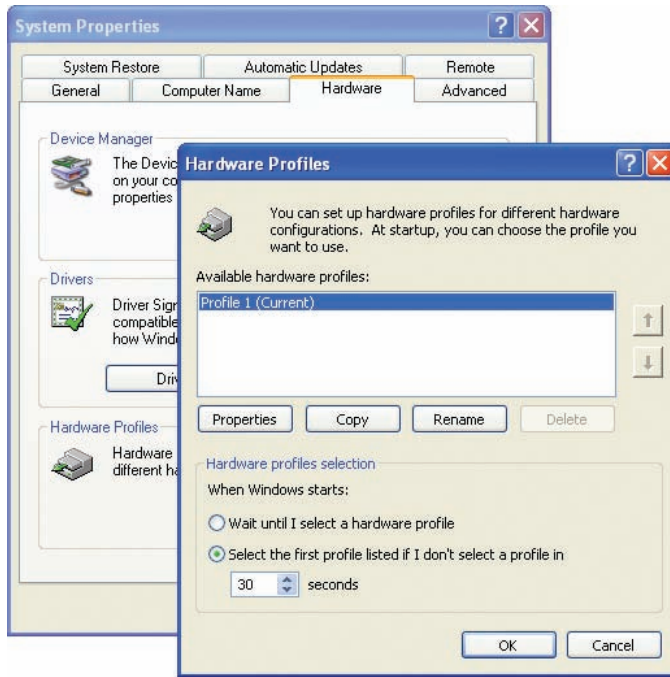
huge difference in the responsiveness of the computer. For the most part, though, just leave these settings alone.

The Advanced tab, shown in Figure 17.35, has three sections: Processor scheduling, Memory usage (Windows XP only), and Virtual memory. Under the Processor scheduling section, you can choose to adjust for best performance of either Programs or Background services. The Memory usage settings enable you to allocate a greater share of memory to programs or to the system cache. The Virtual memory section of this tab enables you to modify the size and location of the page file. Microsoft dropped the Memory usage settings option in Windows Vista and Windows 7.

Microsoft introduced *Data Execution Prevention (DEP)* with Windows XP Service Pack 2. DEP works in the background to stop viruses and other malware from taking over programs loaded in system memory. It doesn't prevent viruses from being installed on your computer, but makes them less effective. By default, DEP monitors only critical operating system files in RAM, but the Data Execution Prevention tab enables you to have DEP monitor all running programs. It works, but you'll take a performance hit. Like other options in the Performance Options dialog box, leaving the default DEP settings is the best option most of the time.

## Hardware Profiles

Windows XP has an interesting feature called **Hardware Profiles**. There are many unique situations, mainly with portable computers, where a user is motivated to not have all of their hardware devices running at all times. Imagine a user who has a laptop with a wireless network card. She also has



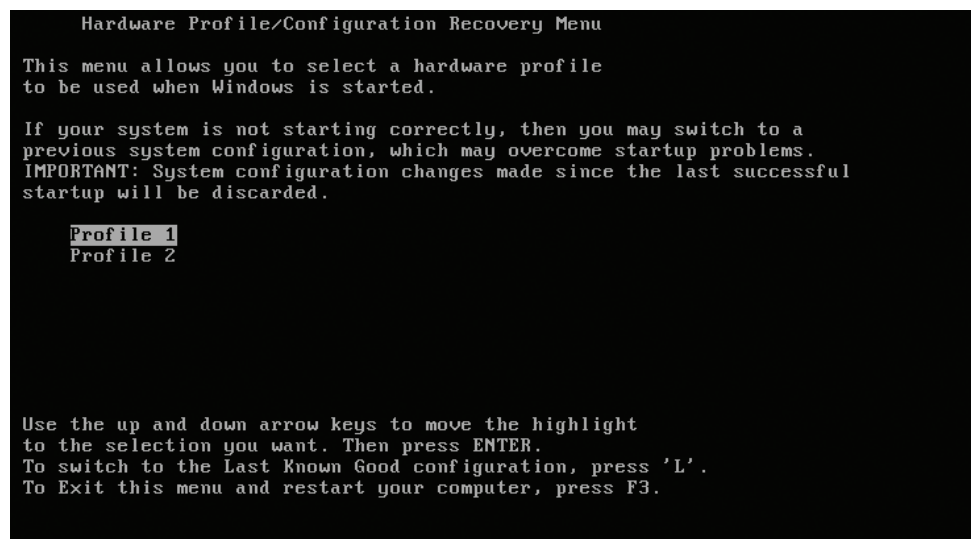
• **Figure 17.36** Default Hardware Profiles

a docking station in her office that includes a wired NIC. When the user is plugged into the docking station, she wants to use the wired connection, and when disconnected, she wants to use the wireless connection. In Windows XP, you can create two hardware profiles: one where the wired network card is disabled in Device Manager and another where the wireless network card is disabled.

You can inspect hardware profiles by going to the System applet in the Control Panel, selecting the Hardware tab, and then clicking Hardware Profiles (see Figure 17.36). All Windows XP systems have one hardware profile by default.

You can make a second profile by copying the default profile. If you have more than one profile, Windows XP will prompt you with a text menu every time you boot the computer, similar to the one shown in Figure 17.37.

There was a tremendous uproar from a small group of impassioned hardware profile fans when Microsoft decided to drop the feature from Windows Vista and Windows 7.



• **Figure 17.37** Hardware Profile boot menu



The Backup Utility is not included in the default installation of Windows XP Home. You must install it manually from the Windows CD-ROM.



### Tech Tip

#### Backup Program Naming Nightmare

Microsoft has been dreadfully inconsistent on the naming of the backup programs that bundle with Windows. Here's the scoop in a nutshell.

The backup program in Windows XP has a slew of names. The official name of the program is Backup Utility for Windows. The Advanced Mode dialog box is called Backup Utility, but the wizard interface differs depending on whether you run the utility in Wizard Mode or click the Backup Wizard button in the Advanced Mode dialog box. The former runs the Backup or Restore Wizard; the latter runs the Backup Wizard. These wizards offer different options, with the Backup or Restore Wizard providing the simpler, consumer-oriented interface. Both wizards are only different faces for the Backup Utility. Got it? Oh, and `ntbackup` is the command-line command to run the program in Windows XP, so Microsoft provides at least a nod at naming consistency.

Most seasoned techs call the backup programs in Windows XP Backup or NTBackup. You need to know the variety of names, though, to provide proper customer support. This is especially true in a help desk environment.

## ■ Preparing Windows for Problems

Techs need to prepare for problems. You must have critical system files and data backed up and tools in place for the inevitable glitches. Different versions of Windows enable you to prepare for problems differently. Windows includes multiple backup systems that do different things. Each backup system enables you to:

- Back up personal data
- Back up local copies of critical system state information
- Restore a backup if your system won't boot

## Backing Up Personal Data

The most important data on your computer is the personal data: your documents, e-mail messages and contacts, Web favorites, photographs, and other files. To handle backing up personal data, every version of Windows comes with some form of backup utility. There are big differences between the backup included in Windows XP and the backup included in Windows Vista and Windows 7, so let's break up the idea of backing up personal data between Windows XP and Windows Vista/7.

### Backup Utility for XP (`ntbackup`)

Windows XP's **Backup Utility** (popularly known by the name of the executable program, `ntbackup`) provides almost all the tools you need to back up files and folders. It has come a long way from its origins in Windows NT. The `ntbackup` program supports a greater variety of devices, enabling you to back up to network drives, local drives, tape, and removable disks (but not optical discs). Most folks, however, still turn to third-party utilities to create system, e-mail, browser, and personal data backups.

You can start NTBackup by navigating the Start menu to Accessories | System Tools, or by clicking the Backup Now button on the Tools tab of the local disk's Properties dialog box. I prefer to start it from Start | Run with the command `ntbackup`. Click the Backup Wizard button to run the Backup Wizard. To use the Windows XP version in Advanced Mode, click Advanced Mode on the opening screen (see Figure 17.38). To have it always open in Advanced Mode, deselect the *Always start in wizard mode* checkbox. If the program is in Advanced Mode and you want to run it as a wizard, click the Wizard Mode link to open the Backup or Restore Wizard.

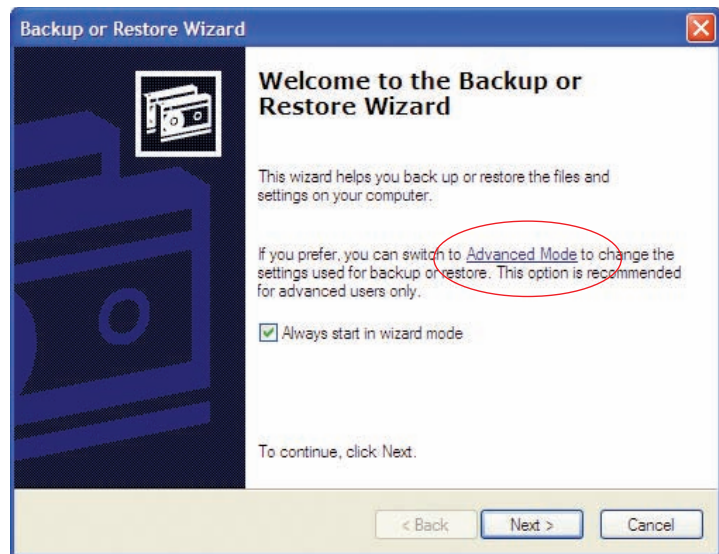
To create a backup, start the Backup Utility, click Advanced Mode, and choose the Backup tab. Check the boxes next to the drives and files you want to include in the backup. To include your system state information, such as Registry and boot files (which you should do), click the System State checkbox. To specify where to put the backup file you're creating, either type the path and file name in the *Backup media or file name* box or click Browse, select a location, type the file name, and click Save. Click Start Backup. Choose whether you want to append this backup to a previous one or overwrite it. Click Advanced to open the Advanced Backup Options dialog box, select *Verify data after backup*, and click OK. Click Start Backup again. A dialog box

shows you the utility's progress. When it finishes, click Close and then close the Backup Utility.

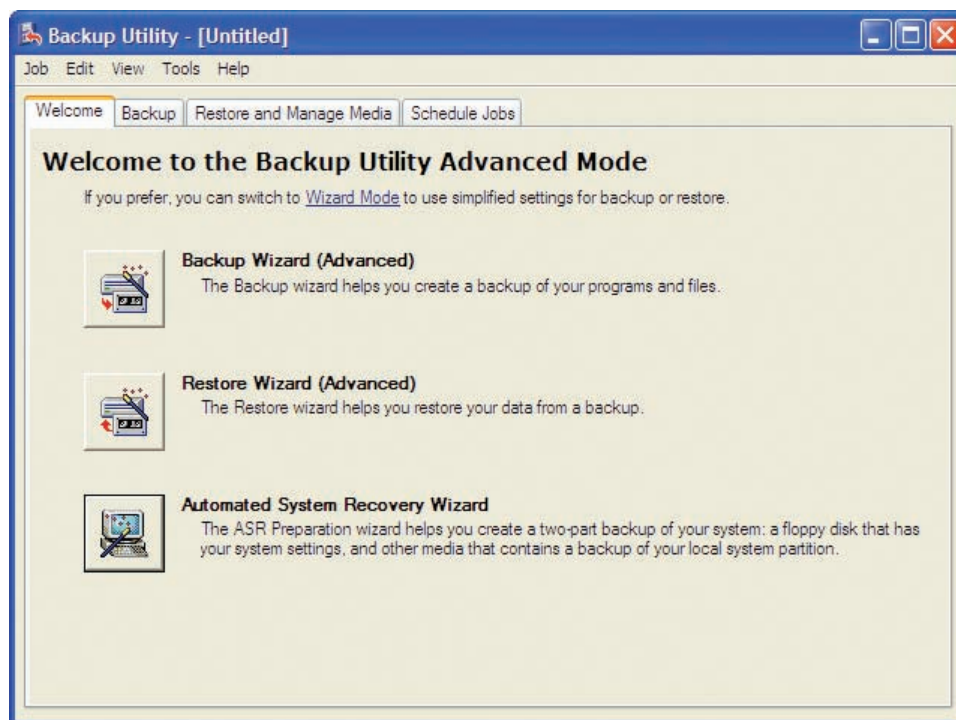
NTBackup gives you three choices after you click Advanced Mode: Backup Wizard (Advanced), Restore Wizard (Advanced), and Automated System Recovery Wizard (see Figure 17.39). First, I'm going to dive into the Backup Wizard and Automated System Recovery Wizard. Then we'll look at tape backups and more backup options.

**Backup Wizard (Advanced)** If you run the Backup Wizard and click the Next button on the Welcome screen, you'll open the dialog box in Figure 17.40. You have three options here. The first two are fairly self-explanatory: You can back up everything or just selected drives and files.

The third option needs some explanation. The *Only back up the System State data* radio button enables you to save "other" system-critical files. This option really makes sense for Windows Server systems because it saves Active Directory information (which your Windows XP systems do not store) as well as other critical, server-specific functions. (I cover more on these topics in Chapter 22.)

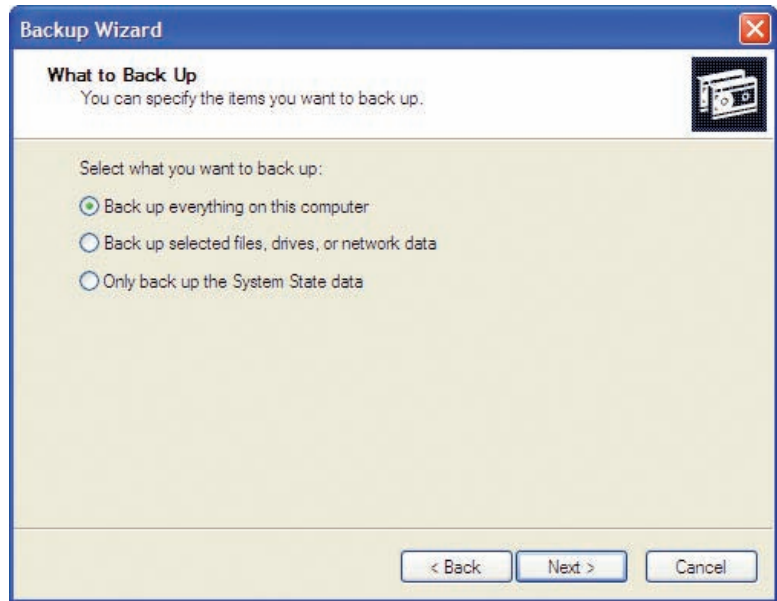


• **Figure 17.38** Choosing to run the Backup Wizard in Advanced Mode



• **Figure 17.39** Windows XP Backup Utility options





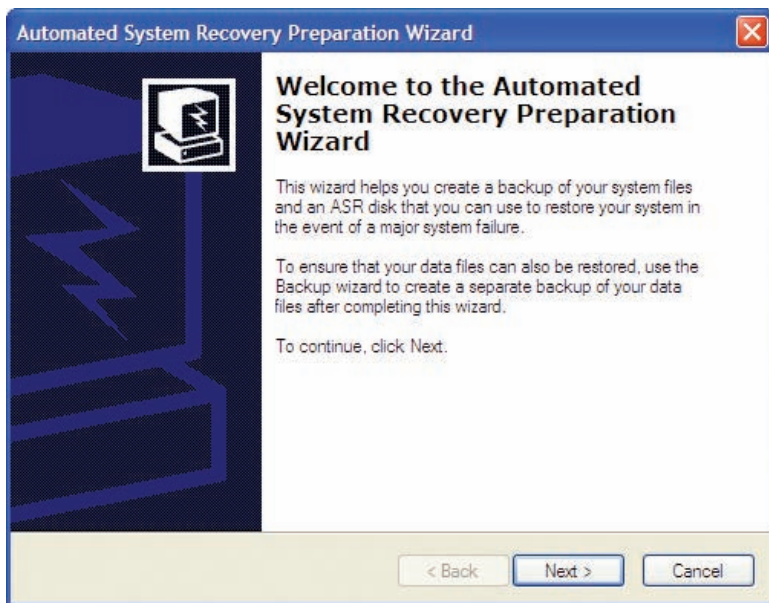
• **Figure 17.40** Backup Wizard options

**Windows XP Automated System Recovery (ASR)** The Windows XP **Automated System Recovery (ASR)** is your last line of defense when restoring functionality to your PC (see Figure 17.41). It backs up your boot and system volumes (meaning your C: drive, in most cases) and the system state information—the Registry, boot files, and other critical system files. Here’s how it works.

First, you create the ASR backup. This involves creating a large backup file that includes the boot volume, the system volume, and the system state information and placing it on a separate drive or some form of removable media. This will include all applications and user data on that one drive—it

won’t back up extra partitions or drives. You also need to create a nonbootable ASR floppy disk. The floppy disk stores information critical to the restoration process. Don’t lose one of these items, either—the ASR backup is tied to its ASR floppy disk and won’t work without both components.

To restore the ASR, you’ll need your Windows XP installation disc. Boot into the Windows installer and press F2 to start the ASR restore process. Insert the ASR floppy disk and follow the instructions on the screen. The installer formats your boot and system partition(s), and then performs a mini-installation of devices, drivers, and other basic configurations. Then the ASR Recovery Wizard launches, asking for the location of that backup file you made. Point it to the file, and the restoration process will complete.



• **Figure 17.41** Creating an ASR backup

**Tape Backup** The odd fact that Microsoft never updated the Backup or Restore Wizard in Windows XP to enable you to back up to optical discs of any sort has kept alive the practice of tape backups. Tape drives connect to the ATA or SCSI bus, just like optical drives, but rather than using a shiny CD-R or DVD+R disc, you have to back up to magnetic tape (see Figure 17.42).

There are a large number of different tape formats, but CompTIA lists only one technology, Digital Linear Tape (DLT), in the CompTIA A+ Acronyms list. DLT was a popular tape format from the 1980s up to the early 2000s, with capacities from 10 MB in the early versions up to (arguably) around 800 GB. DLT is rarely used anymore, and CompTIA should have removed this from the CompTIA A+ exam competencies.

Tape drive manufacturers have done pretty much everything they can do to make tape backups as fast as possible, but the technology suffers from two huge drawbacks. First, it's tape, which means all data must be stored and restored in sequential access. The drive has to go through Files 1 and 2 before reaching File 3, in other words. Second, tape is painfully slow in comparison to hard drives, optical drives, or Flash-media drives. With plenty of cheap online, hard drive, and recordable optical media options available for backup, though, tape's days are numbered.

**Backup Options** The goal of backing up data is to ensure that when a system dies, there will be an available, recent copy you can use to restore the system. You could simply back up the complete system at the end of each day—or whatever interval you feel is prudent to keep the backups fresh—but complete backups can be a tremendous waste of time and materials. Instead of backing up the entire system, take advantage of the fact that not all of the files will be changed in any given period; much of the time you only need to back up what's changed since your last backup. Recognizing this, most backup software solutions have a series of options available beyond the complete backup.

The key to understanding backups other than the full backup is *attributes*, 1-bit storage areas that all files have. The most common attributes are hidden (don't show the file in Computer or when `dir` is typed at the command line), system (it's a critical file for the system), read-only (can't erase it), and archive. These attributes were first used in FAT-formatted drives in



• **Figure 17.42** Backup tapes



The CompTIA A+ 220-802 exam lists *repair disk* as an objective even though the Emergency Repair Disk (ERD) tool was phased out with Windows 2000. If it comes up, know that the ERD was a much simpler version of Windows XP's ASR that backed up critical system and boot files. See also Chapter 19 on creating a *system repair disc*, an optical disc used for restoring critical backups.



Windows Explorer (My Computer in Windows XP, Computer in Vista/7) by default does not show much about files in any view, even when you select Details from the View menu or from the Change your view pull-down menu. The Details view is highly customizable, however, and can reveal a phenomenal amount and variety of information about files.

To customize your view, right-click the column bar (the bar that says Name, Size, Type, Date Modified, and so forth) to look at the default choices. You'll see everything from Attributes, Owner, Author, and Title to file type-specific information such as Genre, Duration, and Bit Rate (for music files). What you see in the initial options differs according to the version of Windows. If the default extra view options don't get your motor revving, selecting the More option brings up a menu offering many more view options! For the purposes of this section, click the Attributes box to display file and folder attributes.

the DOS era, but they are still completely supported by all file formats. The *archive bit* works basically like this: Whenever a file is saved, the archive bit is turned on. Simply opening a file affects the current state of the archive bit. Backup programs usually turn off a file's archive bit when the file is backed up. In theory, if a file's archive bit is turned off, there's a good backup of that file on some tape. If the archive bit is turned on, it means that the file has been changed since it was last backed up (see Figure 17.43).

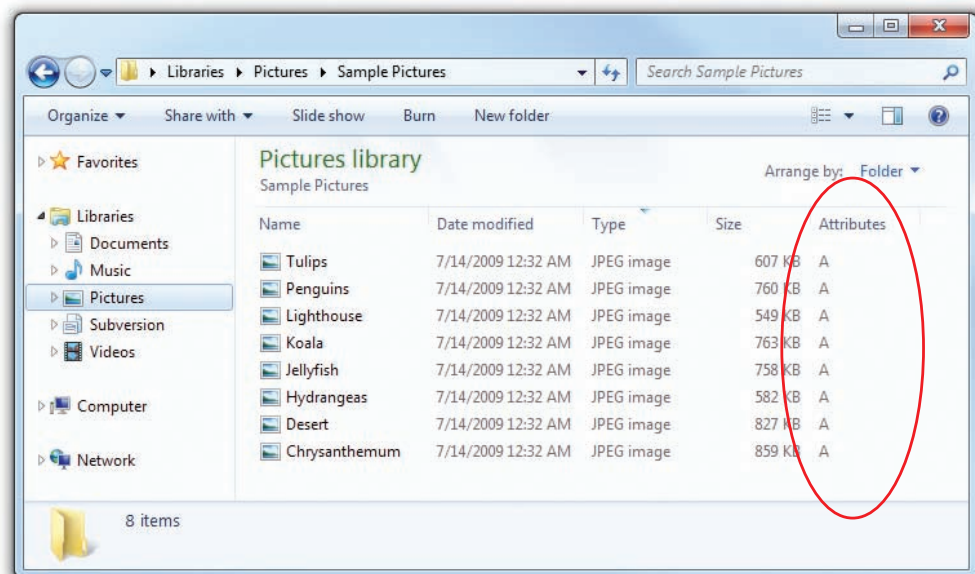
Archive bits are used to perform backups that are not full backups. The following backup types are most often supported:

- A *normal backup* is a full backup. Every file selected is backed up, and the archive bit is turned off for every file backed up. This is the standard "back it all up" option.
- A *copy backup* is identical to a normal backup, with the important distinction being that the archive bits are *not* changed. This is used (although not often) for making extra copies of a previously completed backup.
- An *incremental backup* includes only files with the archive bit turned on. In other words, it copies only the files that have been changed since the last backup. This backup turns off the archive bits.
- A *differential backup* is identical to an incremental backup, except that it doesn't turn off the archive bits.
- A *daily backup*, also known as a *daily copy backup*, makes copies of all the files that have been changed that day. It does not change the archive bits.



Be sure you know the types of backups, including which ones change the archive bits and which ones do not.

The motivation for having both the incremental and differential backups may not be clear at first glance—they seem so similar as to be basically the same. Incremental seems the better option at first. If a file is backed up, you



• **Figure 17.43** The archive bit on these files is on.

would want to turn off the archive bit, right? Well, maybe. But there is one scenario where that might not be too attractive. Most backups do a big weekly normal backup, followed by daily incremental or differential backups at the end of every business day. Figure 17.44 shows the difference between incremental and differential backups.

Notice that a differential backup is a cumulative backup. Because the archive bits are not set, it keeps backing up all changes since the last normal backup. This means the backup files will get progressively larger throughout the week (assuming a standard weekly normal backup). The incremental backup, by contrast, only backs up files changed since the last backup. Each incremental backup file will be relatively small and also totally different from the previous backup file.

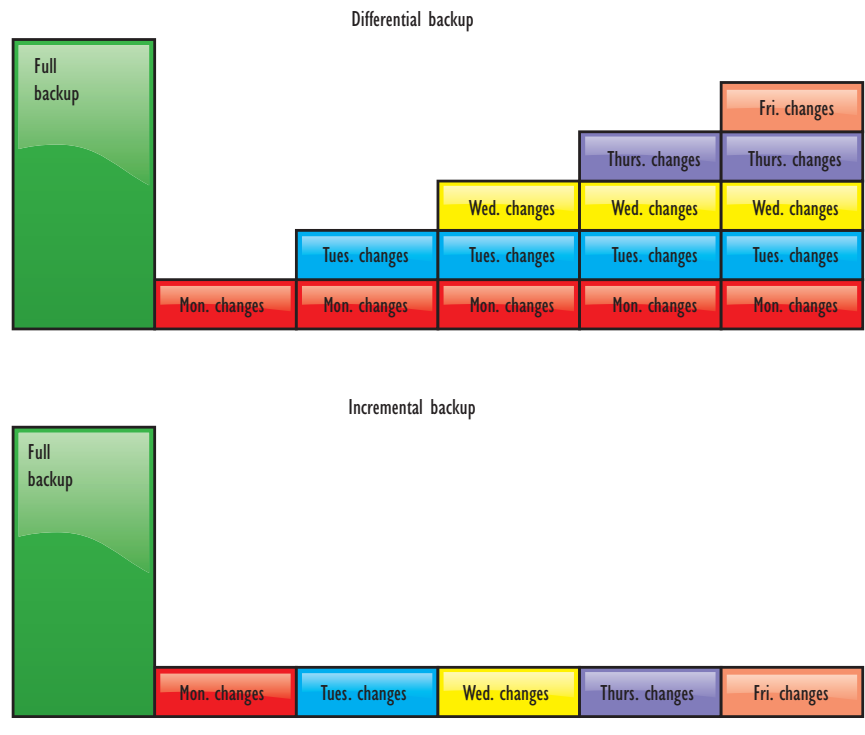
Let's assume that the system is wiped out on a Thursday morning. How can you restore the system to a useful state?

If you're using an incremental backup, you will first have to restore the last weekly backup you ran on Monday, then the Tuesday backup, and then the Wednesday backup before the system is restored to its Thursday morning state. The longer the time between normal backups, the more incremental backups you must restore.

Using the same scenario but assuming you're doing differential instead of incremental backups, you only need the weekly backup and then the Wednesday backup to restore your system. A differential backup always requires only two backups to restore a system. Suddenly, the differential backup looks better than the incremental! On the other hand, one big benefit of incremental over differential is backup file size. Differential backup files are massive compared to incremental ones.

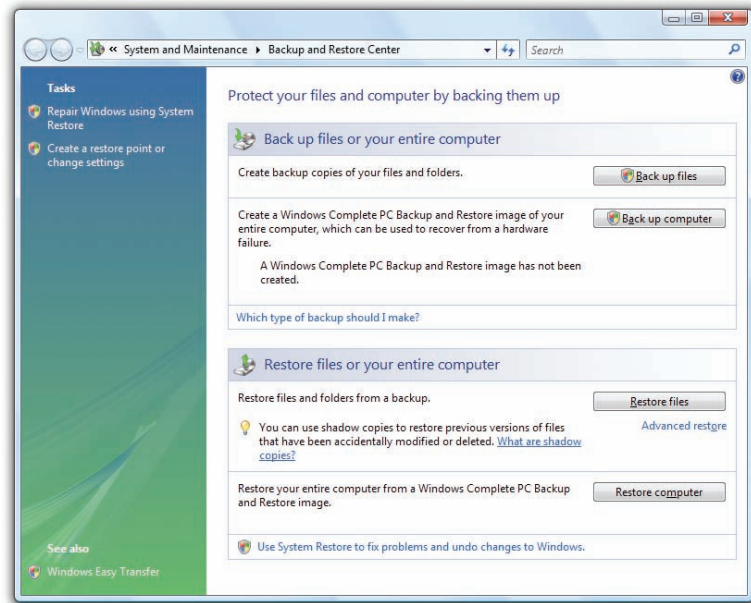
## Backup and Restore Center for Windows Vista/7

Microsoft retired the `ntbackup` program with Windows XP, replacing it with the more automated and simpler *Backup and Restore Center* (Windows Vista) and *Backup and Restore* (Windows 7) Control Panel applets. The `ntbackup` program required you to choose the files you wanted to back up as well as the type of backup (incremental, differential, or normal). Windows Vista and Windows 7 no longer ask those questions, at least not directly. In Windows Vista, you can either back up files or back up your computer (Figure 17.45). Both choices will first ask you where you want to store the backup (Figure 17.46).

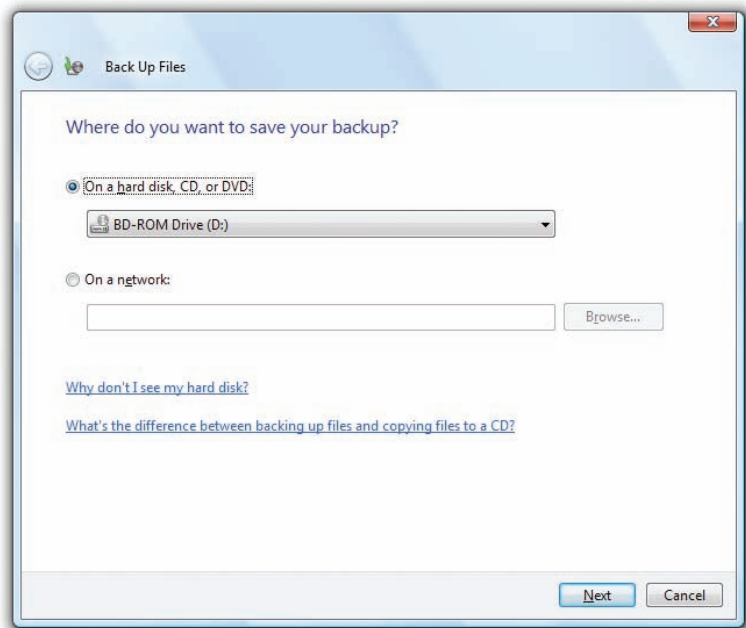


• **Figure 17.44** Incremental versus differential





• **Figure 17.45** Backup options in Vista



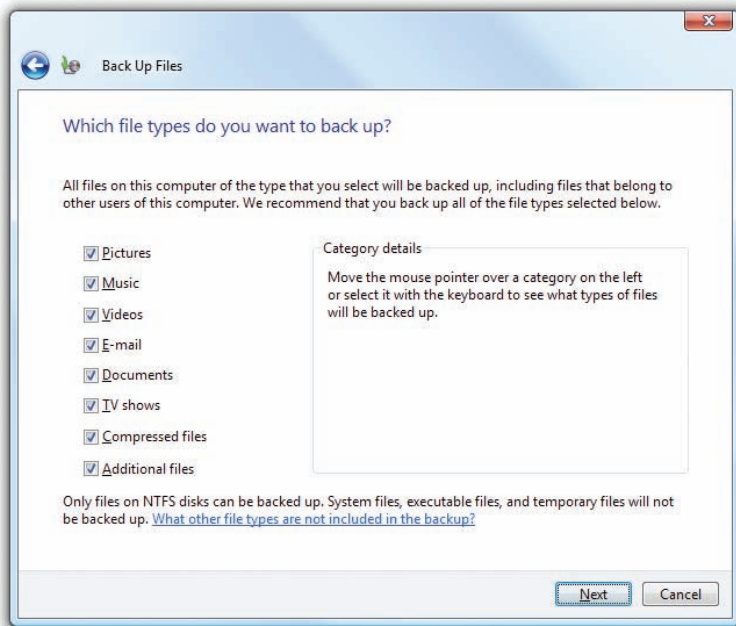
• **Figure 17.46** Backup location in Vista



Windows Vista and Windows 7 do not back up to tape drives.

Unlike `ntbackup`, Windows Vista and Windows 7 don't support backing up to tape. Acceptable options for backup media include flash drives, optical discs of all sorts, or even over a network. You can even copy the backup to any hard drive, as long as it's not the drive you're backing up.

As the name implies, the *Back up computer* option backs up your entire computer to a system image. All you need to do is pick a destination for the image (optical drive, hard drive, or network location) and Windows



• **Figure 17.47** Types of files to back up

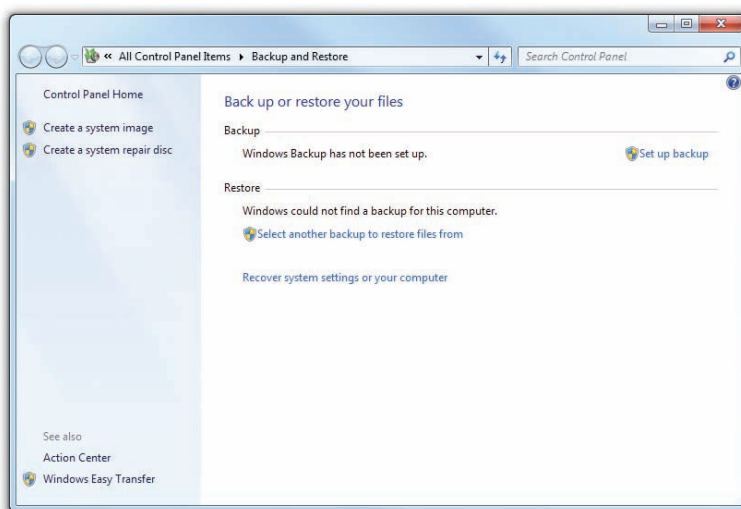
takes care of the rest. Choosing the *Back up files* option is another matter entirely. Clicking this button doesn't bring up a directory tree like you saw in ntbackup. Instead, you see the screen shown in Figure 17.47.

The *Back up files* option in Vista only enables you to back up personal information for all users. If you want to back up any installed applications, or even Windows itself, don't bother using the *Back up files* option that comes with Windows Vista.

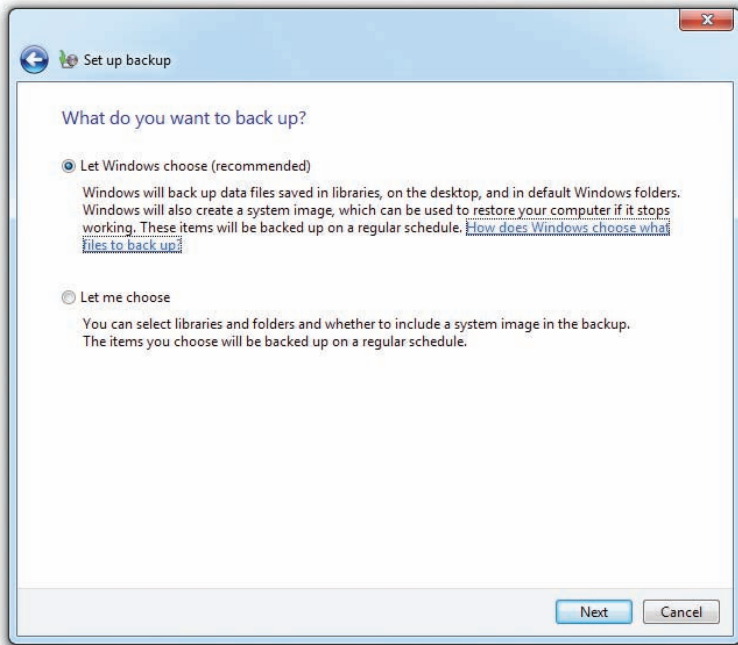
Windows 7's Backup and Restore utility includes a number of noteworthy improvements over Windows Vista's. First of all, Microsoft changed the look of the main screen (Figure 17.48).



Windows Vista and Windows 7 will not back up content stored on non-NTFS volumes.



• **Figure 17.48** Windows 7 Backup and Restore



• **Figure 17.49** What do you want to back up?

Windows image files use the .wim extension.

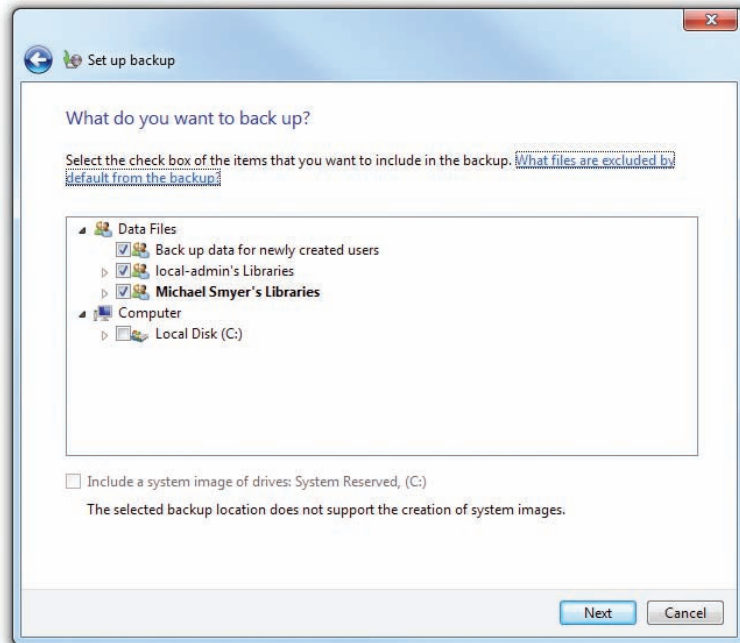
Clicking the *Set up backup* link in Windows 7 opens a dialog box asking you to choose your backup location—very similar to Vista’s backup. After selecting your backup location and clicking *Next*, you then see the screen shown in Figure 17.49.

If you select *Let Windows choose (recommended)*, you’ll get a backup similar to the Vista backup, but with one very important difference. You’ll back up each user’s personal data, but Windows 7 doesn’t stop there. Assuming you have enough space in your backup location, Windows 7 will automatically add a system image that includes the entire Windows operating system, every installed program, all device drivers, and even the registry.

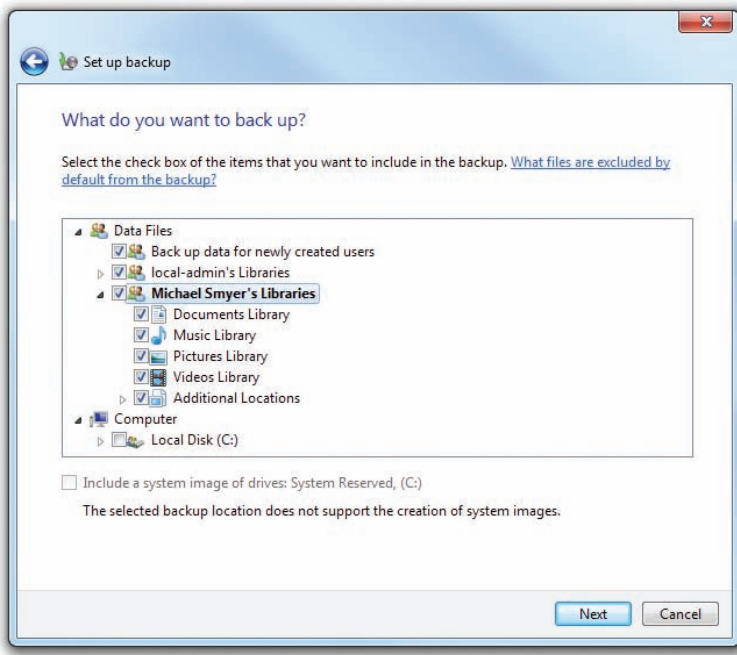
Selecting *Let me choose* is equally interesting. Unlike Vista’s selection, Windows 7 enables you to pick individual users’ files to back up (Figure 17.50).

By selecting a user, you can choose libraries or the user’s personal folders to back up, as shown in Figure 17.51. Also note the

checkbox that gives you the option to make a system image, just as if you selected the *Let Windows choose (recommended)* option.



• **Figure 17.50** Backup showing a list of users

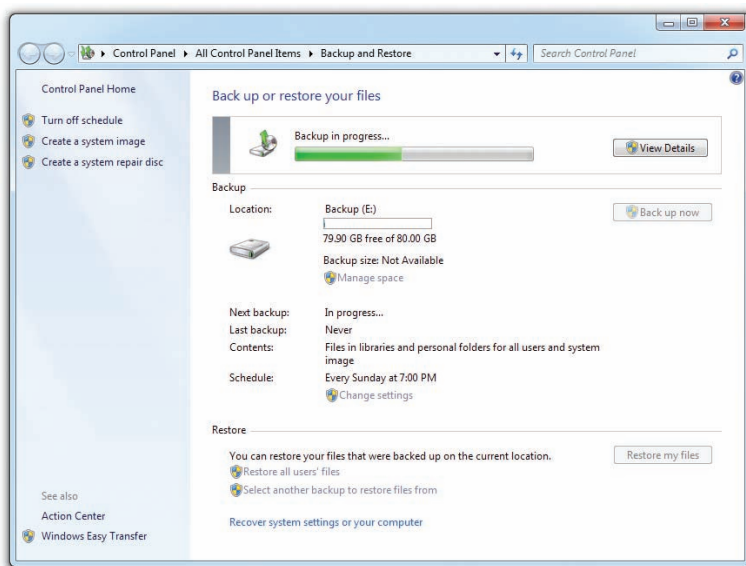


• **Figure 17.51** Single user, showing some of the user's libraries/folders

Once you complete the wizard, Windows starts backing up your files. While the backup runs, you can monitor its process with an exciting and handy progress bar (Figure 17.52). If you can't handle that much excitement, you can close the backup window while the OS backs up files. The process can take a long time, many hours with a modern system with a large hard drive.



You can also choose to create just a system image in Windows 7. From the Backup and Restore applet, select *Create a system image*. It works like the system image function in Windows Vista.



• **Figure 17.52** Backup in progress ...





## Try This!

### Creating a System Image

If you have a copy of Windows 7 installed and a handy second hard drive with enough free space to hold the contents of your primary drive, try this! Install the second hard drive (see Chapters 11 and 12 if you need to recall the steps) and run the Backup and Restore applet. Create a system image and then bask in how easy it is to keep your system secure in Windows 7!

## System Restore

Every technician has war stories about the user who likes to add the latest gadget and cool software to his computer. Then he's amazed when things go very, very wrong: the system locks up, refuses to boot, or simply acts weird. This guy also can't remember what he added or when. All he knows is that you should be able to fix it—fast.

This is not news to the folks at Microsoft, and they have a solution to this problem. It's called **System Restore**, and they first introduced it in Windows Me, with further refinements in Windows XP. The System Restore tool enables you to create a **restore point**, a copy of your computer's configuration at a specific point in time. If you later crash or have a corrupted OS, you can restore the system to its previous state.

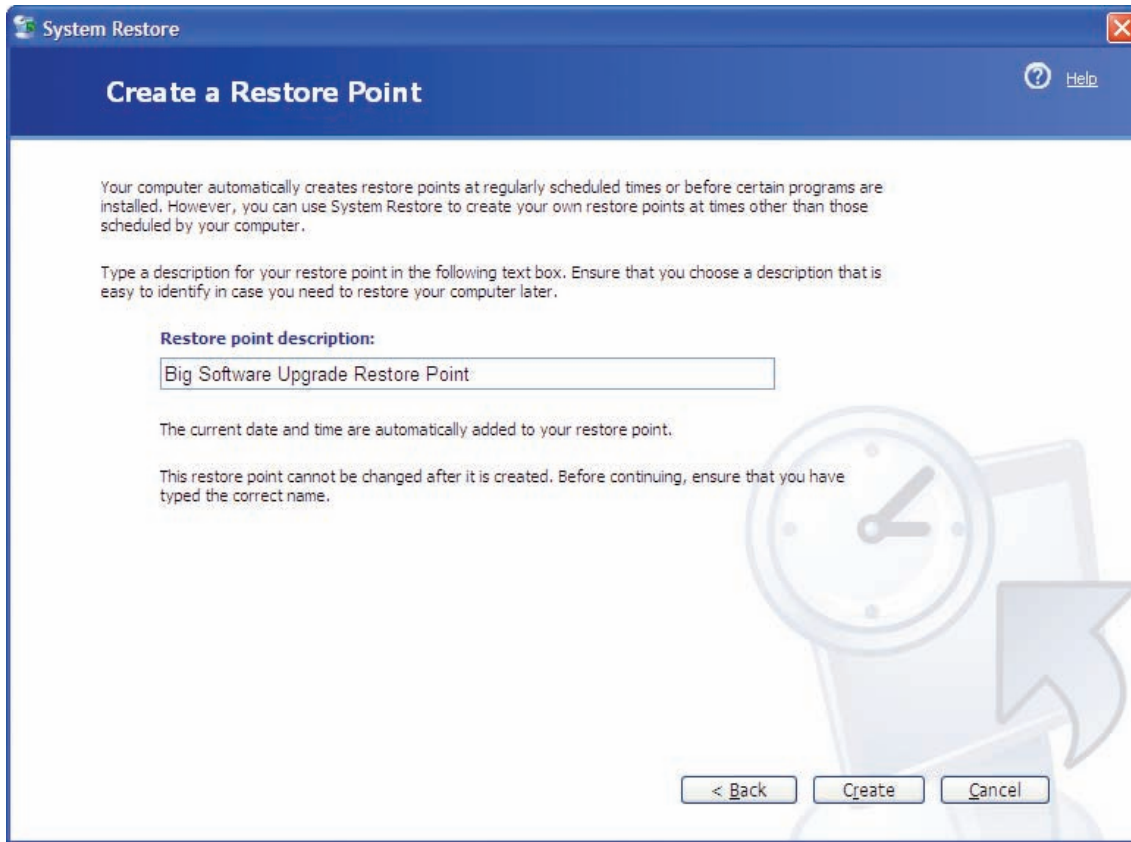
To create a restore point in Windows XP, go to Start | All Programs | Accessories | System Tools | System Restore. When the tool opens, select *Create a restore point* and then click Next. Type in a description on the next screen (see Figure 17.53). There's no need to include the date and time because the System Restore adds them automatically. Click Create and you're finished.

System Restore in Windows Vista/7 is much more automatic, with the operating system making a number of restore points automatically. To make your own restore point, right-click Computer and select Properties, and then click the *System protection* link in the Tasks list. On the System Protection tab, click the Create button to open the dialog box shown in Figure 17.54.

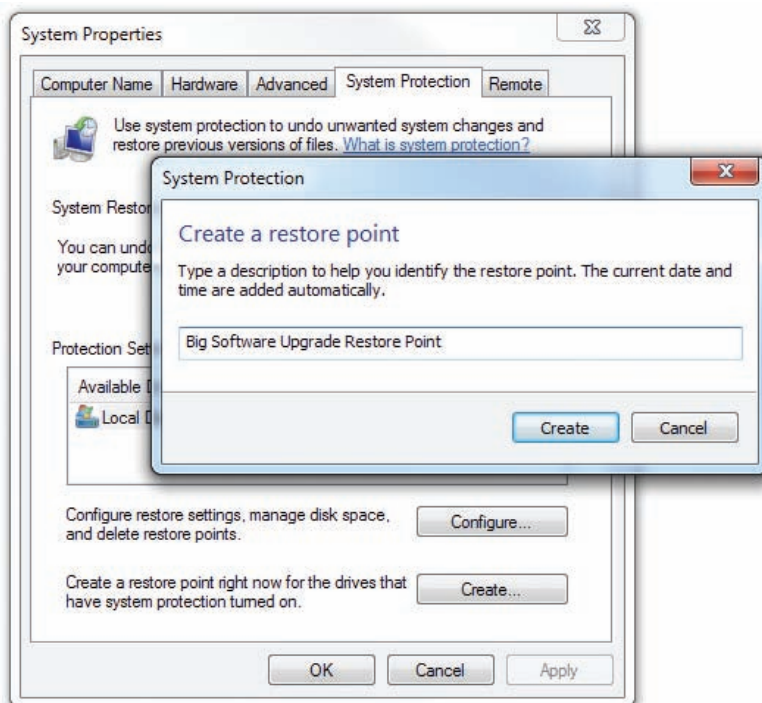
If you click the System Restore button, you might be surprised at how many system restore points are already made for you (see Figure 17.55).

The System Restore tool creates some of the restore points automatically, including every time you install new software. Thus, if installation of a program causes your computer to malfunction, simply restore the system to a time point prior to that installation, and the computer should work again.

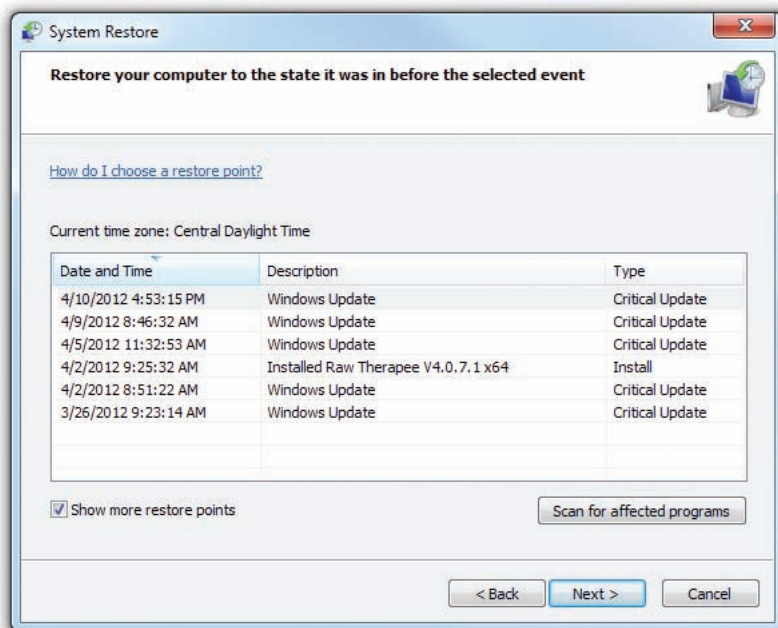
During the restore process, only settings and programs are changed. No data is lost. Your computer includes all programs and settings as of the restore date. This feature is absolutely invaluable for overworked techs. A simple restore fixes many user-generated problems.



• **Figure 17.53** Creating a restore point in Windows XP

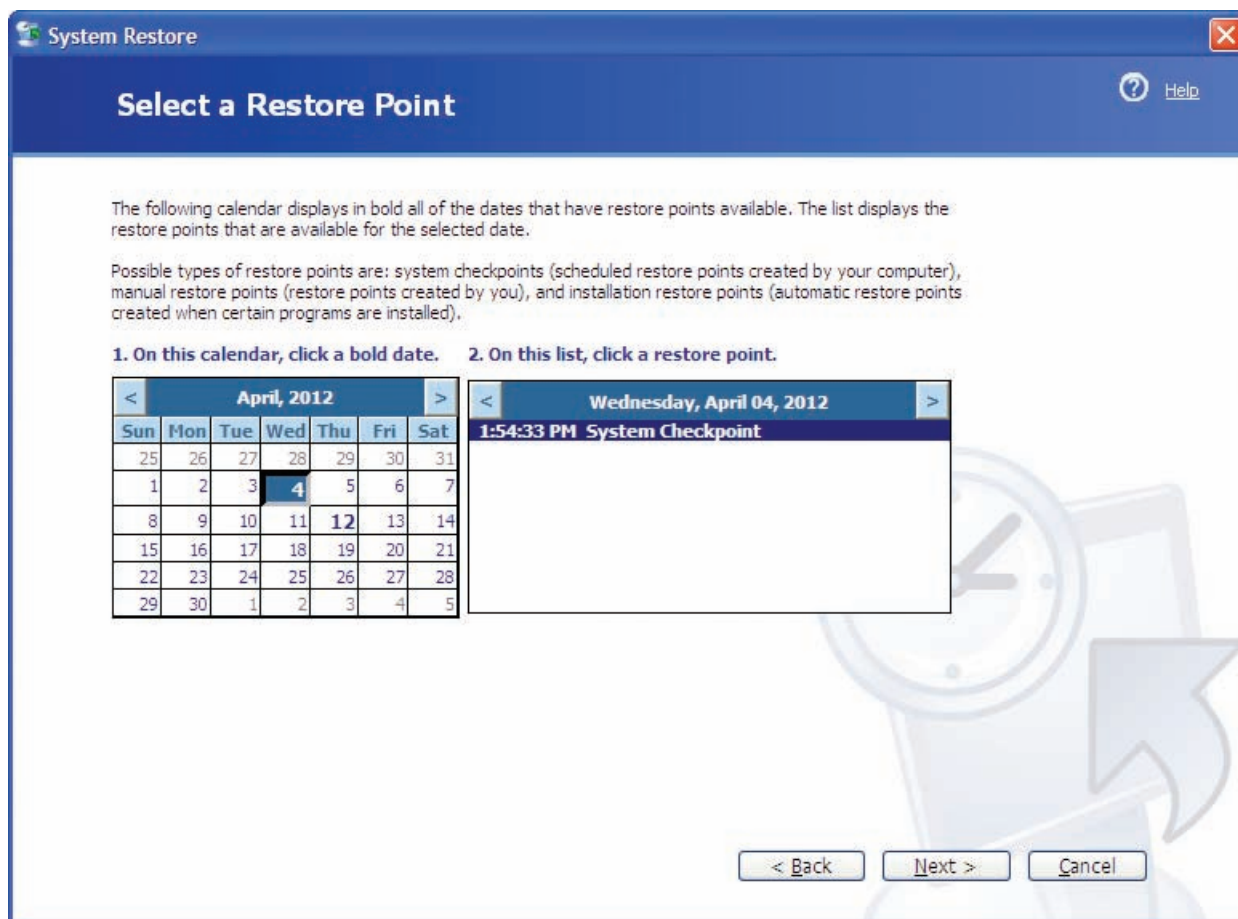


• **Figure 17.54** Creating a manual restore point in Windows 7



To restore to a previous time point, start the System Restore Wizard by choosing Start | All Programs | Accessories | System Tools | System Restore. If you are using XP, then select the first radio button, *Restore my computer to an earlier time*, and click Next. In Windows Vista and Windows 7, just click the Next button. Figure 17.56 shows a calendar with restore points. Any day with a bold-face date has at least one restore point. In Windows Vista/7 this calendar was replaced with a simple list, as you saw in Figure 17.55. These points are created after you add or remove software or install Windows updates and during the normal shutdown of your computer. Select a date on the calendar, select a restore point from the list on the right, and click Next.

• Figure 17.55 Restore points in Windows 7

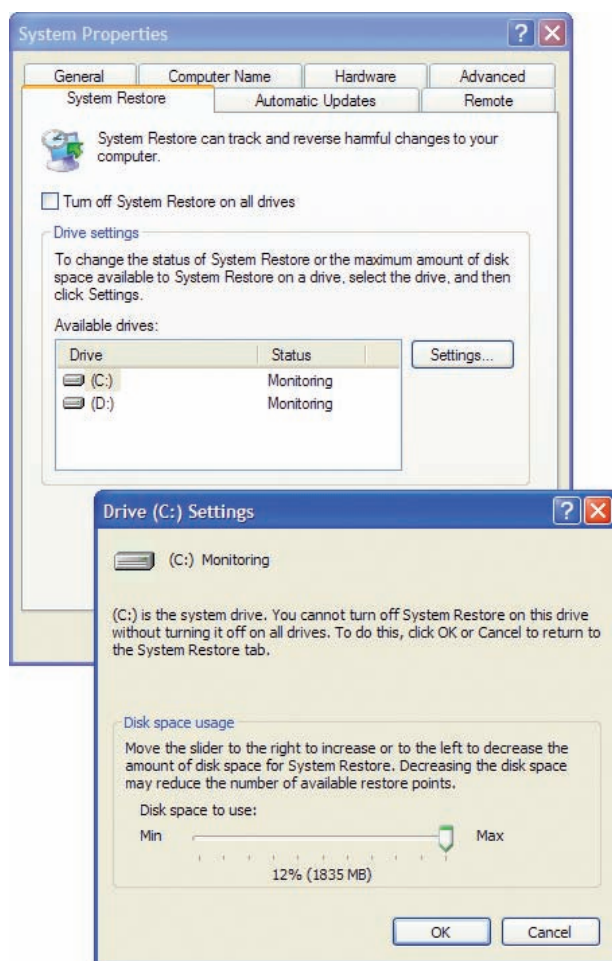


• Figure 17.56 Calendar of restore points in Windows XP

The last screen before the system is restored shows a warning. It advises you to close all open programs and reminds you that Windows will shut down during the restore process. It also states that the restore operation is completely reversible. Thus, if you go too far back in time, you can restore to a more recent date.

You don't have to count on the automatic creation of restore points. You can open System Restore at any time and simply select *Create a restore point*. Consider doing this before making changes that might not trigger an automatic restore point, such as directly editing the Registry.

System Restore is turned on by default and uses some of your disk space to save information on restore points. To turn System Restore off or change the disk space usage in Windows XP, open the System Properties applet in Control Panel and select the System Restore tab (Figure 17.57). In Windows Vista/7, right-click Computer and select Properties, and then click the *System protection* link in the Tasks list. On the System Protection tab, click the Configure button.



• **Figure 17.57** System Restore tab in System Properties applet



# Chapter 17 Review

## ■ Chapter Summary

After reading this chapter and completing the exercises, you should understand the following about maintaining and optimizing Windows.

### Perform maintenance tasks in Windows

- Windows Update retrieves updates and service packs from the Internet and patches your system. Keeping your system updated prevents viruses and malicious software from exploiting vulnerabilities in your operating system.
- Every version of Windows is capable of Automatic Updates. You can configure the time, frequency, and number of updates to download and/or install.
- Disk Cleanup clears out the junk files that accumulate from daily use. You can reach this tool through the Start menu (Start | All Programs | Accessories | System Tools), or you can open My Computer or Computer, right-click the drive you want to clean up, select Properties, and click the Disk Cleanup button.
- Keeping your Registry clean ensures that your system continues to run efficiently and without errors. Unfortunately, Microsoft doesn't offer any built-in Registry cleaner tools, so you have to use third-party tools such as CCleaner to perform this task.
- When you can't find a software reason for a problem such as a system freezing on shutdown, the problem might be the actual physical hard drive. The tool to investigate that is Error-checking. You can perform Error-checking from a command line or the Start | Run dialog box (or Start | Search bar) using the `chkdsk` command.
- Run Disk Defragmenter on a regular basis to keep your system from slowing down because of files scattered in pieces on your hard drive.
- Maintenance only works properly when it's done at regular intervals. You can use Task Scheduler/Schedule Tasks to schedule regular maintenance on your computer, though many utilities include built-in scheduling interfaces.
- The System Configuration utility enables techs to edit and troubleshoot operating system and

program startup processes and services. Prior to Windows Vista, the System Configuration utility also offered quick access to troubleshoot and edit the `boot.ini` file.

- Windows comes with the System Information tool, which collects information about hardware resources, components, and the software environment. When it finishes doing that, it provides a nice and tidy little report, allowing you to troubleshoot and diagnose any issues and conflicts. You can also use System Information to gather information about remote computers by simply selecting View | Remote Computer and then entering the remote computer's network machine name.

### Optimize Windows

- Windows supports Autorun, a feature that enables it to look for and read a special file called `autorun.inf` immediately after an optical disc is inserted, and then run whatever program is listed in `autorun.inf`. If you need to install a program manually, however, you can use the Add or Remove Programs applet in the Control Panel. In Windows Vista and 7, Microsoft has replaced the Add or Remove Programs applet with Programs and Features, which does not have the Add New Programs feature.
- With Windows Vista/7, you most likely will be prompted by UAC when installing an application. This is to give you time to review what is happening to your system in case you did not approve of the program being installed.
- Each installed application program takes up space on your computer's hard drive, and programs that you no longer need simply waste space that could be used for other purposes. Removing unnecessary programs can be an important piece of optimization. You remove programs by using the Add or Remove Programs or Programs and Features applet in the Control Panel. Select the desired program from the list of installed programs and click Uninstall.
- The third function of the Add or Remove Programs applet/Programs and Features applet is to add

or remove Windows components and features. In Windows XP, this is done by selecting Add/Remove Windows Components, which opens the Windows Components Wizard. In Windows Vista/7, this is done by clicking the *Turn Windows features on or off* option on the Tasks list.

- Windows Update provides an easy method to update drivers from manufacturers that take advantage of the service. If you are using Windows XP, the only trick to this is that you usually need to select the Custom option to see these updates because Windows only installs high-priority updates when using the Express option. When you click on the Custom option, look under Hardware, Optional (on the left) to see if Windows has any driver updates. If you are using Vista/7, you will need to click *View available updates* to see if any drivers are available for your system.
- Device drivers become part of the operating system and thus have the potential to cause lots of problems if they're written poorly. To protect Windows systems from bad device drivers, Microsoft uses driver signing, which means that each driver has a digital signature. When an unsigned driver is detected during hardware installation, you'll see a message offering you the choice to stop or continue the installation. Signed drivers are more or less a sure thing, but that doesn't mean unsigned ones are a problem—just consider the source of the driver when installing it.
- You can control how Windows XP behaves when drivers are being installed by clicking the Driver Signing button on the Hardware tab of the System Properties dialog box. This displays the Driver Signing Options dialog box. If you select Ignore, Windows will install an unsigned driver without warning you. Windows Vista and Windows 7 have eliminated the driver signing options. In 64-bit versions of Windows, all drivers must be signed. No exceptions.
- Right-clicking on a device in Device Manager displays the context menu. From here you can update or uninstall the driver, disable the device, scan for hardware changes, or display the Properties dialog box. The Driver tab has buttons labeled Driver Details, Update Driver, Roll Back Driver, and Uninstall. Windows Vista/7 add the Disable button. The Roll Back Driver option enables you to remove an updated driver, thus rolling back to the previous driver version.

- Windows should automatically detect any new device you install in your system. If not, use the Add Hardware Wizard (or simply Add Hardware if using Vista or Add a device in Windows 7) to get the device recognized and drivers installed. You'll find it on the Hardware tab of the System Properties dialog box in Windows XP and Vista. In Windows 7, use the *hdwwiz.exe* program to get to the same tool.
- One optimization you can perform on all Windows versions is setting Performance Options. Performance Options are used to configure CPU, RAM, and virtual memory (page file) settings. The Performance Options dialog box has three tabs: Visual Effects, Advanced, and Data Execution Prevention. The Visual Effects tab enables you to adjust visual effects that impact performance. The Advanced tab has three sections: Processor scheduling, Memory usage, and Virtual memory.
- Microsoft introduced Data Execution Prevention (DEP) with Windows XP Service Pack 2. DEP works in the background to stop viruses and other malware from taking over programs loaded in system memory. It doesn't prevent viruses from being installed on your computer, but makes them less effective.
- Hardware Profiles in Windows XP enable you to switch several hardware configurations at once during the Windows boot process.

### Prepare Windows for problems

- The most important data on your computer is the personal data: your documents, e-mail messages and contacts, Web favorites, photographs, and other files. To handle backing up personal data, every version of Windows comes with some form of backup utility.
- The Windows XP Backup Utility (*ntbackup*) provides almost all the tools you need to back up files and folders. The *ntbackup* program supports a variety of devices, enabling you to back up to network drives, local drives, tape, and removable disks (but not optical discs).
- The Windows XP Automated System Recovery (ASR) enables you to create a backup of your system. This backup includes a floppy disk and backup media containing the system and boot volume(s) and system state information.

- The archive bit works like this: Whenever a file is saved, the archive bit is turned on. Simply opening a file affects the current state of the archive bit. Backup programs usually turn off a file's archive bit when the file is backed up. If the archive bit is turned on, it means that the file has been changed since it was last backed up.
- A normal backup is a full backup. Every file selected is backed up, and the archive bit is turned off for every file backed up.
- A copy backup is identical to a normal backup, except that the archive bits are *not* changed. This is used (although not often) for making extra copies of a previously completed backup.
- An incremental backup includes only files with the archive bit turned on. In other words, it copies only the files that have been changed since the last backup. This backup turns off the archive bits.
- A differential backup is identical to an incremental backup, except that it doesn't turn off the archive bits.
- A daily backup, also known as a daily copy backup, makes copies of all the files that have been changed that day. It does not change the archive bits.
- Microsoft replaced ntbacup in Windows Vista with the Windows Backup and Restore Center, and with Backup and Restore in Windows 7. Both utilities have only two options: create a backup or restore from a previous backup. Vista/7 no longer support tape backups, nor do they let you choose between differential and incremental backups.
- You can use the System Restore tool to create a restore point, a copy of your computer's configuration at a specific point in time. If your computer later crashes or has a corrupted OS, you can restore the system to its previous state. During the restore process, only settings and programs are changed. No data is lost. Your computer will include all programs and settings as of the restore date. System Restore is turned on by default and uses some of your disk space to save information on restore points.

## ■ Key Terms

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**Add or Remove Programs** (612)

**Automated System Recovery (ASR)** (624)

**Automatic Updates** (601)

**Autorun** (611)

**Backup and Restore Center** (627)

**Backup Utility (ntbackup)** (622)

**Device Manager** (618)

**Disk Cleanup** (603)

**driver signing** (616)

**Hardware Profiles** (620)

**Performance Options** (619)

**Programs and Features** (612)

**restore point** (632)

**Scheduled Tasks** (606)

**service pack** (597)

**System Configuration utility (msconfig)** (609)

**System Information tool (msinfo32)** (610)

**System Restore** (632)

**Task Scheduler** (606)

**update** (597)

**Windows Update** (597)

## ■ Key Term Quiz

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

1. In Windows Vista and 7, you use the \_\_\_\_\_ applet to add and remove programs.
2. Windows XP uses the \_\_\_\_\_ to create a backup of the system, using both a floppy disk and a backup medium such as tape, but the restore side involves completely reinstalling the operating system.
3. To change which programs and services start with Windows, you would use the \_\_\_\_\_.

4. If installing a new driver causes problems in your system, \_\_\_\_\_ enables you to roll back the driver to a previously installed version.
5. Microsoft occasionally packages several updates for Windows together into a(n) \_\_\_\_\_.
6. You can use \_\_\_\_\_ to disable certain graphical flourishes, such as animations, transparencies, and more.
7. While Windows Update is an important part of your arsenal against bugs, viruses, and other problems, you should configure \_\_\_\_\_ so that Windows regularly downloads and installs the updates for you.
8. Windows XP includes a neat feature called \_\_\_\_\_ that enables you to switch several hardware configurations at once during the Windows boot process.
9. When you insert an optical disc into your PC, Windows uses the \_\_\_\_\_ feature to start the disc automatically.
10. Microsoft uses \_\_\_\_\_ to protect PC users from installing bad drivers.

## ■ Multiple-Choice Quiz

1. Which tool in Windows XP Home loaded by default can you use to back up essential system files?
  - A. Emergency Repair Disk
  - B. Backup and Recovery Wizard
  - C. System Restore
  - D. Recovery Console
2. Mark loaded a new video card on his system, but now everything looks very bad. What should he do first?
  - A. Go to Event Viewer and check the log
  - B. Go to Device Manager
  - C. Go to the printed manual
  - D. Call tech support
3. Which of the following should be your first choice to remove an application that you no longer need?
  - A. Delete the program files
  - B. Use the uninstall program that came with the application
  - C. Use the Add or Remove Programs applet or the Programs and Features applet.
  - D. Use the Registry Editor to remove references to the application
4. Which of the following backup features does Windows 7 not support? (Select two.)
  - A. System Restore
  - B. Backup and Restore
  - C. Tape Backup
  - D. Setting differential vs. incremental backups
5. What program can you use to keep your systems patched and up-to-date?
  - A. Windows Dispatcher
  - B. Windows Patcher
  - C. Windows Update
  - D. Windows Upgrade
6. Pam needs to connect a hard drive controller to her new Windows 7 64-bit computer but is unable to because of the older, unsigned driver. What can she do to make Windows load her driver?
  - A. Start the computer in Disable Driver Signature Enforcement mode.
  - B. Install the driver in Windows XP compatibility mode.
  - C. She's plain out of luck.
  - D. Use the Legacy Driver option in Device Manager.
7. Diane complains that her system seems sluggish and she keeps running out of disk space. What tool can you use to get rid of unnecessary files and compress older files? Select the best answer.
  - A. Disk Cleanup
  - B. Disk Doctor
  - C. File Manager
  - D. Registry Cleaner



8. Alberto installs a video card into a Windows XP computer and it seems to work just fine until he tries to run a game. Then he gets low-end graphics and it just doesn't look right. What might he try to fix the problem? Select the best answer.
  - A. Check the video card manufacturer's Web site and download updated drivers
  - B. Check the video card manufacturer's Web site and download the FAQ
  - C. Run the Driver Update utility
  - D. Reinstall Windows
9. Which of the following operating systems enables you to back up files to a tape using the included backup utility?
  - A. Windows Vista Business
  - B. Windows 7 Professional
  - C. Windows 7 Ultimate
  - D. Windows XP Professional
10. Which of the following commands opens the System Information tool?
  - A. msconfig
  - B. msinfo
  - C. msinfo32
  - D. mscnfg32
11. Mark wants to run Error-checking on his Windows 7 machine once every week. Which tool enables him to set Windows to do this automatically?
  - A. msconfig
  - B. Startup Repair
  - C. Hardware Profiles
  - D. Task Scheduler
12. Restoring an Automated System Recovery backup in Windows XP requires which three components? (Select three.)
  - A. Windows XP installation disc
  - B. ASR floppy disk
  - C. ASR backup media
  - D. A recent system restore point
13. From which utility can you run the Windows Memory Diagnostic Tool?
  - A. Automated System Recovery
  - B. Device Manager
  - C. System Recovery Options
  - D. msconfig
14. When performing automatic updates, Windows uses which feature to download additional updates for other Microsoft products?
  - A. Software notifications
  - B. msinfo32
  - C. Microsoft Update
  - D. Registry
15. Joan recently bought a new gamepad and used the Add a Device wizard to install it, but it still won't work. What should she do next? (Select two.)
  - A. Check the manufacturer's Web site for updated drivers
  - B. Run the Automated System Recovery tool to return the PC to a functioning state
  - C. Use a restore point in System Restore to return the PC to a functioning state
  - D. Run Windows Update to search for new drivers

## ■ Essay Quiz

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1. Your company's CEO is concerned about the backup policy in place for your file servers—namely, that there isn't one. He has asked you for advice, so write him a report about the types of backups available, how they work, and the storage requirements for each.
2. Your boss wants you to write a brief essay on how your users should back up their data for protection against accidental loss. Half the users have Windows XP PCs; the other half are running Windows 7 Professional. Keep in mind that your target audience is users, not trained technicians, so you should go for the user-level tools.

3. You've been tasked with organizing the standard maintenance routines for the Boston office's 16 Windows 7 Professional PCs. Write a couple of paragraphs describing the tools available and how often each should be run.
4. Your friend Steve got a new Windows 7 computer, but it's so loaded with trial-version

software from the manufacturer that it confuses him. He wants to unload some of these useless programs, but he doesn't want to trash his new PC. Write a brief essay describing the tool(s) he needs to use to uninstall the programs and clean up afterward.

## Lab Projects

### • Lab Project 17.1

You learned that restore points are copies of your system's configuration at a specific point in time. You know that Windows automatically creates some restore points. But there may be situations when you would like to have a copy of the current system

configuration. That's why Microsoft also allows users to create a restore point at any time. Review the process, decide on a description, and then create a restore point. Note that it automatically includes the date and time when you created it.

### • Lab Project 17.2

After reading this chapter you know how critical it is to keep patches, updates, and service packs current to help the computer stay healthy and to protect it from viruses that may exploit flaws in the

operating system. Now's a good time to make sure your operating system is current. Run the Windows Update utility and decide which updates to install. (Now, don't you feel better about your system?)