

Understanding Windows

In this chapter, you will learn how to

- Relate the history of Microsoft Windows
- Explain the Windows interface
- Identify the operating system folders of Windows 2000, XP, and Vista
- Describe the utilities in Windows essential to techs

As a tech, you need to understand Windows at a level beyond that of regular users. This chapter introduces you to some of the more powerful aspects of Windows, such as NTFS and the Registry. Not only must techs run through the standard Windows features that everyone uses every day (Start button, Recycle Bin, and so on), they must also be comfortable drilling down underneath that user-friendly surface to get their hands a little dirty.

This chapter begins by introducing and organizing the many variations of Windows on the market today and helping you appreciate the difference between, for example, Windows XP Home and Windows Vista Ultimate. The chapter then takes you through the Windows interface in detail. The third section looks more closely at the techie aspects of Windows, including the structure of the OS. The fourth section provides an overview of the many utilities for techs available in Windows. The chapter closes in the “Beyond A+” section with a discussion of the versions of Windows not on the current CompTIA A+ exams, such as Windows 7 and non-desktop versions of Windows. Let’s get started!

Historical/Conceptual

A Brief History of Microsoft Windows

Many users think of Windows as a monolithic thing, as *the* operating system (OS) for the PC (as opposed to the Macintosh), but as a tech you need to understand that Microsoft produces many varieties of the OS, each with specific tools, utilities, file structures, and interfaces. And you need to be able to navigate through any modern version of Windows fluidly.

Microsoft currently supports seven families of Windows, of which three concern the CompTIA A+ certified technician: Windows 2000, Windows XP, and Windows Vista. (I'll cover the other four families of Windows in the "Beyond A+" section of this chapter.) Within each of these families—my word, not Microsoft's—Windows comes in multiple versions. Here's the list for the top three:

Windows Family	Versions (32-bit)	Versions (64-bit)
Windows 2000	<ul style="list-style-type: none"> • Windows 2000 Professional • Windows 2000 Server 	Nothing widely available
Windows XP	<ul style="list-style-type: none"> • Windows XP Home • Windows XP Professional • Windows Media Center • Windows XP Tablet¹ 	<ul style="list-style-type: none"> • Windows XP 64-bit version • Windows XP Professional x64 Edition
Windows Vista ²	<ul style="list-style-type: none"> • Windows Vista Home Basic • Windows Vista Home Premium • Windows Vista Business • Windows Vista Ultimate 	<ul style="list-style-type: none"> • Windows Vista Home Basic • Windows Vista Home Premium • Windows Vista Business • Windows Vista Ultimate

¹ Windows XP Tablet edition is not covered on the CompTIA A+ exams but is included here for completeness.

² Microsoft has released two other versions of Windows Vista: Starter Edition and Enterprise. Vista Starter Edition is a simplified version of the operating system designed for the developing world and is not sold in developed countries. Vista Enterprise is a version of Vista Business designed for large-volume customers and is only sold to Microsoft's enterprise-level customers.

Table 4-1 Versions of Windows on the CompTIA A+ exams

The problem of variety is compounded the minute you start working with older computers or talking with users or techs who've been in computers for a few years. You'll hear about Windows 95, for example, or Windows Me, or even Windows 3.x. Huh? What are these versions (Figure 4-1)? How do they fit in the picture?



Figure 4-1 Lots of Windows!

This section outlines the history of Microsoft Windows and then takes an in-depth look at the differences among the many versions of Microsoft's flagship operating system. That way you can sort out the essentials for today's techs from the many varieties you'll hear about.

Microsoft entered the operating system game in the early 1980s with a command-line OS called Microsoft Disk Operating System, or MS-DOS. With a command-line OS, you interacted with the computer to run programs and save files and all the other computing functions by typing and then pressing the ENTER key on your keyboard. This whole typing thing worked for people who could memorize commands and such, but alternative operating systems, such as the Apple Macintosh, offered a visual interface, where you could interact with the computer by clicking on pictures. The time came for Microsoft to step up its game and produce a graphical user interface (GUI) where users could use a mouse to point and click.

Early Windows

The earliest version of Windows, Microsoft Windows 1.0, dates from 1985 and was little more than a graphical overlay of the DOS command-line operating system. This overlay version of Windows went through a number of updates, ending with the first truly popular version of Windows, Windows for Workgroups version 3.1 (Figure 4-2).

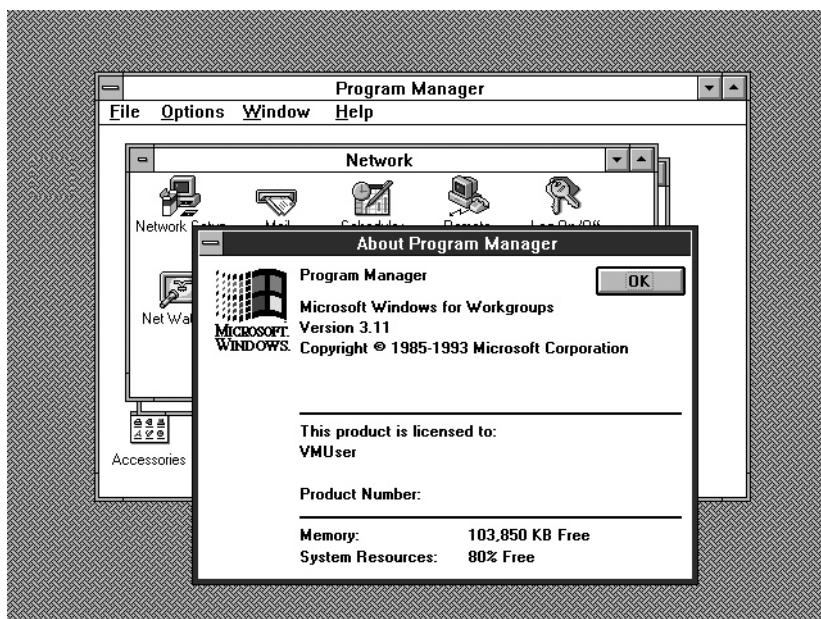


Figure 4-2 Windows for Workgroups



NOTE Microsoft released several versions of Windows 3.1, with minor differences in name. Techs call the versions collectively Windows 3.x.

In 1989, Microsoft offered a completely separate version of Windows called Windows NT. Windows NT was a true graphical operating system and was dramatically more powerful than the Windows overlay versions. Windows NT also cost more than other versions of Windows, however, and saw little adoption outside of servers and systems where users needed a lot of power. Windows NT went through a number of versions, culminating with Windows NT 4.0 in 1996 (Figure 4-3).

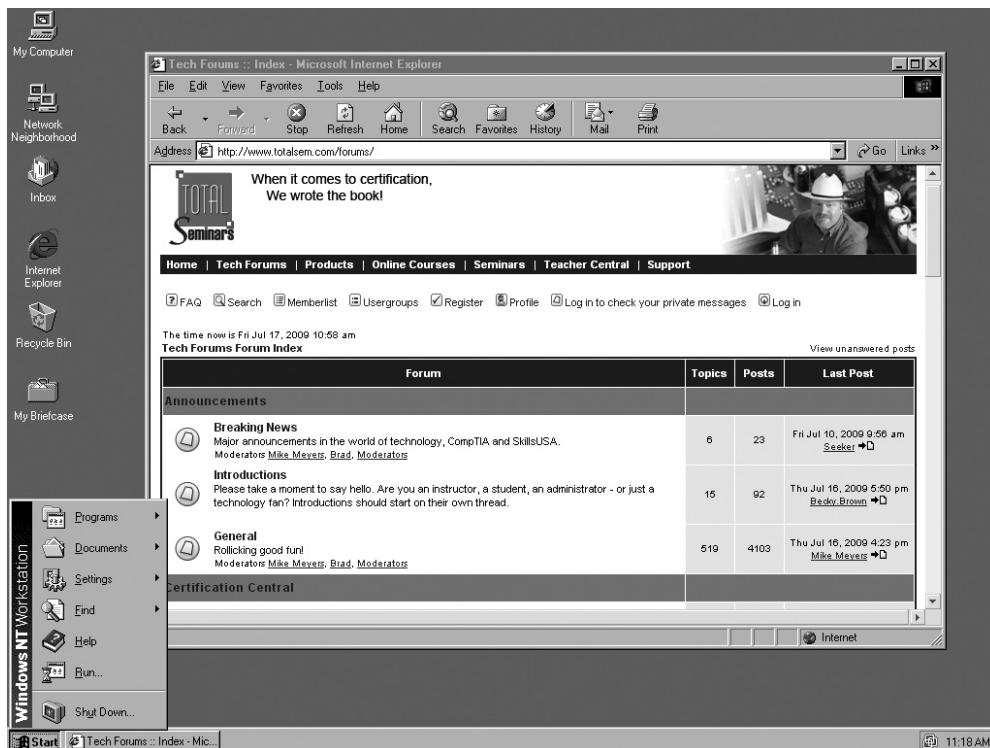


Figure 4-3 Windows NT 4.0

Comparing Windows NT to the old overlay versions of Windows is akin to comparing the first computer game you ever played to the games we play today: technically the same thing (a game), but that's about it. Windows NT had so many features that showing them all could take days, but one is important. NT came with a new way to organize hard drives and files, called the NT File System (NTFS). Before NTFS, all versions of Windows used an ancient file system called the file allocation table (FAT).

FAT was great when first invented in the late 1970s, but by the mid-80s it was showing its age. NTFS took care of a number of problems, the biggest of which was security. FAT had no security. There was no way to control what people did with your files. NTFS was built from the ground up with security in mind. We'll cover both FAT and NTFS later in the book, but for now appreciate that only Windows NT had NTFS.

It wasn't until 1995 that Microsoft dumped the overlay concept and introduced Windows 95, the first version of Windows for the standard user that was also a full-blown operating system (Figure 4-4). Windows 95 offered many improvements over Windows 3.x, and eventually Microsoft released several upgraded versions as well, such as Windows 98, Windows 98 SE, and Windows Me. The upgraded versions continued to use the FAT file system. Over the years, Windows has gone through massive changes and a large number of improved versions. The later versions have nothing in common with earlier versions other than the name "Windows."

NOTE When we describe Windows 95, 98, 98 SE, and Me from a historical standpoint, we lump them all together, using the term "Windows 9x."

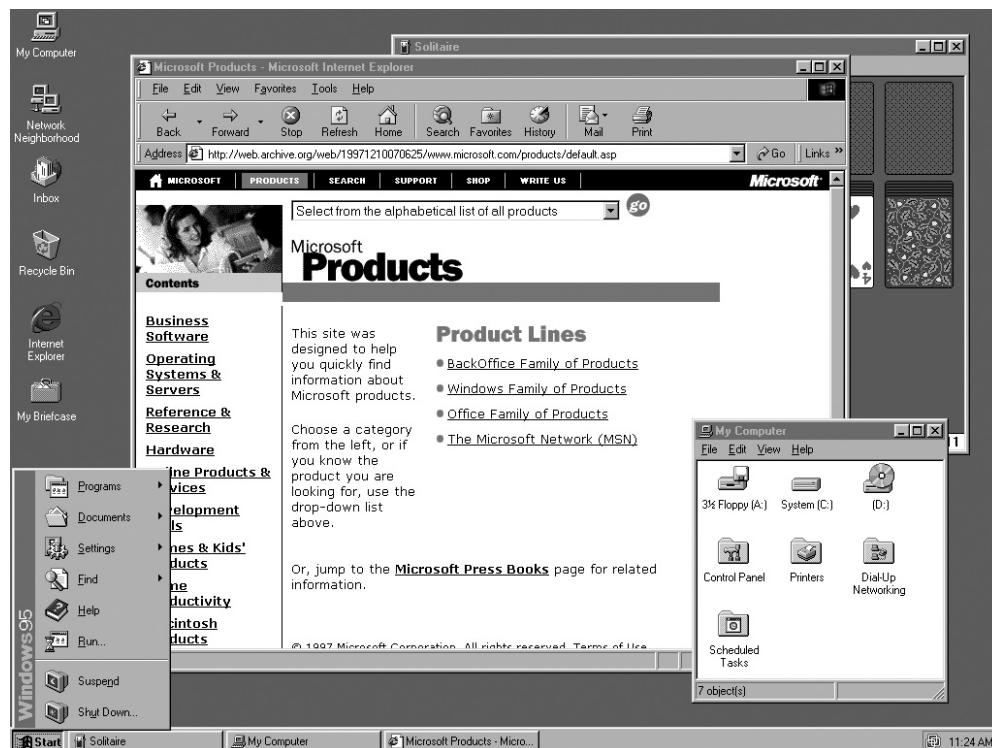


Figure 4-4 Windows 95—The Windows of your forefathers

Modern Windows

The vast majority of computers in the field today run one of the three modern families of Windows, so the CompTIA A+ certification focuses on those as well: Windows 2000, Windows XP, and Windows Vista. But as you know from Table 4-1 at the beginning of this chapter, just saying the name of a Windows family doesn't do the varieties within that family justice. The trick is to organize these versions in such a way to discover their similarities and differences. In this section, we'll look at versions of Windows 2000, XP, and Vista, as well as a few other versions of Windows, and see the differences in detail.

A great place to start is with the arrival of Windows 2000 in 2001. Throughout most of the 1990s, before Windows 2000 came along (followed very quickly by Windows XP), Windows was in a bit of a mess. Microsoft had two totally different operating systems—each called Windows—that it sold for two different markets. Microsoft sold the Windows 9x series for the home user and small office, and the much more powerful Windows NT series for corporate environments.

Essentials

Windows 2000

Windows 2000 was the first step toward changing this mess. It was based on the old Windows NT (including support for NTFS), but for the first time it included a great interface, provided support for dang near any program, and was substantially easier to use than the old Windows NT. Microsoft originally presented Windows 2000 as a replacement for Windows NT, but its stability and ease of use motivated many knowledgeable Windows 9x users to upgrade to Windows 2000. Windows 2000 started to appear as “the single Windows to replace all the other versions.”

Windows 2000 came in two versions: Professional and Server. The CompTIA A+ exams do not cover Windows Server versions, but a good tech should at least know that these server versions exist. If you were to look at the Windows 2000 Server desktop, you'd be hard pressed to see any obvious differences from the Windows 2000 Professional version. Don't let Windows 2000 Server fool you (Figure 4-5). Windows Server is a heavy-duty version, loaded with extra software and features that make it superb for running an office server. Windows Server versions are also extremely expensive, costing on average of around \$200 per computer that accesses the server.



EXAM TIP Windows 2000 was the last version of Windows to come in both Server and Professional versions. After the release of Windows XP, Microsoft introduced the next version of Windows Server as Server 2003. Windows Server 2008 is the latest version of Windows Server.

Windows XP

Windows XP came hot on the heels of Windows 2000. Under the hood, XP was basically the same as Windows 2000, but added a dramatically improved interface and

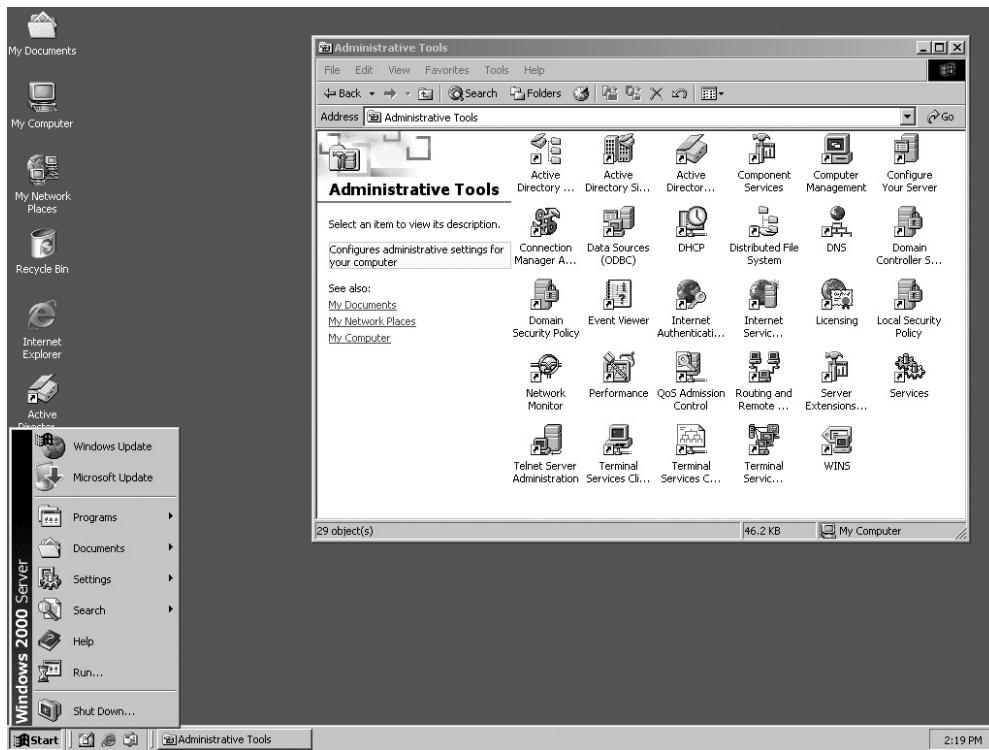


Figure 4-5 Windows 2000 Server

a number of new features, such as a built-in CD writer. Microsoft also broke with the beauty of 2000's "one OS for everyone" idea. Microsoft visualized three types of users—professionals, home users, and media junkies—so Windows XP came in several versions, such as Windows XP Professional, Windows XP Home, and Windows XP Media Center.

Windows XP Professional

Microsoft Windows XP Professional is, in many people's opinions, the most versatile and, therefore, the most mainstream version of Windows XP. Microsoft tuned Windows XP Professional for office environments with many users sharing lots of data and multiple users sharing single computers. Windows XP Professional provides full-blown data security, and it is the only version of Windows XP with the capability of logging into a special Windows Server-controlled network called a *domain*.

A Windows domain is a group of networked computers all under the control of a single computer running some version of Windows Server. Users on a domain can make a single login to their computer that defines everything they can do on every other computer on the domain. (See Chapter 23, "Local Area Networking," for all the details of the amazing Windows domain.) Figure 4-6 shows a typical Windows XP Professional desktop.



Figure 4-6 Windows XP Professional

Windows XP Home

As its name implies, Windows XP Home is designed for the home and small-office user. Windows XP Home is a stripped-down version of XP Professional. The best way to describe Windows XP Home is to list the Windows XP Professional features that Windows XP Home lacks. Windows XP Home does *not* have

- **The ability to log on to a Windows domain** A Windows Home PC may log into any single Windows server, but you must have a user name and password on every single server. With a domain, you can have one user name and password that works on all computers that are members of the domain.
- **Encrypting file system** With Windows XP Professional, you can encrypt a file or a folder so that only you can read it. Windows XP Home edition lacks this feature.
- **Support for multiple processors** Windows XP Home does not support more than one physical CPU. Windows XP Professional supports two separate CPUs.



NOTE CPU support is based on physical CPUs, not the number of cores in a single CPU. See Chapter 5, “Microprocessors,” for details on multi-core CPUs.

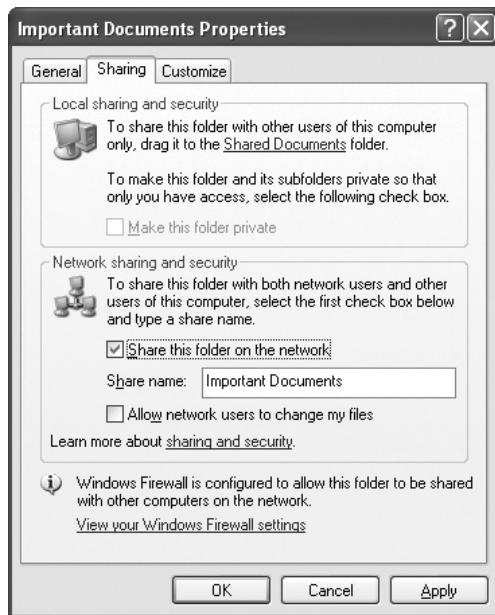
- **Support for Remote Desktop** A Windows XP Professional PC may be remotely accessed from another computer by using the Remote Desktop (Figure 4-7). You cannot access a Windows XP Home system in this fashion.



Figure 4-7 Remote Desktop

- **Support for NTFS Access Control** The NTFS file system is capable of powerful controls on what users may do to a file or folder. Windows XP Home doesn't give you the ability to control these NTFS permissions individually. When you look at the properties of a file or folder in Windows XP Home, you'll notice that there is no Security tab. Instead, Windows XP Home's Sharing tab (Figure 4-8) shows that only one folder, the Shared Documents folder, is open for sharing—very different from XP Professional.
- **Support for group policies** Do you need to keep users from using a certain program? Do you want to prevent them from changing the screensaver? What do you want to do if they try to log in three times unsuccessfully? That's the job of group policies. Well, if you want this level of control on your system, get Windows XP Professional, because XP Home doesn't support them. Group policies are discussed in Chapter 26, "Securing Computers."

Figure 4-8
Windows XP
Home Sharing tab



A few more differences exist between Windows XP Professional and XP Home, but these are the ones you're most likely to run into. Basically, if you want serious control of the folders, files, users, and network, you need XP Professional.

Windows XP Media Center

Microsoft Media Center is a specialized XP version that includes the very handy Windows Media Center program (Figure 4-9). Media Center is a Personal Video Recorder (PVR) program that enables you to watch and record television (you'll need a TV tuner card) and organize all of your media, from photos to music.

On the Microsoft Media Center Web site, Microsoft declares that the Windows XP Microsoft Media Center edition is based on Windows XP Professional; however, other than the Media Center program, Windows XP Media Center's capabilities are identical to those of Windows XP Home.

Windows Vista

Even though Windows 7 is available, Windows Vista is the latest version of Windows on the current CompTIA A+ exams. It's important to recognize Vista and know what choices you have when deciding which version of Vista you need for a particular PC. Windows has a number of versions of Vista, each geared toward a particular market segment. Let's look at the most common versions of Vista.

Windows Vista Home Basic

Windows Vista Home Basic is roughly equivalent to Windows XP Home. Microsoft gears it to home users not needing more advanced multimedia support.

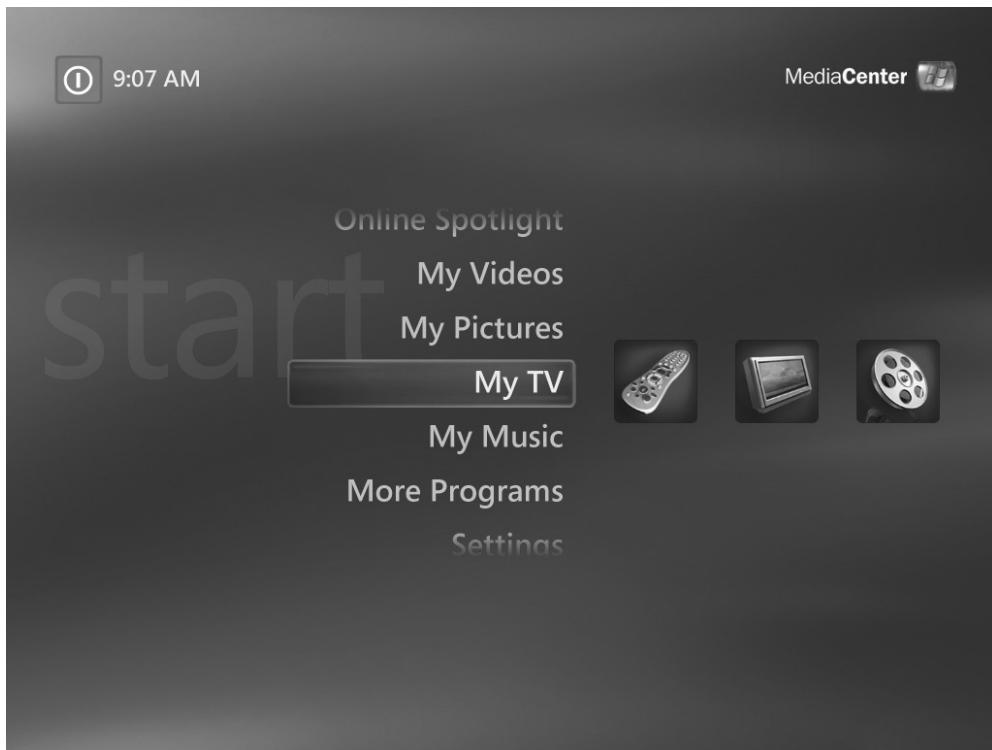


Figure 4-9 Microsoft Media Center

Windows Vista Home Premium

Windows Vista Home Premium (Figure 4-10) is the same as Windows Vista Home Basic, but it adds an upgraded Windows Media Center PVR application, similar to the one found in Windows XP Media Center.

Windows Vista Business

Windows Vista Business is the basic business version and has all the security, file-sharing, and access controls seen in Windows XP Professional.

Windows Vista Ultimate

Windows Vista Ultimate combines all of the features of every other Vista version and includes some other features, such as a game performance tweaker and DVD ripping capability (Figure 4-11).



EXAM TIP You can determine your Windows version by right-clicking My Computer in Windows 2000 or XP, or Computer in Vista and Windows 7, and selecting Properties.

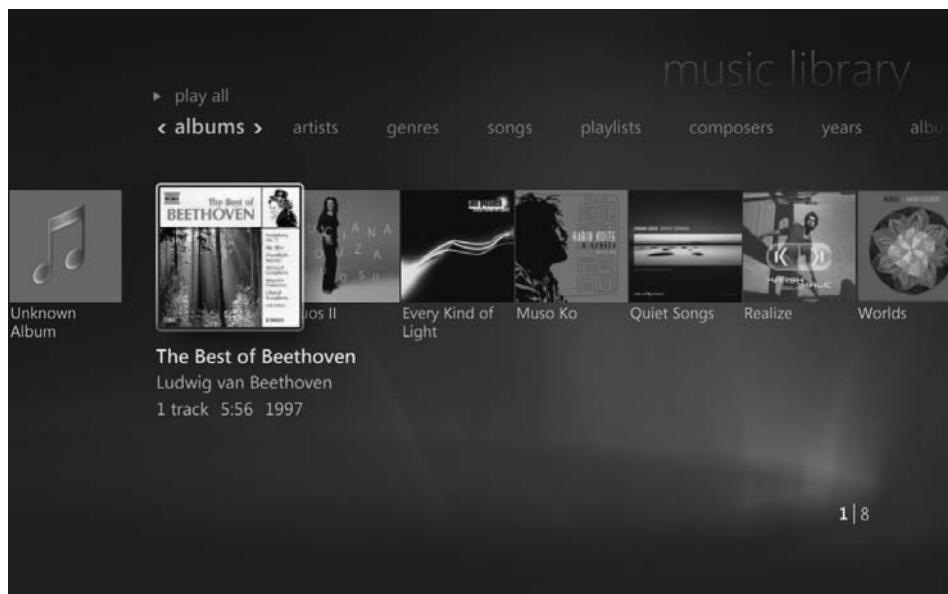


Figure 4-10 Vista Home Premium Media Center



Figure 4-11 Vista Ultimate

Enter 64-bit Windows

From roughly 1986 to around 2001, all CPUs were 32-bit. While we will save the big discussion of what 32-bit means for Chapter 5, “Microprocessors,” for now let’s keep it simple: a 32-bit CPU can only use a maximum of 4 gigabytes of RAM ($2^{32} = 4,294,967,296$). Starting in 2001 we began to see 64-bit CPUs that could accept more than 4 gigabytes. 64-bit CPUs are now extremely common.



NOTE CPUs and 32- and 64-bit processing are covered in much greater detail in Chapter 5, “Microprocessors.”

The leap from 32-bit to 64-bit processing has a number of advantages. The really big compelling reason to go from 32- to 64-bit is that 64-bit CPUs support more than 4 gigabytes of RAM. The more RAM you have, the more programs—and the bigger the programs—your system will run. Until fairly recently, not too many of us cared to go above 4 gigabytes of RAM. We didn’t need the RAM and we didn’t have a CPU that could run at 64-bits. My, how things have changed over the past few years!



EXAM TIP Remember for the exams that 32-bit CPUs can support up to 4 GB of RAM. In concept, 64-bit CPUs can support up to 16 terabytes of memory, although you certainly won’t find that much memory in the typical PC.

The 64-bit CPUs first showed up with the Intel Itanium back in 2001. At that time the only folks interested in 64-bit processing were large data centers and a few organizations that needed to crunch big numbers. To run a computer with an Itanium, you needed an operating system that worked with a 64-bit processor. Up to this point, every version of Windows only ran at 32-bit. Microsoft answered the call by creating special 64-bit versions of Windows 2000 and XP, but these 64-bit versions of Windows 2000 were very rare.

In 2003, Advanced Micro Devices (AMD) started to ship the popular Athlon 64 CPU. This CPU could run in either 32-bit or 64-bit mode, making 64-bit a realistic option for most of us. Intel followed AMD around 2004 with Pentium 4 CPUs also capable of 32-bit or 64-bit processing. Since then, almost every CPU sold by Intel or AMD has the ability to run in either 32-bit or 64-bit mode. Moving from the 32-bit to the 64-bit world is easy, but only if you have a version of Windows to support 64-bit. Microsoft has multiple versions of Windows designed to support 64-bit CPUs.



NOTE All 32-bit versions of Windows support a maximum of 4 gigabytes of RAM. If your PC has more than 4 gigabytes and you’re not running 64-bit Windows, you might as well remove any RAM above 4 gigabytes. You’re wasting it!

Windows XP 64-bit Versions

The 64-bit-only version of Windows XP was called Windows XP 64-bit Edition (apparently Microsoft decided not to get cute when naming that one). Given that it only worked on Intel Itanium processors, the chance of your seeing this operating system is pretty small unless you decide to work in a place with powerful server needs. The Windows XP Professional x64 Edition is much more common, as it runs on any AMD or Intel processor that supports both 32 and 64 bits (Figure 4-12).



Figure 4-12 Windows XP Professional x64 Edition

Windows XP 64-bit versions have had some impact, as they were the first stable Windows versions that truly supported 64-bit processing, but it was the introduction of Microsoft Vista that really started the move into the 64-bit world.

Windows Vista 64-bit Versions

Every one of the earlier listed Vista versions comes in both a 32-bit and 64-bit versions. As we move into PCs with more than 4 gigabytes of RAM, it's important to make sure your version of Windows is a 64-bit version (Figure 4-13).

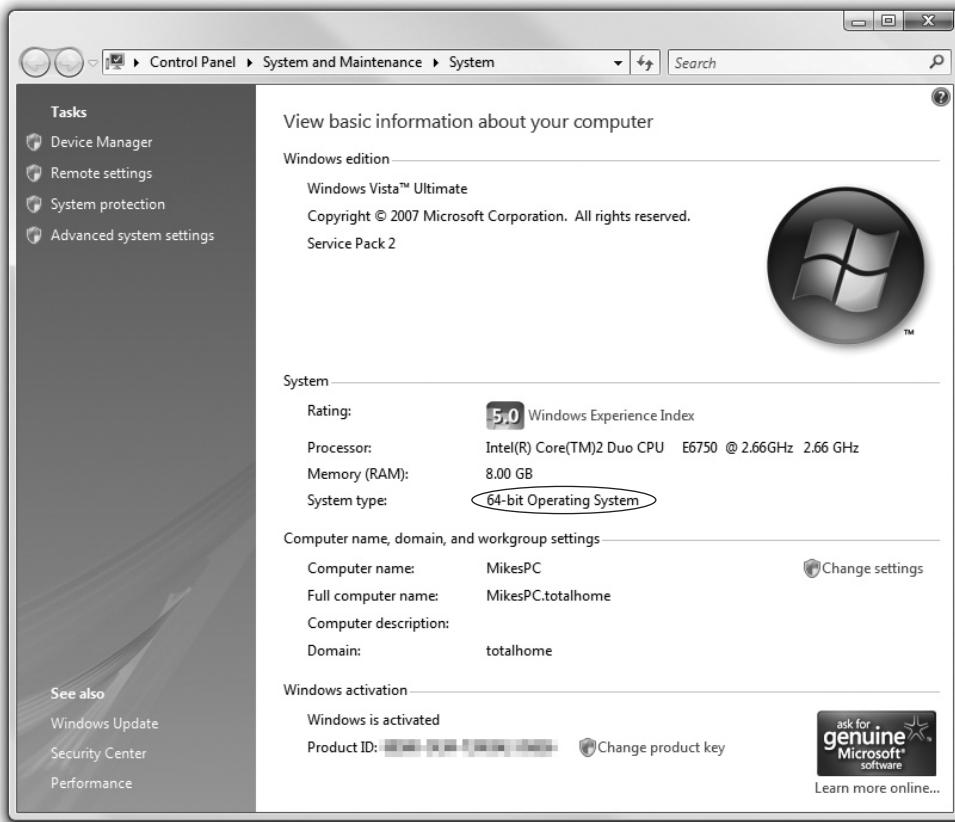


Figure 4-13 64-bit Vista



NOTE Windows 7 is not on the CompTIA A+ exams, but you should still know it. Every version of Windows 7 comes in 32-bit and 64-bit on the same install disc.

Transitioning to 64-bit Windows

Techs use the x# terminology to describe a particular computer architecture, implying that there is some compatibility within that architecture. This matters because people need some comfort that the software they purchase will work properly with the computer they have. The transition from 32-bit versions of Windows to 64-bit versions of Windows requires a certain update in terminology.

x86 versus x64 Intel originally used numbers to name its CPUs, such as 8086, 80286, 80386, and so on. To talk about them collectively, the industry replaced the leading numbers with an x and kept the numbers that stayed consistent for all the processors, thus x86 describes the Intel CPU architecture for PCs. All the 32-bit versions of Windows were designed to run on x86 architecture.

The move to 64-bit CPUs and, equally importantly, to 64-bit versions of Windows required some sort of change in terminology. Microsoft and others picked up the x# terminology and changed it to market 64-bit-only versions of their software, branding the 64-bit software as *x64*. A consumer, therefore, could look at a product such as Windows XP Professional x64 Edition and very quickly know that the software was designed for 64-bit CPUs rather than 32-bit CPUs.

The two x# uses—x86 and x64—don’t really compare, but that’s okay. Computer people love the letter X almost as much as car manufacturers do.

Software Compatibility Transitions to updated architecture, such as the change from x86 to x64, creates concern among users, because they fear that their old programs won’t run or will run poorly, or that they’ll have problems with compatibility down the road. Techs need to allay those fears by educating users properly. Here’s the scoop in a nutshell.

Most of the 64-bit processors run either 32-bit or 64-bit versions of Windows without missing a beat. The 64-bit versions of Windows require a 64-bit CPU; they snicker at 32-bit (or x86) processors and refuse to play. Many companies have produced 64-bit versions of application software that only works with 64-bit Windows running with a 64-bit CPU. Great, right? But what about all those 32-bit applications out there working for a living? It gets interesting.

Windows Vista 64-bit versions support most 32-bit applications, sometimes without any user intervention and sometimes through explicit use of the Windows compatibility mode options. (Just for the record, you sometimes need to use Windows compatibility mode options to run older programs on Windows Vista 32-bit versions, so it’s not just a function of 64-bit support for 32-bit apps.) Windows can try to emulate previous versions of Windows if an application balks at loading.

To run a program in an emulated version of Windows, you need to access the primary executable file that, when double-clicked, makes the program run. We’ll go through where to find your program files in the various versions of Windows later in this chapter, but a quick example should suffice here. A user has a custom program—called “Widgets for XP”—designed to take advantage of particular features in Windows XP Professional with Service Pack 2 installed and it doesn’t work in Windows Vista. Open Computer and go to C:\Program Files\Widgets for XP and look for a file with the type listed as Application, such as WidgetsXP.exe (Figure 4-14). Right-click and select Properties.

On the Compatibility tab, you can select the checkbox next to *Run this program in compatibility mode for:* and select the OS of choice (Figure 4-15). In this case, we would select Windows XP (Service Pack 2) to provide optimal compatibility for the application. Windows saves the configuration change and tries to open the program in compatibility mode each time the program loads.

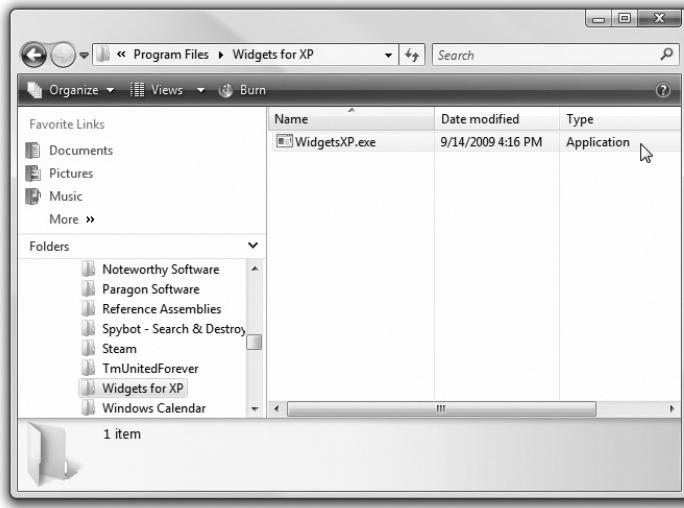


Figure 4-14 Finding an executable file

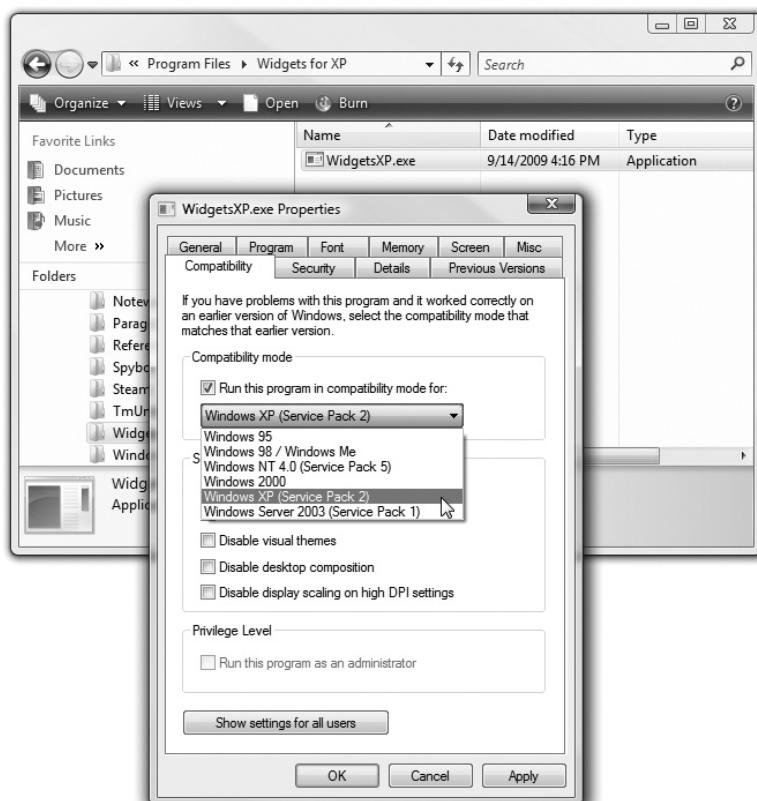


Figure 4-15 Compatibility mode options

The Windows Interface

All versions of Windows share certain characteristics, configuration files, and general look and feel. Here's some good news: You'll find the same, or nearly the same, utilities in almost all versions of Windows, and once you master one version—both GUI and command-line interface—you'll pretty much have them all covered. This section covers the essentials: where to find things, how to maneuver, and what common utilities are available. Where versions of Windows differ in concept or detail, I'll point that out along the way. You'll get to the underlying structure of Windows in the subsequent two sections of this chapter. For now, let's look at the common user interface.

User Interface

Windows offers a set of utilities, or *interfaces*, that every user should know about—both how and why to access them. And since every user should know about them, certainly every CompTIA A+ certified tech should as well! Let's take a quick tour of the typical Windows GUI.



EXAM TIP Odds are pretty good you already know the Windows Interface—but do you know what the CompTIA A+ calls all these parts? Don't skip this section!

Login

Logging into a Windows computer is something we all do, but few of us take time to appreciate. Your user name and password define what you can do on your computer. Every version of Windows supports multiple users on a single machine, so the starting point for any tour of the Windows user interface starts with the *login screen*. Figure 4-16 shows the old, ugly, but very functional Windows 2000 login screen.

Figure 4-16
Windows 2000
login screen



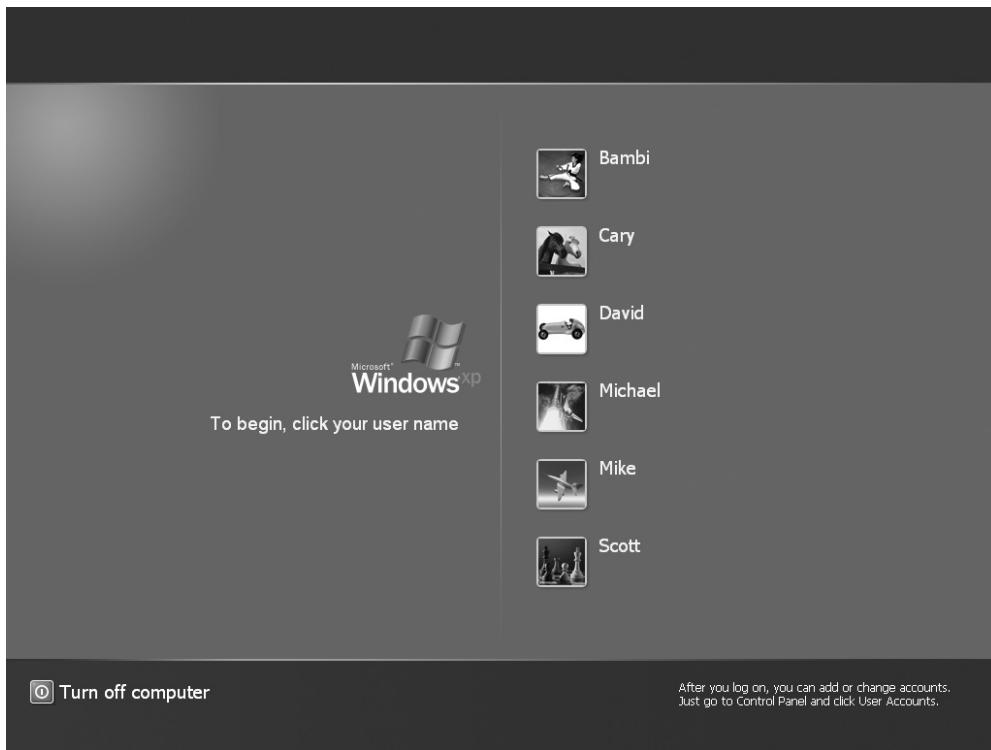


Figure 4-17 Windows XP Welcome screen

Microsoft improved the login screen in XP, creating a new type of login called the *Welcome screen* (Figure 4-17). If you're using Windows XP Home or Media Center, this is the only login screen you will see. Windows XP Professional also has the Welcome screen. If you're running a Windows XP Professional system that connects to a Windows domain, however, you go right back to the classic login screen (Figure 4-18).

Figure 4-18
Windows XP
domain login
screen



Windows Vista dumped the old login screen entirely. All versions of Windows Vista use an improved version of XP's Welcome screen (Figure 4-19).



Figure 4-19 Windows Vista Welcome screen

Desktop

The Windows *desktop* is your primary interface to the computer. The desktop is always there, underneath whatever applications you have open. The desktop analogy appeals to most people—we're used to sitting down at a desk to get work done. Figure 4-20 shows a nice, clean Windows XP desktop; note the icons on the left and the various graphical elements across the bottom. You can add folders and files to the desktop and customize the background to change its color or add a picture. Most people like to do so—certainly, I do! As an example, Figure 4-21 shows the desktop from my home system—a Windows Vista Ultimate PC.



NOTE Your desktop is actually a folder in your computer. Whatever is in that folder shows up on your desktop. It's critical that you know how to get to that folder in every version of Windows covered on the CompTIA A+. Read on.



Figure 4-20 Windows XP desktop

Clearly the Vista desktop differs a lot compared to the Windows XP desktop. What you're seeing is something called the Aero desktop. *Aero* desktop adds a number of impressive aesthetic features to your desktop that Microsoft claims makes the user experience more enjoyable and productive. I'm not going to get into an argument on the value of the Aero desktop, but it is an important part of the Windows Vista (and Windows 7) interface. Most of the Aero features are overly technical—even for the CompTIA A+ exams—but the end result is a faster, smoother desktop with two interesting features: transparency and Flip 3D. *Transparency*, as the name implies, gives an adjustable amount of transparency to the edges of your windowed programs, as you can see in Figure 4-22.

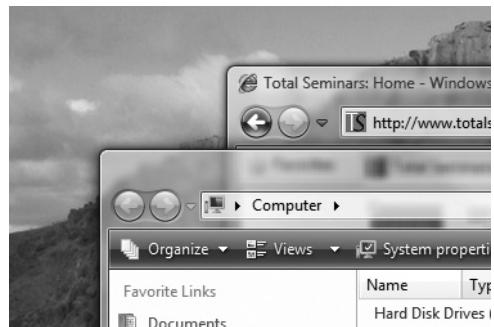


EXAM TIP Vista Home Basic does not support Aero desktop.



Figure 4-21 Mike's messy desktop

Figure 4-22
Transparency



Flip 3D enables you to view and select all of your open Windows in a 3-D format as shown in Figure 4-23. It's actually very handy once you start using it.



Figure 4-23 Flip 3D

Flip 3D is fun to use. Press the **WINDOWS KEY-TAB** key combination to start it. Keep pressing the key combination to cycle through the windows. When the window you want is in the forefront, release the keys, and that window will be the active window on your screen. Try **WINDOWS KEY-TAB-SHIFT** to scroll through your windows in the opposite direction.

To use the Aero desktop, you must have a video card that supports Aero. We'll save the in-depth discussion for Chapter 19, "Video," but for now here's what Microsoft says your video needs:

- DirectX 9 capability or better
- At least 128 megabytes of video RAM
- Windows Display Driver Model (WDDM) driver
- Pixel Shader version 2.0

Now that you know what you need (again, these will be covered in detail in Chapter 19, "Video"), here's the easy way. When you install Vista, the installer checks your video to determine if it can support Aero. If your video card is capable, Aero is turned on automatically.

On an installed system, press the WINDOWS KEY-TAB combination. If the Flip 3D appears, you have Aero. If it doesn't, Aero is not active.

To turn on Aero, right-click on your desktop and then select the Personalize menu option. Next, select Window Color and Appearance. If you see a screen that looks like Figure 4-24, you already have Aero running. If you see a screen that looks like Figure 4-25, select the Windows Aero color scheme to activate the Aero desktop.

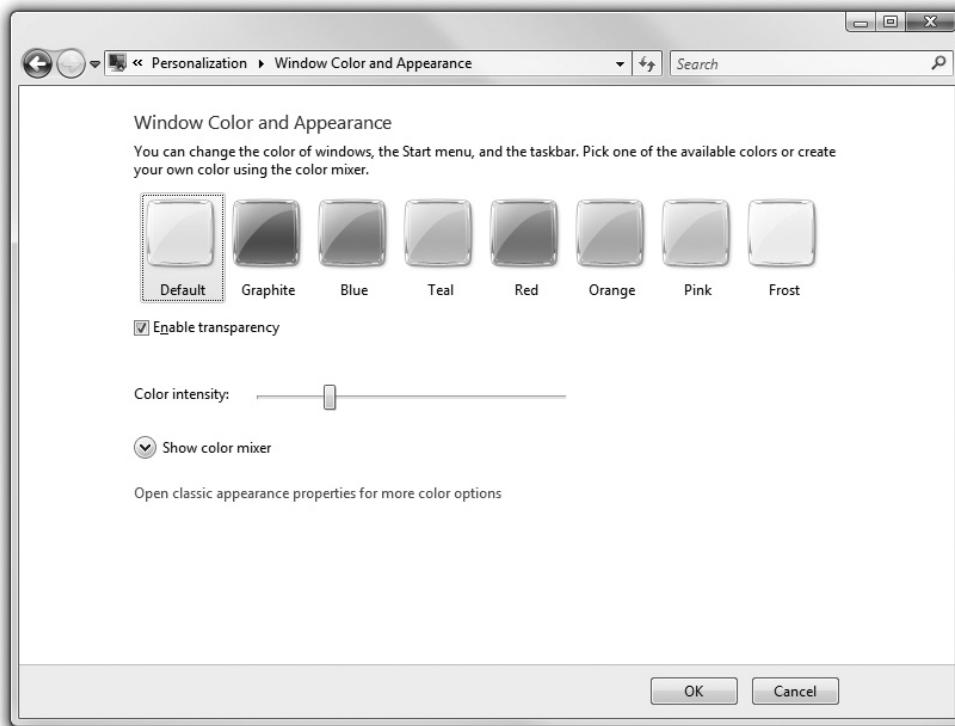


Figure 4-24 You've got Aero!



NOTE If you can't run on Aero desktop, you need to upgrade your system to meet the minimum requirements. This usually means a new video card or updated video card drivers. See Chapter 19, "Video," for details.

If you're running Aero, note that the Window Color and Appearance screen shown in Figure 4-24 has a slider to adjust the transparency settings and a checkbox to turn transparency off completely.

There are a number of other features that, although not on the CompTIA A+ certification exams, you really should try. The WINDOWS KEY-T combination gives a preview of

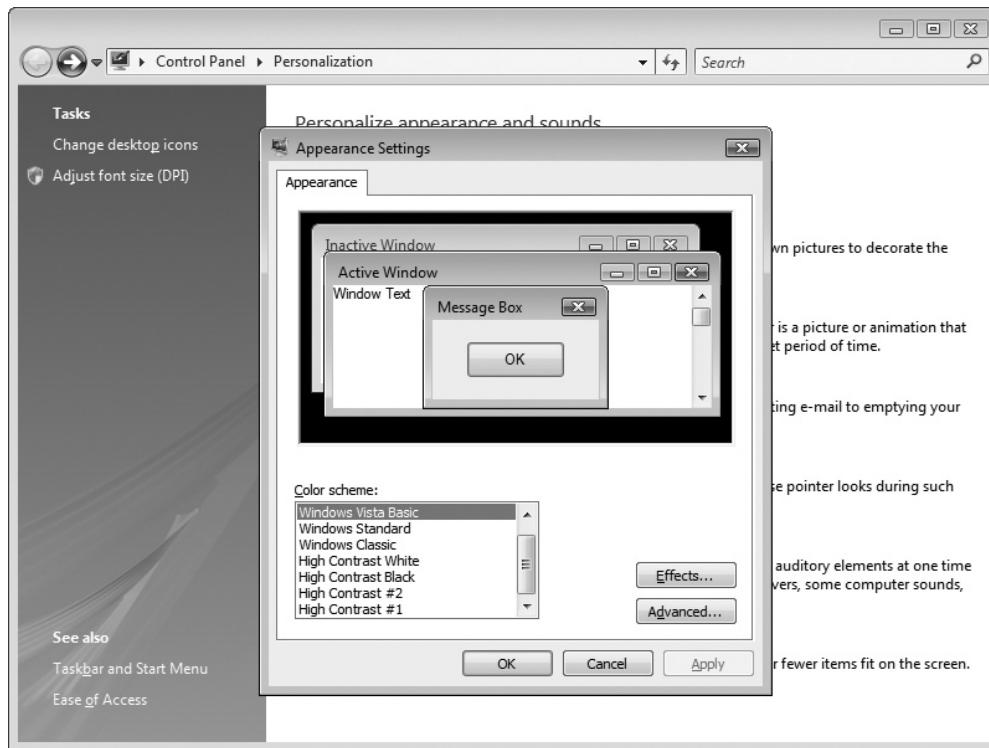


Figure 4-25 The lack of transparency and the flat window with no drop shadow shows that Aero is not activated.

all minimized windows. ALT-TAB gives a preview of all running windows. Try Aero. It may not be the productivity tool Microsoft promises it to be, but it sure is fun.

Taskbar and Start Menu

The *taskbar* runs along the bottom of all Windows desktops and includes up to four sections (depending on the version of Windows and your configuration). Starting at the left side, these are the Start button, the Quick Launch toolbar, the running programs area, and the notification area. Although the taskbar by default sits at the bottom of the desktop, you can move it to either side or to the top of the screen.

One of the main jobs of the taskbar is to show the *Start button*, probably the most clicked button on all Windows systems. You can find the Start button on the far left end of the taskbar. Figure 4-26 shows the Start buttons for Windows 2000, Windows XP, and Windows Vista (in order).

Click the Start button to bring up the Start menu, where you can see the applications installed on the system and start them. Now,

Figure 4-26

Three different Windows Start buttons



move your mouse cursor onto the All Programs (Windows XP) or Programs (all other versions) menu item. When the All Programs/Programs menu appears, move the cursor to the Accessories menu. Locate the Notepad program and click it. By default, Windows hides lesser-used menu options, so if you don't see Notepad, click the double down-arrows at the bottom of the Accessories menu to make Notepad appear.



NOTE You have a lot of clicking to do in this chapter, so take a moment to reflect on what I call the General Rules of Clicking. With a few exceptions, these rules always apply, and they really help in manipulating the Windows interface to do whatever you need done:

- Click menu items once to use them.
- Click icons once to select them.
- Click icons twice to use them.
- Right-click anything and select Properties to see its properties.

Great! If you opened Notepad properly, you should see something like Figure 4-27, with Notepad displaying an untitled text page. Notice how Notepad shows up on the taskbar at the bottom of your screen. Most running programs appear on the taskbar in this way. Close the Notepad program by clicking on the button with the X in the upper-right corner of the Notepad window. Look again at the taskbar to see that Notepad no longer appears there.

Figure 4-27
Notepad application (note the buttons in the upper-right corner)



Now look all the way to the right end of the taskbar. This part of the taskbar is known officially as the *notification area*, though many techs and the CompTIA A+ certification exams call it the *system tray*. You will at a minimum see the current time displayed

in the system tray, and on most Windows systems you'll also see a number of small icons there. Figure 4-28 shows the system tray on my PC.

Figure 4-28
System tray showing several icons and the time





EXAM TIP Microsoft calls the area at the far right of the taskbar the *notification area*, but you might see it referred to on the CompTIA A+ certification exams as the *system tray*.

These icons show programs running in the background. Most programs run in a window. Background programs function like any other program except they do not use a window, simply because the nature of their particular jobs makes a window unnecessary. Thousands of programs like to run in the system tray: network status, volume controls, battery state (on laptops), and removable device status are just a few examples. What shows up on yours depends on your version of Windows, what hardware you use, and what background programs you have installed. Some of the icons in Figure 4-28, for example, include my antivirus program, a handy notification program for incoming Facebook and Twitter messages, and my UPS program.

Near the left end of the taskbar, next to the Start button, you will find the *Quick Launch toolbar* (Figure 4-29), a handy extra where you can select often-used programs with a single click. On Windows XP systems, the Quick Launch toolbar is not displayed on the taskbar by default, so before you can use this convenient feature, you

must right-click the taskbar, select Properties, and check Show Quick Launch. To change the contents of the Quick Launch toolbar, simply drag icons onto or off of it.

Figure 4-29
Quick Launch
toolbar



The Many Faces of Windows Explorer

Windows Explorer enables you to manipulate files and folders stored on all the drives in or connected to your computer. Microsoft presents the tool in a variety of ways to help you focus quickly on what you want to accomplish. If you want to see the contents of an optical disc, for example, you can open *My Computer* (Windows 2000/XP) or *Computer* (Windows Vista/7) by double-clicking the icon on the desktop or selecting the icon from the Start menu to have Windows Explorer open with the drives displayed (Figure 4-30). To display the contents of a drive or folder, double-click it.

Windows Explorer in Windows 2000 has a fairly Spartan interface, whereas Windows XP offers a series of common tasks in a bar along the left side of the screen, as you can see in Figure 4-30. Windows Vista also offers tasks, but the options display in a bar below the location bar, near the top of the window (Figure 4-31).

When you access *My Documents* (Windows 2000/XP) or *Documents* (Windows Vista/7) by double-clicking the icon on the desktop or selecting from the Start menu, Windows opens Windows Explorer with your user folders displayed. Because your *My Documents/Documents* folder is stored (by default) on the C: hard drive, Windows Explorer shows the contents of that drive, drilled down specifically to your folders.

The fact that one way to open Windows Explorer is to double-click *My Computer* or *Computer*, and another way to open Windows Explorer is to double-click *My Documents* or *Documents*—and the two methods show different contents initially—leads many users to assume that they have two distinct tools. That's simply not the case.

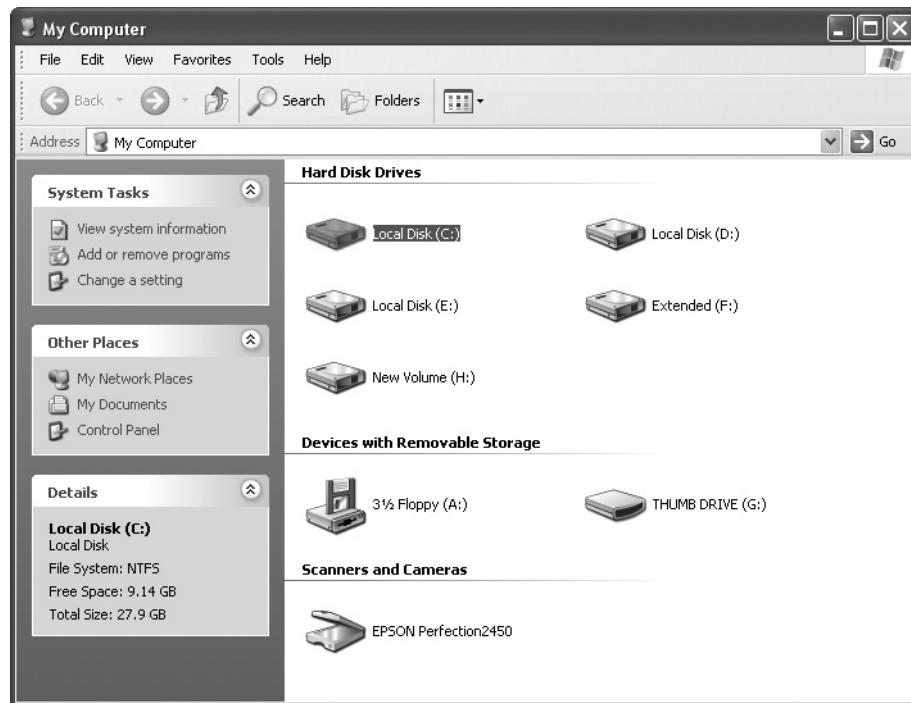


Figure 4-30 Windows Explorer in Windows XP displaying the drives installed, as well as common tasks on the left

Windows Explorer changes what's displayed to suit specific tasks preset by Microsoft, but it's a single tool that can point to different locations on your computer.

Even better, you can change the look of Windows Explorer by clicking a button. The Folders button in Windows 2000 and Windows XP toggles the *Folders list* on or off on the left (Figure 4-32). The Folders list is a tree menu that enables you to move the focus of Windows Explorer to different folders or drives. The Folders list replaces the common tasks bar in Windows XP. Note that the Folders list is enabled by default in Windows Vista no matter whether you open the tool through Computer or Documents.

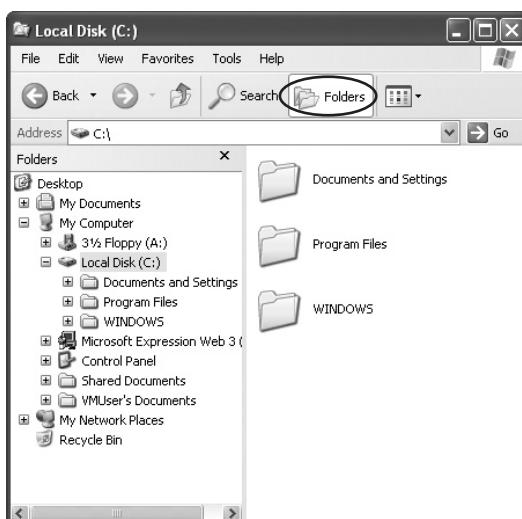
In Windows Vista, you can alter the view of Windows Explorer in several ways. On the task bar, you can click the down arrow next to Views to change the size of the icons, the details displayed, and more. You can turn off the Folders list if desired by clicking the down arrow next to Organize and then selecting Layout from the menu options.

The Folders list view makes copying and moving files and folders from one location to another very easy. The steps differ slightly when you copy to a folder on the same drive versus when you copy to a folder on a different drive, although the first step is the same: Select a folder in the Folders list, and the contents of that folder appear in the main pane on the right.



Figure 4-31 Windows Explorer in Windows Vista displaying the drives installed and showing tasks

Figure 4-32
Windows
Explorer in Win-
dows XP with
the Folders list
toggled on



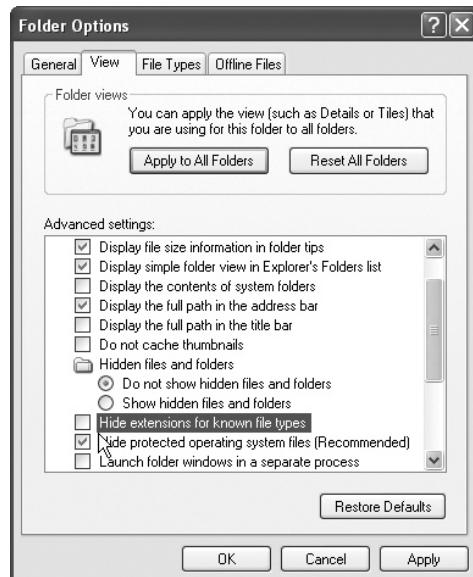
To move or copy a file from one folder to another folder on the same drive, click and hold a file or folder in the main pane and then drag the cursor over to any folder in the Folders list. A → symbol will appear in Windows Vista and 7, although not in Windows 2000 or XP. Release the mouse button, and you move that file or folder to the new folder. If you want to copy a file or folder rather than move it, press the **CTRL** key on your keyboard and then click and drag into the desired folder. The → symbol (if any) changes to a +; release the mouse button to copy the file or folder.

To copy or move a file from one folder to another folder on a different drive, click and hold a file or folder in the main pane and then drag the cursor over to any folder in the Folders list, and a + symbol will appear. Release the mouse button, and you'll make a copy of that file or folder in the new folder. If you want to move a file or folder rather than just copy it, press the **SHIFT** key on your keyboard and then click and drag into the desired folder. The + symbol changes to a → in Windows Vista/7 or just goes away in Windows 2000/XP; release the mouse button to move the file or folder.

Notice the differences in the icons displayed in Windows Explorer? Windows assigns different icons to different types of files, based on their *extensions*, the set of characters at the end of a filename, such as .EXE, .TXT, or .JPG. The oldest extensions, starting from back in the DOS era, are usually three characters, but current programs may use two-character extensions, such as .JS (JavaScript) or .AU (audio), or even four-character extensions, such as the ubiquitous .HTML for Web pages. In rare cases, a filename might actually have no extension.

As you look at these icons on your own screen, some of you might say, "But I don't see any extensions!" That's because Windows hides them by default. To see the extensions in 2000/XP, select Tools | Folder Options to open the Folder Options dialog box (Figure 4-33). Click the View tab and uncheck *Hide extensions for known file types*. In Vista, click on Organize | Folder and Search Options | View tab to see the same dialog box.

Figure 4-33
Folder Options
dialog box



There are two other very handy settings under the View tab, but to see the results well, you need to be in the C: drive of My Computer, as shown in Figure 4-34.



Figure 4-34 Default My Computer view where many things are hidden

Go back into the View tab under Folder Options, click the *Show hidden files and folders* radio button, and then uncheck *Hide protected operating system files*. Click the *Apply to folders* button in Windows Vista, the *Apply to all folders* button in Windows XP, or the *Apply* button in Windows 2000. Your C: drive should look like Figure 4-35 (it shows

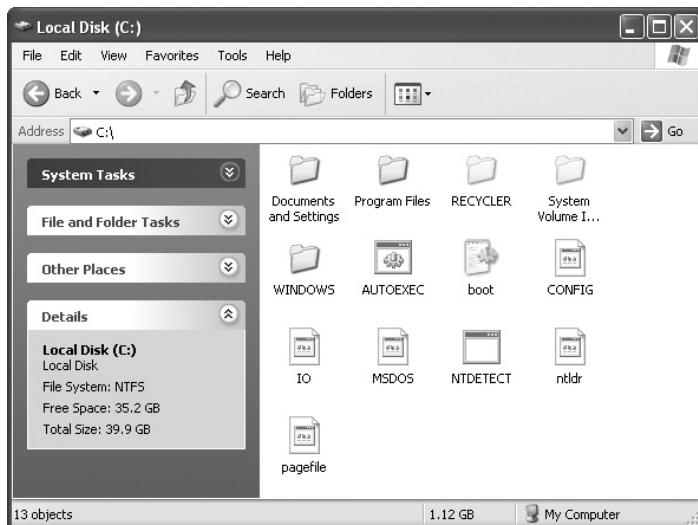


Figure 4-35 My Computer displaying hidden files and folders

the Windows XP version) when you are finished. As before, when you return to examining the folder contents, you will see the file extensions, and possibly some previously hidden files.

Now that those files are visible, you have the awesome responsibility of keeping them safe. In general, the less you handle your vital system files, the better. You'll learn some ways to do useful things with files that were previously hidden, but unless you really know what you're doing, it's best to leave them alone. Before you turn a PC over to someone who isn't a trained PC tech, you'll probably want to hide those system files again.

Microsoft has tried to help users organize their files and folders through various user folders and subfolders that you access through Windows Explorer. The different operating systems offer different choices, so let's look at My Documents and the User's Files.

My Documents, My [Whatever] All versions of Windows provide a special folder structure for each user account so users have their own places to store personal data. This folder grouping is called *My Documents* in Windows 2000 and XP. Many Windows programs take advantage of My Documents and by default store their files in the folder or in a subfolder.

Windows XP installations do not show My Documents on the desktop by default. On Windows XP, you can access it readily through the Start menu, or you can add it to your desktop. Right-click the desktop and select Properties to open the Display Properties dialog box. Select the Desktop tab, and then click on the Customize Desktop button to open the Desktop Items dialog box (Figure 4-36). On the General tab, select the checkbox next to My Documents, My Computer, or both, and then click OK to close the dialog box and make any selected icons appear on the desktop.

Figure 4-36
XP Desktop
Items dialog box





NOTE As with most tools in Windows, Microsoft gives you more than one way to accomplish tasks. In XP and Vista, try right-clicking the Start menu icon, selecting Properties, and choosing the Classic Start Menu radio button.

Windows XP adds a number of subfolders to My Documents: My Pictures (which offers filmstrip and thumbnail views of pictures you store there), My Music (which will fire up Media Player to play any file), My Videos (which, again, starts Media Player), and more. Figure 4-37 shows My Pictures, using the thumbnail view. Many applications have since jumped on the bandwagon and added their own My [Whatever] folders in My Documents. Before I retired my Windows XP machine, for example, I had My eBooks, My Web Sites, My Received Files, My Virtual Machines...My Goodness!

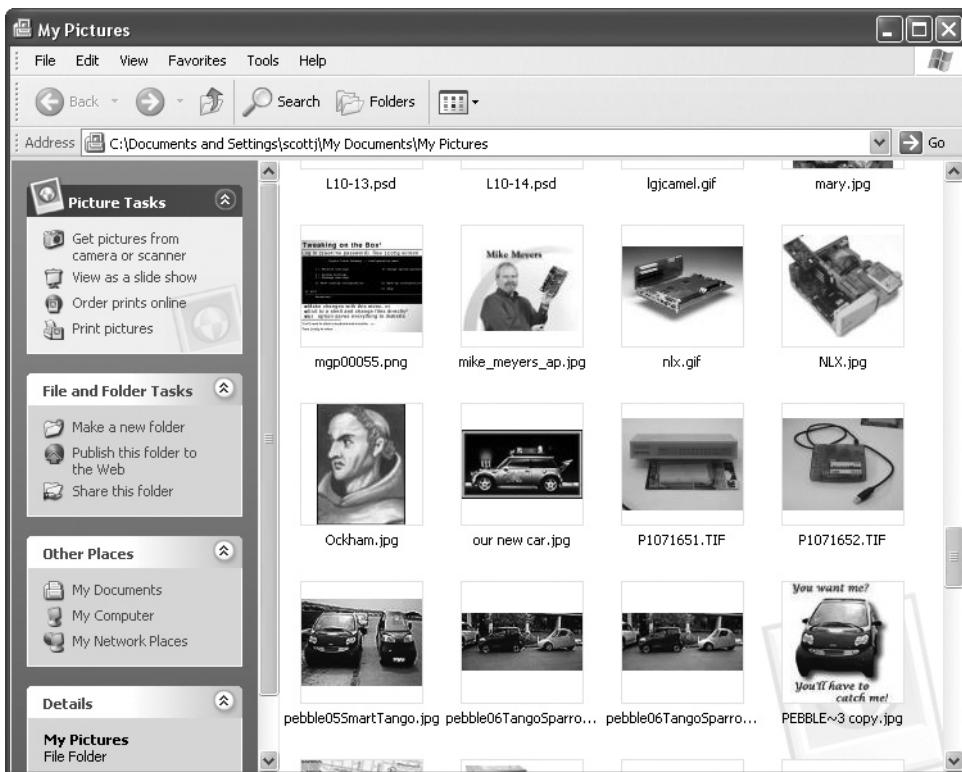


Figure 4-37 My Pictures subfolder in My Documents

User's Files Windows Vista takes the equivalent of My Documents to a whole new level with the *User's Files* option. (Although a Documents folder is available, it's designed literally for documents, such as text files.) Click on the Start menu and you'll see a folder option with the user name of the account that's currently logged into the

computer. With that option, not only do you get all of the folders you get in Windows 2000/XP, but Vista also adds a number of other folders as well as interesting but important data such as your Internet Explorer favorites and copies of recent searches.

Just as with Windows XP, the user's folder does not show on the desktop by default. To see this folder, right-click on the desktop, select Personalize, and then click *Change desktop icons* on the left of the Personalization window. You'll see a Desktop Icon Setting dialog box where you can select the User's File option to display the personal files of the logged-in user account. Figure 4-38 shows the User's Files folder for my editor, with the Desktop Icon Settings dialog box in the background.



Figure 4-38 Typical user accounts folder in Windows Vista

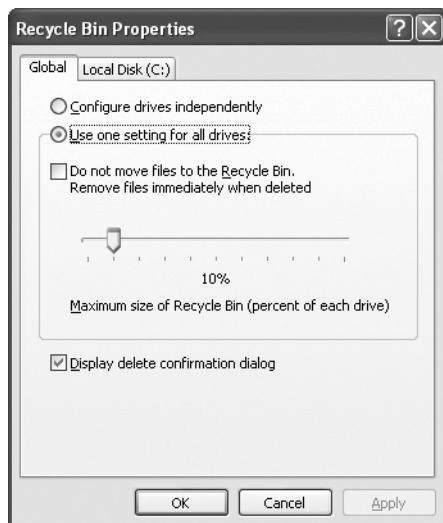
No matter what your version of Windows decides to call it, My Documents/User's Files is an incredibly critical part of your computer's directory structure. Not only does this store your most personal (and important) documents, it also stores most of the personalization settings for each user. You'll see more of My Documents/User's Files in the next section.

Recycle Bin

In Windows, a file is not erased when you delete it. Windows adds a level of protection in the form of a special folder called the *Recycle Bin*. When you delete a file in Windows, the file moves into the Recycle Bin. It stays there until you empty the Recycle Bin or restore the file, or until the Recycle Bin reaches a preset size and starts erasing its oldest contents.

To access the Recycle Bin's properties, right-click the icon and select Properties. The Recycle Bin's properties look different in different versions of Windows, but they all work basically the same. Figure 4-39 shows the properties of a typical Windows XP Recycle Bin. Note that you set the amount of drive space to use for the Recycle Bin, 10 percent being the default amount. If a hard drive starts to run low on space, this is one of the first places to check.

Figure 4-39
Windows XP
Recycle Bin Prop-
erties



My Network Places/Network

Systems tied to a network, either via a network cable or by a modem, have a folder called *My Network Places* in XP or simply *Network* in Vista (see Figure 4-40). This shows all the current network connections available to you. You'll learn about My Network Places in Chapter 23, "Local Area Networking."

Windows Sidebar

Windows Vista comes with a UI feature called the *Windows Sidebar*, a tool that sits on the desktop and enables small helper applications—called Microsoft Gadgets—to run. You can display a clock, for example, or a dynamic weather update. Vista comes with a

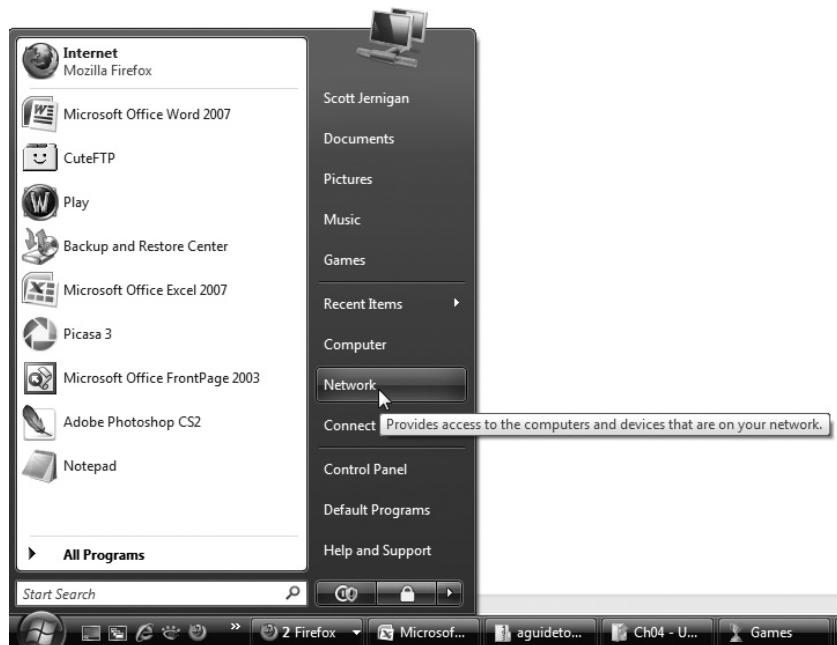
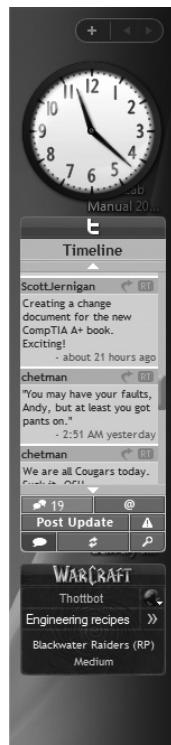


Figure 4-40 Network in Windows Vista

Figure 4-41
Windows Sidebar
in action



handful of Gadgets, but developers have gone crazy with them, enabling you to add all sorts of useful tools, such as the Twitter feed and World of Warcraft search and realm status Gadgets in Figure 4-41.

Hot Keys

In Windows, you can use key combinations to go directly to various programs and places. Here's a fairly extensive list of general-purpose commands for Windows. Be aware that some applications may change the use of these commands.

Function Keys

- F1 Help
- F2 Rename
- F3 Search menu
- F5 Refresh the current window
- F6 Move among selections in current windows

Popular Hot Keys

- CTRL-ESC Open Start menu
- ALT-TAB Switch between open programs
- ALT-F4 Quit program
- CTRL-Z Undo the last command
- CTRL-A Select all the items in the current window
- SHIFT-DELETE Delete item permanently
- SHIFT-F10 Open a shortcut menu for the selected item (this is the same as right-clicking an object)
- SHIFT Bypass the automatic-run feature for optical media (by pressing and holding down the SHIFT key while you insert optical media)
- ALT-SPACE Display the main window's System menu (from this menu you can restore, move, resize, minimize, maximize, or close the window)
- ALT-ENTER Open the properties for the selected object

Working with Text

- CTRL-C Copy
- CTRL-X Cut
- CTRL-V Paste
- CTRL-Z Undo

Windows Key Shortcuts

These shortcuts use the special Windows key:

- WINDOWS KEY Start menu
- WINDOWS KEY-D Show desktop
- WINDOWS KEY-E Windows Explorer
- WINDOWS KEY-L Locks the computer
- WINDOWS KEY-TAB Cycle through taskbar buttons (or Flip 3D with Windows Aero in Vista)
- WINDOWS KEY-BREAK Open the System Properties dialog box



NOTE I've covered only the most basic parts of the Windows desktop in this chapter. The typical Windows desktop includes many other parts, but for techs and for the CompTIA A+ certification exams, what you've learned here about the desktop is more than enough.

Practical Application

Operating System Folders

The modern versions of Windows organize essential files and folders in a relatively similar fashion. All have a primary system folder for storing most Windows internal tools and files. All have a set of folders for programs and user files. All use a special grouping of files called the Registry to keep track of all the hardware loaded and the drivers that enable you to use that hardware. Finally, every version has a RAM cache file, enabling more robust access to programs and utilities. Yet once you start to get into details, you'll find some very large differences. It's very important for you to know in some detail the location and function of many common folders and their contents.



EXAM TIP The CompTIA A+ exams love to ask detailed questions about the locations of certain folders. Make sure you know this section!

System Folder

SystemRoot is the tech name given to the folder in which Windows has been installed. *SystemRoot* by default is C:\WINNT in Windows 2000, while Windows XP and Vista's *SystemRoot* defaults to C:\WINDOWS. Be warned, these are defaults but not always the case; during the installation process, you can change where Windows is installed.

It's handy to know about *SystemRoot*. You'll find it cropping up in many other tech publications, and you can specify it when adjusting certain Windows settings to make sure they work under all circumstances. When used as part of a Windows configuration setting, add percent signs (%) to the beginning and end like so: %*SystemRoot*%.

If you don't know where Windows is installed on a particular system, here's a handy trick. Get to a command prompt, type `cd %systemroot%`, and press ENTER. The prompt changes to the directory in which the Windows OS files are stored. Slick! See Chapter 15, "Working with the Command-Line Interface," for details on how to use the command prompt in Windows.

The system folder contains many subfolders, too numerous to mention here, but CompTIA wants you to know the names of a number of these subfolders, as well as what goes in them. Let's run through the subfolders you should recognize and define (these folders are in all versions of Windows):

- %*SystemRoot*\FONTS All of the fonts installed in Windows live here.
- %*SystemRoot*\Offline Files When you tell your Web browser to save Web pages for offline viewing, they are stored in this folder. This is another folder that Windows automatically deletes if it needs the space.
- %*SystemRoot*\SYSTEM32 This is the *real* Windows! All of the most critical programs that make Windows run are stored here.

- %SystemRoot%\Temp Anytime Windows or an application running on Windows needs to create temporary files, they are placed here. Windows deletes these files automatically as needed, so never place an important file in this folder.

Program and Personal Document Folders

Windows has a number of important folders that help organize your programs and documents. They sit in the root directory at the same level as the system folder, and of course they have variations in name depending on the version of Windows. We'll assume that your computer is using a C: drive—a pretty safe assumption, although there actually is a way to install all of Windows on a second hard-drive partition.

C:\Program Files (All Versions)

By default, most programs install some or all of their essential files into a subfolder of the Program Files folder. If you installed a program, it should have its own folder in here. Individual companies decide how to label their subfolders. Installing Photoshop made by Adobe, for example, creates the Adobe subfolder and then an Adobe Photoshop subfolder within it. Installing Silverlight from Microsoft, on the other hand, only creates a Microsoft Silverlight folder with the program files within it. (Some programmers choose to create a folder at the root of the C: drive, bypassing Program Files all together, but that's becoming increasingly rare.)

C:\Program Files (x86)

The 64-bit versions of Windows Vista and Windows 7 create two directory structures for program files. The 64-bit applications go into the C:\Program Files folder. The 32-bit applications, in contrast, go into the C:\Program Files (x86) folder. The separation makes it easy to find the proper version of whatever application you seek.

Personal Documents

As you might expect, given the differences among the desktop names for personal document locations outlined earlier in the chapter, the personal folders for Windows 2000/XP and Windows Vista differ in location and name. Windows 2000 and Windows XP place personal folders in the Documents and Settings folder, whereas Windows Vista uses the Users folder. From there, they differ even more.

C:\Documents and Settings (2000 and XP) All of the personal settings for each user are stored here. All users have their own subfolders in Documents and Settings. In each user folder, you'll find another level of folders with familiar names such as Desktop, My Documents, and Start Menu. These folders hold the actual contents of these items. Let's dive through these to see the ones you need to know for the CompTIA A+ exams.

- \Documents and Settings\Default User (hidden) All of the default settings for a user. For example, if the user doesn't specify a screensaver to use, Windows refers to this folder's settings to determine what screensaver it should use if needed.

- **\Documents and Settings\All Users** You can make settings for anyone who uses the computer. This is especially handy for applications: some applications are installed so all users may use them and some might be restricted to certain users. This folder stores information for any setting or application that's defined for all users on the PC.
- **\Documents and Settings\Shared Documents (XP Only)** If you're using XP's Simple File Sharing, this is the only folder on the computer that's shared.
- **\Documents and Settings\<User Name>** This folder stores all settings defined for a particular user (Figure 4-42).

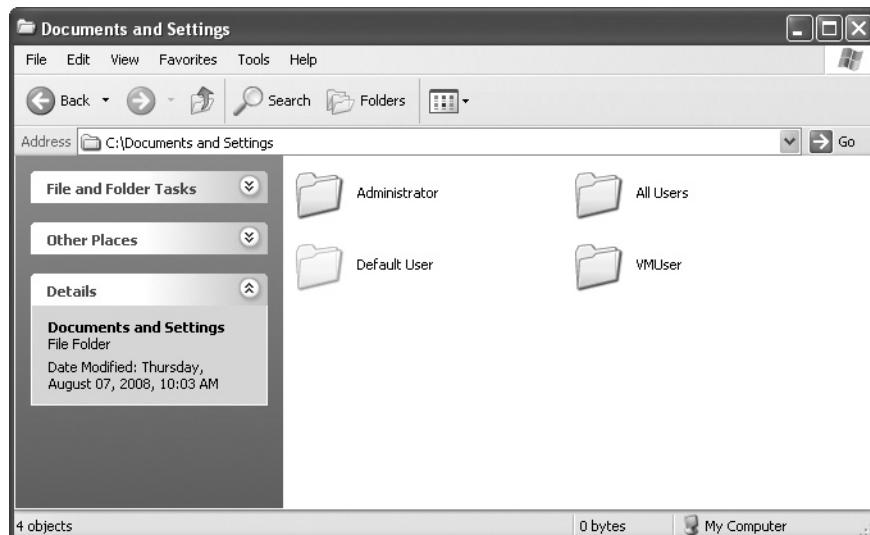


Figure 4-42 Contents of a typical \Documents and Settings folder in XP

Opening any user's folder reveals a number of even lower folders. Each of these store very specific information about the user.

- **\Documents and Settings\<User Name>\Desktop** This folder stores the files on the user's desktop. If you delete this folder, you delete all the files placed on the desktop.
- **\Documents and Settings\<User Name>\<User name's>Documents** This is the My Documents folder for another user on the computer.
- **\Documents and Settings\<User Name>\Application Data (hidden)** This folder stores information and settings used by various programs that the user has installed.
- **\Documents and Settings\<User Name>\Start Menu** This folder stores any customizations the user made to the Start menu.

C:\Users (Vista) Vista dumps the old Documents and Settings for the Users folder. Functionally similar to Documents and Settings, there are a number of sub-folders here that you need to know to pass the CompTIA A+ exams.

Let's repeat the process, locating the same functions in their new locations.

- \Users\Default (hidden), \Users\All Users, All of these folders retain the same functions as in 2000/XP.



NOTE Vista and 7 make a special hidden folder called "Default User" that points to the User folder to support older applications.

- \Users<user name> The big change takes place under each of the \Users<user name> folders. This folder still stores all settings defined for a particular user; however, this folder in Vista/7 is much more detailed than in 2000/XP (Figure 4-43). Luckily, you only need to know a few folders for the exams.
- \Users<User Name>\Desktop Same as 2000/XP.

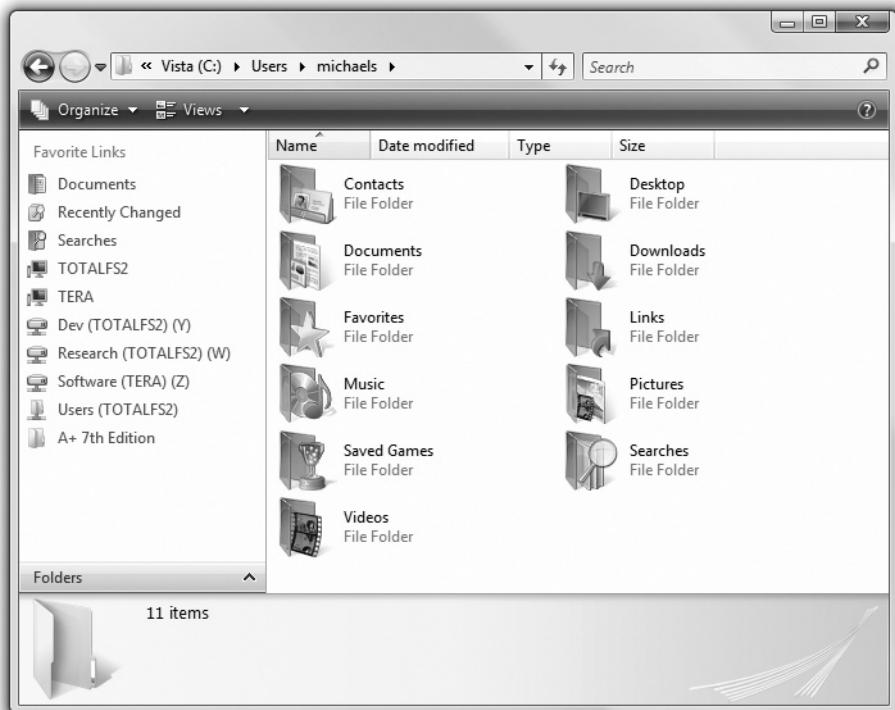


Figure 4-43 Contents of a typical \Users<User Name>\ folder in Vista

- **\Users\<User Name>\Documents** This is the Documents folder for that user. Compare the name of this folder to the one in Windows 2000/XP and know which is which.
- **\Users\<User Name>\Downloads** Microsoft's preferred download folder for applications to use. Most applications do use this folder, but some do not.
- **\Users\<User Name>\Start Menu** Same as 2000/XP.



EXAM TIP Be very careful here. Some of the folder name differences between 2000/XP and Vista/7 are subtle. Make sure you know the difference.

Any good tech knows the name and function of all the folders just listed. As a tech, you will find yourself manually drilling into these folders for a number of reasons. Users rarely go directly into any of these folders with Windows Explorer. That's a good thing since, as a technician, you need to appreciate how dangerous it is for them to do so. Imagine a user going into a \Users\<User Name>\Desktop folder and wiping out someone's desktop folders. Luckily, Windows protects these folders by using NTFS permissions, making it very difficult for users to destroy anything other than their own work.

Registry

The *Registry* is a huge database that stores everything about your PC, including information on all of the hardware in the PC, network information, user preferences, file types, and virtually anything else you might run into with Windows. Almost any form of configuration you do to a Windows system involves editing the Registry. Every version of Windows stores the numerous Registry files (called *hives*) in the \SystemRoot%\System32\config folder. Fortunately, you rarely have to access these massive files directly. Instead, you can use a set of relatively tech-friendly applications to edit the Registry.

The CompTIA A+ certification exams do not expect you to memorize every aspect of the Windows Registry. You should, however, understand the basic components of the Registry, know how to edit the Registry manually, and know the best way to locate a particular setting.

Accessing the Registry

Before you look in the Registry, let's look at how you access the Registry directly by using a Registry editor. Once you know that, you can open the Registry on your machine and compare what you see to the examples in this chapter.

Windows 2000 comes with two Registry editors: REGEDT32.EXE, shown in Figure 4-44, and the much older REGEDIT.EXE (Figure 4-45). You start either of these programs by going to a command prompt and typing its filename.

The reason for having two different Registry editors is long and boring, and explaining it would require a very dull 15-minute monologue (preferably with an angelic chorus singing in the background) about how the Registry worked in Windows 9x and Windows NT. Suffice it to say that in Windows 2000, only REGEDT32 is safe to use for actual editing, but you can use the older REGEDIT to perform searches, because REGEDT32's search capabilities are not very good.

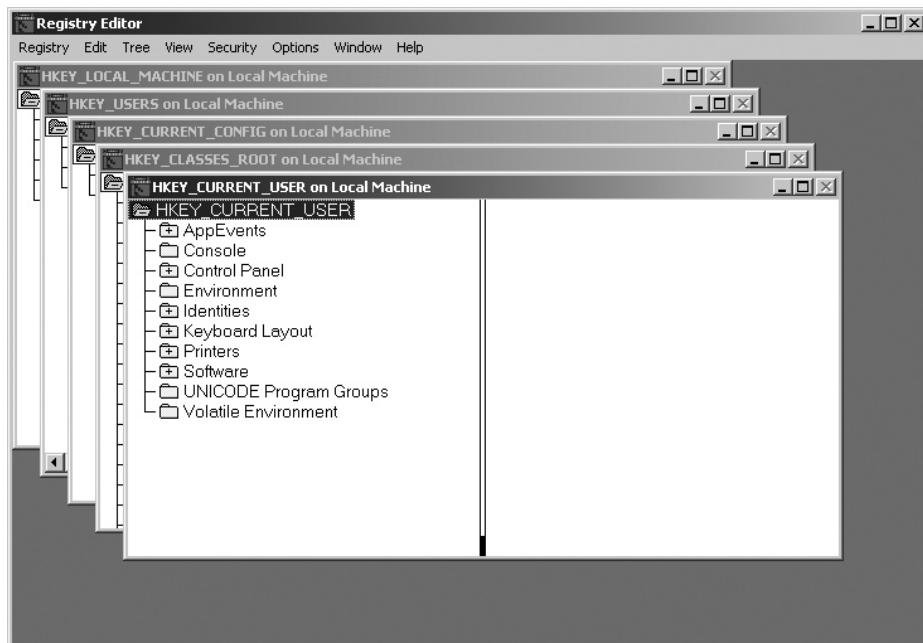


Figure 4-44 REGEDT32 in Windows 2000

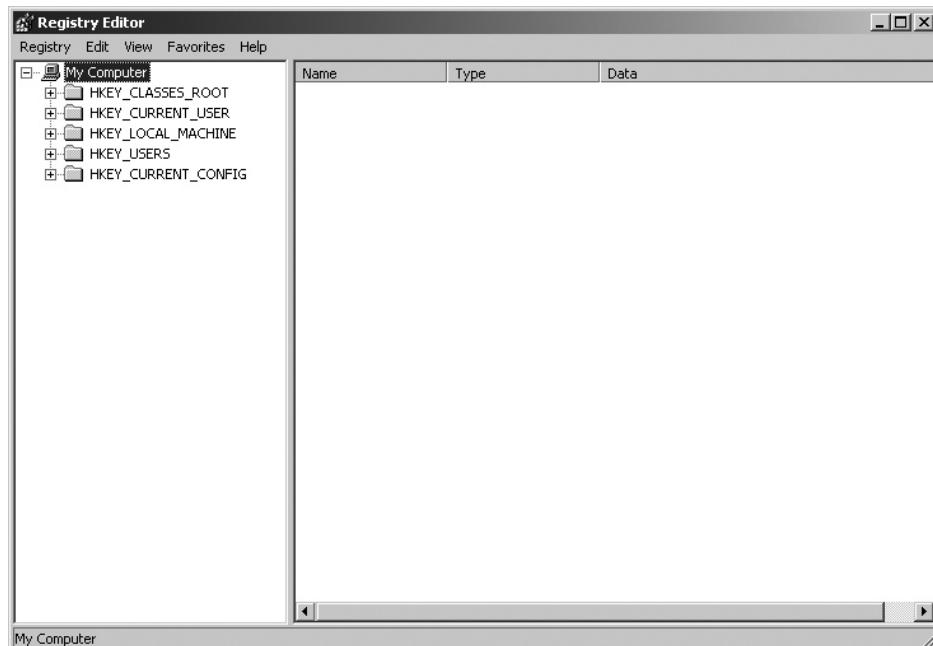


Figure 4-45 REGEDIT in Windows 2000

Starting with Windows XP, Microsoft eliminated the entire two-Registry-editor nonsense by creating a new REGEDT32 that includes strong search functions. No longer are there two separate programs, but interestingly, entering either REGEDIT or REGEDT32 at a command prompt brings up the same program, so feel free to use either program name. We can also dispense with calling the Registry Editor by its filename and use its proper title.

Registry Components

The Registry is organized in a tree structure similar to the folders in the PC. Once you open the Registry Editor in Windows, you will see five main subgroups, or *root keys*:

- HKEY_CLASSES_ROOT
- HKEY_CURRENT_USER
- HKEY_USERS
- HKEY_LOCAL_MACHINE
- HKEY_CURRENT_CONFIG

Try opening one of these root keys by clicking on the plus sign to its left; note that more subkeys are listed underneath. A subkey also has other subkeys, or *values*. Figure 4-46 shows an example of a subkey with some values. Notice that the Registry Editor shows keys on the left and values on the right, just as Windows Explorer shows directories on the left and files on the right.

NOTE When writing about keys and values, I'll use the expression *key = value*.



The screenshot shows the Windows Registry Editor window. The left pane displays a tree view of registry keys under 'My Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Valve\Steam'. The right pane shows a table of registry values:

Name	Type	Data
ab](Default)	REG_SZ	(value not set)
ab]cip	REG_SZ	US
ab]CM	REG_SZ	69.28.148.250;69.28.156.2...
ab]CMVer	REG_DWORD	0x4436b62e (1144436270)
ab]ELP	REG_DWORD	0x00000000 (0)
ab]InstallPath	REG_SZ	C:\Program Files\Valve\Steam
ab]Rate	REG_SZ	9999

My Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Valve\Steam

Figure 4-46 Typical Registry keys and values

The secret to understanding the Registry is to understand the function of the five root keys first. Each of these root keys has a specific function, so let's take a look at them individually.

HKEY_CLASSES_ROOT

This root key defines the standard *class objects* used by Windows. A class object is a named group of functions that define what you can do with the object it represents. Pretty much everything that has to do with files on the system is defined by a class object. For example, the Registry uses two class objects to define the popular MP3 sound file. If you search the Registry for the .MP3 file extension, you will find the first class object, which associates the .MP3 file extension with the name "Winamp.File" on this computer (Figure 4-47).

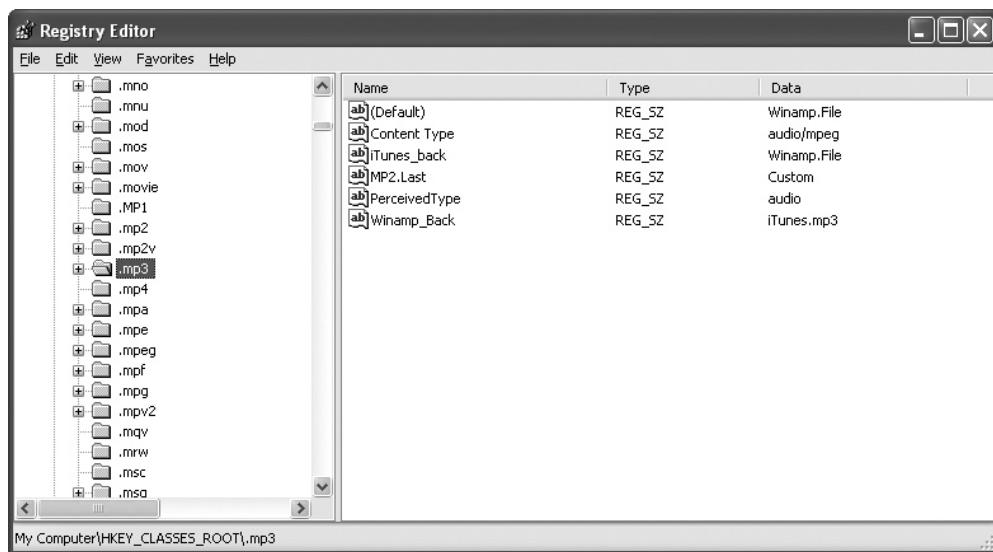


Figure 4-47 Association of .MP3 with Winamp

Ah, but what are the properties of Winamp.File? That's what the HKEY_CLASSES_ROOT root key is designed to handle. Search this section again for "Winamp.File" (or whatever it said is the value for your MP3 file) and look for a subkey called "open." This variable determines the *file association* (Figure 4-48), which is the Windows term for what program to use to open a particular type of file.

This subkey tells the system everything it needs to know about a particular software item, from which program to use to open a file, to the type of icon used to show the file, to what to show when you right-click on that file type. Although it is possible to change most of these settings in the Registry Editor, the normal way is to choose more user-friendly methods. In Windows XP, for example, you can right-click on a file and select Properties, and then click the Change button on the General tab to open the Open With dialog box (Figure 4-49). From there you can browse to select the program you want to use.

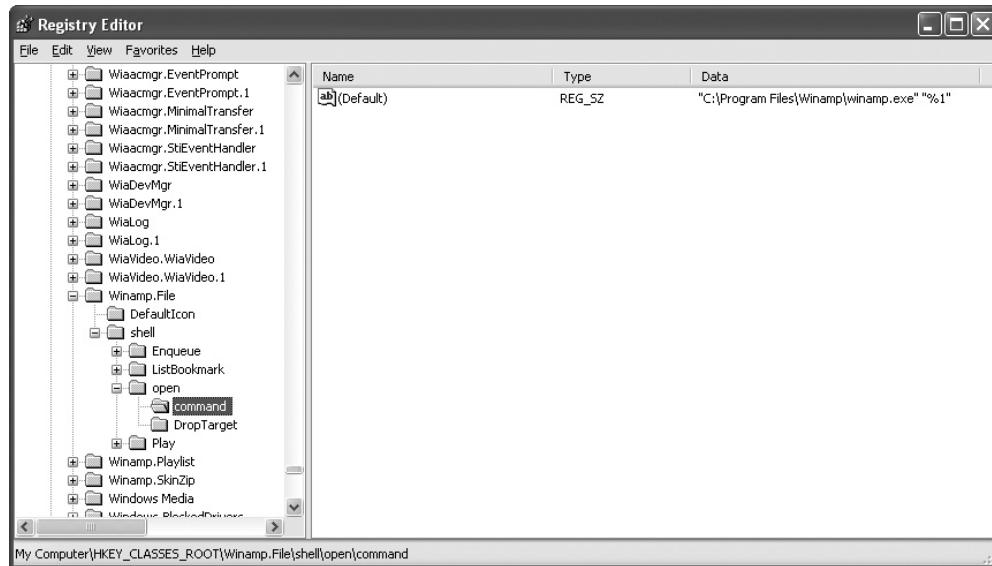
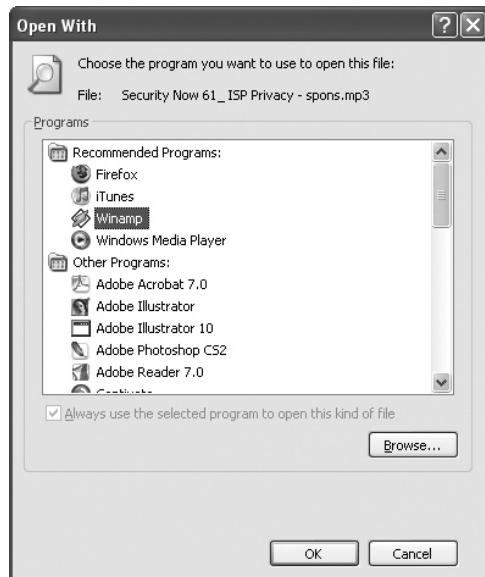


Figure 4-48 Winamp file settings

Figure 4-49
Changing the file
association the
easy way



HKEY_CURRENT_USER and HKEY_USERS

Windows is designed to support more than one user on the same PC, storing personalized information such as desktop colors, screensavers, and the contents of the desktop for every user that has an account on the system. HKEY_CURRENT_USER stores the current user settings, and HKEY_USERS stores all of the personalized information for

all users on a PC. While you certainly can change items such as the screensaver here, the better way is to right-click on the desktop and select Properties.

HKEY_LOCAL_MACHINE

This root key contains all the data for a system's non-user-specific configurations. This encompasses every device and every program in your PC. For example, Figure 4-50 shows the description of a DVD disc drive.

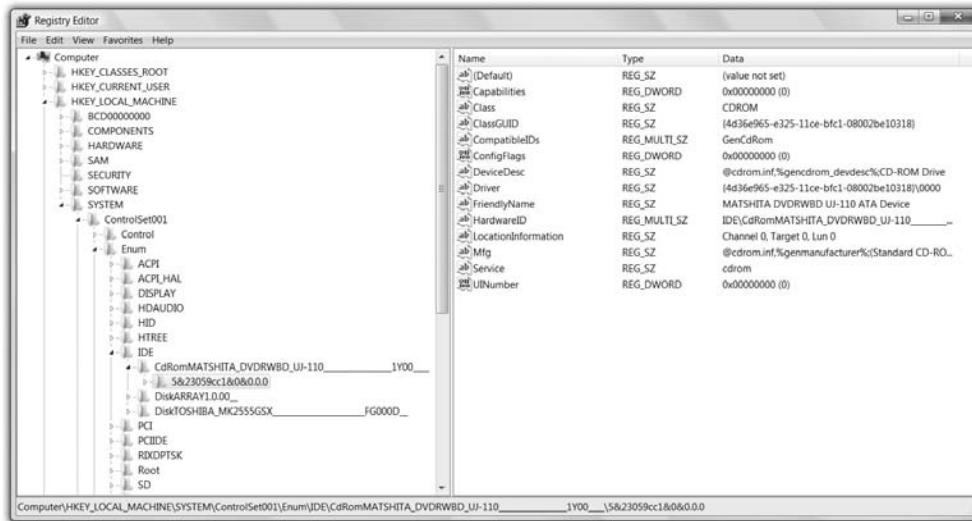


Figure 4-50 Registry information for a DVD drive

HKEY_CURRENT_CONFIG

If the values in HKEY_LOCAL_MACHINE have more than one option, such as two different monitors, this root key defines which one is currently being used. Because most people have only one type of monitor and similar equipment, this area is almost never touched.

Page File

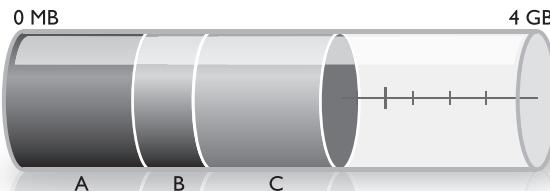
Windows uses a portion of the hard drive as an extension of system RAM, through what's called a *RAM cache*. A RAM cache is a block of cylinders on a hard drive set aside as what's called a *page file*, *swap file*, or *virtual memory*. When the PC starts running out of real RAM because you've loaded too many programs, the system swaps programs from RAM to the page file, opening more space for programs currently active. All versions of Windows use a page file, so here's how one works.



EXAM TIP The default and recommended page file size is 1.5 times the amount of installed RAM on your computer.

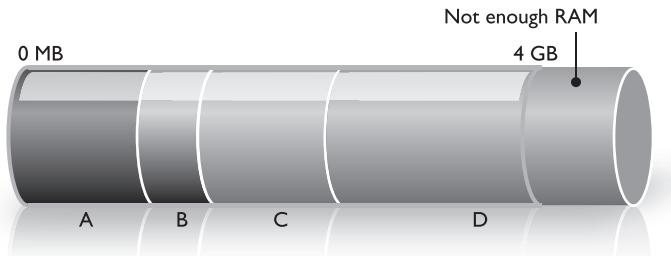
Let's assume you have a PC with 4 GB of RAM. Figure 4-51 shows the system RAM as a thermometer with gradients from 0 to 4 GB. As programs load, they take up RAM, and as more and more programs are loaded (labeled A, B, and C in the figure), more RAM is used.

Figure 4-51
A RAM thermometer showing that more programs take more RAM



At a certain point, you won't have enough RAM to run any more programs (Figure 4-52). Sure, you could close one or more programs to make room for yet another one, but you can't keep all of the programs running simultaneously. This is where virtual memory comes into play.

Figure 4-52
Not enough RAM to load program D



Windows' virtual memory starts by creating a page file that resides somewhere on your hard drive. The page file works like a temporary storage box. Windows removes running programs temporarily from RAM into the page file so other programs can load and run. If you have enough RAM to run all your programs, Windows does not need to use the page file; Windows brings the page file into play only when insufficient RAM is available to run all open programs.



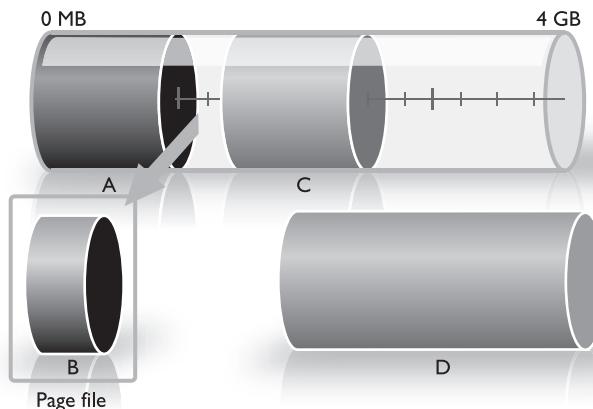
NOTE Virtual memory is a fully automated process and does not require any user intervention. Tech intervention is another story!

To load, Program D needs a certain amount of free RAM. Clearly, this requires that unloading some other program (or programs) from RAM without actually closing any programs. Windows looks at all running programs—in this case A, B, and C—and decides which program is the least used. That program is then cut out of or swapped from RAM and copied into the page file. In this case, Windows has chosen Program B (Figure 4-53). Unloading Program B from RAM provides enough RAM to load Program D (Figure 4-54).

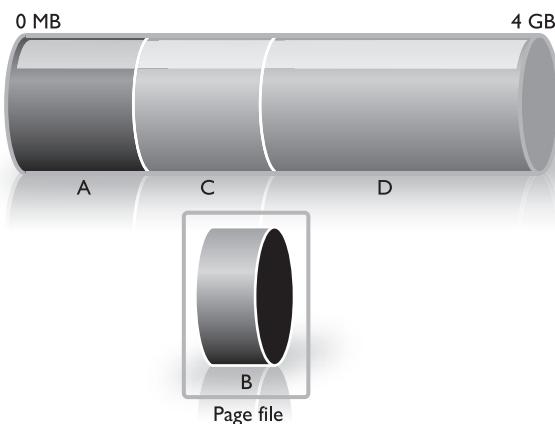
It is important to understand that none of this activity is visible on the screen. Program B's window is still visible, along with those of all the other running programs. Nothing tells the user that Program B is no longer in RAM (Figure 4-55).

Figure 4-53

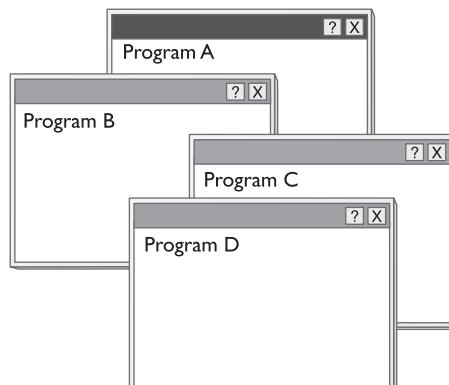
Program B being unloaded from memory

**Figure 4-54**

Program B stored in the page file—room is made for Program D

**Figure 4-55**

You can't tell whether a program is swapped or not.



So what happens if you click on Program B's window to bring it to the front? The program can't actually run from the page file; it must be loaded back into RAM. First, Windows decides which program must be removed from RAM, and this time Windows chooses Program C (Figure 4-56). Then it loads Program B into RAM (Figure 4-57).

Figure 4-56
Program C is swapped to the page file.

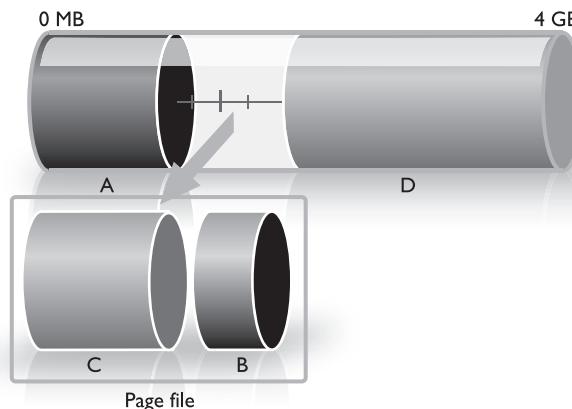
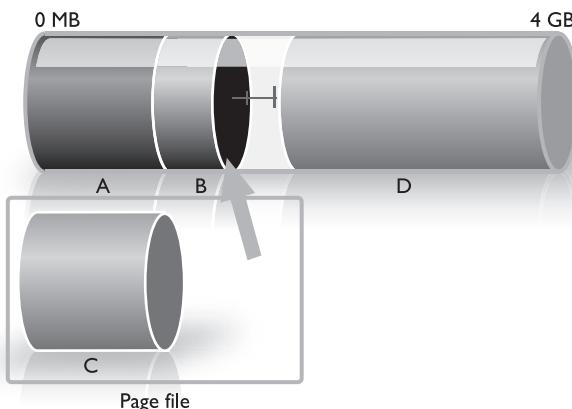


Figure 4-57
Program B is swapped back into RAM.



Swapping programs to and from the page file and RAM takes time. Although no visual clues suggest that a swap is taking place, the machine slows down quite noticeably as Windows performs the swaps. The alternative (Figure 4-58) is far less acceptable. Page files are a crucial aspect of Windows operation.

Figure 4-58
The alternative to page files



Windows handles page files automatically, but occasionally you'll run into problems and need to change the size of the page file or delete it and let Windows re-create it automatically. The page file is PAGEFILE.SYS. You can often find it in the root directory of the C: drive, but again, that can be changed. Wherever it is, the page file is a hidden system file, which means in practice that you'll have to play with your folder-viewing options to see it.



NOTE If you have a second hard drive installed in your PC, you can often get a nice performance boost by moving your page file from the C: drive (the default) to the second drive. To move your page file in all versions of Windows, go to the Control Panel | System applet and select the Advanced tab in 2000/XP or Advanced system settings menu in Vista/7. This opens the System Properties dialog box. In the Performance section, click the Settings button to open the Performance Options dialog box. Select the Advanced tab, and then click the Change button in the Virtual Memory section. Select a drive from the list and give it a size or range, and you're ready to go.

Just don't turn virtual memory off completely. Although Windows can run without virtual memory, you will definitely take a performance hit.

Tech Utilities

Windows offers a huge number of utilities that enable techs to configure the OS, optimize and tweak settings, install hardware, and more. The trick is to know where to go to find them. This section shows the six most common locations in Windows where you can access utilities: right-click, Control Panel, System Tools, command line, Administrative Tools, and the Microsoft Management Console. Note that these are locations for tools, not tools themselves, and you can access many tools from more than one of these locations. However, you'll see some of the utilities in many of these locations. Stay sharp in this section, as you'll need to access utilities to understand the inner workings of Windows in the next section.

Right-Click

Windows, being a graphical user interface OS, covers your monitor with windows, menus, icons, file lists—all kinds of pretty things you click on to do work. Any single thing you see on your desktop is called an *object*. If you want to open any object in Windows, you double-click on it. If you want to change something about an object, you right-click on it.

Right-clicking on an object brings up a small menu called the *context menu*, and it works on everything in Windows. In fact, try to place your mouse somewhere in Windows where right-clicking does *not* bring up a menu (there are a few places, but they're not easy to find). What you see on the little menu when you right-click varies dramatically depending on the item you decide to right-click. If you right-click a running program in the running program area on the taskbar, you'll see items that relate to a window, such as move, resize, and so on (Figure 4-59). If you right-click on your desktop, you get options for changing the appearance of the desktop (Figure 4-60). Even different types of files show different results when you right-click on them. Right-clicking is something techs do often.

Figure 4-59
Right-clicking on
a program

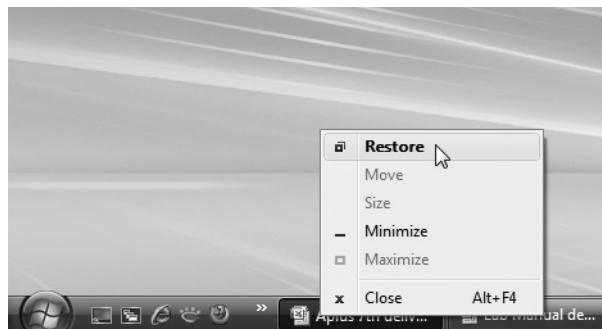


Figure 4-60
Right-clicking on
the desktop



Figure 4-61
Right-clicking on
My Computer



One menu item you'll see almost anywhere you right-click is Properties. Every object in Windows has properties. When you right-click on something and can't find what you're looking for, select Properties. Figure 4-61 shows the results of right-clicking on My Computer—not very exciting. But if you select Properties, you'll get a dialog box like the one shown in Figure 4-62.

Figure 4-62

My Computer properties



Control Panel

The *Control Panel* handles most of the maintenance, upgrade, and configuration aspects of Windows. As such, the Control Panel is the first set of tools for every tech to explore. Select Start | Settings | Control Panel to open the Control Panel in Windows 2000 and Windows Vista. In Windows XP, the Control Panel is directly on the Start menu by default.

The Control Panel in Windows 2000 opens in the traditional icon-littered view. In Windows XP and Vista, the Control Panel opens in the Category view, in which all of the icons are grouped into broad categories such as "Printers and Other Hardware." This view requires an additional click (and sometimes a guess about which category includes the icon you need), so most techs use the Switch to Classic View link to get back to the icons. Figure 4-63 shows the Windows XP Control Panel in both Category and Classic views.

A large number of programs, called *applets*, populate the Control Panel. The names and selection of applets vary depending on the version of Windows and whether any installed programs have added applets. But all versions of Windows share many of the same applets, including Display/Personalization, Add or Remove Programs/Programs and Features, and System (all versions)—what I call the *Big Three* applets for techs. With Display/Personalization, you can make changes to the look and feel of your Windows desktop and tweak your video settings. Add or Remove Programs/Programs and Features enables you to add or remove programs. The System applet gives you access to essential system information and tools, such as the Device Manager, although Microsoft wisely added Device Manager right on the Control Panel starting with Vista.



Figure 4-63 Windows XP Control Panel in two views: Category (left) and Classic (right)

Every icon you see in the Control Panel is actually a file with the extension .CPL. Any time you get an error opening the Control Panel, you can bet you have a corrupted CPL file. These are a pain to fix. You have to rename all of your CPL files with another extension (I use .CPB) and then rename them back to .CPL one at a time, each time reopening the Control Panel, until you find the CPL file that's causing the lockup.



EXAM TIP Even these common applets vary slightly among Windows versions. The CompTIA A+ certification exams do not test you on every little variance among the same applets in different versions—just know what each applet does.

You can use the Control Panel applets to do an amazing array of things to a Windows system, and each applet displays text that helps explain its functions. The Add Hardware applet in Windows XP, for example, says quite clearly, “Installs and troubleshoots hardware” (Figure 4-64). They are all like that. Figure 4-65 shows the User Accounts applet. Can you determine its use? (If not, don’t sweat it. I’ll cover users in Chapter 16, “Securing Windows Resources.”) Don’t bother trying to memorize all these applets. Each Control Panel applet relevant to the CompTIA A+ exams is discussed in detail in the relevant chapter throughout the rest of the book. For now, just make sure you can get to the Control Panel and appreciate why it exists.

Figure 4-64
Add Hardware
Wizard of the
Add Hardware
applet



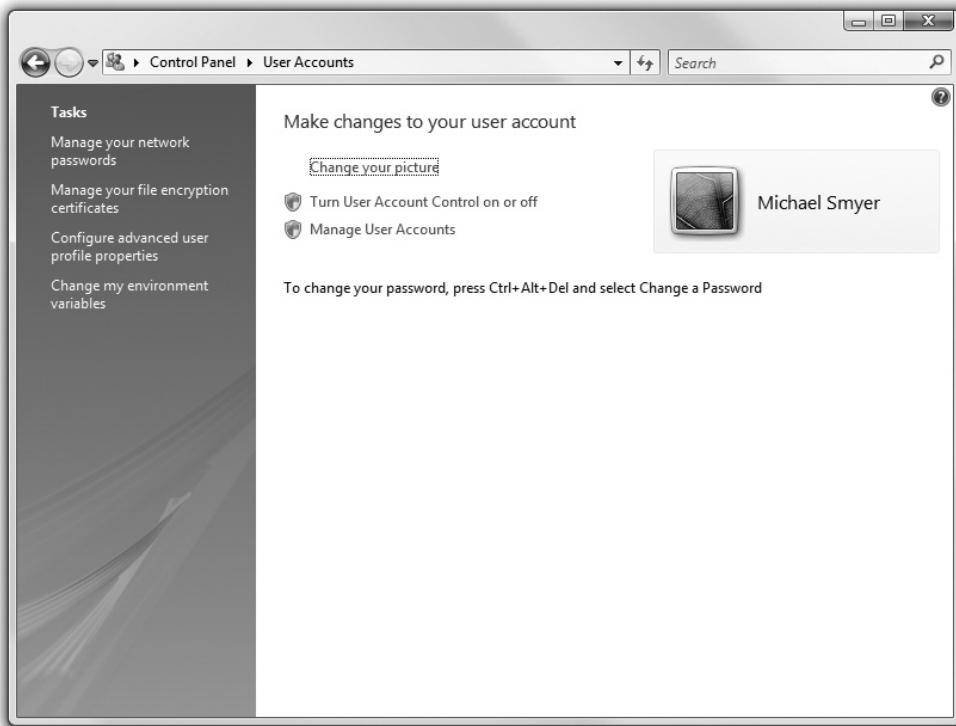


Figure 4-65 User Accounts window of the User Accounts applet

Device Manager

With the *Device Manager*, you can examine and configure all of the hardware and drivers in a Windows PC. As you might suspect from that description, every tech spends a lot of time with this tool! You'll work with the Device Manager many more times during the course of this book and your career as a PC tech.

There are many ways to get to the Device Manager—make sure you know all of them! The first way is to open the Control Panel and double-click the System applet icon. This brings up the System Properties dialog box. In 2000/XP, you access the Device Manager by selecting the Hardware tab and then clicking the Device Manager button. Figure 4-66 shows the Hardware tab of the System Properties dialog box in Windows XP. In Vista/7, the System dialog box has a direct connection to Device Manager (Figure 4-67).

You can also get to the System Properties dialog box in all versions of Windows by right-clicking My Computer/Computer and selecting Properties. From there, the path to the Device Manager is the same as when you access this dialog box from the Control Panel.

Figure 4-66
Windows XP System applet with the Hardware tab selected

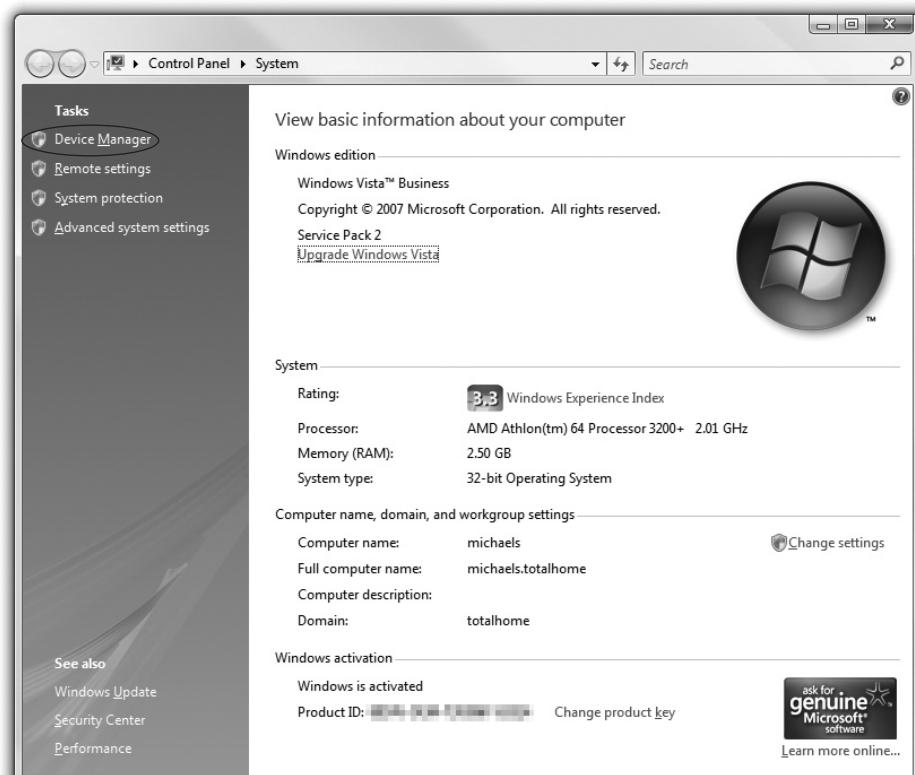


Figure 4-67 Windows Vista System applet with the Device Manager menu option circled



NOTE Holding down the WINDOWS key and pressing PAUSE is yet another way to get to the System Properties dialog box. Keyboard shortcuts are cool!

The second (and more streamlined) method is to right-click My Computer/Computer and select Manage. This opens a window called Computer Management, where you'll see Device Manager listed on the left side of the screen, under System Tools. Just click on Device Manager and it opens. You can also access Computer Management by opening the Administrative Tools applet in the Control Panel and then selecting Computer Management (Figure 4-68).

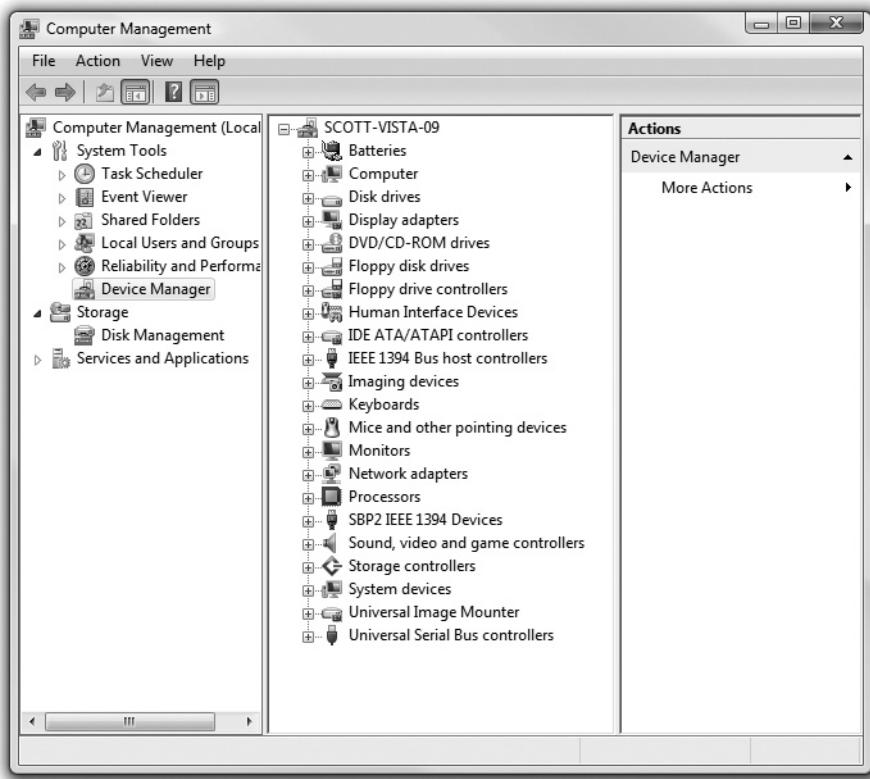


Figure 4-68 Device Manager in Computer Management

Why are there so many ways to open Device Manager? Well, remember that we're only looking at locations in Windows from which to open utilities, not at the actual utilities themselves. Microsoft wants you to get to the tools you need when you need them, and it's better to have multiple paths to a utility rather than just one.



EXAM TIP The CompTIA A+ exams want you to know multiple ways to open Device Manager.

The Device Manager displays every device that Windows recognizes, organized in special groups called *types*. All devices of the same type are grouped under the same type heading. To see the devices of a particular type, you must open that type's group. Figure 4-68 shows a Windows Vista Device Manager screen with all installed devices in good order—which makes us techs happy. If Windows detects a problem, the device has a red X or a black exclamation point on a yellow field, as in the case of the device in Figure 4-69.



NOTE There is one other “problem” icon you might see on a device in Device Manager—a blue *i* on a white field. According to Microsoft, this means you turned off automatic configuration for a device.

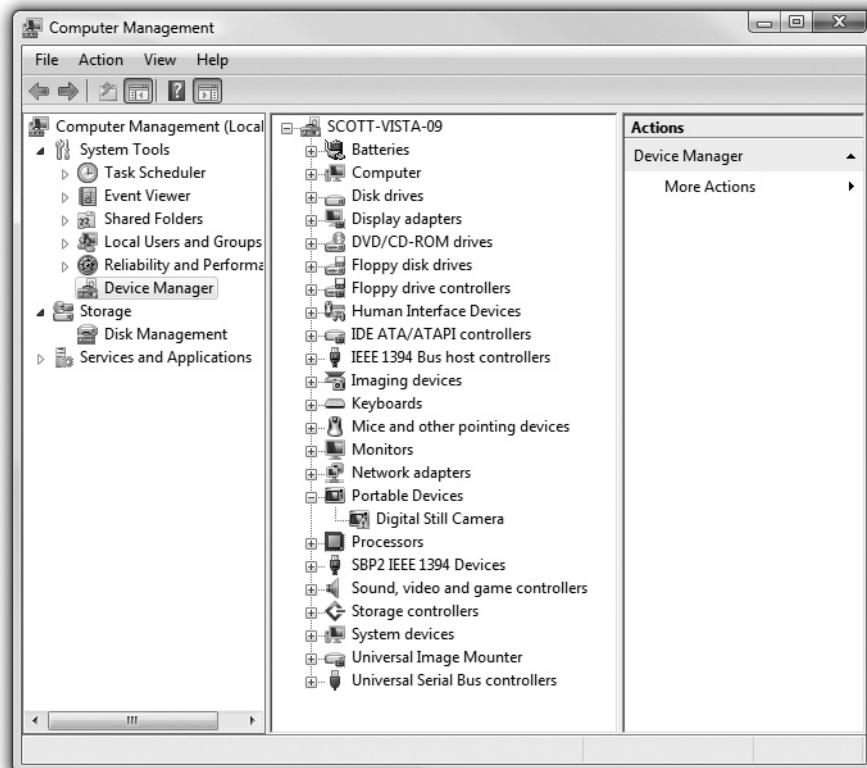


Figure 4-69 Problem device

A red X in Windows 2000 or XP means Windows (or you) disabled the device—right-click on the device to enable it. The tough one is the black exclamation point. If you see this, right-click on the device and select Properties. Read the error code in the Device Status pane, and then look up Microsoft Knowledge Base article 310123 to see what to do. There are around 40 different errors—nobody bothers to memorize them! (The knowledge base article is for Windows XP, but these error codes are the same in all versions of Windows.)

Vista and Windows 7 use the same icons and add one very handy one. If a device is working but you manually disable it, you get a down-arrow (Figure 4-70). Just as in previous versions, right-click the down-arrow and select Properties. You'll see a nice dialog box explaining the issue (Figure 4-71).

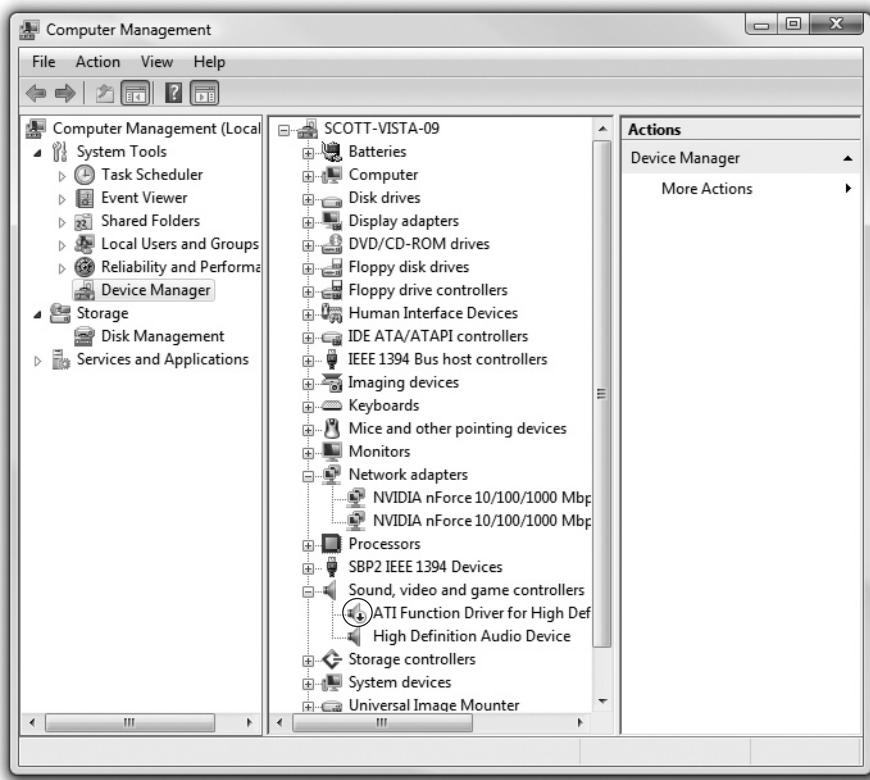


Figure 4-70 Hmm...could be a problem.

The Device Manager isn't just for dealing with problems. It also enables you to update drivers with a simple click of the mouse (assuming you have a replacement driver on your computer.) Right-click a device and select Update Driver from the menu to get the process started. Figure 4-72 shows the options in Windows Vista.

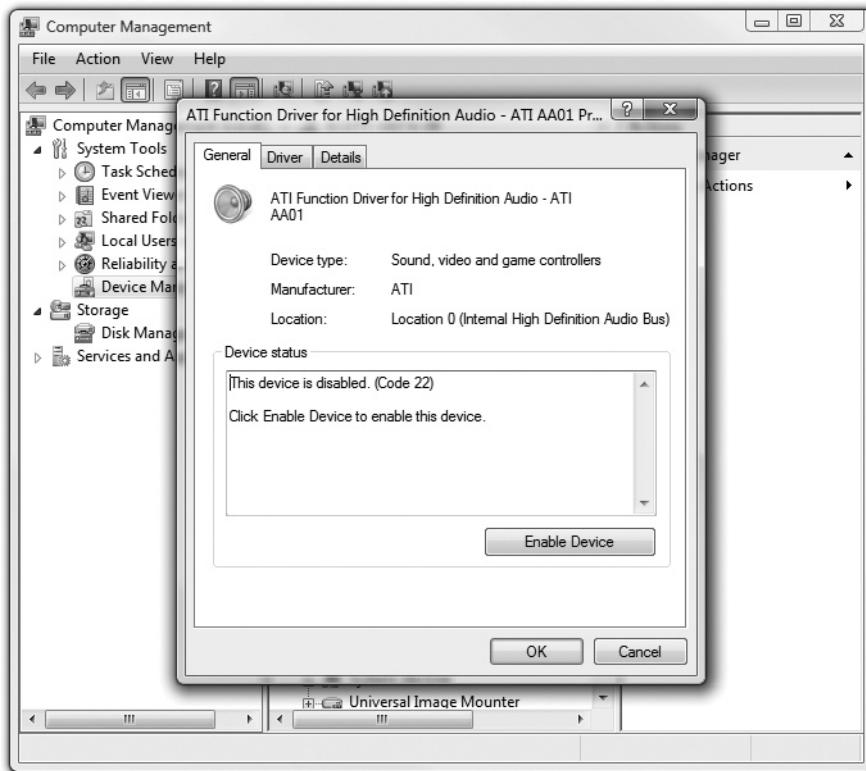
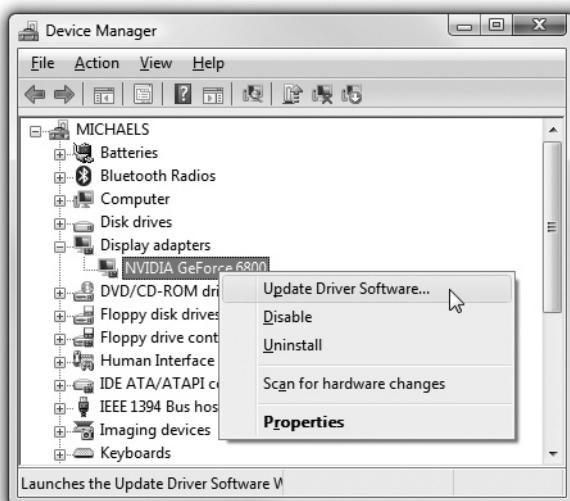


Figure 4-71 Problem device properties

Figure 4-72
Selecting Update
Driver Software
in the Windows
Vista Device
Manager

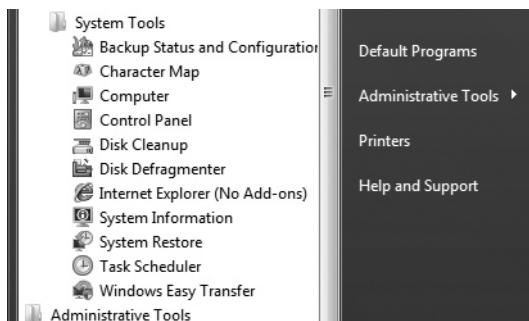


Make sure you can get to Device Manager! You will come back to it again and again in subsequent chapters, because it is the first tool you should access when you have a hardware problem.

System Tools

The Start menu offers a variety of tech utilities collected in one place: select Start | Programs | Accessories | System Tools. In the *System Tools* menu, you'll find commonly accessed tools such as System Information and Disk Defragmenter (Figure 4-73).

Figure 4-73
System Tools
menu options



Many techs overlook memorizing how to find the appropriate Windows tool to diagnose problems, but nothing hurts your credibility with a client like fumbling around, clicking a variety of menus and applets, while mumbling, "I know it's around here somewhere." The CompTIA A+ certification exams, therefore, test you on a variety of paths to appropriate tools. One of those paths is Start | Programs | Accessories | System Tools. Windows XP has all the same tools as Windows 2000, plus a few more. Vista adds a few beyond XP. I'll say what version of Windows has the particular system tool.

Activate Windows (XP, Vista)

Windows XP unveiled a copy-protection scheme called *activation*. Activation is a process where your computer sends Microsoft a unique code generated on your machine based on the Install CD/DVD's product key and a number of hardware features, such as the amount of RAM, the CPU processor model, and other ones and zeros in your PC. Normally, activation is done at install time, but if you choose not to activate at install or if you make "substantial" changes to the hardware, you'll need to use the Activate Windows utility (Figure 4-74). With the Activate Windows utility, you can activate over the Internet or over the telephone.

NOTE Once you've activated Windows, this applet goes away.



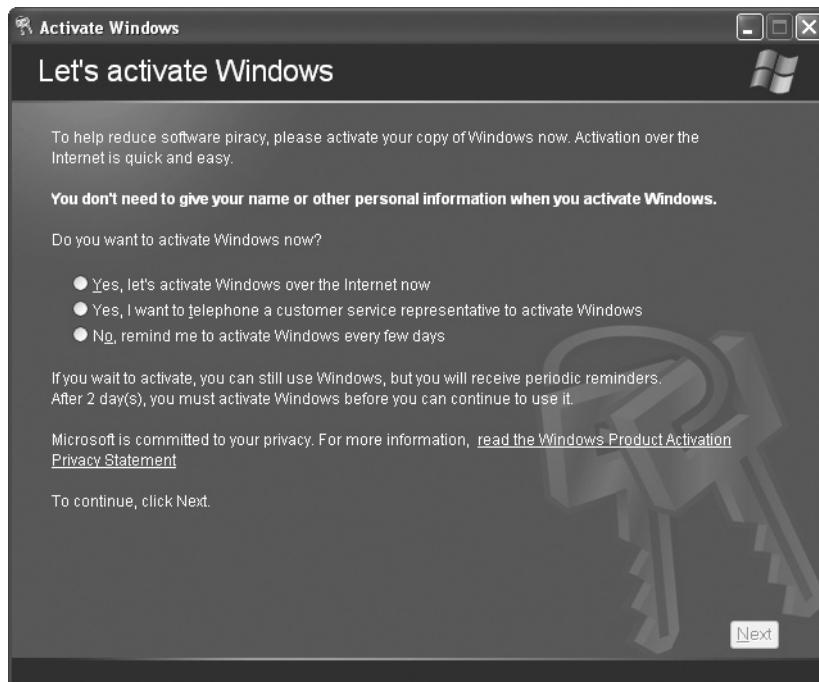


Figure 4-74 Activate Windows

Backup (2000, XP)

The Backup utility enables you to back up selected files and folders to removable media such as tape drives. Backing up is an important function that's covered in detail in Chapters 16, "Securing Windows Resources," and 26, "Securing Computers."



NOTE Neither Windows XP Home nor Windows XP Media Center Edition includes Backup during installation. You must install the Backup program from the Windows installation CD by running the \Valueadd\MSFT\Ntbackup\INTbackup.msi program.

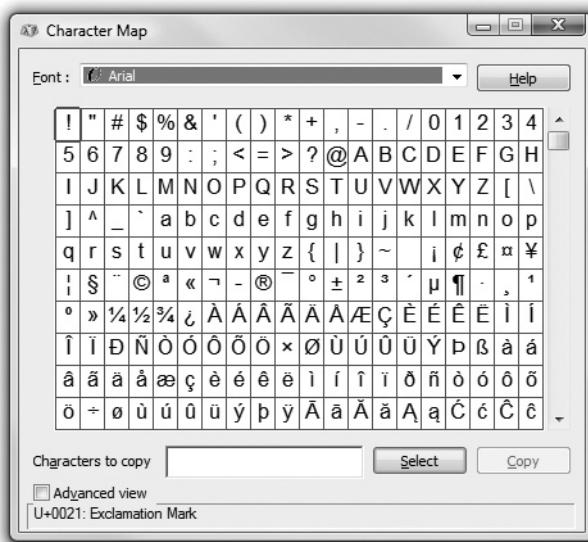
Backup Status and Configuration (Vista, 7)

Vista and 7 do not enable you to back up files on your computer selectively. You can only back up personal data with the Backup Status and Configuration Tool or, if you have Vista Business, Ultimate, or Enterprise, perform a complete PC backup by using Windows Complete PC Backup. If you want to pick and choose the file to back up, you need to buy a third-party tool. Also, this tool only allows you to back up to optical media, a hard drive, or a networked drive.

Character Map (All)

Ever been using a program only to discover you need to enter a strange character such as the euro character (€) but your word processor doesn't support it? That's when you need the Character Map. It enables you to copy any Unicode character into the Clipboard (Figure 4-75).

Figure 4-75
Character Map



Disk Cleanup (All)

Disk Cleanup looks for unneeded files on your computer, which is handy when your hard drive starts to get full and you need space. You must run Disk Cleanup manually in Windows 2000, but Windows XP and Windows Vista start this program whenever your hard drive gets below 200 MB of free disk space.

Disk Defragmenter (All)

You use Disk Defragmenter to make your hard drive run faster—you'll see more details on this handy tool in Chapter 12, "Implementing Hard Drives." You can access this utility in the same way you access the Device Manager; you also find Disk Defragmenter in the Computer Management Console. A simpler method is to select Start | All Programs | Accessories | System Tools—you'll find Disk Defragmenter listed there. You can also right-click on any drive in My Computer or Computer, select Properties, and click the Tools tab, where you'll find a convenient Defragment Now button.

Files and Settings Transfer Wizard (Windows XP)

Suppose you have an old computer full of files and settings, and you just bought yourself a brand new computer. You want to copy everything from your old computer onto your new computer—what to do? Microsoft touts the Files and Settings Transfer Wizard as just the tool you need (Figure 4-76). This utility copies your desktop files and folders and,

Figure 4-76
Files and Settings
Transfer Wizard



most conveniently, your settings from Internet Explorer and Outlook Express; however, it won't copy over your programs, not even the Microsoft ones, and it won't copy settings for any programs other than IE and Outlook Express. If you need to copy everything from an old computer to a new one, you'll probably want to use a disk-imaging tool such as Norton Ghost.

Windows Easy Transfer (Windows Vista)

Vista's Windows Easy Transfer is an aggressively updated version of the Files and Settings Transfer Wizard. It does everything the older version does and adds the capability to copy user accounts and other settings (Figure 4-77).

Scheduled Tasks (All)

With the Scheduled Tasks utility, you can schedule any program to start and stop any time you wish. The only trick to this utility is that you must enter the program you want to run as a command on the command line, with all the proper switches. Figure 4-78 shows the configuration line for running the Disk Defragmenter program.

Security Center (Windows XP)

The Security Center is a one-stop location for configuring many security features on your computer. This tool is also in the Control Panel. Vista removes Security Center from System Tools. All of these security features, and many more, are discussed in detail in their related chapters.

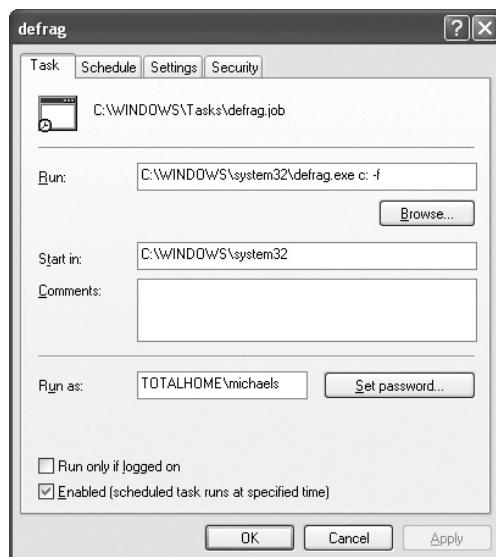
System Information (All)

System Information is one of those tools that everyone (including the CompTIA A+ exams) likes to talk about, but it's uncommon to meet techs who say they actually use this tool. System Information shows tons of information about the hardware and software



Figure 4-77 Windows Easy Transfer

Figure 4-78
Task Scheduler



on your PC (Figure 4-79). You can also click on the Tools menu to use it as a launch point for a number of programs.

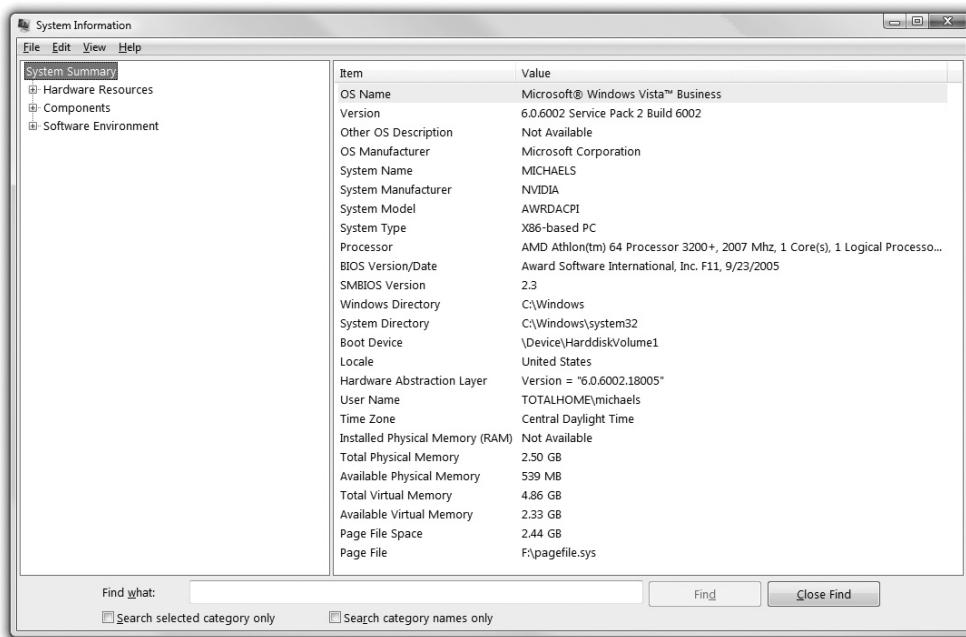


Figure 4-79 System Information

System Restore (XP, Vista)

System Restore is not only handy, it's also arguably the most important single utility you'll ever use in Windows when it comes to fixing a broken system. System Restore enables you to take a "snapshot"—a copy of a number of critical files and settings—and return to that state later (Figure 4-80). System Restore holds multiple snapshots, any of which you may restore to in the future.

Imagine you're installing some new device in your PC, or maybe a piece of software. Before you actually install, you take a snapshot and call it "Before Install." You install the device, and now something starts acting weird. You go back into System Restore and reload the previous snapshot, and the problem goes away.

System Restore isn't perfect. It only backs up a few critical items, and it's useless if the computer won't boot, but it's usually the first thing to try when something goes wrong—assuming, of course, you made a snapshot!

BitLocker (Vista Enterprise and Ultimate)

BitLocker is a tool to encrypt files, folders, or entire hard drives. It's a great way to make sure other people can't read your stuff, but it also makes data recovery risky. If you really want security, use BitLocker.

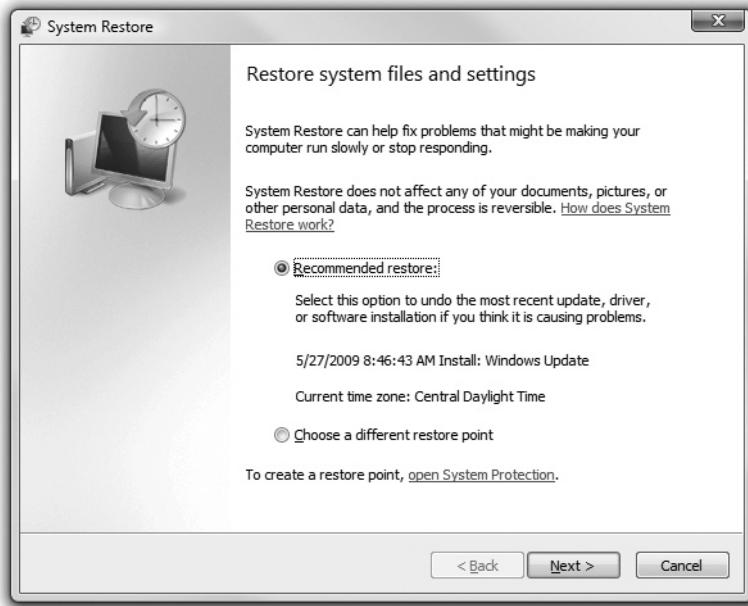


Figure 4-80 System Restore

Command Line

The Windows command-line interface is a throwback to how Microsoft operating systems worked a long, long time ago when text commands were entered at a command prompt. Figure 4-81 shows the command prompt from DOS, the first operating system commonly used in PCs.

A screenshot of a DOS command prompt window. The window is titled "MS-DOS Version 6.00". Inside the window, the command "C:\>ver" is typed and its output "MS-DOS Version 6.00" is displayed. Below this, the command "C:\>_" is typed, indicating the prompt for the next command.

Figure 4-81 DOS command prompt



NOTE The command-line interface goes back to the early days of computing, but it continues to be an essential tool in all modern operating systems, including Linux, Mac OS X, and all versions of Windows. Chapter 15, “Working with the Command-Line Interface,” goes into the command line in detail.

DOS is dead, but the command-line interface is alive and well in every version of Windows—including Windows 7. Every good tech knows how to access and use the command-line interface. It is a lifesaver when the graphical part of Windows doesn’t work, and it is often faster than using a mouse if you’re skilled at using it. An entire chapter is devoted to the command line, but let’s look at one example of what the command line can do. First, you need to get there. In Windows XP, select Start | Run, and type cmd in the dialog box. Click OK and you get to a command prompt. In Windows Vista, you do the same thing in the Start | Start Search dialog box. Figure 4-82 shows a command prompt in Windows Vista.

```

Administrator: C:\Windows\system32\cmd.exe
05/22/2009 03:52 PM <DIR> Graphics
09/24/2007 11:30 AM <DIR> install
04/22/2008 12:06 PM <DIR> logs
05/22/2009 03:52 PM 551,408 mss32_s.dll
05/22/2009 03:52 PM <DIR> Public
05/22/2009 03:52 PM <DIR> resource
10/10/2007 12:07 PM <DIR> servers
07/03/2007 04:27 PM <DIR> skins
07/03/2007 04:31 PM <DIR> steam
05/22/2009 03:52 PM 2,880,760 Steam.dll
05/22/2009 03:46 PM 1,217,784 Steam.exe
09/15/2005 03:20 PM 318 steam.ico
05/22/2009 04:58 PM 796,916 Steam.log
05/13/2009 12:15 PM <DIR> steamapps
05/22/2009 03:52 PM 3,004,912 steamclient.dll
05/22/2009 03:52 PM 2,987,256 SteamUI.dll
05/22/2009 03:52 PM 60,312 SteamUI_838.mst
05/22/2009 03:46 PM 14 Steam_53.mst
09/13/2005 05:49 PM 9,653 steam_install_agreement.rtf
03/29/2007 03:29 PM 121 Support.url
05/22/2009 03:52 PM 77,824 ThirdPartyLegalNotices.doc
05/22/2009 03:52 PM 268,784 tier0_s.dll
11/14/2008 05:39 PM <DIR> userdata
05/22/2009 03:52 PM 371,184 vstdlib_s.dll
05/22/2009 03:52 PM 256,496 WriteMiniDump.exe
23 File(s) 16,165,307 bytes
16 Dir(s) 47,442,325,504 bytes free
C:\Program Files\Steam>

```

Figure 4-82 Command prompt in Windows Vista

Once at a command prompt, type dir and press ENTER on your keyboard. This command displays all the files and folders in a specific directory—probably your user folder for this exercise—and gives sizes and other information. DIR is just one of many useful command-line tools you’ll learn about in this book.

Microsoft Management Console

One of the biggest complaints about earlier versions of Windows was the wide dispersal of the many utilities needed for administration and troubleshooting. Despite years of research, Microsoft could never find a place for all the utilities that would please even a small minority of support people. In a moment of sheer genius, Microsoft determined

that the ultimate utility was one that the support people made for themselves! This brought on the creation of the amazing Microsoft Management Console.

The *Microsoft Management Console (MMC)* is simply a shell program in Windows that holds individual utilities called *snap-ins*. To start an MMC, select Start | Run or just Start, type **mmc** and press ENTER to get a blank MMC. Blank MMCs aren't much to look at (Figure 4-83).



Figure 4-83 Blank MMC

You make a blank MMC console useful by adding snap-ins, which include most of the utilities you use in Windows. Even the good old Device Manager is a snap-in. You can add as many snap-ins as you like, and you have many to choose from. Many companies sell third-party utilities as MMC snap-ins.

For example, to add the Device Manager snap-in, open the blank MMC and select File | Add/ Remove Snap-in (Console |Add/Remove Snap-in in Windows 2000). Here you will see a list of available snap-ins in Windows Vista (Figure 4.84). (Click the Add button in 2000/XP to open a similar screen.) Select Device Manager, and click the Add button to open a dialog box that prompts you to choose the local or a remote PC for the snap-in to work with. Choose Local Computer for this exercise, and click the Finish button. Click the Close button to close the Add Standalone Snap-in dialog box, and then click OK to close the Add/Remove Snap-in dialog box.

You should see Device Manager listed in the console. Click it. Hey, that looks kind of familiar, doesn't it (see Figure 4-85)?

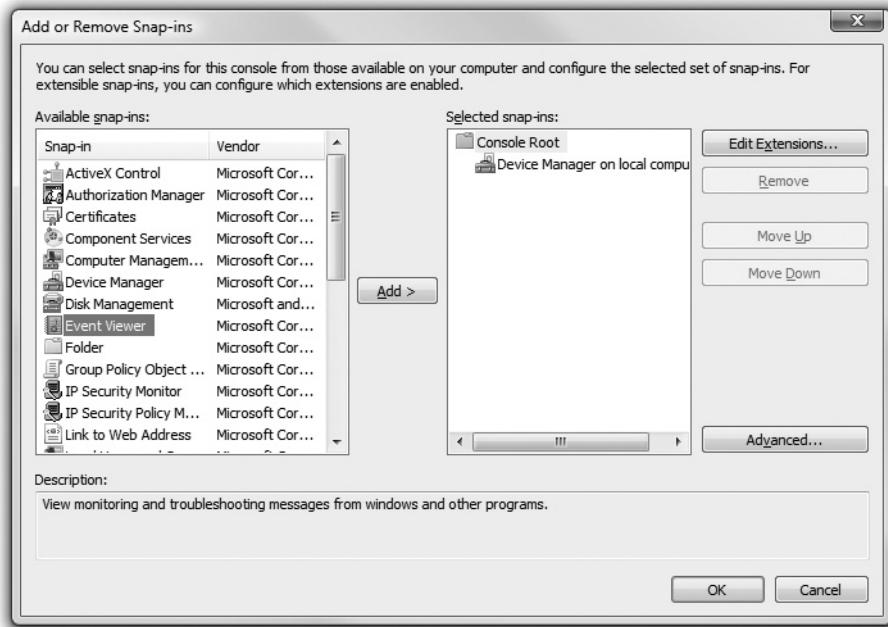


Figure 4-84 Available snap-ins

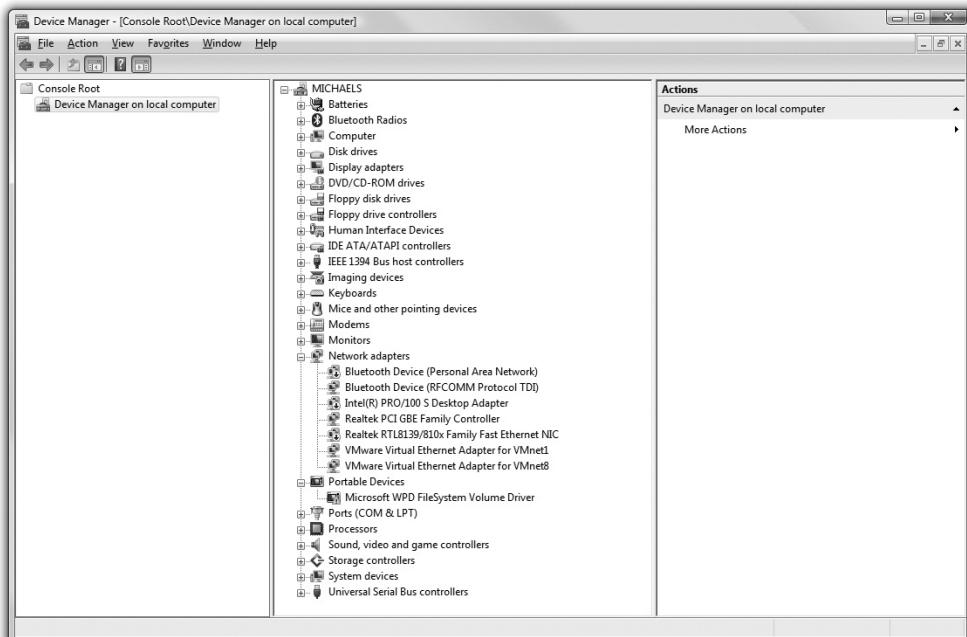


Figure 4-85 Device Manager as a snap-in

Figure 4-86
The Device Manager shortcut on the desktop



Once you've added the snap-ins you want, just save the console under any name, anywhere you want. I'll save this console as *Device Manager*, for example, and drop it on my desktop (see Figure 4-86). I'm now just a double-click away from the Device Manager.

Administrative Tools

Windows combines the most popular snap-ins into an applet in the Control Panel called *Administrative Tools*. Open the Control Panel and open Administrative Tools (Figure 4-87).



Figure 4-87 Administrative Tools

Administrative Tools is really just a folder that stores a number of pre-made consoles. As you poke through these, notice that many of the consoles share some of the same snap-ins—nothing wrong with that. Of the consoles in a standard Administrative Tools collection, the ones you'll spend the most time with are Computer Management, Event Viewer, Reliability and Performance (or just Performance in Windows 2000/XP), and Services.



EXAM TIP The CompTIA A+ certification exams have little interest in some of these snap-ins, so this book won't cover them all. If I don't mention it, it's almost certainly not on the test!

Computer Management

The *Computer Management* applet is a tech's best buddy, or at least a place where you'll spend a lot of time when building or maintaining a system (Figure 4-88). You've already spent considerable time with two of its components: System Tools and Storage. Depending on the version of Windows, System Tools also offers System Information, Performance Logs and Alerts, Reliability and Performance, Device Manager, and more. Storage is where you'll find Disk Management.

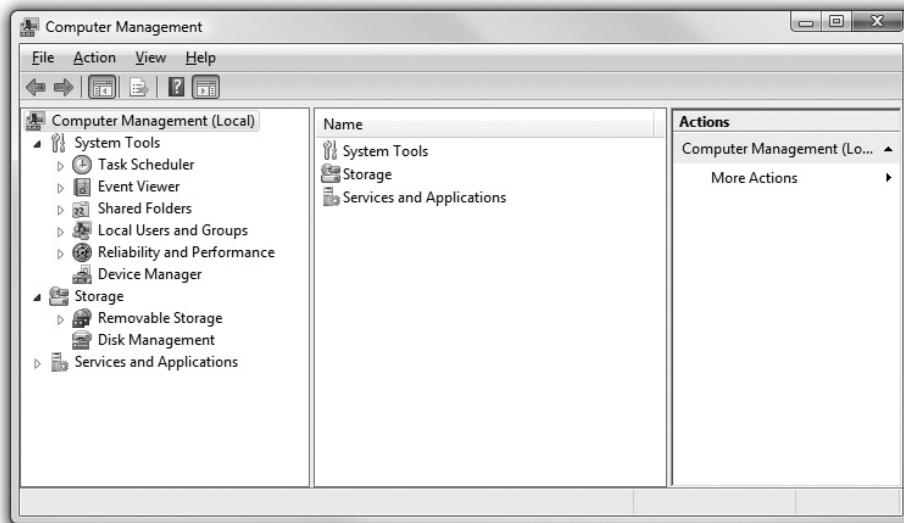


Figure 4-88 Computer Management applet

Event Viewer

Event Viewer shows you at a glance what has happened in the last day, week, or more, including when people logged in and when the PC had problems (Figure 4-89). You'll see more of Event Viewer in Chapter 26, "Securing Computers."

Performance (Windows 2000/XP)

The *Performance* console consists of two snap-ins: System Monitor and Performance Logs and Alerts. You can use these for reading *logs*—files that record information over time. The System Monitor can also monitor real-time data (Figure 4-90).

Suppose you are adding a new cable modem and you want to know just how fast you can download data. Click the plus sign (+) on the toolbar to add a counter. Click

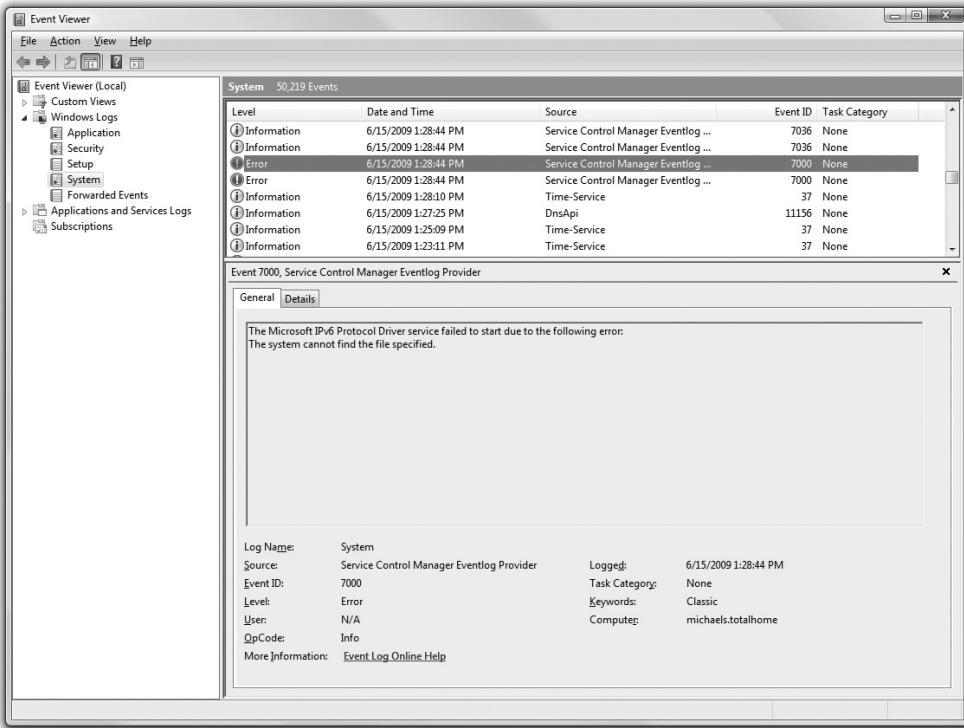


Figure 4-89 Event Viewer reporting system errors

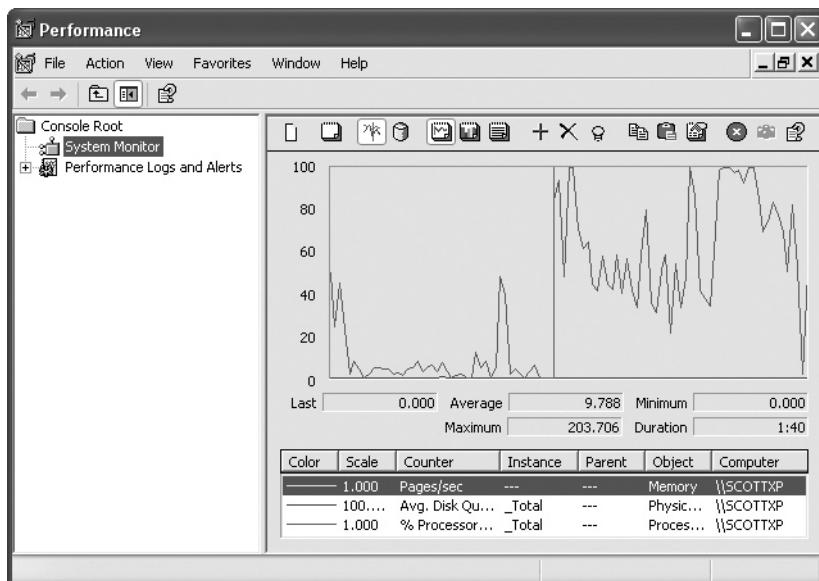
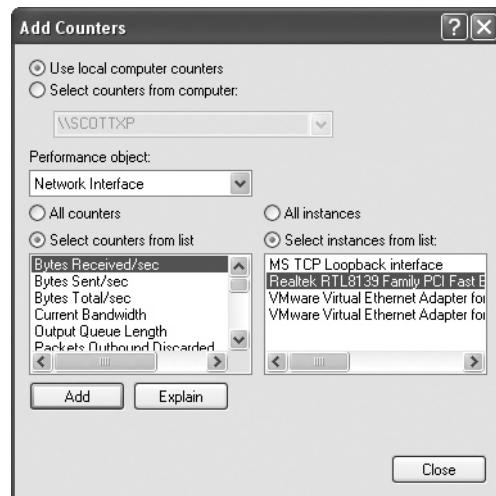


Figure 4-90 System Monitor in action

the *Use local computer counters* radio button, and then choose Network Interface from the Performance Object pull-down menu. Make sure the *Select counters from list* radio button is selected. Last, select Bytes Received/sec. The dialog box should look like Figure 4-91.

Figure 4-91
Setting up a throughput test



Click Add, and then click Close; probably not much is happening. Go to a Web site, preferably one where you can download a huge file. Start downloading and watch the chart jump; that's the real throughput (Figure 4-92).

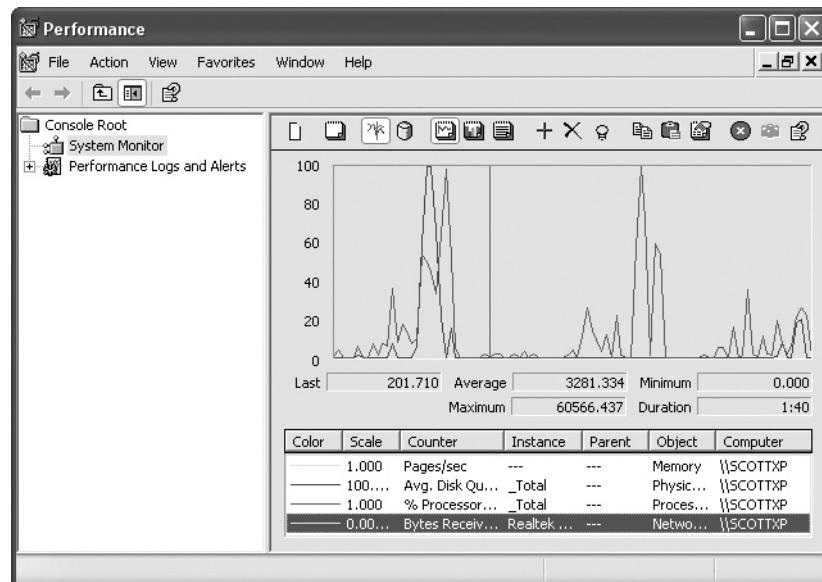


Figure 4-92 Downloading with blazing speed



NOTE You'll learn more about the Performance console in Chapter 17, "Maintaining and Troubleshooting Windows."

Reliability and Performance Monitor (Windows Vista)

The *Reliability and Performance Monitor* in Windows Vista offers just about everything you can find in the Performance applet of older versions of Windows—although everything is monitored by default, so there's no need to add anything. In addition, it includes the Reliability Monitor. The Reliability Monitor enables you to see at a glance what's been done to the computer over a period of time, including software installations and uninstalls, failures of hardware or applications, and general uptime (Figure 4-93). It's a nice starting tool for checking a Vista machine that's new to you.



NOTE You'll learn more about the Reliability and Performance Monitor in Chapter 17.

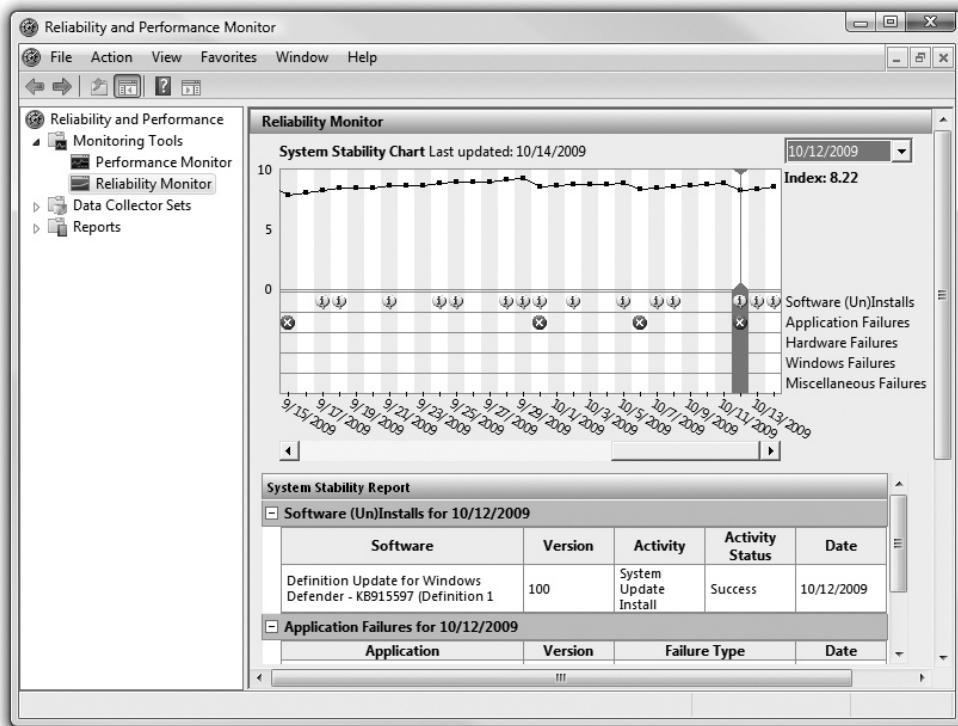


Figure 4-93 The Reliability and Performance Monitor open to the Reliability Monitor screen

Services

Windows runs a large number of separate programs called *services*. The best way to visualize a service is to think of it as something that runs, yet is invisible. Windows comes with about 100 services by default, and they handle a huge number of tasks, from application support to network functions. You can use the Services applet to see the status of all services on the system, including services that are not running (Figure 4-94).

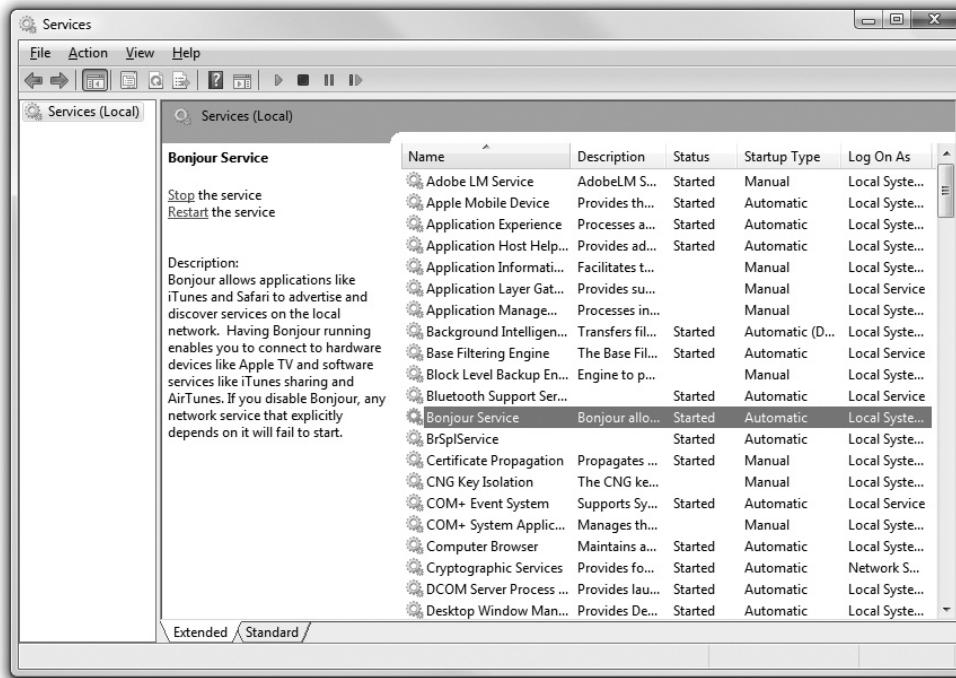


Figure 4-94 Services applet

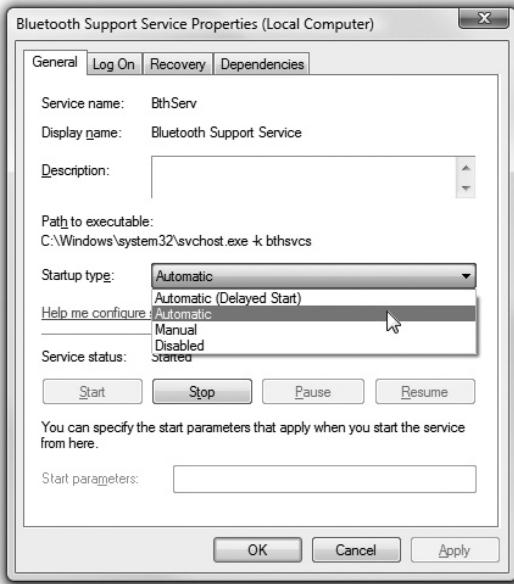
Right-click a service and select Properties to modify its settings. Figure 4-95 shows the properties for the Bluetooth support service. See the Startup type pull-down menu? It shows three options: Automatic, Manual, and Disabled. Automatic means it starts when the system starts, Manual means you have to come to this tab to start it, and Disabled prevents anything from starting it. Make sure you know these three settings, and also make sure you understand how to start, stop, pause, and resume services (note the four buttons below Startup Type).



EXAM TIP The CompTIA A+ certification exams are not interested in having you memorize all of these services—just make sure you can manipulate them.

Figure 4-95

Bluetooth support service properties



Beyond A+

Microsoft adds or tweaks utilities from one version of its flagship operating system to the next. Plus, tools often move from version to version. The Performance applet in Windows XP, for example, became the Reliability and Performance Monitor in Windows Vista. With Windows 7, Microsoft shifted things again, with Reliability going into a new Control Panel applet called Action Center. Go figure. Half the fun in migrating to a new OS is hunting down your favorite tools!

This Beyond A+ section addresses the several versions of Windows not on the CompTIA A+ exams: Windows 7, Windows Mobile, Windows XP Tablet PC Edition, and Windows Embedded.

Windows 7

Windows 7 came out just a few months after CompTIA announced the 220-701 and 220-702 exams, so it's not on those exams. However, the differences between Vista and 7 are so minor "under the hood" that it's safe to say if you know Vista, you know Windows 7 (Figure 4-96).



EXAM TIP Remember Windows 7 is *not* on the CompTIA 220-701 and 220-702 exams.



Figure 4-96 Windows 7

Windows Mobile

Windows Mobile is a very small version of Windows designed for PDAs and phones. Windows Mobile is only available as an Original Equipment Manufacturer (OEM) product, which means you buy the device and it comes with Windows Mobile you can't buy some PDA or phone and then buy Windows Mobile separately.

Windows XP Tablet PC Edition

A tablet PC is a laptop with a built-in touch screen. The idea behind a tablet PC is to drastically reduce, if not totally eliminate, the use of a keyboard (Figure 4-97). In some situations, tablet PCs have started to become popular. Windows XP Tablet PC Edition is Microsoft's operating solution for tablet PCs. Tablet PC Edition is still Windows XP, but it adds special drivers and applications to support the tablet.



NOTE You'll see more of Windows XP Tablet PC Edition in Chapter 21, "Portable Computing."

Windows Vista comes with the Tablet PC features built in, so there's no need for a special tablet-version of Vista (or Windows 7, for that matter).



Figure 4-97 Tablet PC

Windows Embedded

The world is filled with PCs in the most unlikely places. Everything from cash registers to the F-22 Raptor fighter plane contains some number of tiny PCs. These aren't the PCs you're used to seeing, though. They almost never have mice, monitors, keyboards, and the usual I/O you'd expect to see, but they are truly PCs, with a CPU, RAM, BIOS, and storage.

These tiny PCs need operating systems just like any other PC, and a number of companies make specialized OSs for embedded PCs. Microsoft makes Windows Embedded just for these specialized embedded PCs.

Chapter Review Questions

1. Which of the following is an advantage of running Windows on NTFS as opposed to FAT?
 - A. Security
 - B. Multiple folders
 - C. Long filenames
 - D. Speed
2. Which version of Windows uses the Backup Status and Configuration Tool?
 - A. Windows 2000
 - B. Windows XP Media Center
 - C. Windows XP Professional
 - D. Windows Vista Ultimate

3. What is the proper way to refer to the system root folder?
 - A. %system%
 - B. &system&
 - C. %systemroot%
 - D. &systemroot&
4. What folder is a central storage location for user files in XP?
 - A. Program Files
 - B. My Documents
 - C. My Files
 - D. %systemroot%\Users
5. Which utility is helpful in troubleshooting hardware?
 - A. System Properties
 - B. Device Manager
 - C. Disk Management
 - D. Security Center
6. Which Windows utility backs up critical files and settings and enables you to roll back to a previous state?
 - A. Registry
 - B. System Restore
 - C. System Information
 - D. Microsoft Management Console
7. Many tech tools are grouped together in which location?
 - A. Start | All Programs | Tools
 - B. Start | All Program | Tools | System Tools
 - C. Start | All Programs | System Tools | Accessories
 - D. Start | All Programs | Accessories | System Tools
8. Which utility is missing from the default Windows XP Home installation?
 - A. Backup
 - B. Character Map
 - C. Computer Management
 - D. User Accounts
9. What is displayed in the My Computer window?
 - A. All the drives on your system
 - B. All the Control Panel applets

- C. Installed programs
 - D. Other computers on the network
10. Which Registry root key contains information about file types?
- A. HKEY_CLASSES_ROOT
 - B. HKEY_LOCAL_MACHINE
 - C. HKEY_CURRENT_CONFIG
 - D. HKEY_USERS

Answers

1. A. NTFS offers security. FAT provides no security.
2. D. Backup Status and Configuration Tool did not exist before Vista.
3. C. The SystemRoot is referred to as %systemroot%.
4. B. Most XP users put their personal files in My Documents.
5. B. For hardware in general, turn to the Device Manager.
6. B. System Restore does the trick here, enabling you to back up and restore your system.
7. D. You'll find many useful tools in Start | All Programs | Accessories | System Tools.
8. A. Backup is not installed by default in Windows XP Home.
9. A. My Computer shows your drives.
10. A. You'll find file information in HKEY_CLASSES_ROOT.