



2

Operating System Fundamentals

CERTIFICATION OBJECTIVES

802: 1.1 Compare and contrast the features and requirements of various Microsoft operating systems

✓ Two-Minute Drill

Q&A Self Test

If you lump together all the Windows versions currently in use and count them as a single operating system (OS), Windows is the most widely used PC operating system for home and business. Therefore, technicians should prepare themselves to work with recent versions of the Microsoft Windows desktop operating systems. Like many people, you may have used Windows for much of your life, and you can competently do ordinary tasks, such as navigating folders, saving files, downloading files, and running programs. With such proficiency, you may wonder why you need to study the operating system any further. It's because you need a far different set of skills and knowledge to support Windows than you need to simply use it. Those skills include understanding it enough to competently install, configure, troubleshoot, and maintain it.

On the other hand, you do not need to be a systems programmer who understands the OS's programming code. You only need a base of knowledge, a sharp mind, good powers of observation, and patience.

The coverage of Windows begins in this chapter with an overview of the versions included on the A+ exam, moves to a brief survey of important considerations you should know before installing or upgrading Windows, and finishes with a tour of the user interface.

Discussion of Windows continues in Chapters 8, 9, 10, 13, 19, and 20. Each chapter will take you through a different aspect of supporting Windows, from working with Windows client virtualization (Chapter 8), then installing and upgrading Windows—either into a virtual machine or more conventionally on a physical PC (Chapter 9), managing disks and files (Chapter 10), troubleshooting and maintaining Windows (Chapter 13), and finally, supporting Windows as a network client (Chapter 19). And most other chapters include some mention of Windows relating to the chapter topic.

CERTIFICATION OBJECTIVE

- **802: 1.1** *Compare and contrast the features and requirements of various Microsoft operating systems*

CompTIA Exam Objective 802: 1.1 requires that you understand the differences among various editions of three versions of Windows: Windows XP, Windows Vista, and Windows 7, including the implications of using the 32-bit or 64-bit versions of

each. Be sure that you know the minimum system requirements for each of these versions, their system limits, and upgrade paths. You should be able to recognize the user interface and identify such features as Sidebar, Aero, gadgets, Compatibility Mode, XP Mode, Windows Easy Transfer, Administrative Tools, Windows Defender, Windows Firewall, Security Center, and Event Viewer. Understanding file structure and paths will also help you support Windows, and you should know how to work with Windows User Account Control (UAC).

Introduction to Windows Operating Systems

In this section, you will learn the purpose of operating systems, the differences among versions of the Windows operating system, the characteristics of 32-bit versus 64-bit Windows OSs, and the importance of updates and service packs. This section also contains an overview of selected features, and an explanation of Microsoft Support Lifecycle.

The Purpose of Operating Systems

The purpose of an *operating system (OS)* is to control all of the interactions among the various system components, the human interactions with the computer, and the network operations for the computer system. An OS is actually a group of programs that accomplishes its tasks by building an increasingly complex set of software layers between the lowest level of a computer system (the hardware) and the highest levels (user interactions). An important type of software that works closely with the OS is a *device driver*—program code that allows the OS to interact with and control a particular device. Many device drivers come with Windows and you can easily add others to the OS. That is why new hardware comes packaged with a disc containing a device driver for one or more versions of Windows and other OSs.

The OS is responsible for managing the computer's files in an organized manner and allowing the user to manage data files. The OS keeps track of the functions of particular files and brings them into memory as program code or data when needed. Furthermore, the OS is responsible for maintaining file associations so data files launch in the proper applications. The OS is also responsible for managing the computer's disks, keeping track of each disk's identification, and managing disk space use.

A *user interface (UI)* is both the visual portion of the operating system and the software components that allow the user to interact with the OS for starting programs, creating data, saving files, and other user tasks. A *graphical user interface (GUI)* is

a user interface that takes advantage of a computer's graphics capabilities to make it easier for the user to interact with the OS by manipulating graphic objects on the desktop to accomplish a multitude of tasks.

An operating system also works with one or more computer architectures. A *computer architecture* (sometimes called the platform) is the basic design of a computer describing the data pathways and the methods the computer's CPU uses to access other components with the computer. In physical terms, the main components are the CPU, BIOS, and chipset—all of which you will study in Chapter 3.

The Many Flavors of Windows

Windows comes in many “flavors” involving versions and editions, and updates and service packs from Microsoft occasionally modify each of these. We will clarify the differences among these terms.

Versions

Each Microsoft Windows *version* is a new level of the venerable operating system, with major changes to the core components of the operating system as well as a distinctive and unifying look to the GUI. The Windows versions included on the CompTIA A+ Exam Number 220-802 include Windows XP, Windows Vista, and Windows 7. Although the objectives do not include Windows 8 yet, we do include some coverage of that version as well. Here is a portion of the Windows history to help you see where Microsoft has been with the Windows OS.

In 1995 and 1998, respectively, Microsoft released two desktop versions, Windows 95 and Windows 98—both more or less based on the MS-DOS kernel and targeted to the consumer market, although Windows 98 was widely accepted in the corporate world. At the same time they had an entirely different line of Server OS, Windows NT, based on a much more robust kernel and with built-in security features. In 2000, both their Windows 2000 Workstation product for business desktops and Windows 2000 Server products were built on the same kernel with the same GUI. With the same GUI on the desktop as on servers, IT professionals thought that going forward life would be a bit easier for those who supported both desktop Windows and Windows Server, but that was not going to last because in 2000 Microsoft also introduced Windows Me for home users with new features and a significantly changed look. This product was not successful, and Windows XP, yet another version targeted at the desktop and with a different GUI than the server products, followed

it a year later. The following is a simple summary of the versions that followed Windows Me.

Windows XP Microsoft released Windows XP in 2001 as a desktop operating system. Windows XP has been by far the most popular version of Windows so far. This is mainly due to the shortcomings of its successor, which led many users to stay with Windows XP.



Windows Server 2003 was the first post-Windows XP server version of Windows, and Windows Server 2008 is the most current released version. Since then, the Windows server products have been separate from the consumer versions of Windows, much as they were in the 1990s. They do not share the same kernel with desktop Windows, have many features targeted only to servers, and have names distinct from the desktop version. Server versions, like desktop versions, come in several editions for each version.

The Windows XP default desktop was different from that of Windows 2000 in the overall look, if not in functionality (see Figure 2-1). It also had a cleaner look because the only icon on the desktop by default was the *Recycle Bin*, which pointed to the location where Windows sends deleted files. In addition, Microsoft redesigned and reorganized the Start menu to have two columns rather than just one. Learn more about the Start menu later in this chapter.

Windows Vista Microsoft released Windows Vista in 2007. Seen more as an upgrade to the extremely popular Windows XP, it included improvements in how Windows handles graphics, files, and communications. With enhancements to the GUI, Vista is attractive (see Figure 2-2), but it was not widely adopted due to problems with slow speed and high hardware requirements. As a result, Microsoft extended the support lifecycle of Windows XP, allowing sales of new PCs with Windows XP preinstalled until October 22, 2010.

Windows 7 Released in 2009, Windows 7 includes an enhanced GUI, improved speeds in just about any way you want to measure an OS, and nearly identical hardware requirements as Windows Vista (see Figure 2-3). Given that computers became faster and cheaper (as they do) in the two years between the release of Windows Vista and the introduction of Windows 7, the hardware requirements for Windows 7 are not the burden on the customer that they were for Windows Vista.

FIGURE 2-1

The Windows XP desktop

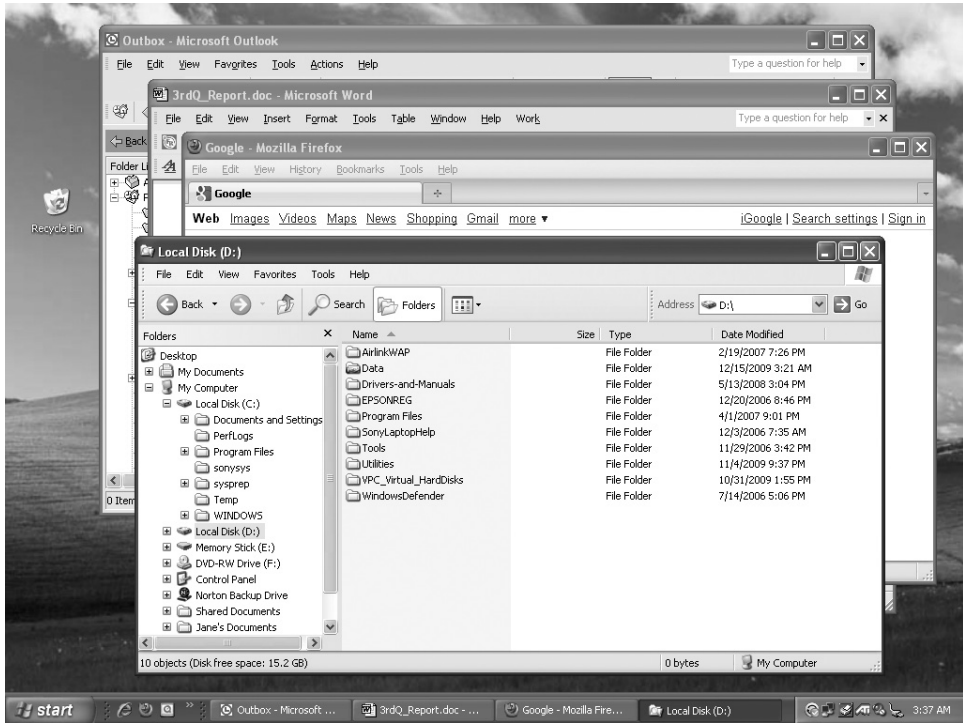


FIGURE 2-2

The Windows Vista desktop

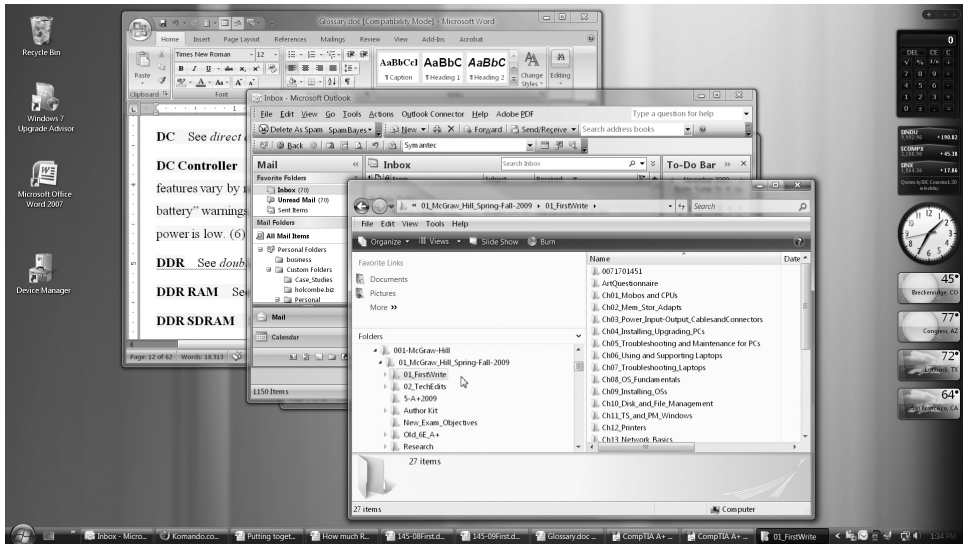
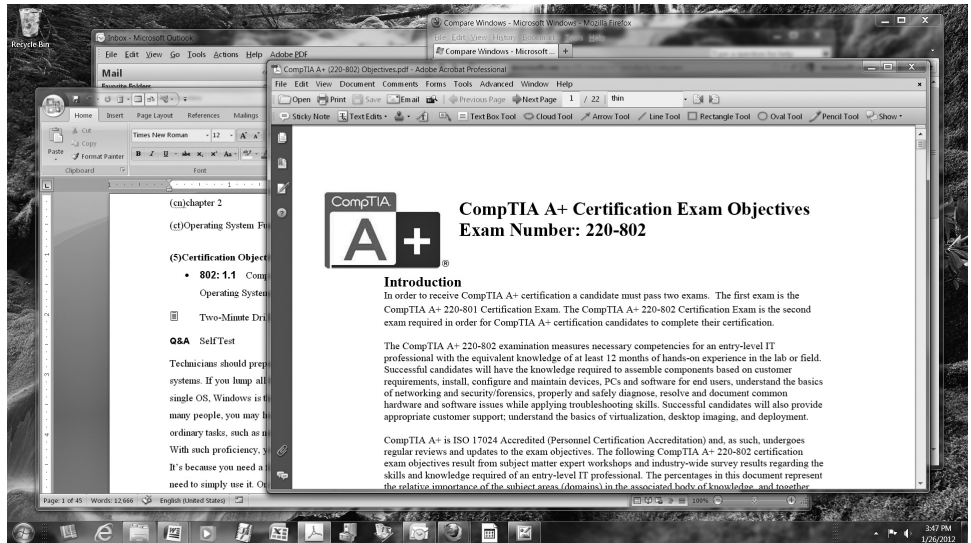


FIGURE 2-3

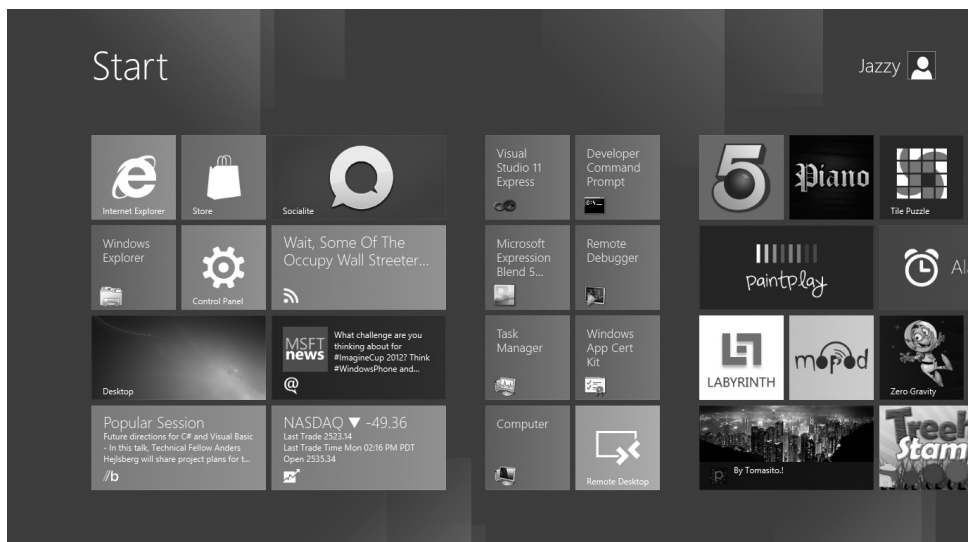
The Windows 7 desktop



Windows 8 Windows 8 is a faster and leaner Windows OS with many improvements over previous versions and some surprising new features. The most obvious is the new Metro GUI, an updated version of the Metro user interface found on Microsoft Windows Phone 7.5. The Start screen shown in Figure 2-4 contains one active tile for every installed application, and these tiles show active content, such as news feeds, stock quotes, slideshows, and more, depending on the application.

FIGURE 2-4

The Windows 8 Start screen



Editions Microsoft brings out an entirely new group of products for each version of Windows. What distinguishes each of these products, called an *edition*, from one another is the mix of features in each that is designed for a specific target market. Some Windows editions are available through retail channels as separate boxed or downloadable products, other editions—sometimes referred to as *original equipment manufacturer (OEM)* editions—are only available preinstalled by manufacturers on new computers. Then, there is the Enterprise edition, only available to large organizations that purchase volume licenses from Microsoft.

One thing that all the editions included on the exam have in common is that they all target desktop, laptop, and tablet PCs. Therefore, the server editions of Windows are not included on the exam.

The list in Table 2-1 contains the Windows editions included in the CompTIA A+ 220-802 exam.

TABLE 2-1 Comparison of the Windows Editions listed on the CompTIA A+ 802 Exam

Windows Version and Edition	Description
Windows XP Home	Designed for home users, it lacked many features included in the Professional edition.
Windows XP Professional	For business or power users, this edition included the ability to join a Windows Server domain, more security features, the ability to be operated by another Windows XP user remotely, and other features required in a business network environment.
Windows XP Media Center	An OEM edition preinstalled on computers with media center capabilities. Not sold separately.
Windows XP 64-bit	The first 64-bit version of Windows, it only ran on systems with the Intel Itanium CPU. They released an updated edition in 2003, but discontinued it in 2005 due to the lack of new Itanium-based computers.
Windows Vista Home Basic	Designed for home users with a limited budget, it lacked many features included in Windows Home Premium, such as the Windows Aero screen effects, and advanced media support found in other versions of Vista, but it does include Windows Photo Gallery and Windows Movie Maker. It does not support high-definition video, but Windows Vista was the first version of Windows to include a performance enhancement called <i>ReadyBoost</i> , which allows you to use flash memory devices as additional cache memory to improve system performance. It also includes security for the home user, such as Windows Firewall and parental controls.
Windows Vista Home Premium	Includes all of the features in Windows Vista Home Basic, with the addition of more advanced multimedia support of Windows XP Media Center, including HDTV, DVD authoring, and much more. Lacks features used in a Microsoft Windows Server domain.

TABLE 2-1 Comparison of the Windows Editions listed on the CompTIA A+ 802 Exam (Continued)

Windows Version and Edition	Description
Windows Vista Business	For business or power users, this edition includes all of the features of Home Basic, except Parental Controls, and it is missing one basic desktop theme. It has the ability to join a Windows Server domain, more security features, the ability for another Windows user to operate remotely, and other features required in a business network environment. Includes <i>Shadow Copy</i> , the ability to track and maintain backup copies of versions of user data files. It works together with <i>System Restore</i> , an automated system for creating backups of the entire Windows operating system, allowing you to roll the system back in time.
Windows Vista Enterprise	Includes all of the features of the Business edition, but with more features targeted to large enterprises. Only available through Microsoft Software Assurance (SA), a software purchasing, volume licensing, and support plan, mainly for large organizations.
Windows Vista Ultimate	Combines the features of both Home Premium and Enterprise editions, as well as a group of optional features bundled as Ultimate Extras that are free through Windows Update. Included is a utility, DreamScene, for using a video as a desktop background; tools for use with BitLocker and Encrypting File System (EFS); a poker game; sound schemes; additional language packs; and a puzzle game.
Windows 7 Starter	Available only as a 32-bit OEM version, preinstalled on low-end computers, such as a <i>netbook</i> , which is a minimally configured computer in the ultra-portable category, designed for connecting to the Internet and little else. The least capable of all the editions, it does include support for playing audio and video and for streaming audio or video to devices or other PCs running Windows 7. It does not include the ability to watch, pause, or record live TV on your PC. You cannot change the desktop backgrounds or themes. It is minimally configured for networking on a home network.
Windows 7 Home Premium	Targeted to the home market, this edition includes Windows Media Center, Windows Aero, and multi-touch support on compatible touch screen devices.
Windows 7 Professional	Designed for power users and small-business users, this edition includes all the features of Home Premium, with additional networking and security features, such as the ability to join a Microsoft Windows Server domain, support for Encrypting File System, and Windows XP Mode for running old applications in a virtual machine running Windows XP.
Windows 7 Enterprise	Similar to the Ultimate edition, but with more features targeted to large enterprises. Only available through Microsoft Software Assurance (SA), a software purchasing, volume licensing, and support plan, mainly for large organizations.
Windows 7 Ultimate	Combines the multimedia features of Home Premium with the security, networking, and compatibility features of Professional editions, including Windows XP Mode for running old applications in a virtual machine running Windows XP. It also includes the data encryption features of BitLocker Drive Encryption and BitLocker To Go and support for 35 languages.

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Several advanced Windows features are just defined here because they are part of the CompTIA A+ Exam 802 1.1 Objective, but you will learn more about

them later in the book. For instance, learn how to work with ReadyBoost in Chapter 9, Shadow Copy in Chapter 10, and System Restore in Chapter 13.

The Windows editions included in the exams are available through retail channels—either the Windows OS purchased alone in retail packaging (sometimes referred to

as “full retail”) or Windows preinstalled and bundled with a computer and known as “OEM Windows.” Microsoft makes OEM Windows available at low prices to manufacturers or system builders with the agreement that they cannot sell it separately from the hardware.

exam**Watch**

For the exam, be prepared to differentiate among the various editions.

32-Bit vs. 64-Bit Windows Operating Systems

Operating systems tie closely to the CPUs on which they can run. Therefore, we often use CPU terms to describe an operating system’s abilities. For instance, Windows 2000 is a *32-bit operating system*. Windows XP, Windows Vista, and Windows 7 come in both 32-bit and 64-bit versions. Most of the Windows XP editions are 32-bit except for a special edition, Windows XP Professional x64 Edition.

The biggest difference between the 32-bit and 64-bit versions of Windows is in the maximum address space used by both system RAM and other RAM and ROM in your computer (see Table 2-2). Windows 64-bit does not use the maximum theoretical address space of a 64-bit CPU.

A *64-bit operating system* requires 64-bit applications, although Microsoft has offered ways to support older applications in each upgrade of Windows, described later in this chapter in “Running Old Applications in Windows.” To determine if a computer is running 32-bit or 64-bit Windows 7, open Control Panel and click System and Maintenance, and then click System and look at the System Type field, which will say “32-bit Operating System” or “64-bit Operating System.”

TABLE 2-2

Windows
Memory Limits

Edition	RAM Limit in 32-bit Windows	RAM Limit in 64-bit Windows
Windows XP Home	4 GB	N/A
Windows XP Professional	4 GB	N/A
Windows XP Media Center	4 GB	N/A
Windows XP Starter	512 MB	N/A
Windows XP 64-Bit	N/A	128 GB
Windows Vista Ultimate/Enterprise/ Business	4 GB	128 GB
Windows Vista Home Premium	4 GB	16 GB
Windows Vista Home Basic	4 GB	8 GB
Windows Vista Starter	1 GB	N/A
Windows 7 Ultimate/Enterprise/ Professional	4 GB	192 GB
Windows 7 Home Premium	4 GB	16 GB
Windows 7 Home Basic	4 GB	8 GB
Windows 7 Starter	2 GB	N/A

Updates

Computer hardware technology does not stand still; therefore, operating systems must change to keep up. Each of the major operating systems is modular, so incremental updates can make some changes to the existing OS version. In Microsoft terminology, an *update* contains one or more software fixes or changes to the operating system. Some updates add abilities to the OS to support new hardware, and some resolve problems discovered with the operating system. This second type of update is often required to fix security problems. A *hotfix* or *patch* is a software fix for a single problem. Hotfix seems to be Microsoft's preferred term.

At one time, these updates, whether for functional or security problems, were issued without a predictable timetable. In recent years, Microsoft has assigned the second Tuesday of each month as the release day for updates. This day is widely called "patch Tuesday."

Service Packs

A *service pack* is a bundle of patches or updates released periodically by a software publisher. Windows service packs are major milestones in the life of a Windows version. For that reason, some devices and applications will require not simply a certain version of Windows, but also a certain service pack.

EXERCISE 2-1

Viewing the Windows Version, Edition, and Service Pack Information

Here is an easy way to determine the version, edition, and service pack level for Windows 7:

1. Open the Start menu and right-click Computer in the column on the right.
 2. Select Properties.
 3. Look for the version, edition, and service pack information near the top of the window, as shown in Figure 2-5.
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Microsoft Support Lifecycle

Each version of Windows has a *support lifecycle*, as defined in Microsoft's Support Lifecycle Policy, first announced in 2002 and updated since then. A support lifecycle defines the length of time Microsoft will support a product, as well as the support options. It applies to most of their products that fall into two broad categories: Business and Developer products and Consumer, Hardware, and Multimedia products. All versions of Windows are included in the support lifecycle.

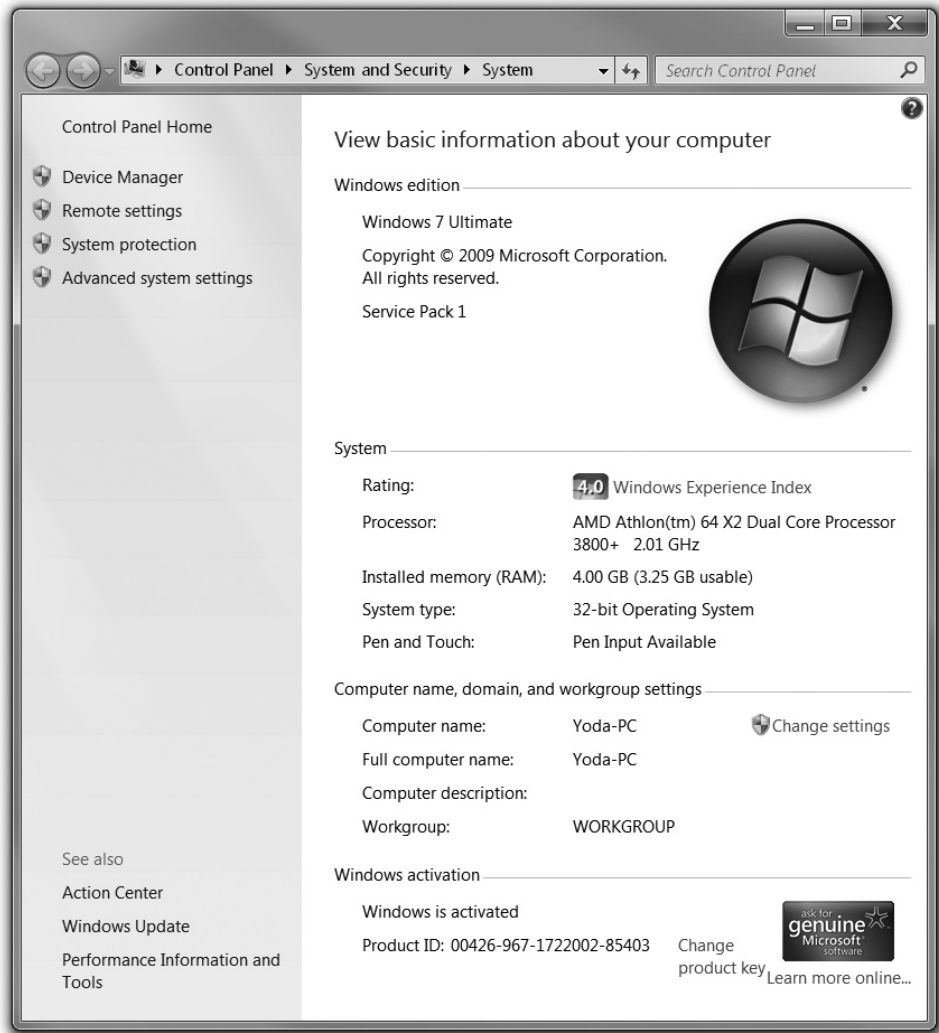
The lifecycle for each product moves through two phases: first is the Mainstream Support phase, followed by the Extended Support phase. Table 2-3, derived from information on Microsoft's Support Lifecycle page, illustrates the support options available during these two phases.

The lifecycle of each version also ties to the installed service pack level. Presently, Microsoft's policy is to end the support of a service pack 24 months after the next service pack releases or at the end of the product lifecycle, whichever comes first.

For instance, the last service pack for the 32-bit version of Windows XP was SP 3, and as of October 22, 2010, Microsoft no longer permits its retail partners or its original equipment manufacturers to sell Windows XP. The company ended support

FIGURE 2-5

This System dialog box shows that the version is Windows 7, the edition is Ultimate, and it includes Service Pack 1.



for Windows XP Service Pack 2 (all 32-bit editions) in July 2010. The 64-bit edition did not include a third service pack, and support for the 64-bit edition of XP SP 2 is scheduled to end in April 2014, when support also will end for SP 3 of the 32-bit edition.

TABLE 2-3

Microsoft Support Phases *Extended Support only available with an extended hotfix agreement purchased within 90 days of the end of mainstream support.

Available Support	Mainstream Support Phase	Extended Support Phase
Paid support	X	X
Security update support	X	X
Nonsecurity hotfix support (to fix a specific problem)	X	*
No-charge incident support	X	
Warranty claims	X	
Design changes and feature requests	X	
Product-specific information available in the online Microsoft Knowledge Base	X	X
Product-specific information available by using the Support site at Microsoft Help and Support	X	X

The current lifecycle for consumer versions of Windows is ten years, as announced in February 2012. Therefore, support for Windows Vista will end April 11, 2017, and for Windows 7 the end date is January 14, 2020. So we can count on updates and security patches for these products until those dates.

To learn more about the lifecycle for a specific product, enter the keywords “Microsoft support lifecycle” into your favorite search engine and select the result that points to the Microsoft Support Lifecycle page. From there, you can do a search on a product, such as Windows 7.

Considerations for Installing or Upgrading Windows

Unless you buy or build a custom computer, when you purchase a PC from a major manufacturer, it will come with the latest version of Windows installed. But what if you wish to install the latest version on your existing PC? It turns out you need to do a bit of homework before you make that step. First, you need to see if your computer meets the recommended system requirements. Then you will want to discover if the new version will be compatible with your existing hardware and applications, and finally, you need to know the upgrade paths to the new version because, in some cases, you cannot upgrade from the installed version and need to be prepared to take

the correct steps to successfully install the new version. This section will prepare you for the actual installation or upgrade of Windows as presented in Chapter 9.

System Requirements

Each revision or version of an OS has specific minimum requirements for the level of CPU, amount of memory, and amount of free hard disk space. To determine if it will run on your existing computer, check the *system requirements* listed on the package and published on Microsoft's Website. This will describe the minimum CPU, RAM, free hard disk space, and video adapter required. You can normally count on the system requirements being greater as you move from one version to another, as from Windows XP to Windows Vista.



Another system requirement is the computer platform on which a given OS will run. Windows runs on the Microsoft/Intel platform, with a range of CPUs (from Intel and makers of compatible products, such as AMD), BIOSs, and chipsets compatible with Microsoft OSs. Some call this the *Wintel* architecture. We

make another distinction between x86 systems, which are Wintel computers that support 32-bit Windows, and x64 systems, which support the 64-bit Windows. To make things a bit more complicated, Windows 8 supports both 32-bit and 64-bit Wintel systems, plus (in a special version) the ARM architecture, named for the manufacturer of these ultra-small CPUs and chipsets designed for mobile devices, such as tablets and smartphones.

Table 2-4 describes the system minimums for three versions of Windows—all Wintel systems. Additionally, an optical drive is required if you want to install from the Windows CD. But these requirements are modest and far less than you will find in the most minimally configured new desktop PC.

You would be very unhappy trying to work on a PC with a minimal configuration, because the programs most people choose to run on desktop computers have grown in their hardware requirements; you will want many hundreds of GBs of hard drive space for the programs you add and the data you will create with those programs. Therefore, our recommended configuration for 64-bit Windows 7 Home Premium, Professional, or Ultimate is 2 GHz 64-bit multicore processor, 2+ GB of system memory, a 120 GB hard drive, and a DirectX 11 adapter with 256 MB graphics memory. Many of the features available with Windows require additional hardware support. For instance, Windows Media Center features need more video RAM and specialized hardware

TABLE 2-4 Windows System Minimums

	Windows XP Professional	Windows Vista Home Premium/Business/Ultimate	Windows 7
CPU	Intel or AMD 233 MHz	800 MHz	1 GHz (32-bit or 64-bit)
RAM	64 MB	512 MB	1 GB (32-bit) or 2 GB (64-bit)
Free Hard Disk Space	1.5 GB	15 GB	16 GB (32-bit) or 20 GB (64-bit)
Video Adapter	Super VGA (800 × 600)	Support for Super VGA graphics	DirectX 9 adapter with WDDM 1.0 or higher device driver

like a TV tuner. Windows Vista's Windows XP Mode requires an additional 1 GB of RAM and an additional 15 GB of available hard disk space, as well as a processor that supports hardware virtualization.

Application and Hardware Compatibility

After Microsoft releases a new Windows version, there is a transition time during which many individuals and organizations choose to stay with the old version; some move to the new version right away; and others make the change gradually. Not everyone immediately embraces the new OS and replaces their old OS with the new one. There are many reasons for this.

System Requirements

Old hardware may be below the system requirements. Therefore, if the old operating system is functioning adequately, individual users, as well as businesses, will not simply reflexively upgrade to the new OS until they have a compelling reason to do so.

Hardware Compatibility

The BIOS in an older PC may not support critical features of the new OS, and if the manufacturer does not offer a BIOS upgrade, the computer will not support the new OS. Hardware compatibility problems extend to peripherals when manufacturers do not create new device drivers for a new OS.

Software Compatibility

Some applications are written to take advantage of certain features (or weaknesses) in older versions of Windows. Large organizations have often delayed upgrading to a new OS until they could either find a way to make the critical old applications run in the new OS or find satisfactory replacements that would work in the new OS.

Upgrade Advisor

Although the recent versions of Windows test the compatibility of the hardware and (in the case of an upgrade) software early in the installation process, you would be smart to run this test yourself before you start the installation process—even before purchasing the new OS. Microsoft provides a utility for each of its recent upgrades that lets you test your computer and hardware for compatibility. This program is Upgrade Advisor.

Upgrade Advisor comes on the Windows XP installation disc, so you can select it from the menu that appears during Autorun. The Windows Vista and Windows 7 CDs will run the Upgrade Advisor from the Internet. For those who want to run the test before purchasing a version of Windows, download Upgrade Advisor from the Internet. Check out the Microsoft Website to locate the Upgrade Advisor for a specific version of Windows.

After testing the hardware and the software, the Upgrade Advisor produces a report providing valuable information and recommendations or tasks that you need to perform before installing the next version of Windows, and it may show tasks to perform after the installation. You may find the tasks needed to make a computer meet the compatibility and minimum system requirements are too expensive to perform on an older computer and decide to postpone your move to the new version until you are ready to replace the old system.

Exercise 2-2 provides the steps for acquiring and running the Windows 7 Upgrade Advisor. Chapter 9 includes details on the practice of upgrading an installed Windows OS with a new Windows OS.

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The Acronym lists for both the CompTIA A+ 801 and 802 Exam Objectives include the now-obsolete hardware compatibility list (HCL), a list of

compatible hardware that was included on the Windows distribution discs and maintained by Microsoft at their Website. The Upgrade Advisor replaced it.



EXERCISE 2-2

Running Upgrade Advisor

You can see if your Windows computer hardware and application software will be compatible with Windows 7. You will need a broadband Internet connection to successfully complete this exercise.

1. Open your Internet browser and enter the keywords **windows upgrade advisor** into your favorite search engine.
2. From the results, select a link (within the Microsoft.com domain) for the version of the Upgrade Advisor you desire.
3. Download and save the Upgrade Advisor file to the desktop.
4. When the download completes, locate the file on the desktop and double-click it to run the Advisor.
5. When the Upgrade Advisor completes, it will display a task list similar to the one in Figure 2-6. Print this out or save it.

Once, when we ran the Upgrade Advisor, it produced a report that found only one incompatibility—an antivirus program that was only incompatible with the Setup program but was compatible with the new version of Windows. Therefore, it suggested removing the program before installing the OS, and then reinstalling it afterward. The computer in question was a test computer, so we ignored the instructions just to see what the consequences would be. After the upgrade, Windows did not run, and it would not even boot up into Windows's Safe Mode (described in Chapter 13). After several hours of trying to fix the installation, we had to wipe the hard drive clean and start from scratch.

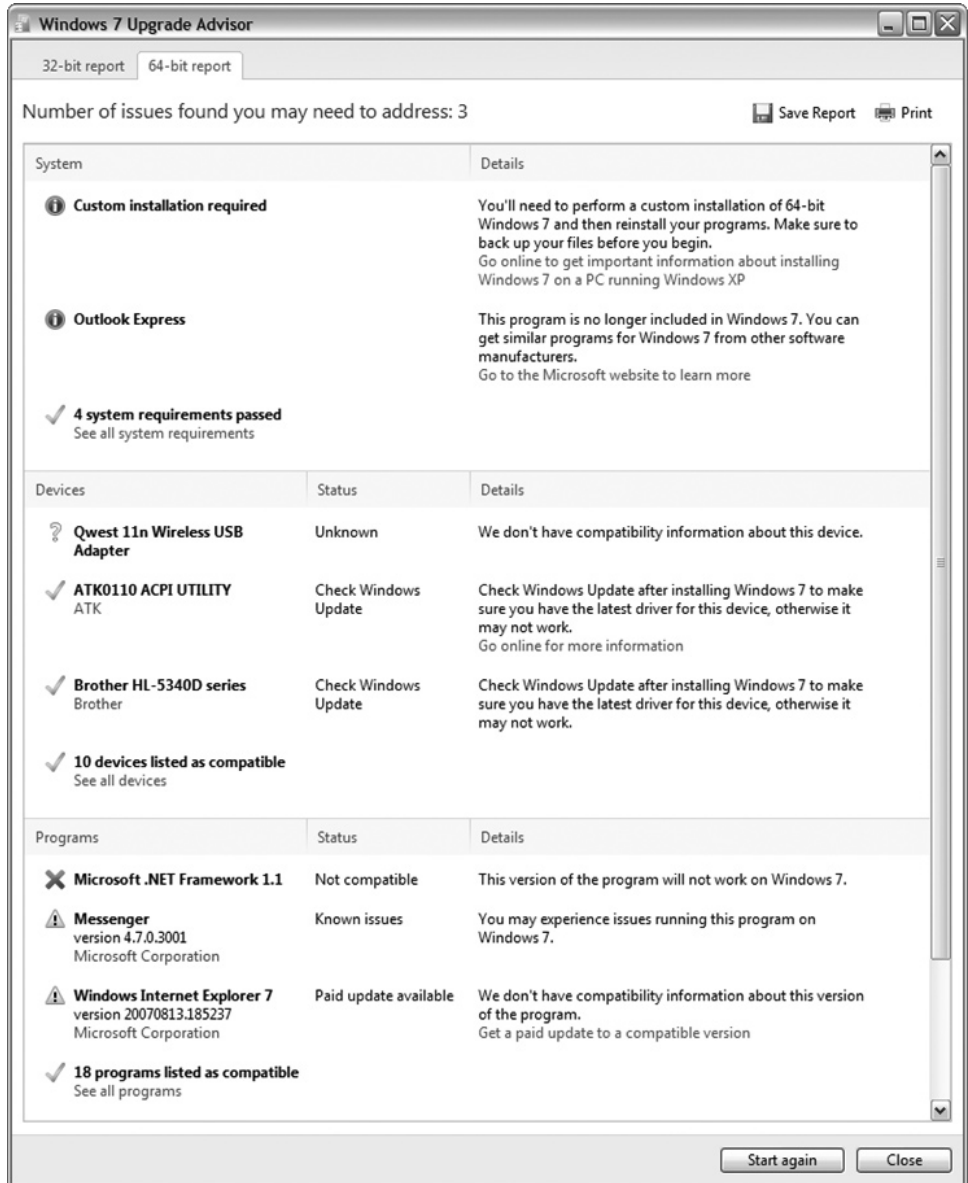
Running Old Applications in Windows

Many individuals and organizations use older applications that will not work on newer versions of Windows. The program may fail to install in the new OS, or, if you have upgraded a system to a new version of Windows, an old application may issue an error message, such as “This program requires Windows x,” where x is an older version of Windows.

Or, you may not receive such a clear message, but the program may behave erratically. If this program worked in the older version of Windows, you may need to take measures to make it happy in the new version. The official answer to this is to use Compatibility

FIGURE 2-6

A portion of the Windows 7 Upgrade Advisor task list



Mode in all versions of Windows discussed in this book or Windows XP Mode in Windows 7. An additional option is available for Windows XP and Windows Vista that is similar to Windows XP Mode. We'll examine these options.

Compatibility Mode

Some programs will run in a newer version of Windows if you first make temporary changes to Windows XP, Windows Vista, or Windows 7 that only affect the problem program while it is running and do not directly affect other programs. This feature is *Compatibility Mode* and you can enable and configure it using the *Program Compatibility Wizard*, also called the *Program Compatibility Troubleshooter* in Windows 7. Call up this Wizard from the Help and Support Center, and it guides you through the steps to select the application program, the older Windows OS you wish to emulate, and the display settings. The wizard saves the settings it creates in the properties of the application's shortcut or program file.

Alternatively, you can manually alter the compatibility settings for any program from the program's properties or from its shortcut.



Only use Compatibility Mode for old productivity applications (word processing, spreadsheet, and so on.). Never use Compatibility Mode for antivirus programs, backup programs, or system programs (such as disk utilities and drivers) because these types of programs require more access to the disk and other resources than they will be allowed within Compatibility Mode.

Windows XP Mode and Windows Virtual PC

If Compatibility Mode does not enable an old program to run properly, and if you are running Windows 7 Professional, Enterprise, or Ultimate edition, then you can use Windows XP Mode, which is Microsoft Virtual PC with a fully licensed version of XP installed. Windows XP Mode is not designed for 3-D games and other programs with high-end graphics needs, and it may not work with certain hardware, such as TV tuners. Once again, use this for the business productivity program that you need but cannot upgrade to a compatible version. Learn more about Windows XP Mode in Chapter 8, when we explore the topic of operating system virtualization for Windows.

Clean Install versus an Upgrade

An upgrade of an operating system, also called an *in-place upgrade*, is an installation of a newer operating system directly over an existing installation. An upgrade has the benefit of saving you the trouble of reinstalling all your programs and creating all your preference settings. You would have to do all this after a clean installation, which is an installation on a blank or “clean” hard drive. Upgrades also leave you with a brand-new OS on an old computer, but that is your choice.

Upgrade Paths

You can directly upgrade to Windows XP Professional from Windows 98, Windows Me, Windows NT 4.0 Workstation SP 5, and Windows 2000 Professional. Upgrade paths to Windows Vista from Windows XP are edition-specific, as shown in Table 2-5, in which an “X” indicates in-place installation (upgrade). N/A indicates that you must do a clean installation. The upgrade path from Windows XP Professional requires a clean reinstall.

You cannot directly upgrade from Windows XP or older versions to Windows 7. Table 2-6 lists the direct upgrade paths to Windows 7, and, as in Table 2-5, N/A indicates that you must do a clean install.

Migrating Data and Settings

When preparing to move to a new version of Windows from an older version, whether you plan to do a clean install or an in-place upgrade, you will want to

TABLE 2-5 Upgrade Paths to Windows Vista

	Windows Vista Home Basic	Windows Vista Home Premium	Windows Vista Business	Windows Vista Ultimate
Windows XP Professional	N/A	N/A	X	X
Windows XP Home	X	X	X	X
Windows XP Media Center	N/A	X	N/A	X
Windows XP Tablet PC	N/A	N/A	X	X

TABLE 2-6 Upgrade Paths to Windows 7

	Windows 7 Home Basic	Windows 7 Home Premium	Windows 7 Professional	Windows 7 Enterprise	Windows 7 Ultimate
Windows Vista Business	N/A	N/A	X	X	X
Windows Vista Enterprise	N/A	N/A	N/A	N/A	X
Windows Vista Home Basic	X	X	N/A	N/A	X
Windows Vista Home Premium	N/A	X	N/A	N/A	X
Windows Vista Ultimate	N/A	N/A	N/A	N/A	X

migrate your data and settings from the old to the new. Microsoft has provided tools for doing this, including *Windows Easy Transfer (WET) Wizard*, a utility introduced in Windows Vista. Learn more about this and other data migration tools in Chapter 9.

SCENARIO & SOLUTION

Which is generally more expensive—Windows purchased as a full retail product or an OEM version purchased preinstalled on a computer?

Windows purchased as a full retail product is more expensive than an OEM version purchased preinstalled on a computer (excluding the cost of the computer).

What is “patch Tuesday?”

Patch Tuesday is the second Tuesday of the month—the day when Microsoft releases regular updates to their products.

Describe the biggest difference between 32-bit Windows and 64-bit Windows.

The biggest difference is in the address space used by both system RAM and other RAM and ROM. A 64-bit Windows OS uses a great deal more address space than the 4 GB of 32-bit Windows, with the actual maximum varying among the versions and editions, but ranging from 8 GB to 192 GB.

The Windows User Interface

This section provides an overview of the Windows user interface, including both the obvious and the less obvious GUI components, such as the Aero feature in Windows Vista and Windows 7, which affects the look of all graphical components. Learn about such objects as the taskbar, Start menu, command prompt, Sidebar, Windows Explorer, and so forth.

This section describes the functions and the ways to use the various user interface components in Windows. It also distinguishes between those utilities you use from the command prompt and Run line utilities. You learn that many of the GUI utilities used to administer Windows run in a special graphical console called an MMC. Although you will see some of these utilities in this section, you will have opportunities to work with most of them in the following chapters of this book, where appropriate.

The Windows Desktop

Windows provides a graphical user interface (GUI) that the user can navigate using a keyboard and mouse or other pointing device. The Windows GUI uses the desktop metaphor. The main Windows screen, called the “desktop,” has containers for your work like when you use a physical desk. Windows organizes these containers, called “folders,” in a hierarchical fashion. This organization allows for easy access to the commonly used files and programs, using a mouse or other pointing device for point-and-click operations.

The Windows desktop has a variety of graphical objects in addition to folders, including, but not limited to, the mouse pointer, icons, shortcuts, dialog boxes, windows, buttons, toolbars, menus, and the taskbar. Not all of these appear at the same time, or at least they are not on the desktop at the end of a standard Windows installation.

Icons and Shortcuts

You encounter and use these icons as you navigate in Windows using your keyboard and pointing device. An *icon* is a tiny graphic image representing applications, folders, disks, menu items, and more. A *shortcut* is an icon that represents a link to any object that an icon can represent. Activating a shortcut (by double-clicking it) is a quick way to access an object, or to start up a program from the desktop, without having to find the actual location of the object on your computer. You can



represent a single object, like a program file, by more than one shortcut, and you can place a shortcut on the desktop, taskbar, and other places within the Windows GUI. Shortcut icons are often (but not always) distinguished by a small bent arrow on the lower left, and they have a title below the icon, like the Microsoft Word shortcut icon shown here.

Windows Explorer

Windows has a very important GUI component, *Windows Explorer*—the program EXPLORER.EXE. This program supports the entire Windows GUI. So, as long as the GUI is running, which means as long as you are able to work in Windows, this program is loaded into memory. Once in the Windows GUI, if you call this program, it opens a window called Windows Explorer that you use for browsing your local disks and files. You open Windows Explorer windows every time you open many Start menu shortcuts, such as My Computer/Computer, My Documents/Documents, and so forth. You can also open Windows Explorer from the Accessories menu of All Programs or by entering **explorer** in the Start | Run dialog box. Switch from the Start screen to the Windows Explorer desktop in Windows 8 by clicking or tapping (with your finger on a touch-sensitive computer) the Desktop tile. Paradoxically, entering **explorer** in the Start Search box in Windows Vista or Windows 7 will bring up Internet Explorer, but entering **explorer.exe** will bring up Windows Explorer.

Microsoft makes incremental changes to Windows Explorer in each new version of Windows. For instance, the Search box in Windows Vista and Windows 7 replaced the Search toolbar button in Windows Explorer in Windows XP. The old Search option did not begin the search until you finished typing in the search string, and then it seemed rather slow. The new Windows Explorer Search box starts searching the contents of the current windows and its folders as you enter the string and displays results as it continues the search.

Windows Aero

Aero is an enhancement to the desktop that Microsoft introduced in Windows Vista and continues in Windows 7 and in Windows 8 Explorer view. These versions of Windows support Aero in all editions except Home Basic, and require a compatible graphics adapter. Aero features include such visual effects as Glass, which makes the frames of a windows transparent (look back at Figure 2-3), and Aero Wizards, a standard design for the wizards that walk you through various functions. Aero includes windows animations, such as Windows Flip 3D, that allows you to switch between open Windows by pressing the WINDOWS key and TAB key simultaneously, as shown in Figure 2-7 . These are but a few of the many features of Aero.

Sidebar and Gadgets

The *Sidebar* was introduced in Windows Vista and removed from subsequent versions. It is a vertical bar located by default on the right side of the Vista desktop with the purpose of containing gadgets. A *gadget* is a mini-program that shows information, such as time and temperature in various locations, stock quotes, and handy tools such as a small yellow notepad or calculator. The Windows Vista Sidebar, shown in Figure 2-8, fits nicely on wide displays where you have enough real estate to keep it visible while working at your normal tasks. You can choose the various gadgets you wish to display, move gadgets off the Sidebar where some of them will automatically grow larger, or choose to eliminate the Sidebar altogether. Microsoft removed the Sidebar from Windows 7 as unnecessary, since gadgets can reside anywhere on the desktop.

To enable a gadget, simply right-click an empty spot on the desktop and click Gadgets to open the Gadget Gallery, shown along with some active gadgets in Figure 2-9. Double-click a gadget to have it appear on the desktop. Windows 8 Live Tiles are more configurable than gadgets.

Taskbar and Systray

By default, Windows displays the *taskbar* as a horizontal bar across the bottom of the desktop. You can reposition the taskbar by simply moving the pointer to an

FIGURE 2-7

Using Flip 3D in
Windows 7



FIGURE 2-8

The Sidebar in Windows Vista with several gadgets



“empty” taskbar area and dragging it to a new position, such as at the top of the desktop or vertically positioned at either side. You can also resize the taskbar by dragging just an edge of it until it is the desired size. The taskbar is also (rarely) called the *Start Bar* because it contains the Start button. The Start button has a label in Windows XP, but in Windows Vista and Windows 7, it is a simple icon with a Microsoft logo, sometimes called the *Windows orb*. The Windows XP taskbar (Figure 2-10) and the Windows Vista taskbar (Figure 2-11) are very similar. Each includes (from left to right) a Start button, the Quick Launch toolbar, buttons for currently running programs, and at the far right, the *systray*, also called the *notification area* or *system tray*. Programs and some hardware devices use the systray to display status icons. These icons may represent devices, such as a network adapter, or represent software, such as a battery meter, antivirus program, and so on. Pausing the mouse pointer over one of these icons will cause a rectangular status box to pop up, as shown in Figure 2-12. Occasionally, a message balloon will pop up over the systray for events relating to one of the icons, such as when making or disconnecting a wireless connection.

The *Quick Launch toolbar*, just to the right of the Start button, is an optional toolbar you can add to the taskbar using the properties dialog box for the taskbar. You can launch any shortcuts on the Quick Launch toolbar with a single click without having to first open the Start menu. The Windows 7 taskbar (Figure 2-13) replaced the Quick Launch toolbar with the ability to pin program icons to the taskbar—a capability previously reserved for the Start menu, and,

of course, we have long had the ability to create new icons on the desktop, called shortcuts.

Configure the taskbar, control the default positioning of windows on the desktop, or open the Task Manager by right-clicking in the empty area of the taskbar and selecting the desired option from the taskbar menu, as shown in Figure 2-14. The choice labeled Properties opens the Properties dialog box for the taskbar and Start menu.

Start Menu

The Start button on the taskbar opens the *Start menu*, which has areas containing shortcuts and submenus. It is the central tool for finding and starting a variety of

FIGURE 2-9

On the left is the Windows 7 Gadget Gallery where you can select a gadget. On the right are several active gadgets.

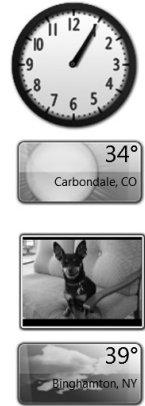


FIGURE 2-10 The Windows XP taskbar



FIGURE 2-11 The Windows Vista taskbar



FIGURE 2-12 Pause the mouse pointer over an icon in the systray to see status information.

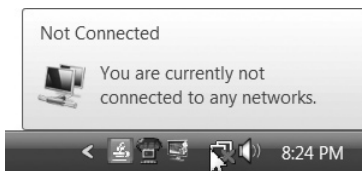
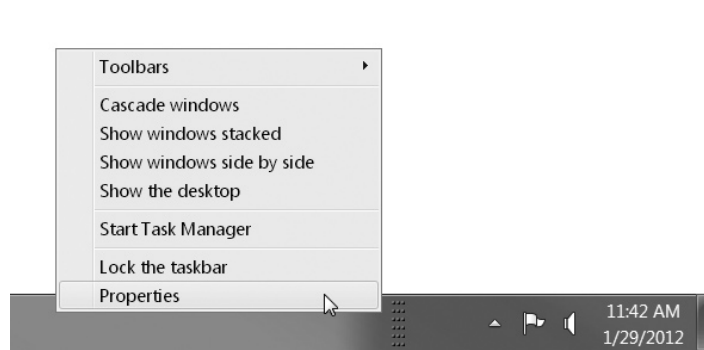


FIGURE 2-13 The Windows 7 taskbar



FIGURE 2-14

Right-click the Windows 7 taskbar to open the taskbar menu.



programs in Windows. Beginning in Windows XP and continuing through Windows 7, the Start menu has a two-column format. The right column contains a fairly standard set of icons that you can configure through the Start menu Properties dialog box. An arrow next to one of these icons indicates that you can expand the item to display the contents or submenus.

At the bottom of the Windows XP Start menu is a bar containing two choices: Log Off and Turn Off Computer. The Log Off option will log off the currently logged-on user, replacing the desktop with a logon screen. Selecting Turn Off Computer will open the Turn off Computer dialog box, which will give you three choices: Standby, Turn Off, or Restart. If you have enabled hibernation, the middle button will read Hibernate.



In Windows Vista, Microsoft moved the Turn Off button (without a label) to the bottom of the Start menu, as shown in Figure 2-15. Clicking this button will normally shut down the computer without displaying an additional dialog box. To the right of the Turn Off button is a lock button to lock the computer while leaving it running. We will describe the use of Lock Computer in Chapter 18. To select more options, click the arrow to the right of the Turn Off button. The standard options here are Switch User, Log Off, Lock, Restart, Sleep, and Shut Down.

FIGURE 2-15

The Windows
Vista Start menu

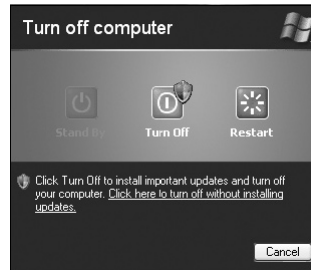


If an update has downloaded to your Windows computer but did not install, you will see an indication of this when you attempt to shut down. In Windows XP, the Turn Off Computer dialog box will display as shown in Figure 2-16, with the Microsoft Security Center icon positioned over the Turn Off button. In Windows Vista and Windows 7, the security icon will display on top of the Turn Off button on the Start menu. In either case, a message will instruct you to click Turn Off to install the updates. If you choose this, do not power off the computer because that will interrupt the update. The computer will turn off automatically after installing the updates.

Pinned Items List A *pinned items list* is located on the top left of the Windows XP, Windows Vista, and Windows 7 Start menus. By default, the pinned items list contains shortcuts to Windows Update and programs for browsing the Internet and using e-mail. The shortcuts in the pinned items list remain there unless you choose to remove or change them. To add shortcuts to the pinned items list, right-click any shortcut and choose Pin To Start Menu. To remove an item from this list, right-click it and choose Unpin From Start Menu. In Windows 7, you can also pin items to the taskbar.

FIGURE 2-16

The Windows XP Turn Off Computer dialog box showing the Security Center icon to indicate that an update is waiting to be installed



Recently Used Programs List Beginning in Windows XP, the Start menu has a separator line that marks the end of the pinned items list and the beginning of the *recently used programs list*, which contains shortcuts to recently run programs. You can change the number of items maintained in this list through the Start menu Properties dialog box.

All Programs Beginning in Windows XP, the All Programs menu item points to a folder containing links to programs and other folders containing programs. When you click All Programs, it opens a pop-up menu with a list of programs and program categories. Changed in Windows Vista and Windows 7, the list opens on top of the pinned items and recently used programs lists, as shown in Figure 2-17, and you click Esc (to close the entire Start menu) or Back to close this list and keep the Start menu open. In all three versions, when you install a new application in Windows, it will usually add a folder or program icon to this list.

Personal Folders The Start menu contains shortcuts to your *personal folders*. In Windows XP, My Documents, My Recent Documents, My Pictures, and My Music point to the currently logged-on user's personal data folders. Microsoft dropped the "My" in My Computer and My Network Places in Windows Vista. The exact folders displayed will depend on how you have configured the Start menu using the Properties dialog box.

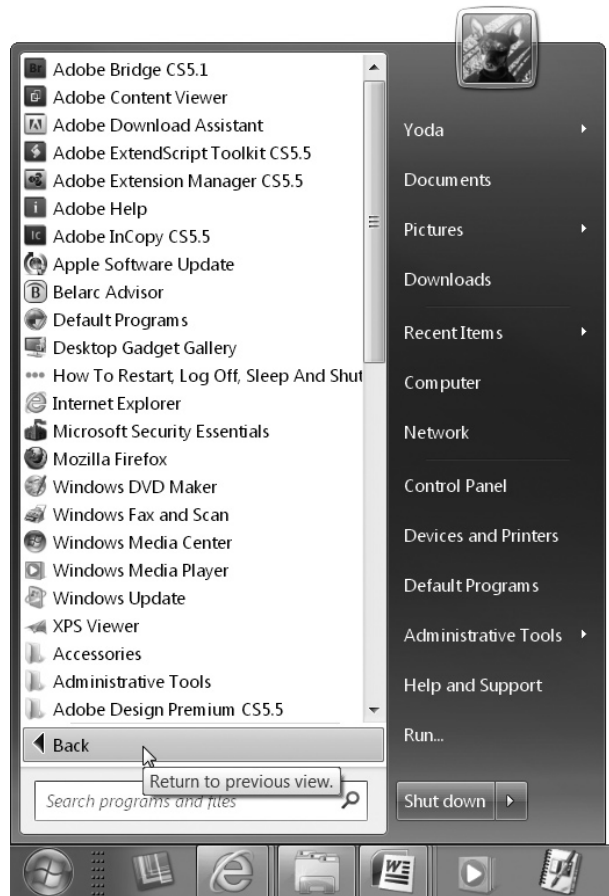
The My Documents/Documents folder contains data files you create. Many applications will, by default, save their data files in this location. In Windows XP, the actual path to the My Documents folder is C:\Documents and Settings\username\My Documents, where *username* is the user name used to log onto the computer. In Windows Vista/7, the path to the Documents folder is C:\Users\username\Documents. The other personal folders are also located in the *username* folder. My Recent Documents/Recent Items contain shortcuts to recent data files, no matter

where you saved the files. My Music/Music contains audio files; My Videos/Videos contains video files such as movies, whereas My Pictures/Pictures is the default location for graphic files such as photo files from digital cameras. Some applications with special file types will create their own folders under My Documents/Documents. Each of these icons on the Start menu points to a folder created as part of the user's personal folders, giving the user a ready-made folder structure for organizing data files of many types.

Start Search In Windows Vista and Windows 7, the Start Search box, mentioned earlier in this chapter, is very powerful and useful. Also called Quick Search or Instant Search, it works like the Run line for launching programs, but that is not all it does; it is much more powerful, searching your entire computer. When you search

FIGURE 2-17

The Windows 7 All Programs list, displayed on top of the left column



on a program it will find it by either its executable name or more common name. Then, once it is selected, press **ENTER** or click it to launch it. We have come to use this as a replacement for the Run line. It saves having to discover where a favorite GUI utility is located in Windows. For instance, by default, Microsoft tucked Device Manager away, requiring several mouse clicks to locate it in the GUI and then launch it. Starting it from the Run line is better, but you must carefully type in its executable name, **devmgmt.msc**. Leave off the extension and you get an error message, but using Start Search, all you need to do is enter **device manager** and voila! Device Manager blossoms on your desktop. So, forget the Run line (except for the A+ exams, of course) and use Start Search.

In Windows 8, Microsoft has again made the Search command both easier to use and more powerful. Simply start typing from the Start screen and searching will start.



Start Search isn't the only such search tool; for a more targeted search of Control Panel applets, use the Control Panel Search box.

My Computer/Computer My Computer resides on the Start menu in Windows XP; in Windows Vista, it is renamed Computer. Whatever the name, use it to open the My Computer or Computer folder in Windows Explorer and display file folders, hard disk drives, and removable storage on the local computer. The actual objects shown depend on the computer's configuration. In Windows XP, clicking the Folders button on the toolbar will change the view from the default view with a task pane on the left and a contents pane on the right to a two-pane view showing a folder hierarchy in the left pane and the contents of the currently selected folder on the right. In the first view, you can select an action from the task pane on the left, or open a folder or drive on the right. In Folder view, you can see the entire folder hierarchy on the left while browsing folders in the right pane. The Windows 7 Computer folder shown in Figure 2-18 has a button bar with buttons that change to match the context of whatever you selected. Use My Computer/Computer for file and folder management outside of your applications.

To work with files and folders you need to understand a few concepts. We will begin with files, folders, and other related concepts, and then move on to discuss paths.

A *file* is a container for data (whether program code or some type of user data) organized as a unit, saved on mass storage, and identified with a special name, called a filename. In Windows and other graphical OSs, a saved file appears to reside in a special container called a *folder* or *directory*, used to organize stored files. A folder can contain files and other folders. We call the folders and files as they exist on a disk, including their relationship to each other and their content, a *file structure* or *folder*

structure. Each version of Windows has a default file structure. This file structure will have other folders and files added to it as you install more programs and save your data files. Figure 2-19 shows part of the default file structure for Windows 7. Among the folders displayed in the left pane, the following are default folders installed by Windows 7: PerfLogs, Program Files, Program Files (x86), Temp, Users, and Windows. The Windows folder and its subfolders contain the core Windows OS components.

A *path* is a method for describing the location of a file on storage in Windows. It includes the drive on which the file resides as well as the folder or folders within which the file sits. For instance, a file named salary rpt.docx located in the data folder on drive C: has a path of C:\data\salary rpt.docx. Notice that a backslash (\) separates the drive designation and the folder name (data), as well as the folder name and the filename. Learn more about files and folders in Chapter 10.

My Network Places/Network The Start menu icon labeled My Network Places in Windows XP, or simply Network beginning in Windows Vista, opens a folder containing shortcuts to network locations on the LAN or the Internet. If the

FIGURE 2-18

The Windows 7
Computer folder

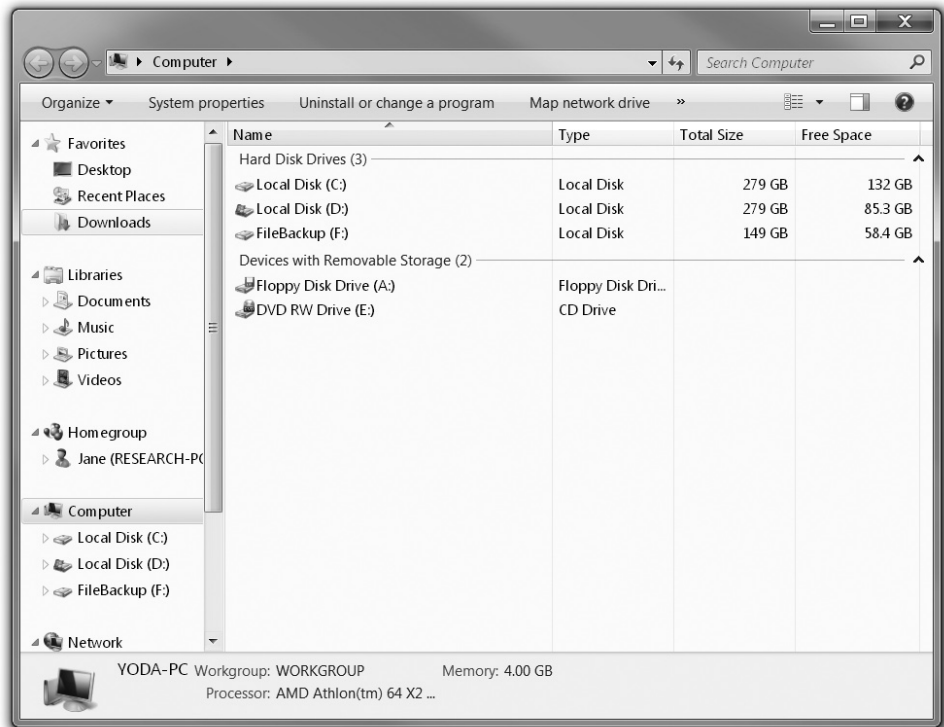
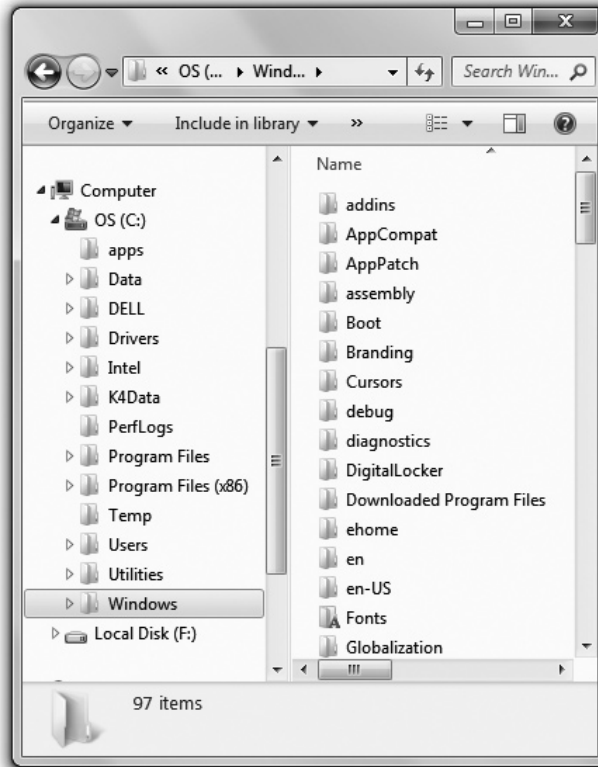


FIGURE 2-19

The Windows 7 default file structure

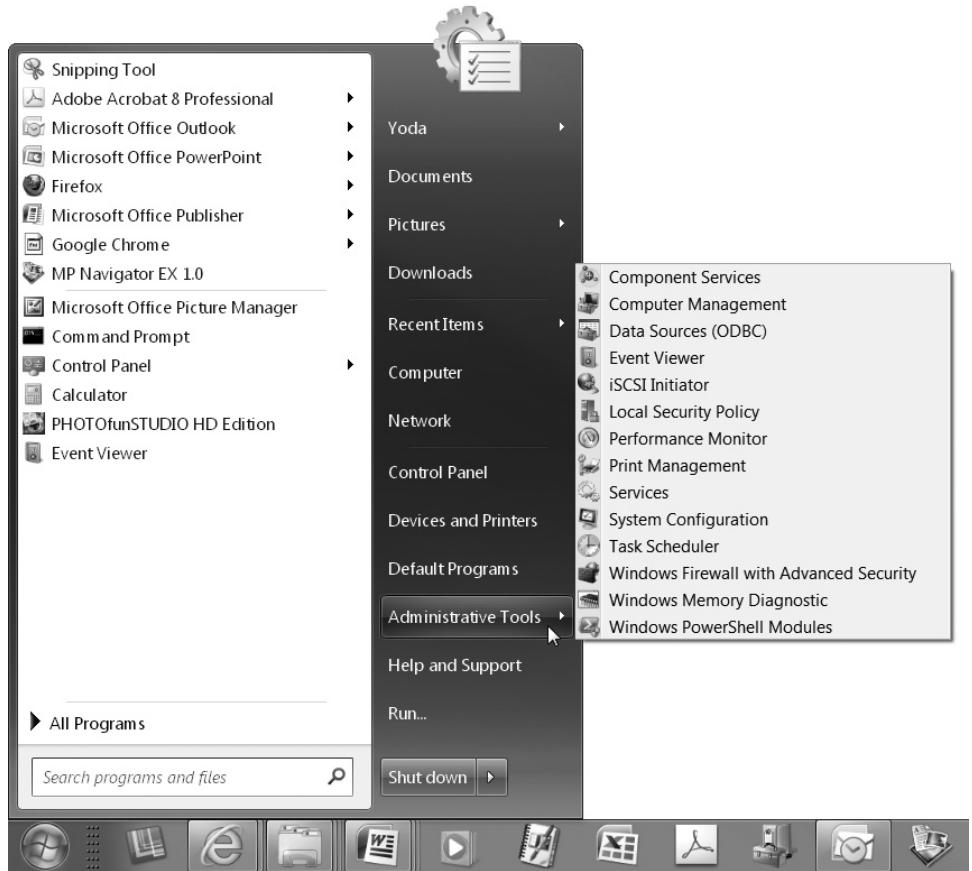


task list in Windows XP is visible, it includes tasks appropriate for working with network locations, such as Add A Network Place, View Network Connections, View Workgroup Computers, and Set Up A Home Or Small Office Network. These tasks are available through the button bar beginning in Windows 7.

Administrative Tools *Administrative Tools* is an optional Start menu item that provides shortcuts to administrative and troubleshooting tools. Click Administrative Tools to see a pop-up menu with a selection of utilities, as shown in Figure 2-20. The actual utilities shown vary among Windows versions, and even among editions of a version. Look for common tools, such as Services, Event Viewer, and Computer Management, among others.

Event Viewer is an administrative tool for logging errors, warnings, and other events that occur in Windows. If someone is having a problem with their computer and reports seeing an error in Windows but cannot recall what it said, open the Event

FIGURE 2-20

Administrative
Tools in
Windows 7

Viewer and search for the error. Beyond retrieving fleeting error messages, Microsoft improved Event Viewer over the years, and it is a great tool for troubleshooting problems, allowing you to pinpoint the source of a problem. You will learn how to use it in Chapter 13, and we will explore other Administrative Tools in later chapters.

Control Panel *Control Panel* is a special folder in Windows that contains icons for several dozen small programs, called applets, which we use to make changes to the Windows configuration. Before Windows Vista, all of the applet icons were displayed together in the Control Panel folder. Beginning in Windows Vista, they changed the look of this folder, as well as how the applets are organized. This new look and organization is called *Category View*, because the many applets are organized into a handful of categories. Figure 2-21 shows the Windows 7 Control Panel.

FIGURE 2-21

Windows 7
Control Panel in
Category View



To switch from Category View to *Classic View* in Windows 7, simply click the down arrow next to Category in the top right of the Control Panel folder. Then select Large Icons or Small Icons, either of which will change Control Panel to Classic View with individual icons for the Control Panel applets. Conversely, to switch back to Category View, simply click the down arrow by Large Icons or Small Icons and select Category. To switch between these two views in Windows Vista Control Panel (not shown here), look for the task pane to the left of the main pane and select either Control Panel Home (for Category View) or Classic View.

Security Tools

We have two entire chapters devoted to security, but the A+ 802 Objective 1.1 explicitly lists several Windows features, so we will introduce them here, explain

security fundamentals in Chapter 18, and show you how to use security tools in Chapter 19.

- *User Account Control (UAC)* is a security feature introduced in Windows Vista to prevent unauthorized changes to Windows. It has been modified and improved on in later versions of Windows.
- *BitLocker drive encryption* is a drive encryption technology introduced in Windows Vista Enterprise and Ultimate editions and continues to be improved in new versions of Windows, although only available in certain editions.
- *Windows Defender* is an antispyware program, built into Windows since Windows 7, and a free download for Windows XP and Windows Vista.
- *Windows Firewall* is Microsoft's free personal firewall, which is software that guards against unauthorized network access to a single computer. First available in Service Pack 2 for Windows XP, it has been built into Windows since then.
- *Windows Security Center* is the Windows Vista page of the Control Panel that presents security status and gives access to Windows's security tools, as shown in Figure 2-22.

FIGURE 2-22

The Windows Vista Security Center



SCENARIO & SOLUTION

The pinned items list on my Start menu contains a program I no longer want in this list. How can I remove it?	Right-click the item and choose Unpin From Start Menu.
I have Windows 7. How can I store my data files in an organized folder structure to make it easy to find the files?	The folder structure for this is already set up in Windows 7. You access these folders through the Start menu Documents shortcut.
As a long-time Windows XP user, the Windows 7 Control Panel confuses me. What can I do to more easily find the applets I am familiar with?	The default view in Windows 7 Control Panel is Category View. To switch to the Windows XP view (Classic View), locate “view by” in the upper right of Control Panel, click the down arrow, and select either Large Icons or Small Icons.

CERTIFICATION SUMMARY

Before you can install and support computers, you must develop an understanding of the concepts beyond those required to simply use an OS. This begins with understanding the purpose of operating systems; knowing the differences among the major operating systems; and understanding updates, service packs, and revision levels. The versions of Windows presently included in the CompTIA A+ exams are Windows XP, Windows Vista, and Windows 7. These versions have many GUI elements in common, but with each new version, Microsoft has made changes, such as modifications to the Start menu, additions of GUI elements, and the visual enhancements of Aero that were introduced in Windows Vista, and improved upon in Windows 7.



TWO-MINUTE DRILL

Here are some of the key points covered in Chapter 2.

Introduction to Windows Operating Systems

- ❑ An OS controls all the interactions among the various system components, human interactions with the computer, and network operations for the computer system.
- ❑ Microsoft Windows comes in versions, such as Windows XP, Windows Vista, Windows 7, and Windows 8.
- ❑ Each Windows version also comes in editions, such as Windows 7 Starter, Windows 7 Home Premium, Windows 7 Professional, Windows 7 Ultimate, and Windows 7 Enterprise.
- ❑ Windows updates are software fixes to the operating system code to fix problems or enhance security. A patch is a fix for a single problem. A service pack is a bundle of patches or updates released periodically by a software publisher.
- ❑ Operating systems tie closely to the CPUs on which they run. Therefore, CPU terms such as 32-bit and 64-bit may also describe an OS. Windows XP, Windows Vista, Windows 7, and Windows 8 all have both 32-bit and 64-bit versions.

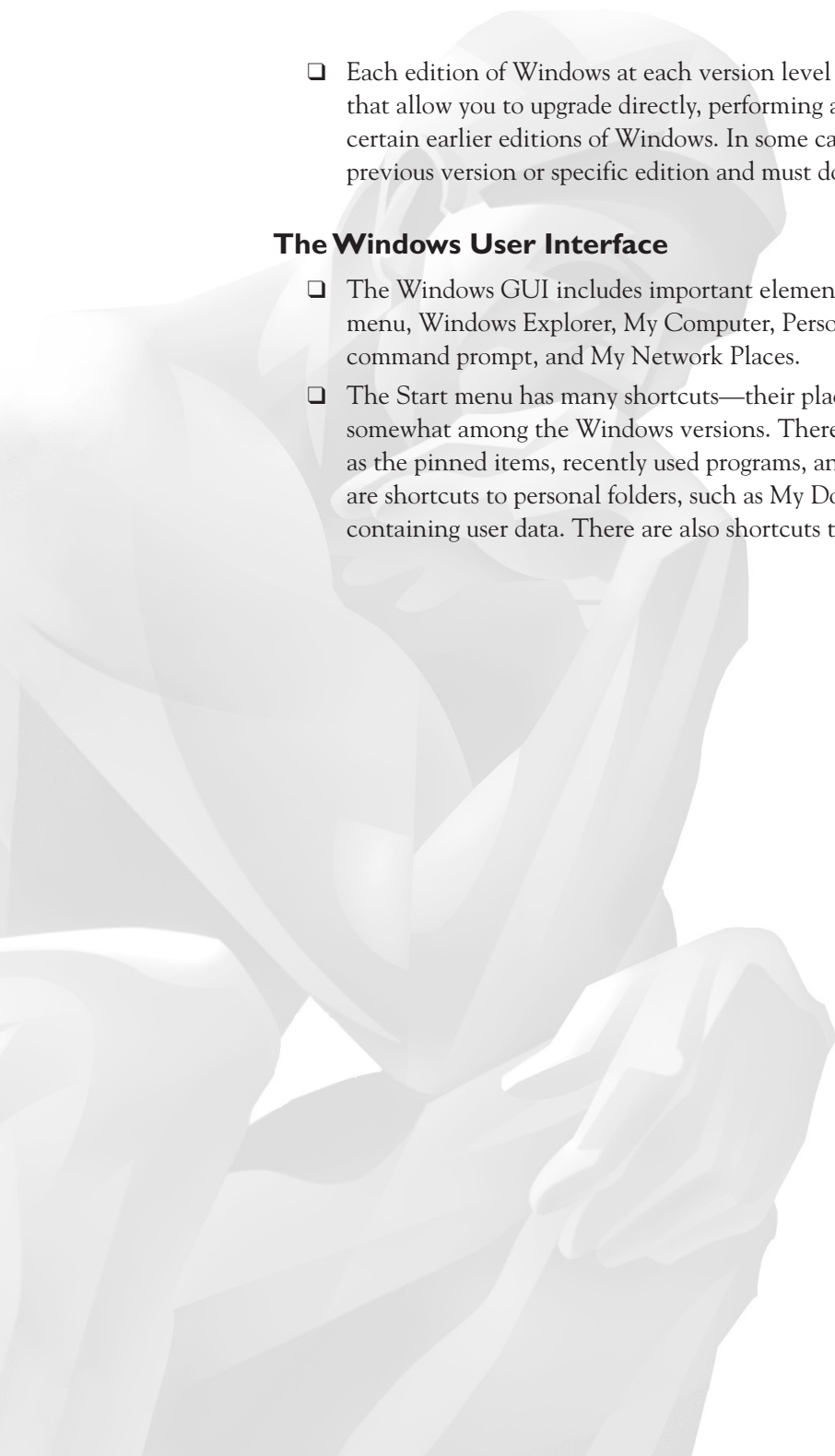
Considerations for Installing or Upgrading Windows

- ❑ Each version of an OS has a certain set of system requirements, which include the computer platform, as well as the amount of RAM and disk space.
- ❑ Each new OS also introduces hardware and software compatibility issues. Windows has features for managing incompatible applications, including Compatibility Mode in Windows XP, Windows Vista, and Windows 7. In addition, Windows 7 has Windows XP Mode, which uses Windows Virtual PC with an instance of a fully licensed Windows XP Professional edition.

- ❑ Each edition of Windows at each version level has unique upgrade paths that allow you to upgrade directly, performing an in-place installation, from certain earlier editions of Windows. In some cases, you cannot upgrade from a previous version or specific edition and must do a clean installation.

The Windows User Interface

- ❑ The Windows GUI includes important elements, such as the taskbar, Start menu, Windows Explorer, My Computer, Personal folders, Control Panel, command prompt, and My Network Places.
- ❑ The Start menu has many shortcuts—their placement and names vary somewhat among the Windows versions. There are lists of shortcuts, such as the pinned items, recently used programs, and All Programs. There are shortcuts to personal folders, such as My Documents or Documents, containing user data. There are also shortcuts to various utilities.



SELF TEST

The following questions will help you measure your understanding of the material presented in this chapter. Read all of the choices carefully because there might be more than one correct answer. Choose all correct answers for each question.

Introduction to Windows Operating Systems

1. What makes up the layers of an operating system?
 - A. Hardware
 - B. Software
 - C. Memory
 - D. Silicon
2. An operating system typically controls what interactions?
 - A. Between the system and the human
 - B. Between the chair and the keyboard
 - C. Between the AC adapter and the wall outlet
 - D. Between Windows and Linux
3. Which of the following describes responsibilities of an OS?
 - A. Printer cartridges
 - B. AC to DC conversion
 - C. Disk and file management
 - D. Inverters
4. If Windows 7 is a version, what is Windows 7 Ultimate?
 - A. OEM Windows
 - B. Edition
 - C. Patch
 - D. Update
5. Which of the following describes the OS code in all but one of the Windows XP editions?
 - A. GUI
 - B. Multitasking
 - C. 64-bit
 - D. 32-bit

6. What Microsoft policy defines the length of time Microsoft will support a product, as well as the support options for that product?
 - A. Software Assurance
 - B. Support Lifecycle
 - C. Upgrade Advisor
 - D. Compatibility Wizard
7. Which of the following is the biggest difference between 32-bit and 64-bit Windows?
 - A. Memory requirements
 - B. Drive space requirements
 - C. Maximum address space
 - D. Administrative tools

Considerations for Installing or Upgrading Windows

8. Which of the following best describes system requirements for an OS?
 - A. Platform
 - B. CPU, amount of RAM, hard disk space, and platform
 - C. Form factor
 - D. Code size
9. Which of the following cannot be directly upgraded to Windows 7 Professional?
 - A. Windows Vista Ultimate
 - B. Windows Vista Home Premium
 - C. Windows Vista Business
 - D. Windows XP Professional
10. Before you install Windows 7, download the latest version of this program to determine if your computer's hardware and software is compatible with the new OS.
 - A. Setup
 - B. Backup
 - C. Upgrade Advisor
 - D. Help | About

- 11.** If an old app will not run in Windows 7 Professional, Enterprise, or Ultimate editions, even after trying other methods to help it run, use this free Microsoft tool, which includes a fully licensed version of XP installed in a virtual machine.
- A. Administrative Tools
 - B. Windows Virtual PC
 - C. Windows XP Mode
 - D. Compatibility Mode

The Windows User Interface

- 12.** The Windows GUI uses this metaphor.
- A. Mouse
 - B. Desktop
 - C. Taskbar
 - D. Task list
- 13.** Folders, mouse pointer, icons, shortcuts, dialog boxes, windows, buttons, etc., are all examples of these components of a GUI.
- A. Pixels
 - B. Pictures
 - C. Graphics
 - D. Graphical objects
- 14.** What is the horizontal bar that is usually across the bottom of the Windows desktop?
- A. Taskbar
 - B. Start menu
 - C. Systray
 - D. Menu bar
- 15.** What is the central tool for finding and starting programs in Windows XP, Windows Vista, and Windows 7?
- A. Taskbar
 - B. Start menu
 - C. Computer
 - D. Menu bar

- 16.** By default, what is the only shortcut displayed on the Windows XP desktop?
- A. Start menu
 - B. Recycle Bin
 - C. My Programs
 - D. My Computer
- 17.** What three buttons usually appear on the Turn off Computer dialog box in Windows XP?
- A. Shut Down, Log Off, Restart
 - B. Standby, Shut Down, Restart
 - C. Log Off, Turn Off, Restart
 - D. Standby, Turn Off, Restart
- 18.** What is the name for the list of items on the upper left of the Start menu beginning in Windows XP, Windows 7, and Windows 8?
- A. Recently used programs list
 - B. Pinned items list
 - C. Quick Launch toolbar
 - D. Task list
- 19.** This enhancement, introduced in Windows Vista, brings to the Windows desktop many new features that affect the entire Windows GUI.
- A. Sidebar
 - B. Gadgets
 - C. Windows Aero
 - D. Systray
- 20.** Which of the following is a feature of Windows Aero that allows you to switch among open windows?
- A. Taskbar
 - B. Aero Wizards
 - C. Windows Flip 3D
 - D. Glass

SELF TEST ANSWERS

Introduction to Windows Operating Systems

- B.** Software makes up the layers of an operating system.
 A, hardware, is incorrect because the operating system itself is entirely software. **C,** memory, is incorrect because although the OS runs in memory, the layers running in memory are composed of software. **D,** silicon, is incorrect because this is a physical ingredient in computer hardware components, not a part of an operating system.
- A,** between the system and the human, is correct because these interactions are the main reason we have operating systems.
 B, between the chair and the keyboard, is incorrect because the human resides between the chair and keyboard, and the operating system does not control that interface. **C,** between the AC adapter and the wall outlet, is incorrect because all that resides there is a power cord. **D,** between Windows and Linux, is incorrect because this is not an interaction typically controlled by an operating system.
- C.** Disk and file management are responsibilities of an OS.
 A, printer cartridges, is incorrect because they are not responsibilities of an OS—they are hardware supplies. **B,** AC to DC conversion, is incorrect because this is the responsibility of a computer power supply. **D,** inverters, is incorrect because this is not an OS responsibility, but a hardware device.
- B,** edition, is correct because Windows 7 Ultimate is an edition of the Windows 7 version.
 A, OEM Windows, is incorrect because that describes any edition of Windows that is bundled with a computer. **C,** patch, is incorrect because a patch is a software fix for a single problem. **D,** update, is incorrect because an update is software that contains fixes to problems in Windows, often security issues.
- D.** 32-bit describes the OS code in all but one of the Windows XP editions.
 A, GUI, is incorrect because a GUI is a component of any Windows XP edition. **B,** multitasking, is incorrect because this describes the OS code of all Windows XP editions. **C,** 64-bit, is incorrect because this describes the OS code in only one edition: Windows XP x64 edition.

6. **B**. Support Lifecycle is the Microsoft policy that defines the length of time Microsoft will support a product.
 A, Software Assurance, is incorrect because this is Microsoft's software purchasing, volume licensing, and support plan for large organizations. **C**, Upgrade Advisor, is incorrect because this is a utility for determining if an existing installation of Windows can be successfully upgraded to a newer version. **D**, Compatibility Wizard, is incorrect because this is a Microsoft wizard for applying compatibility settings for the application program.
7. **C**. Maximum address space is the biggest difference between 32-bit and 64-bit Windows.
 A, memory requirements, **B**, drive space requirements, and **D**, administrative tools, are all incorrect, as none of these is the biggest difference between 32-bit and 64-bit Windows.

Considerations for Installing or Upgrading Windows

8. **B**. CPU, amount of RAM, hard disk space, and platform best describe system requirements for an OS.
 A, platform, is incorrect because this alone does not best describe the system requirements for an OS. **C**, form factor, is incorrect because this describes the dimensions of a hardware device, not the system requirements for an OS. **D**, code size, is incorrect because this just describes the size of the OS code, not the system requirements for the OS.
9. **D**. Windows XP Professional is correct because you cannot directly upgrade any version of Windows XP to any version of Windows 7.
 A, Windows Vista Ultimate, **B**, Windows Vista Home Premium, and **C**, Windows Vista Business, are all incorrect because you can upgrade all of them to Windows 7 Ultimate.
10. **C**. Upgrade Advisor is the program that will determine if your computer has hardware and software compatible with Windows XP, Windows Vista, or Windows 7.
 A, Setup, and **B**, Backup, are incorrect. Neither Setup nor Backup is the program named in this chapter for testing hardware and software compatibility. **D**, Help | About, is incorrect because this is a menu choice in My Computer (and other programs) that will provide version information, not hardware and software compatibility information.
11. **C**. Windows XP Mode is a virtual machine with a fully licensed version of XP installed that is a free feature for Windows 7, used to run incompatible older apps.
 A, Administrative Tools, is incorrect because this is simply a Start menu item that gives access to several helpful utilities. **B**, Windows Virtual PC, is incorrect, because by itself, it is only one part of Windows XP Mode. **D**, Compatibility Mode, is incorrect because this is simply a tool for tweaking the Windows environment in which an incompatible app runs; it is not Windows XP Mode, which is Microsoft Virtual PC with a fully licensed version of XP installed.

The Windows User Interface

12. **B.** Desktop is the metaphor used by the Windows GUI.
 A, mouse, is incorrect because this is not a metaphor for the Windows GUI, but a hardware pointing device used with the Windows GUI. **C,** taskbar, is incorrect because, although this is a Windows GUI component, it is not the metaphor used to describe the Windows GUI. **D,** task list, is incorrect because this is part of the Windows GUI, not a metaphor describing the GUI.
13. **D.** Graphical objects, such as folders, mouse pointer, icons, shortcuts, dialog boxes, windows, buttons, etc., are components of the Windows GUI.
 A, pixels, is incorrect because this describes a dot on a display screen, not a component of the OS GUI. **B,** pictures, is incorrect, even though you could call each of the GUI objects a picture. **C,** graphics, is incorrect, even though you could call each of the GUI objects a graphic.
14. **A.** The taskbar is usually across the bottom of the Windows desktop.
 B, Start menu, is incorrect because this is just a small portion on the left end of the taskbar. **C,** systray, is also incorrect because this is just a small portion of the taskbar—located on the far-right side. **D,** menu bar, is incorrect because this is a component of a window, not the horizontal bar that is usually across the bottom of the Windows desktop.
15. **B.** The Start menu is the central tool for finding and starting programs in Windows.
 A, taskbar, is incorrect because this is only the location of the Start menu and the place that displays buttons for pinned shortcuts (Windows 7) and open programs. **C,** Computer, is incorrect because this is a shortcut in Windows Vista and Windows 7 that opens to display file folders, hard disk drives, and removable storage on the local computer. **D,** menu bar, is incorrect because this is a component of an open window, not the central tool for finding and starting programs in Windows.
16. **B.** Recycle Bin is the only shortcut displayed by default on the Windows XP desktop.
 A, Start menu, is incorrect because this menu is not a desktop shortcut but is located on the taskbar. **C,** My Programs, and **D,** My Computer, are both incorrect because they are not desktop shortcuts (by default) but are located on the Start menu.
17. **D.** Standby, Turn Off, Restart are the usual three buttons on the Turn Off Computer dialog box in Windows XP.
 A, Shut Down, Log Off, Restart; **B,** Standby, Shut Down, Restart; and **C,** Log Off, Turn Off, Restart, are all incorrect because they are not the usual three buttons in the Turn Off Computer dialog box.

- 18.** **B.** Pinned items list is the name for the list of items on the upper left of the Windows Start menu.
- A,** recently used programs list, is incorrect because this is the list below the pinned items list on the Start menu. **C,** Quick Launch toolbar, is incorrect because this is an optional item on the taskbar, not a list on the Start menu. **D,** task list, is incorrect because this is not the name of the list of items on the upper left of the Windows Start menu.
- 19.** **C.** Windows Aero is the enhancement to the Windows GUI introduced in Windows Vista.
- A,** Sidebar, is incorrect. Although this is new in Windows Vista, it does not affect the entire Windows GUI. **B,** Gadgets, is also incorrect because a gadget is simply a small program accessed from the sidebar. **D,** systray, is incorrect because it is a portion of the taskbar.
- 20.** **C.** Windows Flip 3D is a feature of Windows Aero that allows you to switch among open windows.
- A,** taskbar, is incorrect. Although you can use the taskbar buttons to switch among open windows, the taskbar is not a feature of Windows Aero. **B,** Aero Wizards, and **D,** Glass, while both are features of Windows Aero, do not allow you to switch among windows.