CHAPTER 11

Introducing Windows Operating Systems

Windows operating systems are used more than any other operating systems in the world. It's important for an A+ technician to know the basic differences between the different versions of Windows and the differences between editions of specific versions. This chapter introduces the different versions of Windows and compares their features.

Exam 220-802 objectives in this chapter:

- 1.1 Compare and contrast the features and requirements of various Microsoft Operating Systems.
  - Windows XP Home, Windows XP Professional, Windows XP Media Center, Windows XP 64-bit Professional
  - Windows Vista Home Basic, Windows Vista Home Premium, Windows Vista Business, Windows Vista Ultimate, Windows Vista Enterprise
  - Windows 7 Starter, Windows 7 Home Premium, Windows 7 Professional, Windows 7 Ultimate, Windows 7 Enterprise
  - Features:
    - 32-bit vs. 64-bit
    - Aero, gadgets, user account control, bit-locker, shadow copy, system restore, ready boost, sidebar, compatibility mode, XP mode, easy transfer, administrative tools, defender, Windows firewall, security center, event viewer, file structure and paths, category view vs. classic view

REAL WORLD **KNOW THE LIMITATIONS OF 32-BIT SYSTEMS**

Not too long ago, a friend of mine was planning to study for some certification exams and decided to purchase a computer. One of his primary goals was to run virtualized operating systems so that he could create his own virtual network. He ended up buying a 32-bit computer with 4 GB of RAM running Windows 7 Ultimate.

Unfortunately, this did not meet his needs. He quickly realized he didn't have enough RAM to run many virtual machines. Worse, he found out that his system recognized only about 3.25 of the 4 GB of RAM his system had, so he couldn't even upgrade his system with more RAM.

If you remember some of the topics from Chapter 3, "Understanding RAM and CPUs," you probably recognize the problem. A 32-bit CPU and a 32-bit operating system cannot address more than 4 GB of RAM. We talked about the requirements, but because his computer had a 32-bit processor, he couldn't run a 64-bit operating system.

The only winner in this scenario was his daughter. I helped him find a 64-bit system with plenty of RAM for virtualization, and he gave the 32-bit system to her.

An Overview of Windows Operating Systems

Three elements that make a computer useful are the hardware, the operating system, and applications. Earlier chapters focused heavily on the hardware and its capabilities. This section of the book focuses on operating systems.

An *operating system* interacts with the hardware and allows you to run programs or applications. Years ago, operating systems were all text-based. That is, every time you wanted to run a program, you had to type in a command. Today, the majority of operating systems are *graphical user interface (GUI)*-based. In a GUI operating system, you point and click with a mouse to interact with the computer.

Microsoft desktop operating systems are commonly used in enterprises around the world. Certainly, there are other desktop operating systems, but Microsoft systems make up more than 90 percent of the systems in use.

A survey in 2012 by Net Market Share, an information technology (IT) research group, indicated that more than 92 percent of desktop computers use Windows operating systems.

In April 2012, about 46 percent were Windows XP, 39 percent were Windows 7, and 7 percent were Windows Vista. Windows 7 usage continues to climb as Windows XP and Windows Vista systems are upgraded or replaced with Windows 7.

With this in mind, any A+ technician can fully expect to run across Windows-based systems and needs to know about their features. The three primary Windows operating systems are as follows:

- Windows XP—Oldest of the three
- Windows Vista—Released between Windows XP and Windows 7
- Windows 7—Newest of the three

Windows 7 is the newest of the three, and new desktop systems that include Windows have Windows 7 installed. Windows XP is the oldest of the three, and it has become a well-established operating system since it was released in 2001. Windows Vista was released between Windows XP and Windows 7. However, systems that are being upgraded today from Windows XP are typically skipping Windows Vista and going straight to Windows 7.

Each of these operating systems has multiple editions, and some of the editions support 32-bit and 64-bit computers.

Comparing 32-Bit and 64-Bit Capabilities

Current operating systems are available in both 32-bit and 64-bit versions. If the hardware is 64-bit hardware, you can install either the 32-bit or 64-bit operating system versions. However, if the system has 32-bit hardware, you can install only 32-bit versions.

The central processing unit (CPU) is the primary hardware component that determines whether a system is a 32-bit or 64-bit system. If you install a 32-bit operating system on 64-bit hardware, it can work in 32-bit mode. However, it can't take advantage of extra benefits of the 64-bit hardware.

> ***NOTE*** **64-BIT OPERATING SYSTEMS**
>
> **As a general recommendation today, 64-bit operating systems are the best choice if the hardware supports it. They offer better speed and enable you to use more memory. If you install a 32-bit operating system on 64-bit hardware, it is slower than it would be if it used the full 64-bit capabilities.**

x86 vs. x64

The operating systems are referred to as 32-bit and 64-bit operating systems. However, the hardware is named a little differently: as x86 and x64.

32-bit processers are commonly called *x86* processors referring to the x86 family of processors. The first x86 processor was the Intel 8086 processor released in 1978, and it went through multiple improvements over the years.

64-bit processors are commonly called *x64*. In some cases, you might see the term AMD64 instead of x64, indicating that the processor is an AMD processor instead of an Intel processor. Similarly, some Intel processors are designated as Intel 64.

EXAM TIP

The hardware on 32-bit systems is identified as x86, and only 32-bit operating systems can be installed. The hardware on 64-bit systems is identified as x64 (sometimes AMD 64), and they support 64-bit and 32-bit operating systems. You can't install a 64-bit operating system on 32-bit hardware.

Increased Memory

One of the biggest benefits of using a 64-bit operating system is access to more random access memory (RAM). A 32-bit operating system can address only 4 GB of RAM, whereas a 64-bit operating system can theoretically address as much as 16 exabytes of RAM.

EXAM TIP

For reference, the order of byte names is as follows: kilobyte (KB), megabyte (MB), gigabyte (GB), terabyte (TB), petabyte (PB), and exabyte (EB). Even though the processors can address as much as 16 exabytes of RAM, you won't see desktop systems with this much RAM in the near future. The maximum RAM for Windows XP and Windows Vista is 128 GB. Windows 7 supports as much as 192 GB.

Users who only surf the Internet or answer email don't need much memory, so the extra RAM that is supported by 64-bit systems isn't necessary. On the other hand, many power users have applications that require more RAM. This is especially true when users have multiple applications open at the same time.

Missing RAM

If you install 4 GB of RAM on a 32-bit operating system, you'll find that some of it appears to be missing. For example, Figure 11-1 shows the System Properties of a Windows XP system. If this system had 4 GB installed, it would instead indicate that only about 3.25 GB was installed. In the figure, you can see that the system is reporting 512 MB of RAM, and that's exactly how much RAM is installed.

EXAM TIP

Even though a 32-bit operating system can address 4 GB of RAM, it can't use it all. It commonly can use only about 3.2 GB to 3.5 GB of RAM installed on a system. 64-bit operating systems do not have this limitation.

Where's the missing RAM? It's still in the computer, but it is unusable. A 32-bit operating system can address only 4 GB of RAM, but it needs to reserve some of the addressable space for hardware devices such as graphics cards and other peripherals. On this Windows XP system, it's reserving about 760 MB of addressable space. If you install 4 GB of RAM or more into a 64-bit system, it will all be available to the operating system.

If you're running Windows XP, you can view the page shown in Figure 11-1 by clicking Start, right-clicking My Computer, and selecting Properties. You can use the same steps on Windows Vista and Windows 7, although the display is different. Figure 11-2 shows the display on a Windows 7 system with the RAM highlighted.

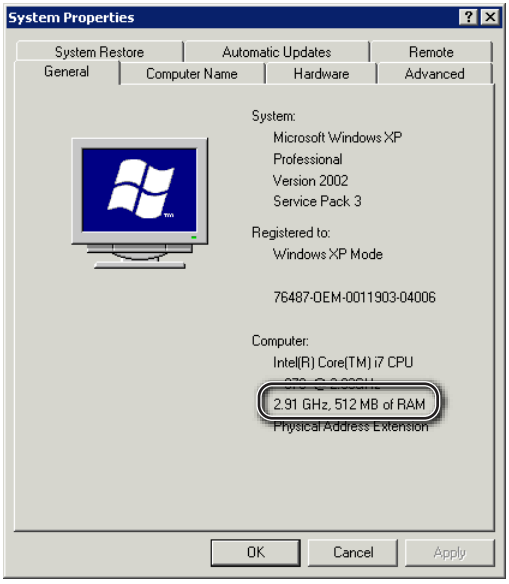


FIGURE 11-1 Windows XP System Properties dialog box.

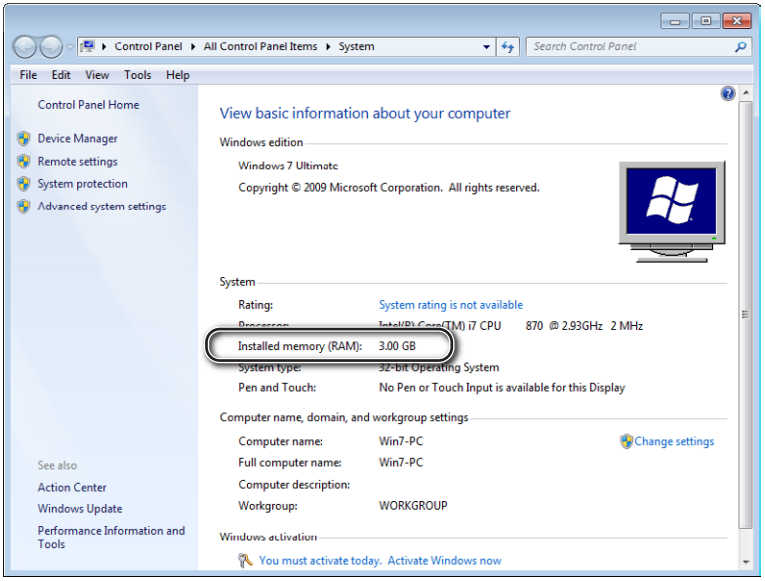


FIGURE 11-2 Windows 7 system properties.

Quick Check

1. What type of operating system is supported by an x86 processor?
2. How much RAM are you likely to see on a 32-bit system with 6 GB of RAM?

Quick Check Answers

1. 32-bit operating system.
2. About 3.25 GB.

Windows 7 Editions

Microsoft has released several editions of Windows 7, following a progression of good, better, best. The Windows 7 editions are as follows:

- **Starter Edition.** This edition is the most basic and has the fewest features. It's available only to manufacturers, and it's installed on some netbooks (very small lightweight laptops). The Starter edition is available only in 32-bit editions.
- **Home Premium Edition.** This is targeted at home users and includes several features, such as Aero, homegroups, and the Windows Media Center.
- **Professional Edition.** A step above the Home Premium Edition is the Professional edition. A major difference compared to the Home Premium Edition is that computers can join a domain within a network.
- **Windows 7 Enterprise.** The Enterprise edition includes some additional features, such as BitLocker Drive Encryption, which are not available in the Professional Edition. Enterprise is available only to Microsoft Software Assurance customers. The Microsoft Software Assurance program provides customers with a wide range of services, such as 24/7 phone support, reduced costs for training, and access to additional software. Many medium-to-large organizations participate in this program and likely run the Enterprise edition.
- **Ultimate Edition.** This edition includes all the features available in any edition of Windows 7, including Windows 7 Enterprise. Home users cannot purchase the Enterprise edition, but they can get the Enterprise edition features by purchasing this edition.

NOTE **WINDOWS 7 HOME BASIC EDITION**

Another edition of Windows 7 is the Windows 7 Home Basic Edition. It is available only in regions that are designated as emerging markets. This includes areas in South America, Africa, and the Middle East, and only a limited number of features are enabled. The CompTIA A+ objectives do not reference this edition.

Windows 7 System Requirements

One of the primary decisions when deciding which edition to use on a system is identifying the hardware requirements. If the hardware doesn't meet the minimum system requirements, you won't be able to run the operating system.

Most editions are available in both 32-bit and 64-bit versions. The exception is Windows 7 Starter, which is available only for 32-bit systems. The minimum system requirements for Windows 7 are as follows:

- Processor—At least 1 GHz or faster
- Minimum RAM
  - 1 GB required for 32-bit systems
  - 2 GB required for 64-bit systems
- Available hard drive space
  - At least 16 GB of free hard drive space required for 32-bit systems
  - At least 20 GB of free hard drive space required for 64-bit systems
- Graphics hardware supporting DirectX 9 with a Windows Display Driver Model (WDDM) 1.0 or higher driver

EXAM TIP

CompTIA A+ exams often focus on the minimum requirements for different operating systems. It's valuable to know what the minimum requirements are.

Even though you can run Windows 7 Ultimate with a 1-GHz processor and 1 GB of RAM, that doesn't mean you should. If you do, it might not be a very satisfying experience. In short, any operating system that uses only the minimum amount of resources won't perform as well as a system that has more resources. Purchasing faster processors and more RAM than the minimum provides much better performance.

Many technicians talk about the "sweet spot" for RAM, or the amount of RAM that provides the best user experience for most users. A figure often recommended is 3 GB for 32-bit systems and 4 GB for 64-bit systems. Power users running multiple resource-intensive applications need more. On the other hand, a user who is only browsing the web and using email might need fewer resources.

Windows 7 System Limits

When deciding on an operating system, it's also important to understand its limits related to hardware support. Table 11-1 shows a comparison of hardware limitations related to memory and processors with the different Windows 7 editions.

TABLE 11-1 Windows 7 System Limits

	Max RAM 32-bit	Max RAM 64-bit	Max processors
Starter	2 GB	n/a	1
Home Premium	4 GB	16 GB	1
Professional	4 GB	192 GB	2
Enterprise	4 GB	192 GB	2
Ultimate	4 GB	192 GB	2

If you install Windows 7 Home Premium on a system with two processors, it will still work. However, it will use only one of the processors.

The limitation on physical processors does not include processor cores. For example, Windows 7 Professional supports two physical processors. However, each of these processors can have multiple cores. All cores on the processor are supported.

Windows 7 32-bit systems include support for processors with up to 32 cores, and 64-bit systems can support up to 256 cores in any single processor. At this writing, some 12-core processors are emerging, but you probably won't see 32-core or 256-core processors for a while.

EXAM TIP

It's valuable to know the limitations of different operating systems. For example, users might complain that they have two processors but their Windows 7 Home Premium operating system recognizes only one. You can let them know that Windows 7 Home Premium supports only one processor and recommend that they upgrade to Windows 7 Professional or Ultimate to access the additional processor.

Quick Check

1. **What is the difference between Windows 7 Enterprise and Windows 7 Ultimate?**
2. **What is the maximum amount of RAM supported by Windows 7 Enterprise?**

Quick Check Answers

1. **Enterprise is available only to Microsoft Software Assurance customers, but anyone can buy Windows 7 Ultimate.**
2. **192 GB.**

Windows XP Editions

Windows XP operating systems have been around since 2001, and they are well-established. The relevant editions of Windows XP are as follows:

- **Windows XP Home**. The Home edition was targeted for home users. It provided basic capabilities.
- **Windows XP Professional**. The Professional edition was targeted for business users and included many more capabilities. For example, users can join a domain, encrypt files, and use remote desktop capabilities.
- **Windows XP Media Center**. Media Center is an enhanced edition of Windows XP Home and gives users additional multimedia capabilities. For example, users can watch and record TV shows, view DVD movies, and listen to music.
- **Windows XP 64-bit Professional**. This edition was for users who wanted more memory and power and is also known as Windows XP Professional x64 Edition. It runs on Advanced Micro Devices (AMD) processors designated with "AMD64" and on Intel processors designated with "Intel 64."

NOTE **RETAIL SALES OF WINDOWS XP DISCONTINUED IN 2008**

Microsoft stopped retail sales of Windows XP in June 2008, and sales of PCs with Windows XP preinstalled stopped in October 2010. However, Microsoft continued to provide mainstream support for Windows XP systems until April 2009, and they will continue to provide extended support until April 2014.

Mainstream vs. Extended Support

Microsoft provides support for operating systems long after they stop selling them. Customers can continue to use the product and will continue to get updates, so you're likely to see these products even if you can't purchase them anymore. Microsoft refers to two types of support: *mainstream support* and *extended support*.

In general, you can think of mainstream support as normal support. Customers receive security updates and other non-security hotfixes and can also receive support for bugs or problems.

The extended support phase ends sometime after the mainstream support phase. Customers will still continue to receive security updates. However, other updates and support are available only to customers who purchase an extended hotfix support agreement. You can read more about it here: *http://support.microsoft.com/gp/lifepolicy*.

Windows XP 64-Bit

Windows XP Professional included two 64-bit editions. In contrast, the Home and Media Center editions are available only in 32-bit editions. The two editions of 64-bit Windows XP systems are as follows:

- **Windows XP 64-Bit Edition.** Windows XP 64-bit systems ran on the Intel Itanium family of processors. Hewlett Packard sold Windows XP 64-bit systems for a while but stopped selling them in 2005.
- **Windows XP Professional x64 Edition.** This edition ran on x86-64 compatible processors sold by both Intel and AMD.

Each 64-bit edition supports as much as 128 GB of RAM, compared to the 4 GB limit of 32-bit systems.

The 64-bit editions of Windows XP weren't as popular as the 32-bit editions. One of the challenges was that many drivers were available only in 32-bit versions and weren't compatible with the 64-bit operating systems. In contrast, most vendors created both 32-bit and 64-bit versions of their drivers for Windows 7 systems, making the 64-bit versions of Windows 7 very popular.

Windows XP System Requirements

System requirements for Windows XP are very light compared to the power that most computers have today. However, when Windows XP first came out, many computers didn't have the hardware to support the recommended minimums.

The minimum system requirements for each edition of Windows XP are as follows:

- Processor
  - Pentium 233 MHz minimum
  - Pentium 300 MHz recommended
- RAM
  - 64 MB minimum
  - 128 MB recommended
- 1.5 GB minimum free hard drive space

Windows XP System Limits

Windows XP editions also have limitations on the maximum amount of RAM and the maximum number of processors they support. Table 11-2 shows a comparison of these limitations with the different Windows XP editions.

TABLE 11-2 Windows XP System Limits

	Max RAM	Max processors
Home	4 GB	1
Professional	4 GB	2
Media Center	4 GB	2
XP 64-bit	128 GB	2
Professional x64	128 GB	2

Windows Vista Editions

Windows Vista operating systems were released in 2007. The goal of Windows Vista was to replace Windows XP, but it wasn't widely embraced. Windows 7 was released in 2009 and is much more popular than Windows Vista. However, there are still many Windows Vista systems out there, and they are covered on the A+ exams.

The relevant editions of Windows Vista are as follows:

- **Windows Vista Home Basic.** This is a basic edition of Windows Vista for home users. It doesn't include many of the features of Windows Vista, such as Windows Aero.
- **Windows Vista Home Premium.** This edition provides many more capabilities for home users and is comparable to the Windows XP Media Center Edition.
- **Windows Vista Business.** The Business edition is targeted for businesses and enterprises. Some additional features include the ability to join a domain, use encrypted files, and use offline files.
- **Windows Vista Enterprise.** Similar to the Windows 7 Enterprise edition, Enterprise is available only to Microsoft Software Assurance customers. It includes additional features, such as BitLocker Drive Encryption.
- **Windows Vista Ultimate.** The Ultimate edition includes all the features available in any edition of Windows Vista. In Windows 7, the Enterprise and Ultimate editions have the same features. In Windows Vista, the Ultimate edition has some additional features that aren't in any other edition. The "Ultimate Extras" included more features, such as games and active backgrounds using Windows DreamScene.

NOTE **RETAIL SALES OF VISTA DISCONTINUED IN 2010**

Microsoft stopped retail sales of Windows Vista in October 2010, and sales of PCs with Windows XP preinstalled stopped in October 2011. However, Microsoft has indicated that it will continue to provide mainstream support for Windows Vista systems until April 2012 and extended support until April 2017.

Windows Vista System Requirements

Windows Vista took advantage of improved hardware available at the time it was released. Compared to Windows XP, it required quite a bit more processing power and RAM and often required hardware upgrades.

The minimum system requirements for Windows Vista are as follows:

- Processor
  - 800-MHz processor minimum
  - 1-GHz processor recommended
- RAM
  - 512 MB minimum
  - 1 GB recommended
- Available hard drive space
  - 20-GB hard drive with at least 15 GB free space
  - 40-GB hard drive with at least 15 GB free recommended
- Graphics hardware supporting DirectX 9 with WDDM
  - 32 MB video RAM for the Home Basic edition
  - 128 MB video RAM for other editions

Windows Vista System Limits

Windows Vista editions have limitations on what hardware they support, just as other operating systems do. Table 11-3 lists the hardware limitations with Windows Vista Editions.

TABLE 11-3 Windows Vista System Limits

	Max RAM 32-bit	Max RAM 64-bit	Max processors
Home Basic	4 GB	8 GB	1
Home Premium	4 GB	16 GB	1
Business	4 GB	128 GB	2
Enterprise	4 GB	128 GB	2
Ultimate	4 GB	128 GB	2

Windows Features

Some features are common to all three versions of Windows (Windows 7, Windows XP, and Windows Vista), whereas some features are available only in specific versions. Table 11-4 identifies features available in the different versions of Windows and identifies the chapter in this book where each topic is covered.

TABLE 11-4 Comparison of Windows Features

Feature	Windows XP	Windows Vista	Windows 7	Chapter
Action Center	--	Yes	Yes	13
Aero	--	Yes	Yes	11
BitLocker	--	Yes	Yes	25
Gadgets	--	Yes	Yes	11
Easy transfer	--	Yes	Yes	12
Homegroups	--	--	Yes	24
Ready boost	--	Yes	Yes	15
Sidebar	--	Yes	--	11
Shadow copy	--	Yes	Yes	15
Security Center	Yes	--	--	13
UAC	--	Yes	Yes	11
Windows Libraries	--	--	Yes	13
Windows XP Mode	--	--	Yes	11

NOTE **FEATURES VARY BY EDITIONS**

Some features are not available in every edition of an operating system. For example, BitLocker is available in Windows 7, but it's not available in the Starter, Home Premium, or Professional editions of Windows. It is available in the Ultimate edition. Other tables in this chapter focus on the differences between editions of each of these operating systems.

Common Features

Many of the features that are common in Windows XP, Windows Vista, and Windows 7 are described in the following list.

EXAM TIP

The following list represents the items that are specifically listed in the CompTIA A+ objectives and are common to each of the operating systems. Other features are also common, but this list identifies the key features you should know about when preparing for the exam.

- **Administrative Tools.** Administrators and advanced users access these tools to configure and troubleshoot a system. The available tools are slightly different between operating systems, but each version includes an Administrative Tools group via the Control Panel. Chapter 13, "Using Windows Operating Systems," covers Administrative Tools.
- **Backup.** Backup tools allow you to back up data so that you can restore it if it becomes corrupted. Backup capabilities are discussed in Chapter 15, "Configuring Windows Operating Systems."
- **Compatibility Mode.** If an application doesn't work in the current operating system, you can use Compatibility Mode to run it with settings from a previous operating system. Methods are presented later in this chapter.
- **Event Viewer.** Each operating system logs events in one of several logs as they occur, and you can view these events in the Event Viewer. Chapter 17 covers the Event Viewer.
- **Join Domain.** Many organizations use domains with central domain controllers for centralized management. If a computer has joined the domain and a user has a user account in the domain, users can log on to the domain with the computer. Steps to join a domain or a workgroup are included in Chapter 18.
- **Offline Files.** Users often access files that are stored on a server when connected in a network. However, mobile computers don't have connectivity to these servers when they are disconnected from the network. Offline Files stores a copy of the files on the user's computer and synchronizes the files when the user reconnects to the network. Chapter 16 covers Offline Files.
- **System Restore.** If a system update or change causes a problem, you can use System Restore to revert the system to a previous state. It allows you to undo system changes without modifying any of the user's files, such as email, documents, and photos. Chapter 15, "Configuring Windows Operating Systems," covers System Restore.
- **Windows Defender.** This is a free download that you can use to protect your systems from viruses and other malicious software (malware). Chapter 26, "Recognizing Malware and Other Threats," covers different types of malware and Windows Defender.
- **Windows Firewall.** Firewalls provide a layer of security protection for systems by filtering network traffic. In many cases, this can reduce a system's vulnerability to attacks. Windows Firewall is covered in Chapter 22, "Network Security Devices."

Windows 7 Features

Table 11-5 shows some of the features that you'll find only in specific editions of Windows 7, along with the chapter where you can read more about the feature.

TABLE 11-5 Windows 7 Features

Feature	Starter	Home Premium	Professional	Ultimate Enterprise	Chapter
64-bit support	--	Yes	Yes	Yes	11
Aero	--	Yes	Yes	Yes	11
Back up and Restore	Yes	Yes	Yes	Yes	15
Back up to network	--	--	Yes	Yes	15
BitLocker Drive Encryption	--	--	--	Yes	25
Encrypting File System (EFS)	--	--	Yes	Yes	16
Join a domain	--	--	Yes	Yes	18
Join homegroup	Yes	Yes	Yes	Yes	24
Offline Files	--	--	Yes	Yes	16
Windows XP Mode	--	--	Yes	Yes	11
UAC	Yes	Yes	Yes	Yes	11

EXAM TIP

CompTIA A+ exams often focus on the different features available in different systems. For example, it's valuable to know that Windows XP Mode is supported in the Professional and Ultimate Editions of Windows 7 and that you can back up to network locations in the Professional and Ultimate Editions, but that these features are not supported in the Starter and Home Premium editions.

Windows Vista Features

Table 11-6 shows some of the features that you'll find only in specific editions of Windows Vista, along with the chapter(s) in which you can read more about each feature.

TABLE 11-6 Windows Vista Features

Feature	Home Basic	Home Premium	Business	Ultimate Enterprise	Chapter
Aero	--	Yes	Yes	Yes	11
Automatic Backups	--	Yes	Yes	Yes	11
BitLocker	--	--	--	Yes	25
Share documents	--	Yes	Yes	Yes	22, 25
Sidebar	Yes	Yes	Yes	Yes	11
Windows Complete PC Backup	--	--	Yes	Yes	11

Quick Check

1. **Which operating systems use libraries?**
2. **Which Windows 7 operating system(s) can back up data to a network location?**

Quick Check Answers

1. **Only Windows 7.**
2. **Windows 7 Professional, Ultimate, and Enterprise.**

Windows Aero

Windows *Aero* is a new feature that became available in Windows Vista and was improved on in Windows 7 with additional features such as Peek, Shake, and Snap. It uses a variety of graphics features, such as translucent effects and animations that enhance the user interface. It also includes some great features that enhance the usability of the system.

Figure 11-3 shows an example of Aero Peek. You can hover the mouse over any item on the taskbar, and Aero displays the item. In the figure, Task Manager is running, and the cursor hovering over the Task Manager icon on the taskbar displays a thumbnail view of the application.

TIP **WINDOWS+TAB**

An easy way to access different applications on your system is by using the Windows+Tab keys. By holding down the Windows key and tapping the Tab key, the screen will scroll through open applications. If you don't have the Windows key on your keyboard, you can use the Alt key instead, although the display isn't the same.

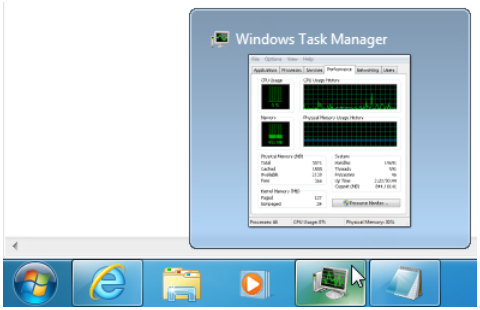


FIGURE 11-3 Windows Aero showing Task Manager from the taskbar.

Peek also allows you to view the desktop, even with multiple windows open. If you hover over the end of the taskbar on the far right (just to the right of the time and date display), all the windows become transparent. If you click this area, all the windows minimize, giving you easy access to your desktop.

Shake allows you to minimize all the windows on the system except for the one you're shaking. Click and hold the title bar of a window, and shake the mouse. All the other windows will be minimized. If you shake the window again, all the other windows will be restored as they were before they were minimized.

Snap is an easy way to resize windows by dragging them to the edge of the screen. Click and hold the title bar, and drag the window to the right, left, or top of your screen. If you drag it to the top, it maximizes the window. If you drag it to the right or left, the window will be resized to half of the screen. You can drag one window to the right, another to the left, and easily compare the two windows side by side.

User Account Control

User Account Control (UAC) is a security feature that first appeared in Windows Vista. It helps prevent malicious software from taking action on a user's computer without the user's knowledge. To understand the benefit, it's worthwhile to understand the problem that it is addressing.

Understanding the Risk Without UAC

If a user is logged on with administrative privileges and the system is infected with a virus, the virus has full administrator access. Because of this, users are strongly encouraged not to use an administrator account for regular work.

> ***NOTE*** **PRIVILEGES**
>
> **Privileges are rights and permissions. Rights indicate what a user can do on a system, such as change the system time or install a driver. Permissions indicate the access that users have to resources such as files or printers. For example, you can grant users permissions to read and modify files or to print to a printer.**

The administrator account is required to do some tasks, such as change a system configuration or install drivers. If a user isn't logged on with an administrator account, the user needs to access a second administrator account to complete these tasks.

Whereas IT professionals commonly use two accounts in this way, it isn't reasonable to expect regular users to use two accounts. Instead, many end users are always logged on with an administrator account, making them more susceptible to virus infections.

Account Separation with UAC

Windows Vista and Windows 7 have two types of accounts: a standard user account and an administrator account. A standard user can do regular work and configure settings that do not affect other users. An administrator account has complete control over the computer.

However, if a user with an administrator account is logged on, UAC works as if the user actually has two accounts (a standard user account and an administrator account) by using two access tokens. One token provides the user with regular user access. When necessary, the second token provides the user with administrative access.

If a user takes action that requires elevated administrator rights, UAC prompts the user to approve the action with a pop-up window similar to Figure 11-4.

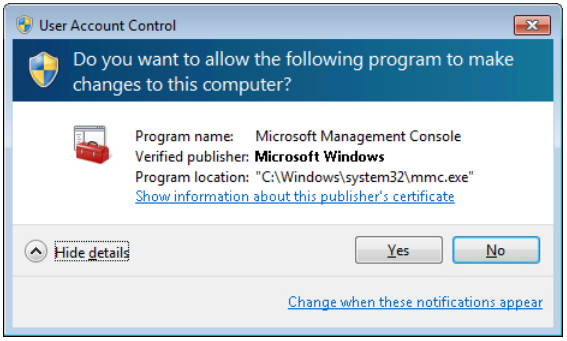


FIGURE 11-4 User Account Control prompt.

> ***NOTE*** **SHIELD ICON**
>
> **Any actions requiring administrator rights have a small icon of a shield to provide a visual cue to the user. The icon is the same as the UAC shield icon shown in Figure 11-4.**

You can click Show Details to get the location of the program that caused the UAC dialog box to appear, or click Hide Details to hide this information. Figure 11-4 shows the result after clicking Show Details and indicates that the Microsoft Management Console (Mmc.exe) is being started.

An important piece of information in the UAC dialog box is the Publisher, which identifies who created the application that is being started. If the publisher can be verified, the

publisher appears as a Verified Publisher. However, if the publisher cannot be verified, the publisher appears as Unknown, as shown in Figure 11-5.

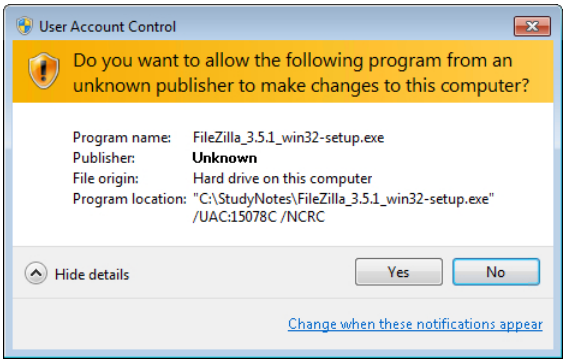


FIGURE 11-5 User Account Control prompt with Unknown publisher.

Legitimate companies can usually be verified. However, attackers trying to install malicious software on your systems will always appear as Unknown. If you see a UAC dialog box with Unknown, you should be suspicious, especially if you didn't take action to modify your system. UAC is trying to protect your system, but you can override the warning by clicking Yes.

By default, UAC dims the desktop and disables all other interaction with the system. The dimmed desktop is also called the secure desktop, and it prevents any other programs, including malicious software, from running. In other words, the action can be approved only with user interaction. The user must either click Yes to approve the action or click No to block it.

If a user does not have administrator permissions with the current account, UAC will prompt the user to enter the user name and password for an account that does have appropriate permissions.

You can manipulate the settings for UAC on Windows 7 with the following steps:

1. Click Start, Control Panel. If necessary, change the display from Category to Large Icons.
2. Select Action Center.
3. Select Change User Account Control Settings.

EXAM TIP

There are multiple methods of finding applets in Control Panel. However, the objectives specifically list using Classic View or the Large Icons view. It's worth your time to explore the Control Panel by using these views.

4. Your display will look similar to the following graphic. You can accept the settings by clicking OK, or you can click Cancel.

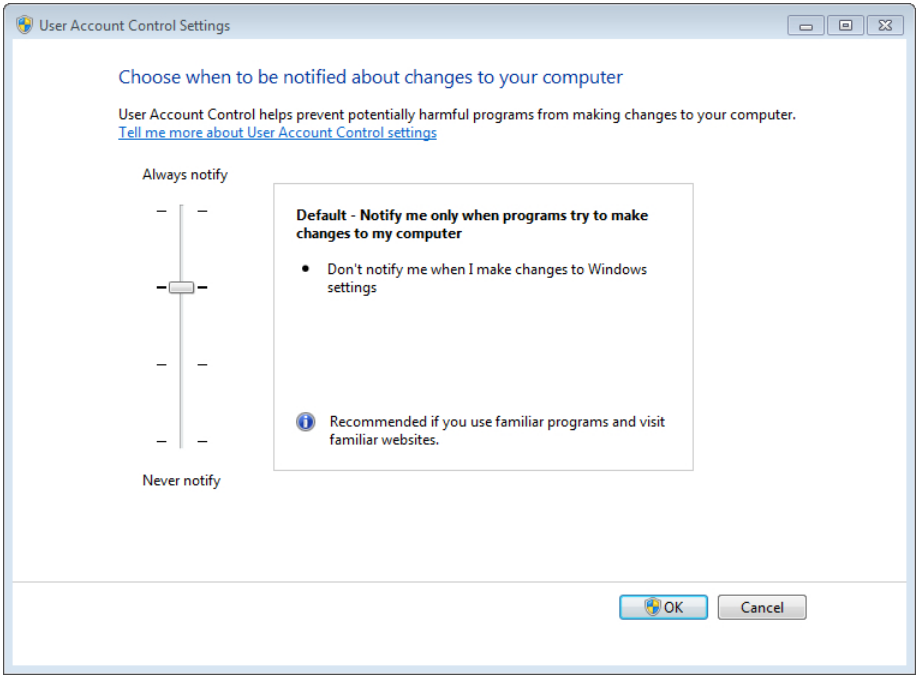


Table 11-7 explains the actions associated with the different UAC settings on a Windows 7 system.

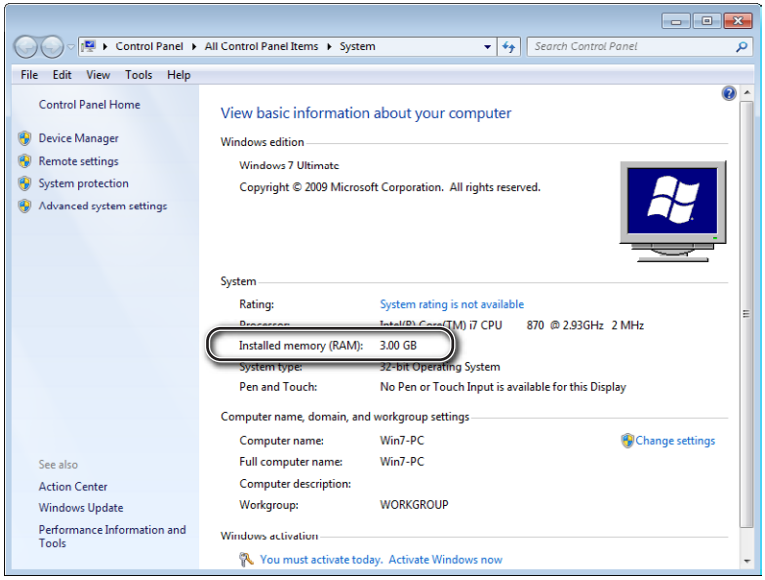
TABLE 11-7 UAC Settings

UAC Setting	UAC Action	Comments
Always Notify.	You'll be notified before programs make changes to your computer or to Windows settings that require administrator permissions.	The most secure setting. Uses secure desktop. (Desktop is dimmed.)
Notify Me Only When Programs Try To Make Changes To My Computer.	You'll be notified before programs make changes to your computer that require administrator permissions, or if a program outside of Windows tries to make changes to a Windows setting. You won't be notified if you try to make changes to Windows settings that require administrator permissions.	This is the default setting and is shown as selected in the graphic from the previous steps. Uses secure desktop. (Desktop is dimmed.)
Notify Me Only When Programs Try To Make Changes To My Computer. (Do Not Dim My Desktop.)	Same as Notify me only when programs try to make changes to my computer, but without using secure desktop.	Desktop is not dimmed. Applications can make changes.

Never Notify.	You won't be notified before any changes are made to your computer. If you're logged on as an administrator, programs can make changes to your computer without you knowing about it. If you're logged on as a standard user, any changes that require the permissions of an administrator will automatically be denied.	Least secure setting and not recommended. Desktop is not dimmed.

Windows Vista did not have the preceding options with UAC. Instead, users could only turn UAC on or off. You can use the following steps to disable or enable UAC on a Windows Vista system:

1. Click Start, Control Panel. If necessary, change the display from Category to Classic View.
2. Select User Accounts.
3. Select Turn User Account Control on or off. If prompted by UAC, click Continue.
4. Your display will resemble the following graphic. You can select or deselect the check box to enable or disable UAC.



IMPORTANT **DISABLING UAC IS NOT RECOMMENDED**

UAC protects against unauthorized changes, and with it disabled, malicious software can make changes without the user's knowledge.

Windows XP Mode

Windows XP Mode is a cool feature available in Windows 7 that allows you to run Windows XP applications on Windows 7 in a virtual Windows XP environment. It is very valuable if an application is incompatible with Windows 7 but will run on Windows XP. This allows users to migrate to Windows 7 even if they need to run legacy applications.

EXAM TIP

Windows XP Mode is available on the Windows 7 Professional and Ultimate editions, but it is not available on Windows Vista.

XP Mode is not installed on Windows 7 systems by default, but it is available as a free download. If you are interested, you can find the instructions and download it from here: *http://www.microsoft.com/windows/virtual-pc/download.aspx*.

This also installs Windows Virtual PC, which allows you to run other virtual operating systems from within your Windows 7 system.

Windows XP Mode includes a fully functional version of Windows XP. You can start XP Mode just as you can start any other application on your Windows 7 system. Additionally, after it's started, you can install and run any applications from within this virtual system. Figure 11-6 shows Windows XP Mode running within Windows Virtual PC.

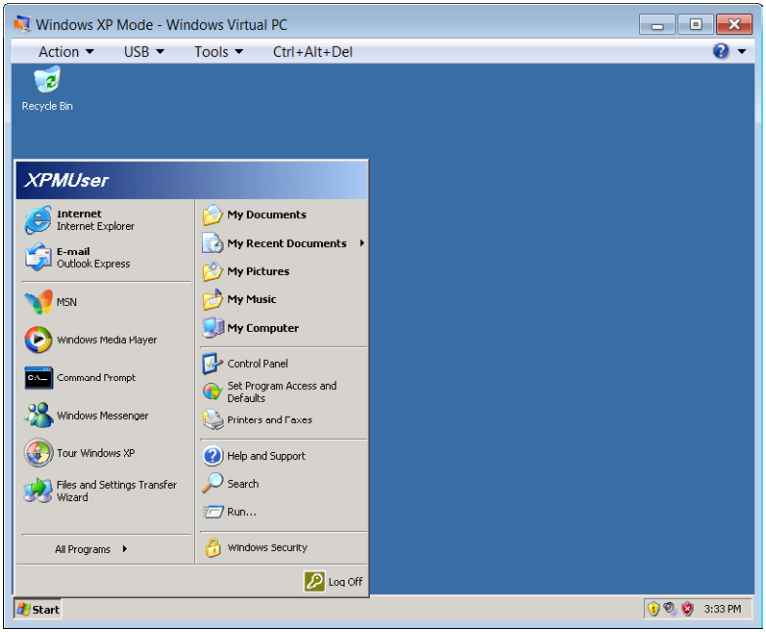


FIGURE 11-6 Windows XP Mode.

Even better, after you've installed applications in the Windows XP Mode virtual system, you can shut down the Windows XP Mode Virtual PC and start the application from the Windows 7 All Programs menu. Users don't have to start Windows XP Mode to start the program. This makes it seamless for the end users.

Chapter 15, "Configuring Windows Operating Systems," talks about the importance of keeping Windows systems up to date with patches. This also applies to Windows XP Mode if it's being used.

Start Bar Layout

Often, the first step in starting an application is clicking the Start button. That sounds simple enough. However, the Start button has changed somewhat between operating systems. Figure 11-6 shows how the Start button looks in Windows XP. Figures 11-7 and 11-8 show the Start button in Windows Vista and Windows 7. (Also, the figures show you some of the changes in the interfaces between the operating systems.)

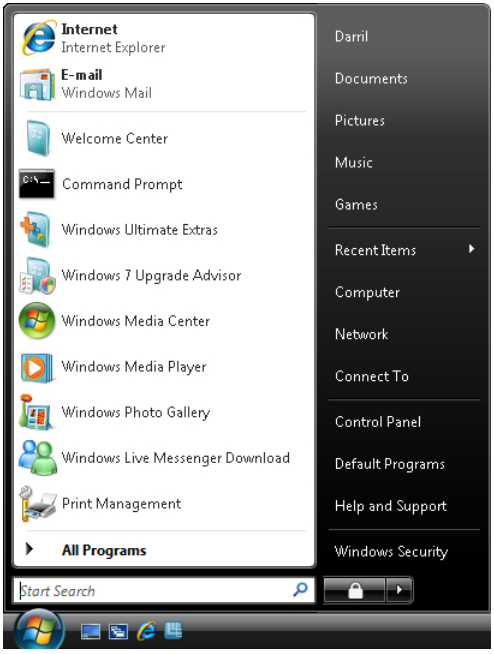


FIGURE 11-7 Windows Vista Start button.

NOTE **EASY SEARCH**

Windows Vista and Windows 7 include a text box right above the Start button, labeled Start Search in Windows Vista and Search Programs And Files in Windows 7. You can often type in the name of the program here and a link to the program will appear. For example, if you type in Backup, several links appear related to the Backup And Restore program.

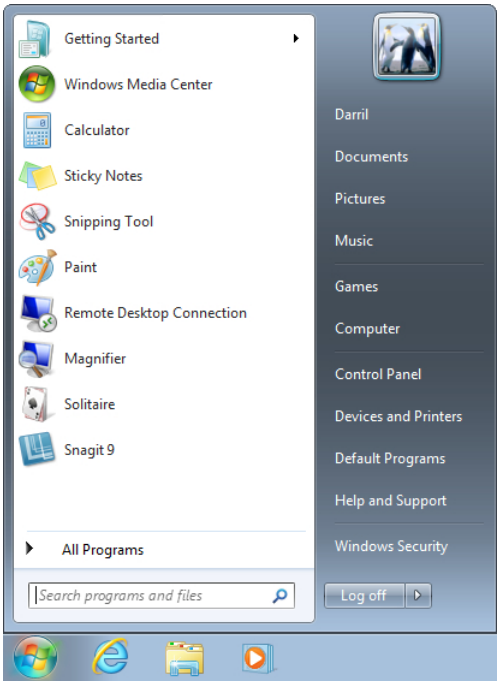


FIGURE 11-8 Windows 7 Start button.

Notice that in Windows XP the button is actually labeled Start, but it's not labeled on Windows Vista and Windows 7. However, if you hover over the button on these operating systems, a tooltip will appear indicating that it is the Start button.

In Windows XP, items were labeled as My Documents, My Computer, and so on, but this terminology isn't used on the main menu anymore. It caused a few humorous problems with help desk professionals talking to users over the phone. If the professional asked the user to "open my computer" or "open my documents," the user sometimes became a little flustered, responding with, "I'm not at your computer."

You can see many commonalities between the operating systems. Each Start menu provides access to All Programs, Control Panel, the user's documents, Help and Support, Windows Security, and more.

NOTE **CONTEXT MENUS**

Many of these menu items provide additional capabilities by right-clicking (sometimes called alt-clicking) the menu item. This often brings up a context menu. For example, you can start Computer Management by right-clicking Computer (or My Computer in Windows XP) and selecting Manage.

Windows Sidebar and Gadgets

The Windows *Sidebar* hosts *gadgets* that users can add to their system in Windows Vista. Gadgets are mini-programs that have a specific functionality. For example, a weather gadget will show the weather for a specific location. Windows Sidebar isn't available in Windows 7, but users can still add gadgets to their desktop.

The sidebar is normally on the right side of the screen with the gadgets docked in the sidebar. However, you can manipulate the settings and the gadgets. You can also add more gadgets by right-clicking the sidebar and selecting Add Gadgets. Your display will be similar to Figure 11-9.

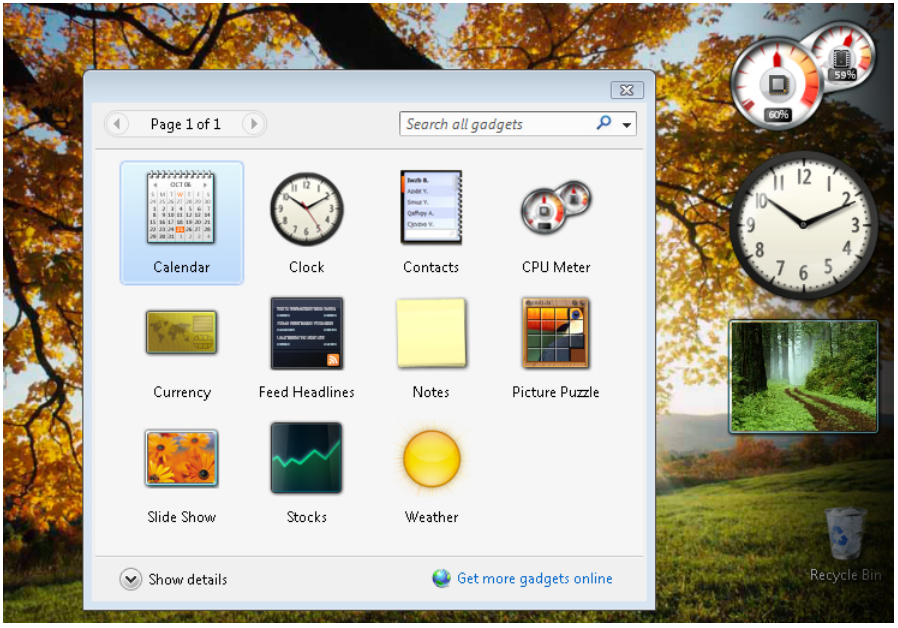


FIGURE 11-9 Adding gadgets to the Windows Vista Sidebar.

You can also add gadgets to the Windows 7 desktop, even though it doesn't have a Sidebar. If you right-click anywhere on the desktop and select Gadgets, you'll see what gadgets are available. You can then double-click any of them to add them to your desktop and even move them wherever you like on the desktop.

Figure 11-10 shows the gadgets available on a Windows 7 system, with two gadgets added to the desktop.

Several gadgets are available by default, but many more are available online. By clicking the link Get More Gadgets Online (shown at the bottom of the Gadgets window in Figures 11-9 and 11-10), users can browse through available gadgets on Microsoft's website.

FIGURE 11-10 Viewing gadgets on Windows 7.

IMPORTANT **DOWNLOAD ONLY FROM TRUSTED DEVELOPERS**

Malicious attackers can write gadgets, so it's important to download gadgets only from trusted developers. Some of the gadgets posted to Microsoft's site are unverified submissions. They can potentially access system files, show objectionable content, or change the behavior of your system.

Sidebar vs. SideShow

Windows Sidebar and SideShow are not the same thing. The sidebar is on the Vista desktop and displays different types of gadgets after a user logs on.

Windows SideShow allows a user to connect a device (such as a Bluetooth or USB device) to the computer. For example, a user could connect a digital photo frame to a computer that has a weather SideShow gadget. The SideShow gadget displays the information on the photo frame. In contrast, the Sidebar gadget is displayed only on the desktop.

Compatibility Mode

You can often manipulate the settings for a legacy application to get it to work without using XP Mode. You can use the Program Compatibility program wizard, or you can manually configure compatibility settings.

The following steps show how to start and run the Program Compatibility program wizard on Windows 7:

1. Click Start and select Control Panel.
2. Select Programs.
3. Select Run Programs Made For Previous Versions Of Windows.
4. On the Program Compatibility screen, click Next. The wizard will identify applications installed on your computer.
5. Select the application that is having problems and click Next.
6. If the program is not listed, select Not Listed (the first item in the list) and click Next. You'll then be able to browse and select the application.
7. You'll be asked to answer some questions related to the problem, and the wizard will configure the settings for you.

Alternatively, you can use Windows Explorer to browse to the application, right-click it, and select Properties. Select the Compatibility tab, and you'll see a display similar to Figure 11-11.

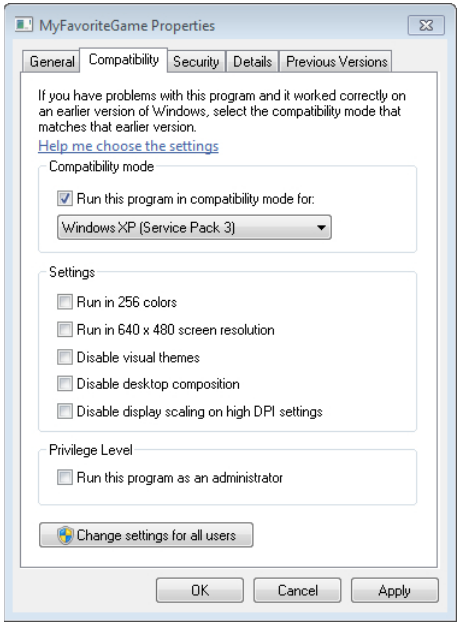


FIGURE 11-11 Manually configuring compatibility settings.

The Compatibility mode section allows you to select a previous operating system. The figure shows the check box that enables the program to run using compatible settings for Windows XP (Service Pack 3). You can select other operating systems all the way back to Windows 95.

Some applications have problems with the advanced graphics features of Windows Vista and Windows 7, and the Settings area allows you to disable some of the graphics features or to use the most basic settings. For example, if the Themes feature is causing problems for the legacy application, select the box to Disable Visual Themes.

Additionally, UAC sometimes causes problems for applications that require administrator privileges to run. You can select Run This Program As An Administrator to overcome this problem.

Quick Check

1. **What Windows security feature helps prevent malicious software from taking action on a user's computer without the user's knowledge?**
2. **What can you use to run an application using settings that mimic a previous operating system?**

Quick Check Answers

1. **User Account Control (UAC).**
2. **Compatibility Mode.**

Examining Directory Structures in Windows

One of the challenges when using any operating system is finding the data and files that you need. As operating systems are improved, these locations are often changed. This section identifies many of the common file locations on different operating systems.

Windows Explorer

The primary tool you use to access files is Windows Explorer. As with many tools in any version of Windows, you can choose from multiple methods to start Windows Explorer.

The following steps outline some methods you can use to start Windows Explorer in different operating systems. Certainly, there are other ways, but the most important thing here is that you should be able to open Windows Explorer to browse the files.

TIP **WINDOWS EXPLORER VS. INTERNET EXPLORER**

Windows Explorer is different than Internet Explorer. Windows Explorer allows you to access and manipulate files on a computer. You can use Internet Explorer to surf the Internet. Sometimes people shorten the name of both to just "Explorer," but this is often confusing. Some people interpret Explorer as Internet Explorer, and others interpret it as Windows Explorer.

To start Windows Explorer on Windows XP, click Start, right-click My Computer and select Explore.

To start Windows Explorer on Windows Vista, click Start, All Programs, Accessories, and select Windows Explorer.

To start Windows Explorer on Windows 7, right-click Start and select Open Windows Explorer.

TIP **KEYBOARD SHORTCUT**

If your keyboard includes the Windows key (usually between the Ctrl and Alt keys on the left of the spacebar), you can open Windows Explorer on any Windows-based system by pressing Windows+E.

Common File Locations

There are many common files and folders among all of the Windows versions. Some of these files are in common locations in each version of Windows, and some are in different locations. Table 11-8 shows the location of common files and folders in each of the Windows editions covered in this chapter.

TABLE 11-8 Common File Locations

	Default location	Comments
Root drive	C:\	Also called system partition
Program files	C:\Program Files	Includes application files
Windows files	C:\Windows	Also called boot partition
System files	C:\Windows\System32	Includes Windows system files
Temporary files	C:\Windows\Temp	Operating system for temporary file storage
Offline Files	C:\Windows\CSC	Also called Client Side Cache
Fonts	C:\Windows\Fonts	Numbers, symbols, and characters with different typefaces

Windows 64-bit operating systems can run both 32-bit and 64-bit applications. In some cases, an application will have both 32-bit and 64-bit versions, giving the user the option of which one to run. However, many potential conflicts are possible if both 32-bit and 64-bit versions of the files are stored in the same location. To avoid problems, these different versions are stored in different locations.

On 64-bit systems, you'll see two Program Files folders. One holds 32-bit application files, and the other folder holds 64-bit application files. They are shown in Table 11-9.

TABLE 11-9 Locations of 32-Bit and 64-Bit Application Files

	32-bit Windows	64-bit Windows
C:\Program Files	32-bit application files	64-bit application files
C:\Program Files (x86)	Not used	32-bit application files

You might remember from earlier in this chapter that x86 indicates a 32-bit system. The folder with (x86) holds all of the 32-bit application files, and the folder without (x86) holds the 64-bit application files on 64-bit systems. Because 32-bit systems don't support 64-bit applications, they have only the C:\Program Files folder.

NOTE **X86 FOLDERS ON 64-BIT SYSTEMS**

Both the C:\Program Files and C:\Program Files (x86) folders are needed on 64-bit systems. Occasionally, users think that because they're running a 64-bit operating system they can delete the (x86) folder. This will break many applications and, most often, requires a complete reinstallation of the operating system to restore functionality.

Boot vs. System Partition

You're likely to hear the terms boot partition and system partition as you work with operating systems. The functions of these are fairly straightforward, but the names can be confusing.

The *system partition* is the location where files necessary to boot the computer are found. It is usually the root of the C drive. The *boot partition* is the location where operating system files are found. On Windows-based systems, the boot partition is usually C:\Windows.

This sounds backward to many people (me included), but it's accurate. The system partition holds the boot files. The boot partition holds the system files. When preparing for the A+ exams, it's valuable to know the difference.

Profile Locations

Any system can support multiple users who can log on to the same computer at different times. These users can personalize the system by changing different settings based on their preferences. For example, users can change the background, modify themes, and save different Favorites in Internet Explorer.

Windows keeps these personal settings for each user in the user's profile. When any user logs on, the user's profile is loaded, giving the user the same settings from the last time the user logged on. Table 11-10 shows the locations of the profiles for different operating systems.

TABLE 11-10 Profile Locations

	Default Profile Location
Windows XP	C:\Documents and Settings
Windows Vista	C:\Users
Windows 7	C:\Users

Figure 11-12 shows Windows Explorer opened to the profile of a user named Darril on a Windows 7 system. You can view these folders with Windows Explorer, but most settings are manipulated through the operating system. For example, when a user creates a Favorite in Internet Explorer, the information is stored in a folder in the profile but the user manipulates only Internet Explorer.

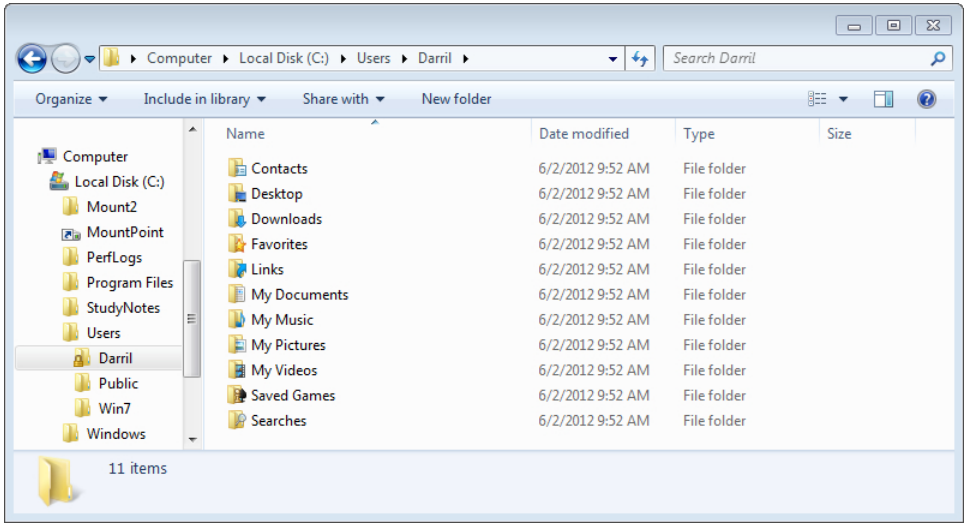


FIGURE 11-12 User profile location on Windows 7.

Quick Check

1. What tool would you use to browse files on a disk?
2. Where are 32-bit application files stored in a 64-bit system?

Quick Check Answers

1. Windows Explorer.
2. C:\Program Files (x86).

Chapter Summary

- 32-bit operating systems are based on x86 processors, and 64-bit systems are based on x64 processors. 32-bit systems can address up to 4 GB of RAM but will utilize only about 3.2 to 3.5 GB of RAM if 4 GB of RAM is installed.
- XP and Vista 64-bit systems can use as much as 128 GB of RAM, and Windows 7 64-bit systems can use as much as 192 GB of RAM. Windows 7 Starter is not available in 64-bit versions.
- Windows 7 requires at least 1 GB of RAM and 16 GB of hard drive space for 32-bit systems and at least 2 GB and 20 GB of hard drive space for 64-bit systems.
- Windows 7 Starter and Home Premium use only one processor, whereas Professional and Ultimate use as many as two processors.
- XP requires a minimum of 64 MB of RAM, but 128 MB is recommended. Windows Vista requires a minimum of 512 MB of RAM, but 1 GB is recommended.
- Windows 7 Ultimate and Windows Vista Ultimate both support BitLocker Drive Encryption.
- Windows 7 Professional and Ultimate editions support Windows XP Mode, joining a domain, Remote Desktop Connection, EFS, offline folders, and backing up to a network.
- User Account Control (UAC) is a security feature that helps prevent unauthorized changes. The default setting notifies the user when programs try to make changes to the computer.
- Windows XP Mode is available in Windows 7 Home Premium and Ultimate editions. It allows users to run legacy programs on Windows 7 in a virtual XP environment.
- Application compatibility settings can be configured to allow some legacy applications to run in Windows 7 without installing Windows XP Mode.
- Vista Home Premium, Business, and Ultimate editions support backing up to a network, but full image backups using Windows Complete PC Backup cannot be used to back up data to a network.

- Windows Explorer is the primary tool used to browse files. The system partition is the location where the boot files are located (C:\ by default). The boot partition is the location where the operating system files are located (C:\Windows by default).
- On a 64-bit system, 64-bit application files are in the C:\Program Files folder, and 32-bit application files are in the C:\Program Files (x86) folder.

Chapter Review

Use the following questions to test your knowledge of the information in this chapter. The answers to these questions, and the explanations of why each answer choice is correct or incorrect, are located in the "Answers" section at the end of this chapter.

1. Which of the following Windows 7 editions include both 32-bit and 64-bit versions? (Choose all that apply.)
   - **A.** Starter
   - **B.** Home Premium
   - **C.** Professional
   - **D.** Ultimate
2. A user is running a 32-bit version of Windows 7 Home Premium with 6 GB of RAM installed. However, the system is recognizing only 3.2 GB of RAM. What is the problem?
   - **A.** Home Premium does not support more than 3.2 GB of RAM.
   - **B.** A 32-bit Windows operating system can recognize only about 3.2 GB of RAM.
   - **C.** The processor is not configured in x64 mode.
   - **D.** The processor is an x86 processor.
3. A user is shopping for a computer and sees some computers labeled as x86 and some as x64. What does x86 mean?
   - **A.** The processor supports 32 bits for addressing RAM.
   - **B.** The processor supports 64 bits for addressing RAM.
   - **C.** The processor supports 86 bits for addressing RAM.
   - **D.** The processor includes eight cores but defaults to two 6 cores.
4. What's the minimum amount of RAM required for Windows 7 on a 32-bit system?
   - **A.** 512 MB
   - **B.** 1 MB
   - **C.** 1 GB
   - **D.** 2 GB

5. What's the maximum number of processors that a Windows 7 Home Premium system can recognize?

   A. 1

   B. 2

   C. 32

   D. 256

6. Which of the following editions of Windows 7 support Windows XP Mode? (Choose all that apply.)

   A. Starter

   B. Home Premium

   C. Professional

   D. Ultimate

7. A user is trying to enable BitLocker on a 32-bit edition of Windows 7 Professional with 2 GB of RAM but is having problems. What is the likely reason?

   A. BitLocker is not supported on 32-bit editions of Windows 7.

   B. BitLocker has not been enabled in the Control Panel.

   C. BitLocker is not supported on systems with less than 3 GB of RAM.

   D. BitLocker is not supported on Windows 7 Professional.

8. A user was able to run a program in Windows XP but cannot get it to run in Windows 7 Home Premium. What's the best solution?

   A. Enable Windows XP Mode

   B. Use the Program Compatibility wizard

   C. Enable UAC

   D. Reinstall Windows XP

9. A user was able to run a program in Windows XP but cannot get it to run in a 64-bit edition of Windows 7 Professional. What's a possible solution?

   A. Use Windows XP Mode

   B. Upgrade to Windows 7 Ultimate and use Windows XP Mode

   C. Enable BitLocker

   D. Reinstall Windows 7 using a 32-bit edition

10. Which of the following Windows 7 editions support backing up to a network location? (Choose all that apply.)

- **A.** Starter
- **B.** Home Premium
- **C.** Professional
- **D.** Ultimate

11. Where are 32-bit application files stored in a Windows 7 64-bit system?

- **A.** C:\Windows
- **B.** C:\Program Files
- **C.** C:\Program Files (x32)
- **D.** C:\Program Files (x86)

Answers

1. **Correct Answers:** B, C, D
   - **A. Incorrect:** Windows 7 Starter edition comes only in 32-bit versions.
   - **B. Correct:** Windows 7 Home Premium edition comes in both 32-bit and 64-bit versions.
   - **C. Correct:** Windows 7 Professional edition comes in both 32-bit and 64-bit versions.
   - **D. Correct:** Windows 7 Ultimate edition comes in both 32-bit and 64-bit versions.
2. **Correct Answer:** B
   - **A. Incorrect:** Windows 7 Home Premium 64-bit versions support up to 16 GB of RAM.
   - **B. Correct:** Any 32-bit operating system can address only 4 GB of RAM, and it also reserves some of this space to address other hardware in the system.
   - **C. Incorrect:** Processors don't have an x64 mode, but even if a system had a 64-bit processor, a 32-bit operating system could still access only about 3.2 GB of RAM.
   - **D. Incorrect:** Because the operating system is a 32-bit edition, it's likely the processor is an x86-based processor, but the reason it can't address more RAM is directly related to the operating system, not the processor.
3. **Correct Answer:** A
   - **A. Correct:** The x86 label indicates that the processor is a 32-bit processor and can address only 4 GB of RAM.
   - **B. Incorrect:** An x64-based processor supports 64-bits for addressing RAM.
   - **C. Incorrect:** There aren't any processors that use 86 bits for addressing RAM.
   - **D. Incorrect:** The 8 and 6 in x86 do not have anything to do with the number of cores in the processor.
4. **Correct Answer:** C
   - **A. Incorrect:** All editions of Windows 7 require more than 512 MB.
   - **B. Incorrect:** All editions of Windows 7 require more than 1 MB.
   - **C. Correct:** Windows 7 32-bit versions require a minimum of 1 GB of RAM.
   - **D. Incorrect:** Windows 7 64-bit versions require a minimum of 2 GB of RAM.
5. **Correct Answer:** A
   - **A. Correct:** Windows 7 Home Premium can recognize and use a maximum of one processor.
   - **B. Incorrect:** Windows 7 Professional and Ultimate editions can recognize and use a maximum of two processors.

C. **Incorrect:** Windows 7 32-bit systems can recognize and use as many as 32-cores within any processor.

D. **Incorrect:** Windows 7 64-bit systems can recognize and use as many as 256-cores within any processor.

6. **Correct Answers:** C, D

A. **Incorrect:** The Windows 7 Starter edition does not support Windows XP Mode.

B. **Incorrect:** The Windows 7 Home Premium edition does not support Windows XP Mode.

C. **Correct:** The Windows 7 Professional edition does support Windows XP Mode.

D. **Correct:** The Windows 7 Ultimate edition does support Windows XP Mode.

7. **Correct Answer:** D

A. **Incorrect:** BitLocker is supported on 32-bit editions of Windows 7 Ultimate edition.

B. **Incorrect:** BitLocker needs to be enabled in the Control Panel, but it is not supported in Windows 7 Professional, so it can't be enabled on this system.

C. **Incorrect:** BitLocker does not have any restrictions related to memory.

D. **Correct:** BitLocker is not supported on Windows 7 Professional, but it is supported on Windows 7 Ultimate.

8. **Correct Answer:** B

A. **Incorrect:** Windows XP Mode is not available in Windows 7 Home Premium, but it is available in the Professional and Ultimate Editions.

B. **Correct:** The Program Compatibility Wizard can be used to run an application using settings from previous operating systems.

C. **Incorrect:** User Account Control (UAC) is a security feature that is normally enabled, but enabling it if it was disabled will not help the compatibility of older applications.

D. **Incorrect:** Many programs can run using older compatibility settings without reinstalling Windows XP, so a reinstallation is not the best solution.

9. **Correct Answer:** A

A. **Correct:** Windows XP Mode is a feature available in Windows Professional and Ultimate editions.

B. **Incorrect:** Windows XP Mode is supported in Professional, so it is not necessary to upgrade to Ultimate.

C. **Incorrect:** BitLocker provides full disk encryption but does not assist with compatibility issues, and it is not available in Windows 7 Professional.

D. **Incorrect:** It is not necessary to reinstall Windows 7, and there is no indication that the application will run in a 32-bit edition.

10. **Correct Answer:** C, D

A. **Incorrect:** Windows 7 Starter does not support backing up to a network location.

B. **Incorrect:** Windows 7 Home Premium does not support backing up to a network location.

C. **Correct:** Windows 7 Professional supports backing up to a network location.

D. **Correct:** Windows 7 Professional supports backing up to a network location.

11. **Correct Answer:** D

A. **Incorrect:** Operating system files are stored in C:\Windows.

B. **Incorrect:** The C:\Program Files folder stores 64-bit application files on a 64-bit system.

C. **Incorrect:** There is no such folder as C:\Program Files (x32).

D. **Correct:** The C:\Program Files (x86) folder stores 32-bit application files on a 64-bit system.