

CRITICAL THINKING

FileMaker Pro, available for both Macintosh and PC, is a database program somewhat similar to Microsoft Access, but does not contain as many advanced features. Instead, it is ideal for small businesses and home users. Use Google or another search engine to

research this software and then write a short review of its pros and cons. Explain why and how it is similar to and different from. Also, provide a short overview of FileMaker Pro's reporting and charting capabilities.



ONLINE DISCOVERY

Virtual reality was described in this lesson. One of the online virtual reality Web sites is located in England.

1. Open your browser and then type the Web site address *www.kenmcbride.com/BenCottages/index.html* into the Address bar. Press Enter to display the Benaughlin Cottages Web site located in the United Kingdom. Use the mouse pointer to manipulate and move the screen. Then use your word-processing

program to write a minimum 100-word description of this Web site.

2. Use Google or another search engine to look for other virtual reality sites. Locate at least one other site. Then use your word-processing software to list the Web site address and write a short description of the Web site.




JOB SKILLS

People with database development skills and experience with various database programs are in high-demand by employers. Companies of all sizes need skilled professionals to manage everything from planning a new database to managing and supporting existing databases. Use the Internet and research the various database programs, and

then list them in a word-processing document. Also research the jobs for database professionals. What skills are necessary for these types of jobs? Is training and certification available? List examples of these training and certification programs.



 Estimated Time:
1.5 hours

LESSON 8

Operating Systems

OBJECTIVES

Upon completion of this lesson, you should be able to:

- Identify the purpose of an operating system.
- Identify different operating systems.
- Share files on different operating systems.
- Identify user rights.
- Troubleshoot common operating system problems.

DATA FILES

You do not need data files to complete this lesson.

WORDS TO KNOW

administrative rights
 administrator account
 driver
 embedded operating system
 emulation card
 file system
 handheld operating system
 Linux
 Mac OS X
 operating system (OS)
 Palm OS
 system administrator
 UNIX
 Windows Embedded CE
 Windows Phone

There are two basic types of software: application software and system software. Fundamental concepts of applications were discussed in detail in Lesson 7. This lesson focuses on system software and how it relates to the operating system and the utility programs that manage computer resources at a low level.



VOCABULARY

operating system (OS)

driver

file system

Identifying the Purpose of an Operating System

Recall that system software facilitates the use of a computer system. An *operating system (OS)* is system software that enables the computer hardware to communicate and operate with the application software. Without an operating system, a computer cannot function because the operating system manages and coordinates the activities and resources of the computer. For example, operating systems perform jobs such as recognizing input from the keyboard, sending output to the monitor and printer, keeping track of files and directories, and controlling peripheral devices such as the printer, monitor, and keyboard. Manufacturers of peripheral devices, such as printers or monitors, provide programs called *drivers* that the operating system uses to communicate with various hardware devices.

An operating system also manages resources for applications. It provides a consistent way for applications to communicate with hardware so you can print documents on many types of printers, for example. Instead of each application duplicating print settings or learning details about the printer, the operating system handles these tasks. This is why your computer system can use hardware and settings different from another computer, but still reliably run the same applications.

Another way an operating system helps applications is by performing system and file maintenance tasks. For example, the operating system is responsible for such system tasks as preparing the desktop, managing visual and audio effects, handling memory, and maintaining power settings. File maintenance responsibilities are equally important; the operating system controls access to files stored on disks and manages the amount of space the files can use. The way an operating system stores files on disk is called a *file system*. The file system regulates the types of names and other attributes a file can have and organizes the files into folders arranged in a hierarchy, where a main folder can contain subfolders that contain files. The file system allows you to find and retrieve files you store on a computer by keeping track of the files you save and where you save them. The file system also identifies sections of a disk that are not being used.

QUICK TIP

The Windows and Macintosh operating systems call file containers *folders*, while the UNIX operating system calls them *directories*.



Identifying Different Operating Systems

Recall that an operating system provides an interface between the user or application program and the computer hardware. See **Figure 8-1**. The types of operating systems most people use fall into two categories: personal computer operating systems and mobile operating systems.

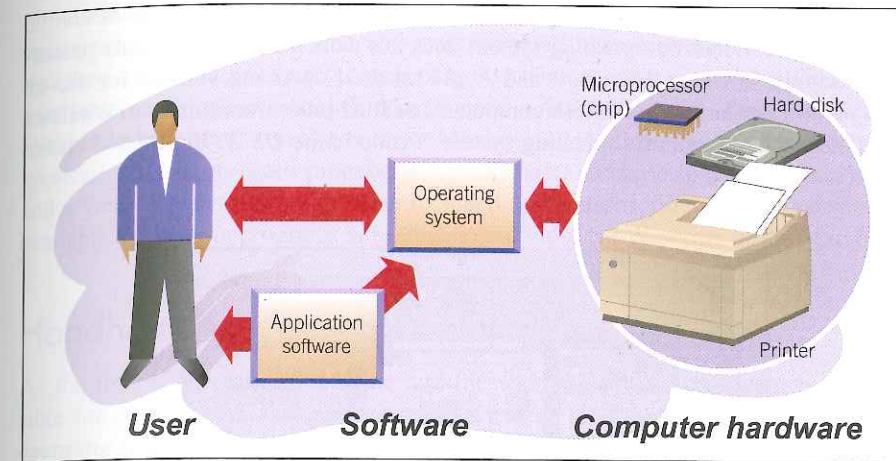


FIGURE 8-1 Operating system

Personal Computer Operating Systems

Several brands and versions of operating system software are available for personal computers. Each is designed to work with one or more particular processors. For example, the Windows operating system is designed to work with an Intel processor or clone. Currently, Microsoft Windows runs on more personal computers worldwide than other operating systems. The most widely used version of Windows is Windows XP, released in 2001. Windows Vista was released in 2006, and Windows 7 was released in 2009. **Figure 8-2** shows the Windows 7 desktop.

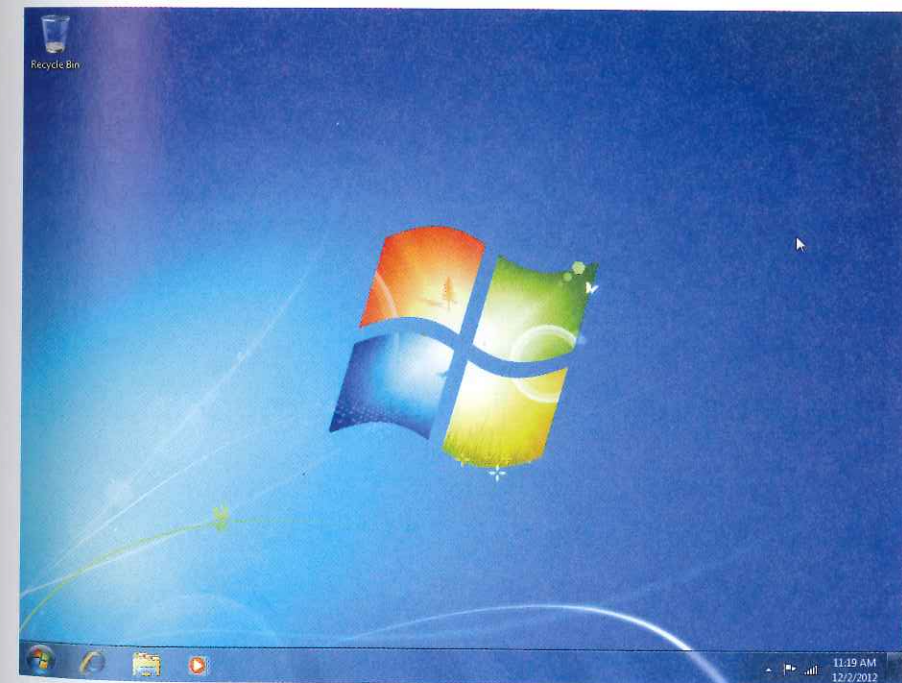


FIGURE 8-2 Windows 7 desktop

Older Macintosh computers contain a processor manufactured by Motorola. Generally, the Windows operating system does not work with this Motorola processor. Recently, however, Microsoft and Apple released operating systems for use on both platforms. Current Macintosh computers use Intel processors similar to Windows computers. The Macintosh operating system is called *Mac OS X*. **Figure 8-3** shows the Mac OS X Lion.

VOCABULARY

Mac OS X

UNIX

Linux

ABOVE AND BEYOND

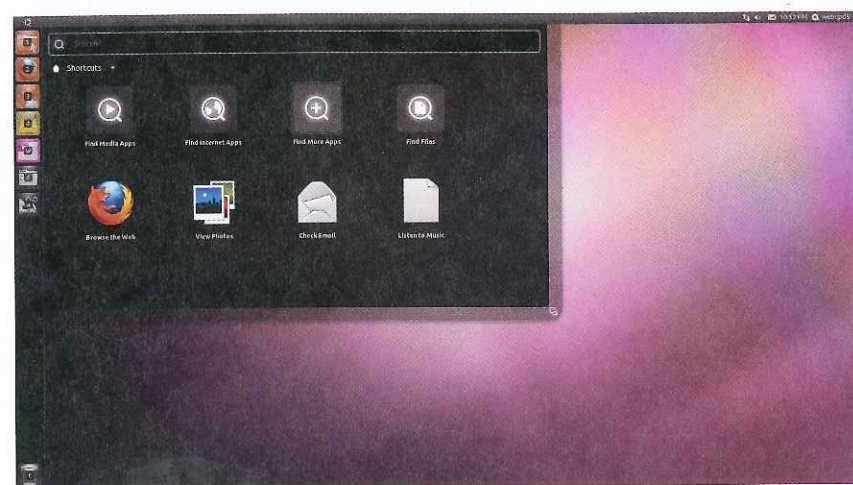
Macintosh popularized the first graphical user interface; however, Apple did not invent the interface. Xerox Corporation developed the idea of using pictorial icons for a computer interface.



Courtesy of Apple

FIGURE 8-3 Macintosh desktop with windows open

Still another operating system is *UNIX*. This operating system is frequently used by scientists and programmers. UNIX was developed by a group of programmers for AT&T and is considered a multitasking, portable operating system. This means it can run on just about any hardware platform. Some versions of UNIX have a command-line interface, where you enter text commands instead of manipulating objects with a mouse, but most versions provide a graphical user interface such as that shown in **Figure 8-4**. There are several variants of the operating system, such as *Linux* and IBM's AIX.



Courtesy of PR Canonical

FIGURE 8-4 Linux desktop

Both the IBM AIX operating system and Linux are based on UNIX. Linux is an open-source program that is free, and programmers and developers can use or modify it as they wish. Linux has a reputation of being stable and rarely crashing. One Linux user interface is called GNOME (pronounced *gah-NOHM*) and allows the user to select a desktop similar to Windows or Macintosh. GNOME also includes software applications such as word processing, spreadsheet, database, presentation, e-mail, and a Web browser. Even with these included applications, however, the number of available application programs is far fewer than those for Windows or the Mac OS.

Handheld and Embedded Operating Systems

As the interface between hardware and the user, the operating system is responsible for coordinating and managing the activities the device performs. *Handheld operating systems* and *embedded operating systems*, also known as mobile operating systems, are similar in principle to operating systems such as Windows or Linux. These systems, however, are smaller and generally less capable than desktop operating systems.

The diminutive operating systems can fit into the limited memory of mobile and handheld devices, such as smart phones, PDAs, tablet computers, mobile game players, and cameras. Mobile and handheld computers and other devices are used in a variety of application areas, including education, health care, automobile navigation, and for people with disabilities. The more popular handheld computers are those that are specifically designed to provide personal information manager (PIM) functions, such as a calendar and address book. These small devices have plenty of memory to hold software, electronic texts, audio, and video (see **Figure 8-5**).

VOCABULARY

handheld operating system

embedded operating system



From left: © thesuperph / iStockphoto; © amrphoto / iStockphoto; © Monique Heydenrych / iStockphoto

FIGURE 8-5 Handheld computers

All of these devices contain an operating system. Operating systems can be categorized by a number of characteristics, including technology, usage, and licensing. In some instances, these categories may overlap. The operating system on most small devices and smart phones resides on a ROM chip. Popular handheld and embedded operating systems include the following:

- **Android:** This is an open-source operating system for mobile devices such as smart phones and tablet computers, and is currently developed by Google. Android is based on a version of Linux.
- **Apple iOS:** This operating system, originally called the iPhone OS, is designed for mobile devices such as the iPhone, iPad, and iPod Touch. You interact with iOS using your fingertips to perform multitouch gestures. The main applications are designed for phone features, e-mail, Web browsing, and media playing.

VOCABULARY

Palm OS

Windows Embedded CE

Windows Phone

- **BlackBerry:** The BlackBerry operating system runs on handheld devices supplied by Research in Motion (RIM). In addition to phone capabilities, this system also provides services such as multitasking, instant messaging, PIM capabilities, and access to Bluetooth devices.
- **Embedded Linux:** This is a scaled-down Linux operating system used in devices such as mobile phones, media players, PDAs, smart watches, and many other types of devices that require an embedded operating system.
- **Palm OS:** A competing operating system to Windows Mobile, *Palm OS* (also called Garnet OS) runs on Palm handhelds and other third-party devices. Some of the more common built-in applications include an address book, calculator, calendar, contacts, and phone book tools. This OS also includes handwriting-recognition software.
- **Symbian OS:** This is a multitasking operating system designed for smart phones. Some of the more popular features include the capability to send and receive e-mail messages and faxes, maintain contact lists, and browse the Web.
- **Windows Embedded CE:** A scaled-down version of the Windows operating system, *Windows Embedded CE* is designed for devices such as digital cameras, security robots, intelligent appliances, gaming devices, GPSs, media players, and set-top boxes.
- **Windows Phone:** Based on Windows Embedded CE, *Windows Phone* is a mobile operating system that runs on smart phones and other types of handheld computers. Originally called Windows Mobile, this operating system allows you to perform tasks such as accessing e-mail, recording and watching video, exchanging instant messages, reading an e-book, playing games, and managing finances. See Figure 8-6.



FIGURE 8-6 Smart phones with Windows Phone



1-3.1.3

Sharing Files on Different Operating Systems

In many business, personal, and educational settings, people share files across operating system platforms. A business might have workers using both Macintosh and Windows computers. Depending on the task, artists and designers might use Macintosh computers, while accountants and writers might have PCs. In the classroom, all of the computers might be the same type, but students might have different types of computers at home. These situations require that multiple systems be able to read disks and share files. Hardware and software solutions are available for these problems.

VOCABULARY

emulation card

One type of hardware solution is an *emulation card* that is added to the motherboard of a computer. These cards enable the computer to run a program that was designed for a different operating system. For example, a card can be added to an older Macintosh that allows it to run Windows programs. Software emulation programs are also available to provide this capability. For example, a Macintosh computer could have software installed that allows it to read disks that were formatted on PCs.

Some file types are readable on different operating systems. One example for word-processing documents is the basic text format (files with a .txt filename extension). This format usually is readable by most word-processing programs on different systems. However, documents saved as .txt files do not retain complicated formatting. Another text format, Rich Text Format (.rtf), does retain more formatting commands, including paragraph breaks, fonts, and styles such as bold and italic. To save a file in text format or Rich Text Format, you use the Save As command in your word-processing program and specifically select Text or Rich Text Format as the file type. These document file types can generally be transferred to other operating systems across a network, to a Linux server, or to a handheld or mobile device (see Figure 8-7).

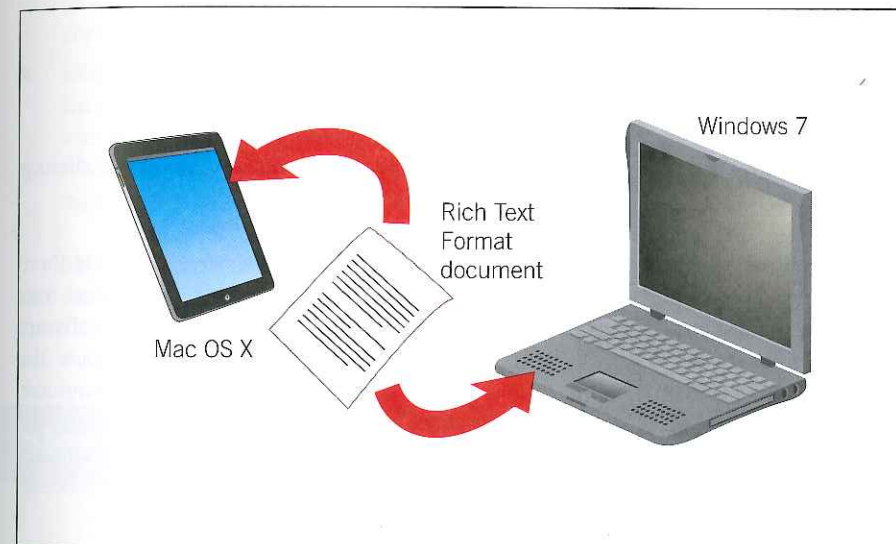


FIGURE 8-7 Transferring files from one operating system to another

If you use the Internet, you regularly share files across different operating systems. Your desktop or laptop computer uses an operating system such as Windows or Mac OS. If you use an Internet service provider to connect to the Internet, you are probably connecting to a UNIX system. If you connect to the Internet using a direct network connection, such as through a school or other organization, you are connecting to computers that use a network operating system. Each operating system provides ways to communicate and exchange information with other operating systems so that you can use more than one operating system simultaneously.



Identifying User Rights

An operating system allows you to interact with a computer and take advantage of the computer's technology, but it also sets limitations to protect itself and the data on the computer. The operating system grants permission allowing you to perform some tasks but preventing you from performing others. The tasks you are allowed to perform are defined by your user rights. The system administrator sets the user rights to protect the computer's security. The *system administrator* is a user who has an *administrator account*, which is a local account or a local security group. (An account is a collection of information that determines which files you can access and which settings you use; you access your user account by providing your user name and password.) The administrator account provides unrestricted access to make system-wide changes to the computer, including those that affect other users. Without administrative rights, you cannot make changes such as setting system options, installing software, or modifying passwords.

A typical system administrator has a variety of duties including the following:

- Creating or deleting user accounts on the computer
- Changing account names, pictures, passwords, and other data
- Establishing security access level
- Allocating storage space
- Monitoring systems to prevent unauthorized access and attacks by malicious software

The administrator can grant *administrative rights* to other users, allowing them to make specified types of changes. Without administrative rights, the typical user cannot perform many system modifications, such as installing or deleting software or changing network settings. To have administrative rights, you must know the administrative password. For example, if you want to install software on a computer, the operating system usually asks for the administrative password before it starts the setup process. If you provide the correct password, the operating system continues the installation. If you don't provide the correct password, it stops the setup process.

VOCABULARY

system administrator
administrator account
administrative rights

ETHICS IN TECHNOLOGY

What Is Computer Ethics?

Ethics is the branch of philosophy concerned with evaluating human action, and developing a system or code of morals of a particular religion, group, or profession.

Ethical judgments are no different in the field of computing than they are in any other area. The use of computers can raise many issues of privacy, copyright, theft, and power, to name just a few. For example, many computer professionals condemn hacking into other computers as unethical, while some defend so-called white-hat hackers who breach computer security because they want to gain a deeper understanding of computers and networks.

In 1990, the Institute of Electrical and Electronics Engineers (IEEE) created a code of ethics, and reaproved it in 2006. This code is available at <http://www.ieee.org/about/corporate/governance/p7-8.html>. The Association for Computing Machinery (ACM) also has a code of ethics and professional conduct provided at www.acm.org/about/code-of-ethics. This code is considered one of the most definitive sets of ethical standards for computer professionals, and contains 24 statements of personal responsibility. Many businesses and organizations have adopted the IEEE or ACM code to guide their own practices. Remember that they are only codes—not laws. People choose to follow them voluntarily.



Troubleshooting Common Operating System Problems

Sooner or later, you will have trouble on your computer that affects the operating system. Examples of these issues are as follows:


- **Incompatibility:** A copy of Quicken for Windows does not run on a computer with a Macintosh operating system. Application software and files need to be compatible with the computer's operating system. Usually, the operating system will not let you install or run an incompatible program. Similarly, an operating system will not let you open a file or use a media device (such as a DVD) if it does not recognize the file or media type.
- **File corruption:** Files can become corrupt as the result of a power failure, turning off the computer without properly shutting it down, a virus, resource conflicts, outdated drivers, bad sectors or lost clusters on the hard drive, bad software installation, and so on. If your operating system is unpredictable, its files might be damaged or corrupted. You can use a system utility that identifies and repairs corrupted files.
- **Disk crashes:** If your system is unstable, programs and even the operating system shut down unexpectedly and you receive error messages when you try to use the operating system and applications. In some instances, restarting, or rebooting, the system can solve the problem. If the problem is more severe, you might need to upgrade or reinstall the operating system.

Microsoft has a number of online tutorials that address Windows 7 performance and maintenance issues. Complete the following exercise to learn about some of these tutorials.

ABOVE AND BEYOND

Sometimes Windows does not boot properly. Instead, a message indicating that you are in safe mode is displayed on the screen. This means that something did not function properly during the boot process. Safe mode provides functionality so you or an expert user can do diagnostic testing.

Step-by-Step 8.1

1. Click the **Start** button  on the taskbar, and then click **Control Panel** to open the Control Panel window. See **Figure 8-8**.

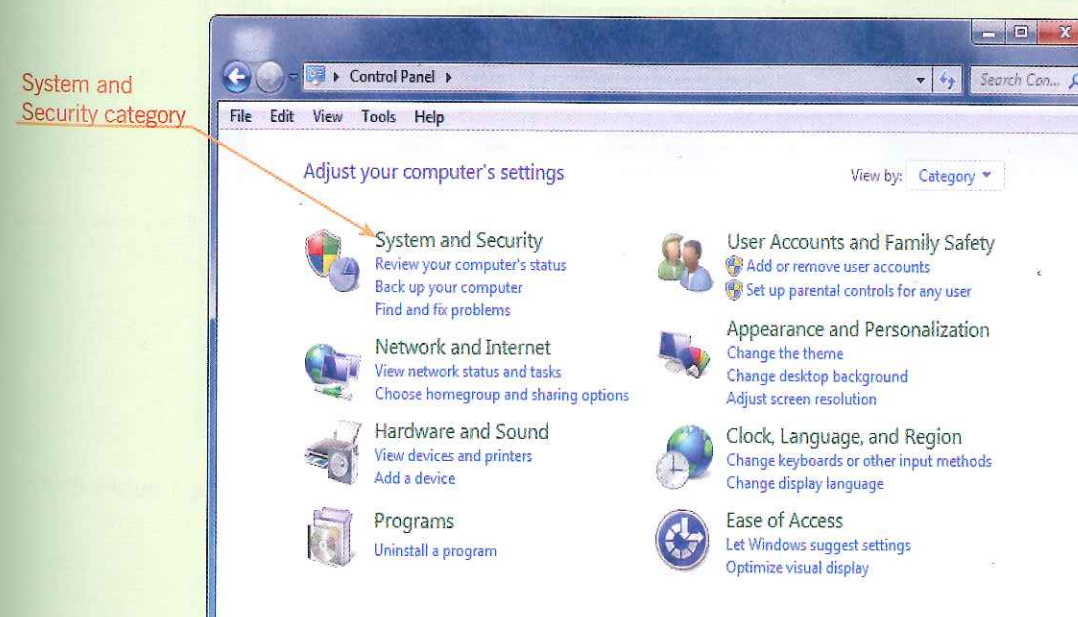
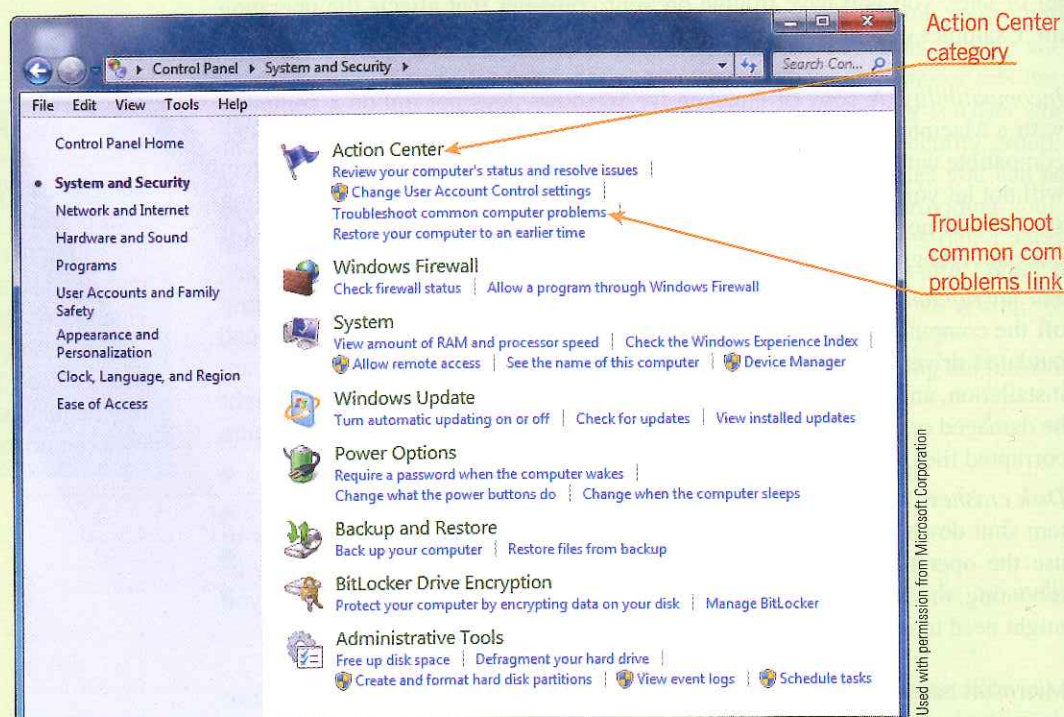


FIGURE 8-8
Control Panel window

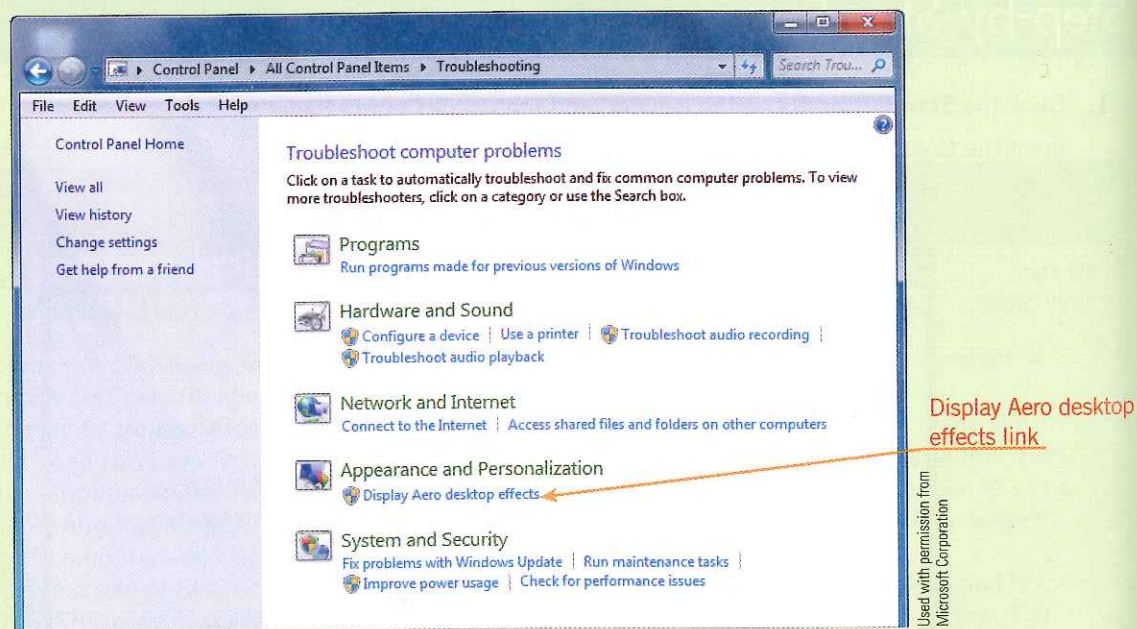
2. Click **System and Security** to open the System and Security window. See **Figure 8-9**.

FIGURE 8-9
System and Security window

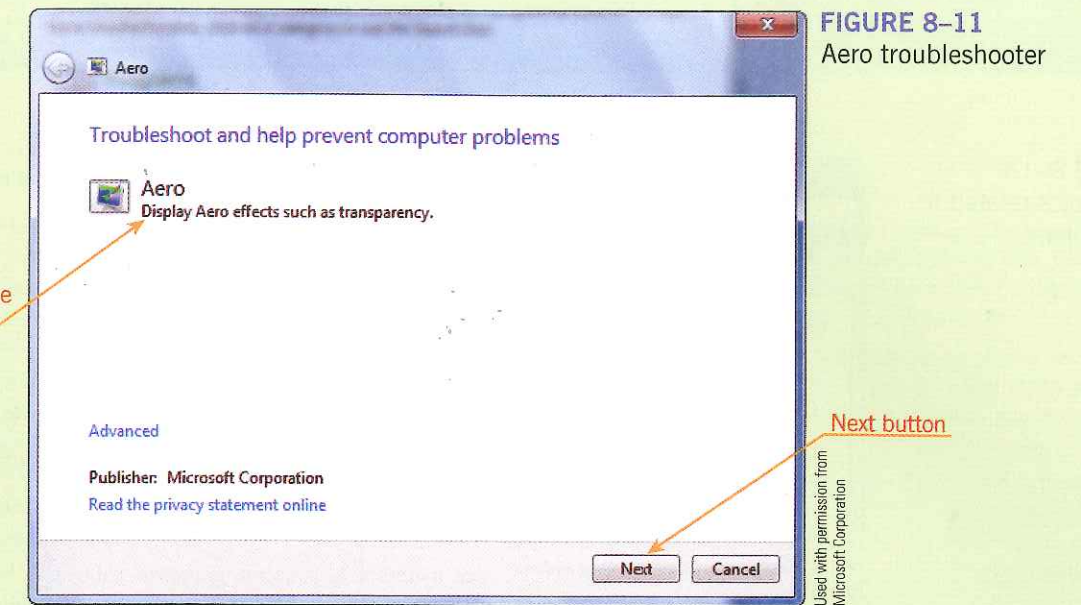


3. In the Action Center category, click **Troubleshoot common computer problems** to display the Troubleshooting window. See **Figure 8-10**.

FIGURE 8-10
Troubleshooting window



4. Click the **Display Aero desktop effects** link to start the troubleshooter, shown in **Figure 8-11**.



5. Click the **Next** button to have Windows detect problems on your computer.
6. If Windows does not detect any problems, a window opens explaining that Troubleshooting couldn't identify the problem. If Windows does detect a problem, click **Skip this fix**. Click **Explore additional options** to open the Additional Information window. See **Figure 8-12**.

Search Help and Support link

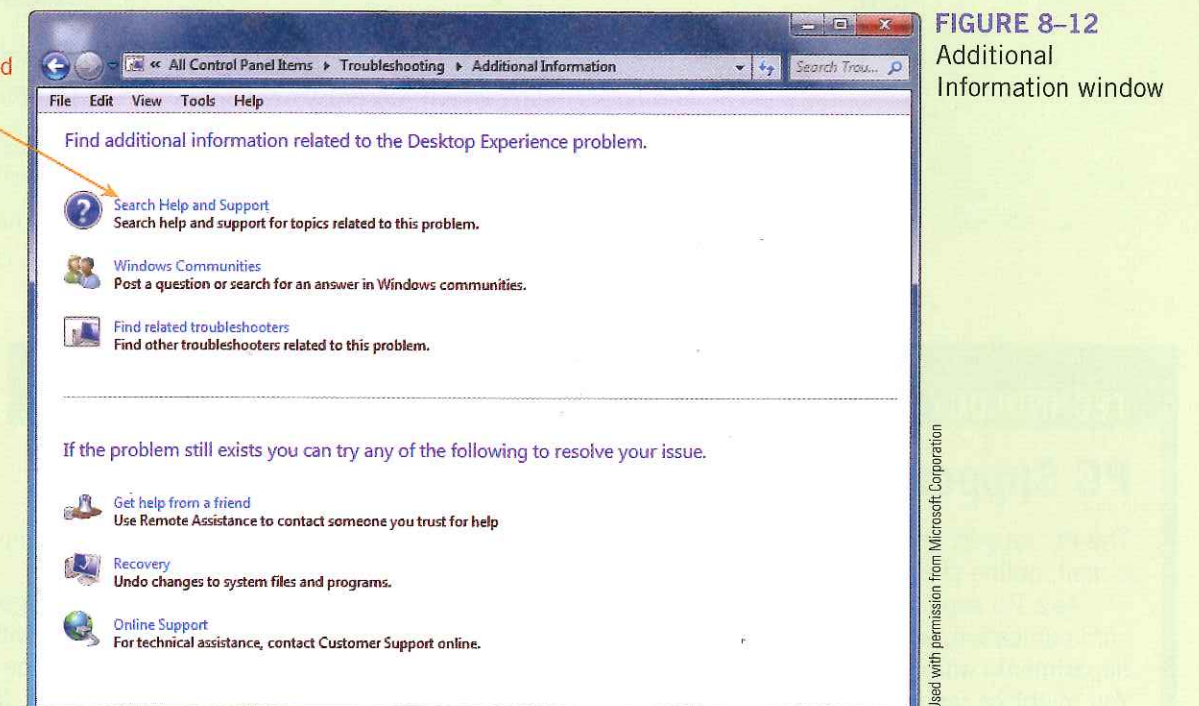
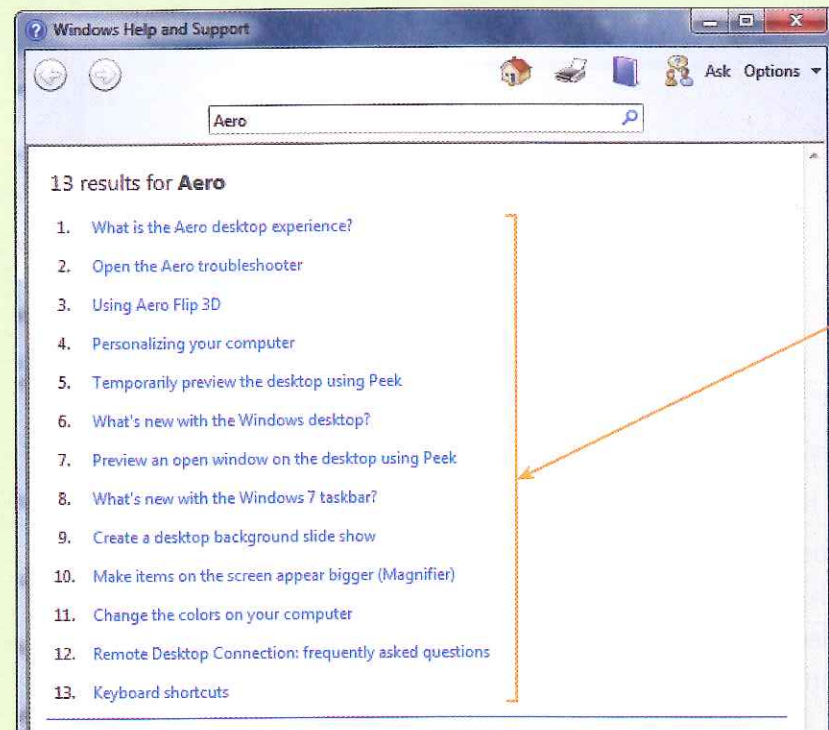


FIGURE 8-12
Additional Information window

7. Click the **Search Help and Support** link to open a Help window listing topics related to the problem. See **Figure 8-13**. The topics in your window might differ.

FIGURE 8-13
Help topics related to the problem



8. Select at least one Help topic to learn more about Aero. In a word-processing document, describe Aero and what you need to run it.
9. Submit your word-processing document to your instructor, and then close all open windows.

TECHNOLOGY CAREERS

PC Support Specialist

The PC support specialist provides support for application software and related hardware via telephone, e-mail, online chats, or site visits to computer users.

As a PC support specialist, you need to be knowledgeable about current software and have good oral communication, written communication, and organizational skills. You are required to interact with all departments within the company and with users who have varying skill levels ranging from novice to expert. You might be required to configure and maintain computer systems running Microsoft Windows, Macintosh OS X, or Linux. You might also test new technologies and techniques, develop and follow computer maintenance and backup procedures, manage upgrades and patches to the operating system and other software, and track computer problems and solutions.

A bachelor's degree is preferred for most of these jobs; however, extensive experience performing tasks such as hands-on hardware and software upgrades is also acceptable.

SUMMARY

In this lesson, you learned:

- An operating system is system software that enables computer hardware to communicate and operate with the application software. Without an operating system, a computer would not function because the operating system manages and coordinates the activities and resources of the computer.
- Operating systems provide a consistent way for applications to communicate with hardware without duplicating settings or learning details about the hardware. They also perform system and file maintenance tasks.
- Windows, Mac OS X, and Linux are common operating systems for personal computers.
- Handheld and embedded operating systems, also known as mobile operating systems, are similar in principle to operating systems such as Windows or Linux. These systems, however, are smaller and generally have fewer capabilities than desktop operating systems.
- To share files across operating system platforms, you can use solutions involving hardware, software, and data. For example, saving data or work files in the Rich Text Format means that most other operating systems can read the file.
- An operating system sets limitations to protect itself and the data on the computer. The operating system grants permission to you to perform some tasks but prevents you from performing others according to your user rights.
- The system administrator has unrestricted access to make system-wide changes to the computer, including those that affect other users. Without administrative rights, you cannot make changes such as system modifications, installing software, or changing network settings.
- Typical operating system problems include file incompatibility, file corruption, and disk crashes.

LESSON REVIEW

TRUE / FALSE

Circle T if the statement is true or F if the statement is false.

- T F 1. The system administrator generally has an administrator account.
- T F 2. Some file types are readable on more than one operating system.
- T F 3. Handheld computers do not contain an operating system.
- T F 4. An operating system manages resources for applications.
- T F 5. There are five basic types of software.

MULTIPLE CHOICE

Select the best response for the following statements.

- The way an operating system stores files on disk is called a _____ system.
 - file
 - recurring
 - backup
 - disk
- The Macintosh operating system is called _____.
 - Vista
 - UNIX
 - Windows
 - Mac OS X
- A(n) _____ card allows a computer to run a program that was designed for a different operating system.
 - emulation
 - DOS
 - replacement
 - Windows Phone
- The tasks an operating system allows you to perform are defined by your _____.
 - password
 - system administrator
 - user rights
 - user interface
- The _____ operating system was developed by a group of programmers for AT&T.
 - Apple Macintosh
 - IBM PC
 - UNIX
 - Windows

FILL IN THE BLANK

Complete the following sentences by writing the correct word or words in the blanks provided.

- Older _____ computers contain a processor manufactured by Motorola.
- Manufacturers of peripheral devices such as printers or monitors provide programs called _____ that enable the operating system to communicate with hardware devices.
- The UNIX operating system is considered a(n) _____, portable operating system.
- Both the IBM AIX system and Linux operating systems are based on _____.
- Handheld operating systems and embedded operating systems also are known as _____ operating systems.

PROJECTS

PROJECT 8-1

Windows Disk Cleanup utility helps you free space on your computer by deleting temporary and other unnecessary files from a drive. Complete the following:

- Use Windows Help and Support and research this utility program.
- In a word-processing document, explain the purpose of this utility and provide an example of how you would access the program and then use it.



PROJECT 8-2

Complete the following:

- Use your favorite search engine to research information about the BlackBerry Playbook.
- Assume that you are going to purchase the Playbook and research its features, applications, and accessories.
- Use your word-processing program to prepare a one-page overview of the Playbook features, applications, and accessories and describe how you could apply these features for personal and business use.



PROJECT 8-3

Windows 7 is the most recent operating system developed for the PC, and Mac OS X is the most recent operating system developed for the Macintosh computer. Complete the following:



- Use your favorite search engine to research information about one of the first operating systems developed for the PC. Also research one of the first operating systems developed for the Macintosh.
- Use a presentation program to prepare a slide show on the early operating systems for the PC and Macintosh. Be sure to name the operating systems, list the system requirements, list the important features, and provide an illustration such as a screen shot, if possible.

TEAMWORK PROJECT



You and two team members have been given the responsibility for purchasing new computers for your company's front office. One team member wants to purchase Apple Macintosh computers with the latest version of the Mac OS X; another wants to purchase PCs with the latest version of Windows; and the third wants to purchase PCs with the UNIX/Linux operating system. The manager has requested that your team do some research and present her with a report so that she can make the best choice. Your report should include the positives and negatives for each of these operating systems. Also include information on how these computers could interact if more than one type of computer was selected.

CRITICAL THINKING

Assume you are a member of a team and your objective is to come up with three ideas on how the Windows 7 operating system can be

improved. Provide an overview of your ideas and explain why they would make the operating system better and easier to use.

ONLINE DISCOVERY

Android is an open-source operating system for mobile devices such as smart phones. Google released Android under the Apache License, authored by the Apache Software Foundation. A software license sets the terms for using the software. For example, a software license usually defines how many copies of the software a user can make or install. Research the Apache License on at least two Web sites and then answer the following questions:

- Is the Apache License free?
- Does the Apache License let users modify the Android software?

- In what programming language was the Android software developed?
- What relationship does the Apache License have with the GNU operating system?
- Provide a brief overview of the information contained on the Web sites you researched. Include the Web site addresses where you located the information.

JOB SKILLS

The Technology Careers sidebar in this lesson describes the job of a PC support specialist. Working as a PC support specialist is a good way to start a career in the computer field. However, this position requires a challenging blend of skills to be successful and earn promotions. As a group or on your own, list the types of skills needed

to be an excellent PC support specialist. Organize the skills into categories such as technical knowledge and communication skills. Which are the most important skills for this job? In which areas are your skills the strongest? Where do you need to improve? What parts of this job do you find attractive and why?