14th edition

Understanding Computers Today and Tomorrow Introductory

Deborah Morley
Charles S. Parker

International Edition

COURSE TECHNOLOGY
CENGAGE Learning

Understanding Computers: Today and Tomorrow, 14th International Edition
Deborah Morley and Charles S. Parker

Vice President of Publishing: David Garza
Executive Editor: Marie Lee
Associate Acquisitions Editor: Amanda Lyons
Product Manager: Leigh Heffron
Associate Product Manager: Julia Leroux-Lindsey
Associate Product Manager: Brianna Hawes
Editorial Assistant: Jacqueline Lacaire
Marketing Manager: Jennifer Stiles
Photo Research: Abigail Reip
Development Editor: Pam Conrad
Content Project Manager: Jennifer Feltri-George
Print Buyer: Fola Orekoya
Proofreader: Karen Annett
Indexer: Alexandra Nickerson
Composition: Integra Software Services Pvt. Ltd.
Text Designer: Marissa Falco
Cover Designer: GEX Publishing Services
Cover Image Credit: GEX Publishing Services

Library of Congress Control Number: 2011944156

International Edition:

Student Edition ISBN 13: 978-1-133-19003-5

Student Edition ISBN 10: 1-133-19003-0

Cengage Learning International Offices

Asia
www.cengageasia.com
tel: (65) 6410 1200

Australia/New Zealand
www.cengage.com.au
tel: (61) 3 9685 4111

Brazil
www.cengage.com.br
tel: (55) 11 3665 9900

India
www.cengage.co.in
tel: (91) 11 4364 1111

Latin America
www.cengage.com.mx
tel: (52) 55 1500 6000

UK/Europe/Middle East/Africa
www.cengage.co.uk
tel: (44) 0 1264 332 424

Represented in Canada by
Nelson Education, Ltd.
tel: (416) 752 9100/(800) 668 0671
www.nelson.com

Cengage Learning is a leading provider of customized learning solutions with office locations around the globe, including Singapore, the United Kingdom, Australia, Mexico, Brazil, and Japan. Locate your local office at: **www.cengage.com/global**

For product information: **www.cengage.com/international**
Visit your local office: **www.cengage.com/global**
Visit our corporate website: **www.cengage.com**

Printed in China
1 2 3 4 5 6 7 18 17 16 15 14 13 12

chapter 1

An Introduction to Computers

After completing this chapter, you will be able to do the following:

1. Explain why it is essential to learn about computers today and discuss several ways computers are integrated into our business and personal lives.
2. Define a computer and describe its primary operations.
3. List some important milestones in computer evolution.
4. Identify the major parts of a personal computer, including input, processing, output, storage, and communications hardware.
5. Define software and understand how it is used to instruct the computer what to do.
6. List the six basic types of computers, giving at least one example of each type of computer and stating what that computer might be used for.
7. Explain what a network, the Internet, and the World Wide Web are, as well as how computers, people, and Web pages are identified on the Internet.
8. Describe how to access a Web page and navigate through a Web site.
9. Discuss the societal impact of computers, including some benefits and risks related to their prominence in our society.

outline

INT

OVERVIEW

Computers and other forms of technology impact our daily lives in a multitude of ways. We encounter computers in stores, restaurants, and other retail establishments. We use computers and the Internet regularly to obtain information, experience online entertainment, buy products and services, and communicate with others. Many of us carry a mobile phone or other mobile device with us at all times so we can remain in touch with others on a continual basis and can access Internet information as we need it. We also use these devices to pay for purchases, play online games with others, watch TV and movies, and much, much more.

Businesses also use computers extensively, such as to maintain employee and customer records, manage inventories, maintain online stores and other Web sites, process sales, control robots and other machines in factories, and provide business executives with the up-to-date information they need to make decisions. The government uses computers to support our nation's defense systems, for space exploration, for storing and organizing vital information about citizens, for law enforcement and military purposes, and other important tasks. In short, computers and computing technology are used in an endless number of ways.

Understanding Computers: Today and Tomorrow is a guide to computers and related technology and how they are being used in the world today. It will provide you with a comprehensive introduction to computer concepts and terminology and give you a solid foundation for any future courses you may take that are related to computers or their use in the world today. It will also provide you with the basic knowledge you need to understand and use computers in school, on the job, and in your personal life, as well as give you an overview of the various societal issues related to technology, such as security and privacy issues, ethical considerations, and environmental concerns.

Chapter 1 is designed to help you understand what computers are, how they work, and how people use them. It introduces the important terms and concepts that you will encounter throughout this text and in discussions about computers with others, as well as includes an overview of the history of computers. It also takes a brief look at how to use a computer to perform basic tasks and to access resources on the Internet and the World Wide Web, in order to provide you with the knowledge, skills, and tools you need to complete the online projects and activities that accompany this textbook. The chapter closes with an overview of the societal impact of computers. ■

TIP

Most of the computer concepts introduced in this chapter are discussed in more detail in subsequent chapters of this text.

PODCAST

Go to the **UC14 CourseMate** to download or listen to the "Expert Insight on Personal Computers" podcast.

COMPUTERS IN YOUR LIFE

Computers today are used in virtually every aspect of most individuals' lives—at home, at school, at work, and while on the go. The next few sections provide an overview of the importance of computers and some of the most common computer-related activities that individuals may encounter every day.

Why Learn About Computers?

Fifty years ago, computers were used primarily by researchers and scientists. Today, computers are an integral part of our lives. Experts call this trend *pervasive computing*, in which few aspects of daily life remain untouched by computers and computing technology. With pervasive computing—also referred to as *ubiquitous computing*—computers are

found virtually everywhere and computing technology is integrated into an ever-increasing number of devices to give those devices additional functionality, such as enabling them to communicate with other devices on an ongoing basis. Because of the prominence of computers in our society, it is important to understand what a computer is, a little about how a computer works, and the implications of living in a computer-oriented society.

Prior to about 1980, computers were large and expensive, and few people had access to them. Most computers used in organizations were equipped to do little more than carry out high-volume processing tasks, such as issuing bills and keeping track of product inventories. The average person did not need to know how to use a computer for his or her job, and it was uncommon to have a computer at home. Furthermore, the use of computers generally required a lot of technical knowledge and the use of the *Internet* was reserved primarily for researchers and educational institutions. Because there were few good reasons or opportunities for learning how to use computers, the average person was unfamiliar with them.

Beginning in the early 1980s, things began to change. *Microcomputers*—inexpensive *personal computers* that you will read about later in this chapter—were invented and computer use increased dramatically. The creation of the *World Wide Web* (*WWW*) in the late 1980s and the graphical *Web browser* in the early 1990s brought personal computing to a whole new level and began the trend of individuals buying and using computers for personal use. Today, more than 80% of all U.S. households include a personal computer, and most individuals use some type of computer on the job. Whether you become a teacher, attorney, doctor, engineer, restaurant manager, salesperson, professional athlete, musician, executive, or skilled tradesperson, you will likely use a computer to obtain and evaluate information, to facilitate necessary on-the-job tasks, and to communicate with others. Today's computers are very useful tools for these purposes; they are also taking on new roles in our society, such as delivering entertainment on demand. In fact, computers and the traditional communication and entertainment devices that we use every day—such as telephones, televisions, gaming devices, and home entertainment systems—are *converging* into single units with multiple capabilities. For instance, you can check your *e-mail* (electronic messages), watch videos, and view other Internet content on your living room TV; you can make telephone calls via your personal computer; and you can view Internet content and watch TV on your *mobile phone* or other *mobile device* (see Figure 1-1). As a result of this *convergence* trend, the computer is no longer an isolated productivity tool; instead, it is an integral part of our daily lives.

Just as you can learn to drive a car without knowing much about car engines, you can learn to use a computer without understanding the technical details of how a computer works. However, a little knowledge gives you a big advantage. Knowing something about cars can help you make wise purchasing decisions and save money on repairs. Likewise, knowing something about computers can help you buy the right one for your needs, get the most efficient use out of it, be able to properly *upgrade* it as your needs change, and have a much higher level of comfort and confidence along the way. Therefore, basic **computer literacy**—knowing about and understanding computers and their uses—is an essential skill today for everyone.

TIP

A growing trend in K-12 schools is *1-to-1 computing*—a typically personalized learning experience where each student has his or her computer to use.

ONLINE VIDEO

Go to the Chapter 1 page of the **UC14 CourseMate** to watch the "What Is Google TV?" video clip.

FIGURE 1-1
Convergence.
Many devices today include computing or Internet capabilities.

Courtesy of Sony Electronics, Inc.

TELEVISIONS
Can be used to access Web pages, e-mail, online videos, and other Internet content, in addition to viewing TV content.

Courtesy of Nokia

MOBILE PHONES
Can be used to access Internet content, play music and games, take photos, watch TV shows, and more, in addition to making phone calls.

>**Computer literacy.** The knowledge and understanding of basic computer fundamentals.

Computers in the Home

Home computing has increased dramatically over the last few years as computers and Internet access have become less expensive and as an increasing number of online consumer activities have become available. Use of the Internet at home to look up information, exchange e-mail, shop, watch TV and videos, download music and movies, research products, pay bills and manage bank accounts, check news and weather, store and organize *digital photos*, play games, make vacation plans, and so forth is now the norm for many individuals (see Figure 1-2). Many individuals also use a computer at home for work-related tasks, such as to review work-related documents or check work e-mail from home.

As the Internet, wireless technology, and devices such as computers, televisions, *digital video recorders* (*DVRs*), and *gaming consoles* continue to converge, the computer is also becoming a central part of home entertainment. *Wireless networking* allows the use of computers in virtually any location and both online and offline content to be sent wirelessly from one device to another. Telephone calls can be made over your Internet connection, and your TV can display Internet content.

Computing technologies also make it possible to have *smart appliances*—traditional appliances (such as refrigerators or ovens) with some type of built-in computer or communications technology that allows them to be controlled by the user via a telephone or the Internet, to access and display Internet information, or to perform other computer-related functions. *Smart homes*—homes in which household tasks (such as watering the lawn, turning the air conditioning on or off, making coffee, monitoring the security of the home and grounds, and managing home entertainment content) are controlled by a main computer in the home or by the homeowner remotely via a mobile phone—have arrived, and they are expected to be the norm in less than a decade. Some believe that one primary focus of smart appliances and smart homes will be energy conservation—for instance, the ability to perform tasks (such as running the dishwasher and watering the lawn) during nonpeak energy periods and to potentially transfer waste heat from one appliance (such as an oven) to another appliance (such as a dishwasher) as needed.

Goodluz/Shutterstock.com

REFERENCE AND COMMUNICATIONS
Many individuals today have access to the Internet at home; retrieving information, obtaining news, viewing recipes, shopping online, and exchanging e-mail are popular home computer activities.

micro10x/Shutterstock.com

PRODUCTIVITY
Home computers are frequently used for editing and managing digital photos and home videos, creating and editing work-related documents, paying bills, and other productivity tasks.

Computers in Education

Today's youth can definitely be called the *computing generation*. From *handheld gaming devices* to mobile phones to computers at school and home, most children and teens today have been exposed to computers and related technology all their lives. Although the amount of computer use varies from school to school and from grade level to grade level, most students today have access to computers at school—some schools have completely integrated computers into the curriculum, such as by adopting *e-book* (electronic) textbooks that run on school-owned portable computers. Many schools (particularly college campuses) today also have *wireless hotspots* that allow students to connect their personal computers or mobile devices wirelessly to the Internet from anywhere on campus. Today, students at all levels are typically required to use a computer to some extent as part of their normal coursework—such as for preparing papers, practicing skills, doing Internet research, accessing Internet content (for instance, class *Web pages* or their campus *YouTube* channel), or delivering presentations—and some colleges require a computer for enrollment. For a look at how mobile phones are being used as a teaching tool at colleges today, see the Technology and You box.

Computers are also used to facilitate *distance learning*—an alternative to traditional classroom learning in which students participate, typically at their own pace, from their current location (via their computers and Internet connections) instead of

Courtesy of Microsoft Corporation

ENTERTAINMENT
Home computers and gaming consoles are becoming a central hub for entertainment, such as the delivery of photos, videos, music, games, TV shows, instant messages, and social networking updates.

FIGURE 1-2
Computer use at home.

COMPUTER LABS AND CLASSROOMS
Many schools today have computers and Internet access available in the classroom and/or a computer lab for student use.

Dmitriy Shironosov/Shutterstock.com

CAMPUS WIRELESS HOTSPOTS
Many college students can access the Internet from anywhere on campus to do research, check e-mail, and more, via a campus hotspot.

Jenkedco/Shutterstock.com

Denver Makle, 7th Army JMTC

DISTANCE LEARNING
With distance learning, students—such as these U.S. Army soldiers—can take classes from home or wherever they happen to be at the moment.

FIGURE 1-3
Computer use in education.

physically going to class. Consequently, distance learning gives students greater flexibility to schedule class time around their personal, family, and work commitments, as well as allows individuals located in very rural areas or stationed at military posts overseas to take courses when they are not able to attend classes physically. Some examples of computer use in education are shown in Figure 1-3.

© iStockphoto.com/STEVECOLEccs

DECISION MAKING
Many individuals today use a computer to help them make on-the-job decisions.

Courtesy of Motion Computing

PRODUCTIVITY
Many individuals today use a computer to perform on-the-job tasks efficiently and accurately.

Goodluz/Shutterstock.com

OFF-SITE COMMUNICATIONS
Many individuals use portable computers or mobile devices to record data, access data, or communicate with others when they are out of the office.

Courtesy of Ingersoll Rand

AUTHENTICATION
Many individuals are required to use authentication systems to punch in and out of work, access facilities, or log on to company computers.

FIGURE 1-4
Computer use on the job.

Computers on the Job

Although computers have been used on the job for years, their role is continually evolving. Computers were originally used as research tools for computer experts and scientists and then as productivity tools for office workers. Today, computers are used by all types of employees in all types of businesses—including corporate executives, retail store clerks, traveling sales professionals, artists and musicians, engineers, police officers, insurance adjusters, delivery workers, doctors and nurses, auto mechanics and repair personnel, and professional athletes. In essence, the computer has become a universal tool for on-the-job decision making, productivity, and communications (see Figure 1-4). Computers are also used extensively for access control at many businesses and organizations, such as *authentication systems* that allow only authorized individuals to enter an office building, punch in or out of work, or access the company network via an access card or a fingerprint or hand scan, as shown in Figure 1-4 and discussed in detail in Chapter 9. In addition to jobs that require the use of computers by employees, many new jobs have been created simply because computers

TECHNOLOGY AND YOU

M-Learning on Campus

While mobile phones have been banned from many classrooms in past years, the tide is turning. Despite concerns about cheating and distractions, many educators are now viewing mobile phones as a tool to enhance learning. One such school is Abilene Christian University (ACU) in Texas where all undergraduates receive either an *iPhone* or *iPod Touch.* The devices are being used to facilitate *m-learning* (*mobile learning*) by providing the means for students to access class schedules, podcasts, flashcards, Google Apps, campus directories, news, and other learning materials at any time, from any location. The devices are also used to facilitate real-time class polls, live assessments, and other in-class activities. These in-class activities can provide both instructors and students with immediate feedback, as well as keep students engaged and interested in the content being presented and discussed in class. ACU has a special mobile learning Web site (see the accompanying figure) to help students access available resources, which are expected to grow as the program evolves.

While notebook and tablet computers are also often used for m-learning activities on college campuses today, the time for mobile phone-based learning may have arrived. ACU considered notebook computers as their m-learning platform, but determined that the larger screens created a barrier between the teacher and the students and so selected the mobile phone as its m-learning platform instead. With the vast majority of college students already owning a mobile phone, and with Web-enabled mobile phones becoming the norm, m-learning could be the next logical step for education.

Courtesy of Abilene Christian University

exist, such as jobs in electronics manufacturing, online retailing, Internet applications, and technology-related computer support.

Computers are also used extensively by military personnel for communications and navigational purposes, as well as to control missiles and other weapons, identify terrorists and other potential enemies, and perform other necessary national security tasks. To update their computer skills, many employees in all lines of work periodically take computer training classes or enroll in computer certification programs.

FURTHER EXPLORATION Go

Go to the Chapter 1 page of the **UC14 CourseMate** for links to information about computer certification programs.

Computers on the Go

In addition to using computers in the home, at school, and on the job, most people encounter and use all types of computers in other aspects of day-to-day life. For example, it is common for consumers to use *consumer kiosks* (small self-service computer-based stations that provide information or other services to the public, including those used for ATM transactions, bridal registries, ticketing systems, and more), *point-of-sale* (*POS*) *systems* (such as

HASLOO/Shutterstock.com

PORTABLE COMPUTERS
Many people today carry a portable computer or mobile device with them at all times or when they travel in order to remain in touch with others and to access Internet resources.

Courtesy of RedBox

CONSUMER KIOSKS
Electronic kiosks are widely available to view conference or gift registry information, print photographs, order products or services, and more.

Courtesy of Visa

MOBILE PAYMENT SYSTEMS
Allow individuals to pay for purchases using a mobile phone or other device.

Courtesy of Ingersoll Rand

CONSUMER AUTHENTICATION SYSTEMS
Allow only authorized members, such as theme park annual pass holders as shown here, access to facilities.

FIGURE 1-5
Computer use while on the go.

those found at most retail stores to check customers out), and *self-checkout systems* (which allow retail store customers to scan their purchases and pay for them without a salesclerk) while in retail stores and other public locations. Individuals may also need to use a computer-based consumer authentication system to gain access to a local health club, theme park, or other membership-based facility (see Figure 1-5).

In addition, many individuals carry a *portable computer* or *mobile device* with them on a regular basis to remain electronically in touch with others and to access information (such as stock quotes, driving directions, airline flight updates, movie times, news headlines, and more) as needed while on the go. These portable devices are also commonly used to watch TV, download and listen to music, access *Facebook* pages and other *social networking* content, and perform other mobile entertainment options, as well as to pay for products and services (refer again to Figure 1-5). *GPS* (*global positioning system*) capabilities are also frequently built into mobile phones, cars, and other devices to provide individuals with driving directions and other navigational aids while traveling or hiking.

WHAT IS A COMPUTER AND WHAT DOES IT DO?

A **computer** can be defined as a programmable, electronic device that accepts data, performs operations on that data, presents the results, and stores the data or results as needed. The fact that a computer is *programmable* means that a computer will do whatever the instructions—called the *program*—tell it to do. The programs used with a computer determine the tasks the computer is able to perform.

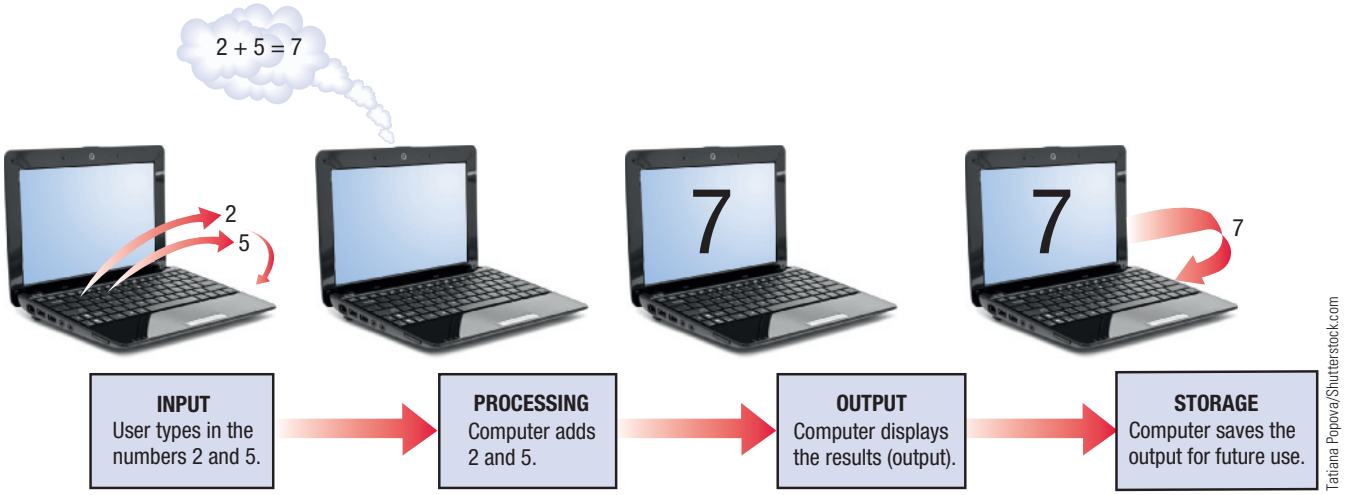
The four operations described in this definition are more technically referred to as *input*, *processing*, *output*, and *storage*. These four primary operations of a computer can be defined as follows:

- **Input**—entering data into the computer.
- **Processing**—performing operations on the data.

VIDEO PODCAST

Go to the Chapter 1 page of the **UC14 CourseMate** to download or listen to the "How To: Keep Your Laptop from Being Stolen" video podcast.

>**Computer.** A programmable, electronic device that accepts data input, performs processing operations on that data, and outputs and stores the results. >**Input.** The process of entering data into a computer; can also refer to the data itself. >**Processing.** Performing operations on data that has been input into a computer to convert that input to output.



Tatiana Popova/Shutterstock.com

FIGURE 1-6
The information processing cycle.

- **Output**—presenting the results.
- **Storage**—saving data, programs, or output for future use.

For example, assume that you have a computer that has been programmed to add two numbers. As shown in Figure 1-6, input occurs when data (in this example, the numbers 2 and 5) is entered into the computer, processing takes place when the computer program adds those two numbers, and output happens when the sum of 7 is displayed on the computer screen. The storage operation occurs any time the data, a change to a program, or the output is saved for future use.

For an additional example, look at a supermarket *barcode reader* to see how it fits this definition of a computer. First, the grocery item being purchased is passed over the barcode reader—input. Next, the description and price of the item are looked up—processing. Then, the item description and price are displayed on the cash register and printed on the receipt—output. Finally, the inventory, ordering, and sales records are updated—storage.

This progression of input, processing, output, and storage is sometimes referred to as the *IPOS cycle* or the *information processing cycle.* In addition to these four primary computer operations, today's computers also typically perform **communications** functions, such as sending or retrieving data via the Internet, accessing information located in a shared company database, or exchanging data or e-mail messages with others. Therefore, communications—technically an input or output operation, depending on which direction the information is going—is often considered the fifth primary computer operation.

Data vs. Information

As just discussed, a user inputs **data** into a computer, and then the computer processes it. Almost any kind of fact or set of facts can become computer data, such as the words in a letter to a friend, the numbers in a monthly budget, the images in a photograph, the notes in a song, or the facts stored in an employee record. When data is processed into a meaningful form, it becomes **information**.

>**Output.** The process of presenting the results of processing; can also refer to the results themselves. >**Storage.** The operation of saving data, programs, or output for future use. >**Communications.** The transmission of data from one device to another. >**Data.** Raw, unorganized facts. >**Information.** Data that has been processed into a meaningful form.

ASK THE EXPERT

Paul Baker, Senior Principal Software Engineer, Walt Disney Imagineering

Would a college student graduating with a computer degree qualify for a job at Walt Disney Imagineering?

Computers play a large role at Walt Disney Imagineering, so a degree based on computers could be a great match if the course load includes science, math, and engineering courses. Every Disney ride is run by a computer and in many cases by several computers. In fact, some of the rides have computers on each and every vehicle. Unlike typical desktop computers, these "ride computers" are specialized for performing specific, distinct tasks and interfacing to the electronic devices that control and monitor mechanical equipment. Consequently, the algorithms used to run these rides—and ensure they operate in a dependable, predictable manner—are heavily based on engineering and physics. Two types of computer-related jobs that exist at Imagineering are Ride Engineering and Pre-Visualization—both require computer skills, as well as strong math, science, and engineering skills.

Information is frequently generated to answer some type of question, such as how many of a restaurant's employees work less than 20 hours per week, how many seats are available on a particular flight from Los Angeles to San Francisco, or what is Hank Aaron's lifetime home run total. Of course, you don't need a computer system to process data into information; for example, anyone can go through time cards or employee files and make a list of people who work a certain number of hours. If this work is done by hand, however, it could take a lot of time, especially for a company with a large number of employees. Computers, however, can perform such tasks almost instantly, with accurate results. *Information processing* (the conversion of data into information) is a vital activity today for all computer users, as well as for businesses and other organizations.

Computers Then and Now

The basic ideas of computing and calculating are very old, going back thousands of years. However, the computer in the form in which it is recognized today is a fairly recent invention. In fact, personal computers have only been around since the late 1970s. The history of computers is often referred to in terms of *generations*, with each new generation characterized by a major technological development. The next sections summarize some early calculating devices and the different computer generations.

Precomputers and Early Computers (before approximately 1946)

Based on archeological finds, such as notched bones, knotted twine, and hieroglyphics, experts have concluded that ancient civilizations had the ability to count and compute. The *abacus* is considered by many to be the earliest recorded calculating device; it was used primarily as an aid for basic arithmetic calculations. Other early computing devices include the *slide rule*, the *mechanical calculator*, and Dr. Herman Hollerith's *Punch Card Tabulating Machine and Sorter.* This latter device (see Figure 1-7) was the first electromechanical machine that could read *punch cards*—special cards with holes punched in them to represent data. Hollerith's machine was used to process the 1890 U.S. Census data and it was able to complete the task in two and one half years, instead of the decade it usually took to process the data manually. Consequently, this is considered to be the first successful case of an information processing system replacing a paper-and-pen-based system. Hollerith's company eventually became *International Business Machines* (*IBM*).

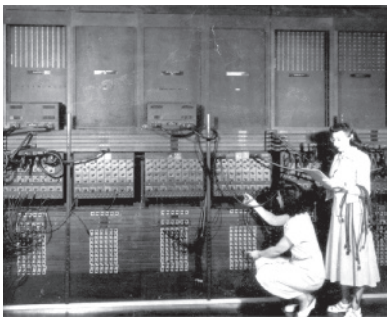
First-Generation Computers (approximately 1946—1957)

The first computers were enormous, often taking up entire rooms. They were powered by thousands of *vacuum tubes*—glass tubes that look similar to large, cylindrical light bulbs—which needed replacing constantly, required a great deal of electricity, and generated a lot of heat. *First-generation computers* could solve only one problem at a time since they needed to be physically rewired with cables to be reprogrammed (see Figure 1-7), which typically took several days (sometimes even weeks) to complete and several more days

to check before the computer could be used. Usually paper punch cards and paper tape were used for input, and output was printed on paper.

Two of the most significant examples of first-generation computers were *ENIAC* and *UNIVAC*. ENIAC, shown in Figure 1-7, was the world's first large-scale, general-purpose computer. Although it was not completed until 1946, ENIAC was developed during World War II to compute artillery-firing tables for the U.S. Army. Instead of the 40 hours required for a person to compute the optimal settings for a single weapon under a single set of conditions using manual calculations, ENIAC could complete the same calculations in less than two minutes. UNIVAC, released in 1951, was initially built for the U.S. Census Bureau and was used to analyze votes in the 1952 U.S. presidential election. Interestingly, its correct prediction of an Eisenhower victory only 45 minutes after the polls closed was not publicly aired because the results were not trusted. However, UNIVAC became the first computer to be mass produced for general commercial use.

PRECOMPUTERS AND EARLY COMPUTERS
Dr. Herman Hollerith's Punch Card Tabulating Machine and Sorter is an example of an early computing device. It was used to process the 1890 U.S. Census data.



FIRST-GENERATION COMPUTERS
First-generation computers, such as ENIAC shown here, were large and bulky, used vacuum tubes, and had to be physically wired and reset to run programs.

SECOND-GENERATION COMPUTERS
Second-generation computers, such as the IBM 1401 mainframe shown here, used transistors instead of vacuum tubes so they were smaller, faster, and more reliable than first-generation computers.

THIRD-GENERATION COMPUTERS
Third-generation computers used integrated circuits which allowed the introduction of smaller computers, such as the IBM System/360 mainframe shown here.

FOURTH-GENERATION COMPUTERS
Fourth-generation computers, such as the original IBM PC shown here, are based on microprocessors. Most of today's computers fall into this category.

Courtesy IBM Corporate Archives, Courtesy U.S. Army

Second-Generation Computers (approximately 1958–1963)

The second generation of computers began when the *transistor*—a small device made of *semiconductor* material that acts like a switch to open or close *electronic circuits*—started to replace the vacuum tube. Transistors allowed *second-generation computers* to be physically smaller, less expensive, more powerful, more energy-efficient, and more reliable than first-generation computers. Typically, programs and data were input on punch cards and *magnetic tape*, output was on punch cards and paper printouts, and magnetic tape was used for storage (see Figure 1-7). *Hard drives* and *programming languages* (such as *FORTRAN* and *COBOL*) were developed and implemented during this generation.

FIGURE 1-7
A brief look at computer generations.

Third-Generation Computers (approximately 1964–1970)

The replacement of the transistor with *integrated circuits* (*ICs*) marked the beginning of the third generation of computers. Integrated circuits incorporate many transistors and electronic circuits on a single tiny silicon *chip*, allowing *third-generation computers* to be even smaller and more reliable than computers in the earlier computer generations. Instead of punch cards and paper printouts, *keyboards* and *monitors* were introduced for input and output; hard drives were typically used for storage. An example of a widely used third-generation computer is shown in Figure 1-7.

TIP

For a more detailed timeline regarding the development of computers, see the "Computer History Timeline" located in the References and Resources Guide at the end of this book.

Fourth-Generation Computers (approximately 1971–present)

A technological breakthrough in the early 1970s made it possible to place an increasing number of transistors on a single chip. This led to the invention of the *microprocessor* in 1971, which ushered in the fourth generation of computers. In essence, a microprocessor contains the core processing capabilities of an entire computer on one single chip. The original *IBM PC* (see Figure 1-7) and *Apple Macintosh* computers, and most of today's modern computers, fall into this category. *Fourth-generation computers* typically use a keyboard and *mouse* for input, a monitor and *printer* for output, and *hard drives*, *flash memory media*, and *optical discs* for storage. This generation also witnessed the development of *computer networks*, *wireless technologies*, and the Internet.

FURTHER EXPLORATION

Go to the Chapter 1 page of the **UC14 CourseMate** for links to information about the history of computers.

Fifth-Generation Computers (now and the future)

Although some people believe that the fifth generation of computers has not yet begun, most think it is in its infancy stage. *Fifth-generation computers* have no precise classification because experts tend to disagree about the definition for this generation of computers. However, one common opinion is that fifth-generation computers will be based on *artificial intelligence*, allowing them to think, reason, and learn. Voice and touch are expected to be a primary means of input, and computers may be constructed differently than they are today, such as in the form of *optical computers* that process data using light instead of electrons, tiny computers that utilize *nanotechnology*, or as entire general-purpose computers built into desks, home appliances, and other everyday devices.

Hardware

The physical parts of a computer (the parts you can touch and discussed next) are called **hardware**. The instructions or programs used with a computer—called *software*—are discussed shortly. Hardware components can be *internal* (located inside the main box or *system unit* of the computer) or *external* (located outside the system unit and connected to the system unit via a wired or wireless connection). There are hardware devices associated with each of the five computer operations previously discussed (input, processing, output, storage, and communications), as summarized in Figure 1-8 and illustrated in Figure 1-9.

FIGURE 1-8
Common hardware listed by operation.

INPUT	PROCESSING
Keyboard	CPU
Mouse	**OUTPUT**
Microphone	Monitor/display screen
Scanner	Printer
Digital camera	Speakers
Digital pen/stylus	Headphones/headsets
Touch pad/touch screen	Data projector
Gaming controller	**STORAGE**
Fingerprint reader	Hard drive
COMMUNICATIONS	CD/DVD/Blu-ray disc
Modem	CD/DVD/Blu-ray drive
Network adapter	Flash memory card
Router	Flash memory card reader
	USB flash drive

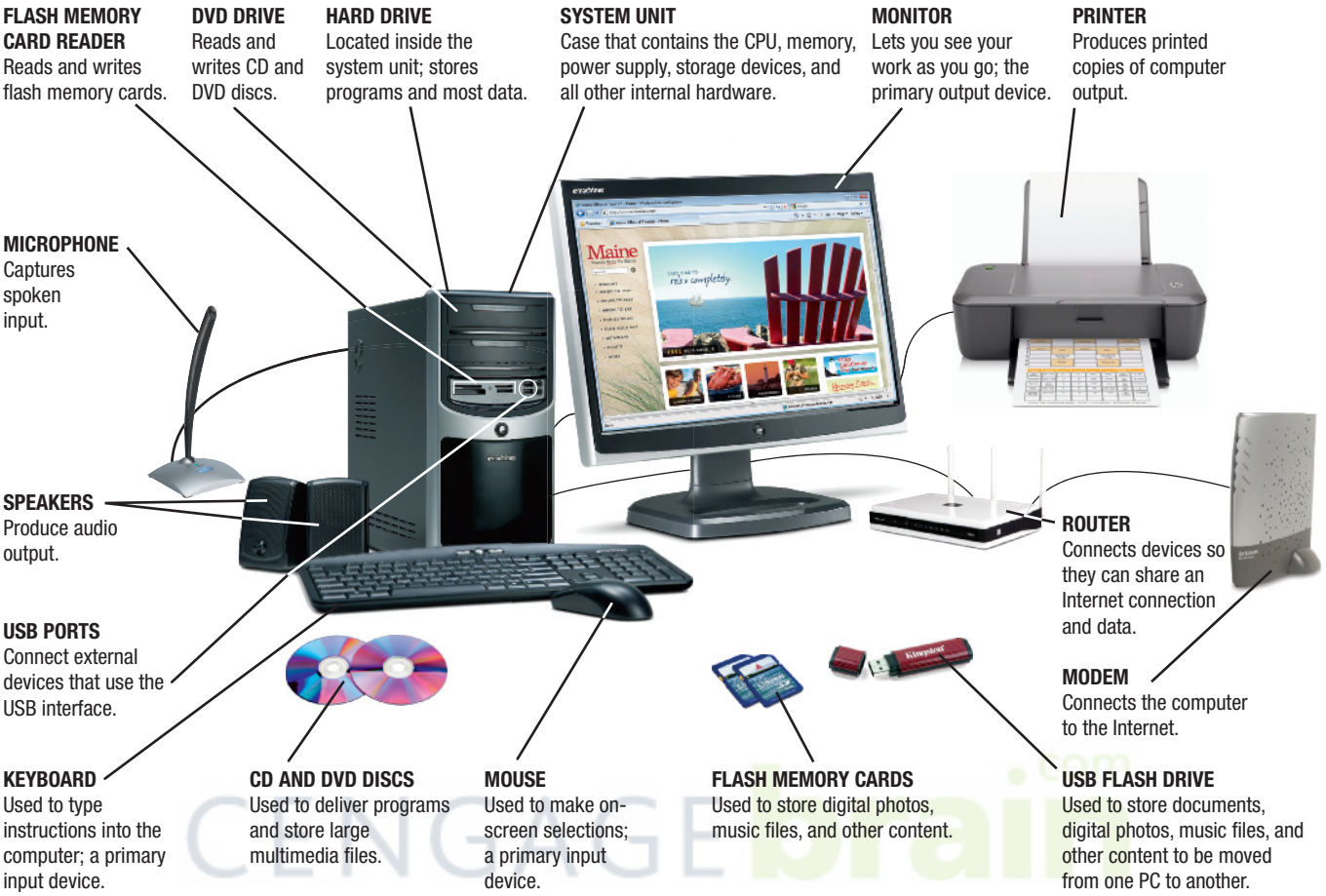
Input Devices

An *input device* is any piece of equipment that is used to input data into the computer. The input devices shown in Figure 1-9 are the *keyboard*, *mouse*, and *microphone*. Other common input devices include *scanners*, *digital cameras*, *digital pens* and *styluses*, *touch pads* and *touch screens*, *fingerprint readers*, and *gaming controllers*. Input devices are discussed in more detail in Chapter 4.

Processing Devices

The main *processing device* for a computer is the *central processing unit* (*CPU*). The CPU is located inside the system unit and performs the calculations and comparisons needed for processing;

>**Hardware.** The physical parts of a computer system, such as the keyboard, monitor, printer, and so forth.



Courtesy of Gateway, Inc., Courtesy, Hewlett-Packard Company; Courtesy of Logitech; Courtesy of D-Link Systems; Courtesy of Kingston Technology Company, Inc.; Nomad_Soul/Shutterstock.com

FIGURE 1-9
Typical computer hardware.

it also controls the computer's operations. For these reasons, the CPU is often considered the "brain" of the computer. Also involved in processing are various types of *memory* that are located inside the system unit and used to store data and instructions while the CPU is working with them. The CPU, memory, and processing are discussed in detail in Chapter 2.

Output Devices

An *output device* accepts processed data from the computer and presents the results to the user, most of the time on the display screen (*monitor*), on paper (via a *printer*), or through a *speaker.* Other common output devices include *headphones* and *headsets* (used to deliver audio output to a single user) and *data projectors* (used to project computer images onto a projection screen). Output devices are covered in more detail in Chapter 4.

Storage Devices

Storage devices (such as *CD/DVD drives* and *flash memory card readers*) are used to store data on or access data from *storage media* (such as *CD discs*, *DVD discs*, and *flash memory cards*). Some storage hardware (such as a *hard drive* or a *USB flash drive*) includes both a storage device and storage medium in a single piece of hardware. Storage devices are used to save data, program settings, or output for future use; they can be installed inside the computer, attached to the computer as an external device, or accessed remotely through a network or wireless connection. Storage is discussed in more detail in Chapter 3.

Communications Devices

Communications devices allow users to communicate electronically with others and to access remote information via the Internet or a home, school, or company computer network. Communications hardware includes *modems* (used to connect a computer to the Internet), *network adapters* (used to connect a computer to a computer network), and *routers* (used to create a small network so a variety of devices can share an Internet connection and data). A variety of modems and network adapters are available because there are different types of Internet and network connections—a modem used to connect to the Internet via a cable connection is shown in Figure 1-9. Communications hardware and computer networks are discussed in more detail in Chapter 7; connecting to the Internet is covered in Chapter 8.

TIP

Software downloaded to a mobile phone or other mobile device is typically called an *app*.

Software

The term **software** refers to the programs or instructions used to tell the computer hardware what to do. Software is traditionally purchased on a CD or DVD or is downloaded from the Internet; in either case, the software needs to be *installed* on a computer before it can be used. Software can also be run directly from the Internet (via Web pages) without being installed on your computer; this is referred to as *Web-based software*, *Software as a Service* (*SaaS*), and *cloud computing* (see the Trend box) and is discussed in more detail in Chapter 6.

Computers use two basic types of software: *system software* and *application software.* The differences between these types of software are discussed next.

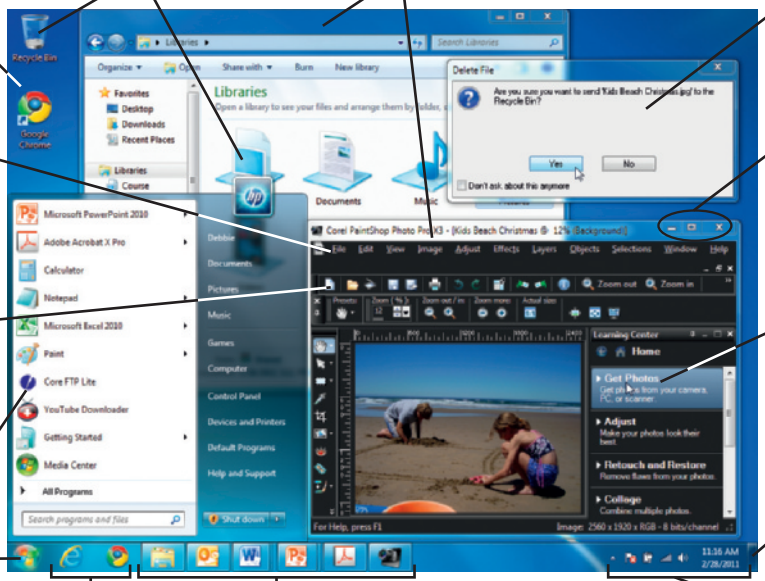
System Software

The programs that allow a computer to operate are collectively referred to as *system software.* The main system software is the **operating system**, which starts up the computer and controls its operation. Common operating system tasks include setting up new hardware, allowing users to run other software, and allowing users to manage the documents stored on their computers. Without an operating system, a computer cannot function. Common *desktop operating systems* designed for personal computers are *Windows*, *Mac OS*, and *Linux*; these and other operating systems (such as the *mobile operating systems* used with mobile phones and other mobile devices) are discussed in detail in Chapter 5.

To use a computer, first turn on the power to the computer by pressing the power button, and then the computer begins to **boot**. During the *boot process*, part of the computer's operating system is loaded into memory, the computer does a quick diagnostic of itself, and then it launches any programs—such as security software—designated to run each time the computer starts up. You may need to supply a password to *log on* to your computer or a computer network to finish the boot process.

Once a computer has booted, it is ready to be used and waits for input from the user. Most software today uses a variety of graphical objects (such as *icons* and *buttons*) that are selected with the mouse (or with a finger or stylus for a computer that supports touch or pen input) to tell the computer what to do. For instance, the **Windows desktop** (the basic workspace for computers running the Windows operating system; that is, the place where documents, folders, programs, and other objects are displayed when they are being used), along with some common graphical objects used in Windows and many other software programs, are shown in Figure 1-10.

>**Software.** The instructions, also called computer programs, that are used to tell a computer what it should do. >**Operating system.** The main component of system software that enables a computer to operate, manage its activities and the resources under its control, run application programs, and interface with the user. >**Boot.** To start up a computer. >**Windows desktop.** The background work area displayed on the screen for computers running Microsoft Windows.



Courtesy of Microsoft

Application Software

Application software (see Figure 1-11) consists of programs designed to allow people to perform specific tasks using a computer, such as creating letters, preparing budgets, managing inventory and customer databases, playing games, watching videos, listening to music, scheduling appointments, editing digital photographs, designing homes, viewing Web pages, burning DVDs, and exchanging e-mail. Application software is launched via the operating system (such as by using the *Windows Start menu* shown in Figure 1-10 for Windows computers) and is discussed in greater detail in Chapter 6.

There are also application programs that help users write their own programs in a form the computer can understand using a *programming language* like *BASIC*, *Visual Basic*, *COBOL*, *C++*, *Java*, or *Python.* Some languages are traditional programming languages for developing applications; others are designed for use with Web pages or multimedia programming. *Markup* and *scripting* languages (such as *HTML*, *XHTML*, and *JavaScript*) used to create Web pages are covered in Chapter 10; traditional programming languages are discussed in detail in Chapter 13.

FIGURE 1-10
The Windows desktop.

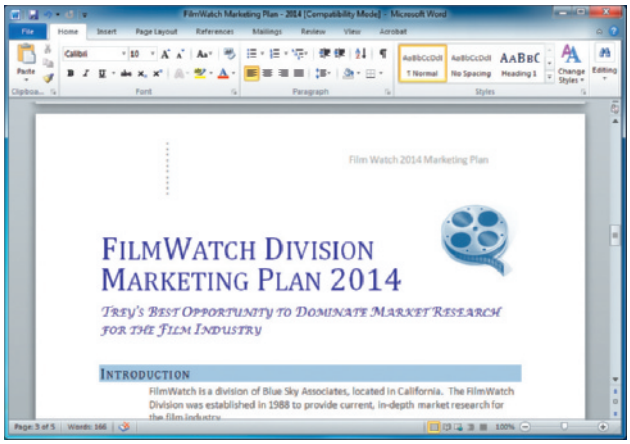
TIP

To launch a program on a Windows computer quickly, begin to type the name of the desired program in the Search box at the bottom of the Start menu and then click the link to the desired program when it is displayed (or press Enter when the proper program name is highlighted).

Computer Users and Professionals

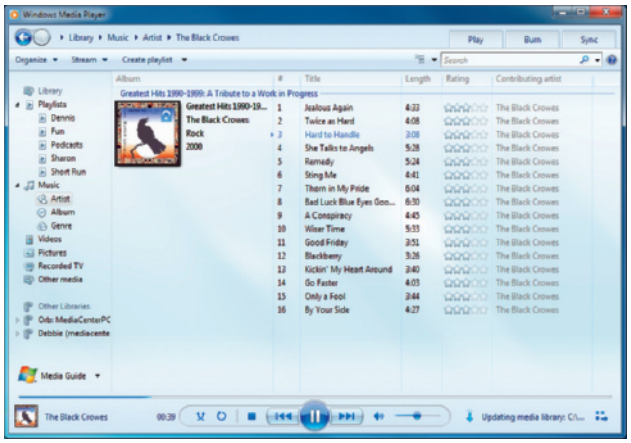
In addition to hardware, software, data, and *procedures* (the predetermined steps to be carried out in particular situations), a computer system includes people. *Computer users*, or *end users*, are the people who use computers to perform tasks or obtain information.

>**Application software.** Programs that enable users to perform specific tasks on a computer, such as writing letters or playing games.



Courtesy of Microsoft

WORD PROCESSING PROGRAMS
Allow users to create written documents, such as reports, letters, and memos.

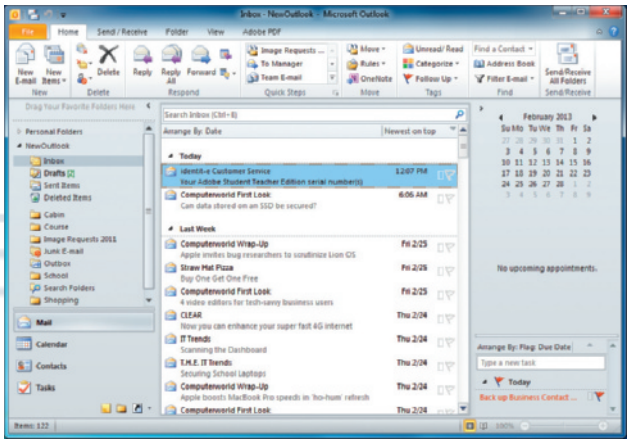


Courtesy of Microsoft

MULTIMEDIA PROGRAMS
Allow users to play music or videos and transfer content to CDs and DVDs.

Courtesy of Red Lobster

WEB BROWSERS
Allow users to view Web pages and other information located on the Internet.



Courtesy of Microsoft

E-MAIL PROGRAMS
Allow users to compose, send, receive, and manage electronic messages sent over the Internet or a private network.

FIGURE 1-11
Examples of application software.

Anyone who uses a computer is a computer user, including an accountant electronically preparing a client's taxes, an office worker using a word processing program to create a letter, a supervisor using a computer to check and see whether or not manufacturing workers have met the day's quotas, a parent e-mailing his or her child's teacher, a college student researching a topic online, a child playing a computer game, and a person shopping online.

Programmers, on the other hand, are computer professionals who write the programs that computers use. Other *computer professionals* include *systems analysts* (who design computer systems to be used within their companies as discussed in Chapter 12), *computer operations personnel* (who are responsible for the day-to-day computer operations at a company, such as maintaining systems or troubleshooting user-related problems), and *security specialists* (who are responsible for securing the company computers and networks against *hackers* and other intruders who are discussed in more detail in Chapter 9). Computer professionals are discussed in more detail in Chapter 12.

TREND

Cloud Computing

In general, the term *cloud computing* refers to computing in which tasks are performed by a "cloud" of servers, typically via the Internet. This type of network has been used for several years to create the supercomputer-level power needed for research and other power-hungry applications, but it was more typically referred to as *grid computing* in this context. Today, *cloud computing* typically refers to accessing Web-based applications and data using a personal computer, mobile phone, or any other Internet-enabled device (see the accompanying illustration). While many of today's cloud applications (such as Google Apps, Windows Live, Facebook, and YouTube) are consumer-oriented, other cloud applications (such as computing power or storage space available on demand, and online sales or service applications) are designed specifically for businesses. Businesses often use applications available in the *public cloud*; they also frequently create a *private cloud* just for data and applications belonging to their company.

The biggest advantages of cloud computing include the ability to access data from anywhere the user has access to an active Internet connection and, since data is stored online instead of on the device being used, the data is safe if the device is lost, stolen, or damaged. In addition, Web-based applications are often less expensive than installed software. Disadvantages of cloud computing include a possible reduction in performance of applications if they run more slowly via the cloud than they would run if installed locally, and the potentially high expense related to data transfer for companies and individuals using high-bandwidth applications. There are also security concerns about how safe the stored online data is from unauthorized access and data loss.

Despite the potential risks, many believe that cloud computing is the wave of the future. In fact, Google's new operating system (called *Chrome OS* and discussed more in Chapter 5) is designed specifically for cloud computing.

Courtesy of Motorola

COMPUTERS TO FIT EVERY NEED

The types of computers available today vary from the tiny computers embedded in consumer products, to the pocket-sized mobile devices that do a limited number of computing tasks, to the powerful and versatile *desktop* and *portable computers* found in homes and businesses, to the superpowerful computers used to control the country's defense systems. Computers are generally classified in one of six categories, based on size, capability, and price.

- *Embedded computers*—tiny computers embedded into products to perform specific functions or tasks for that product.
- *Mobile devices*—mobile phones, small tablets, and other small personal devices that contain built-in computing or Internet capabilities.
- *Personal computers*—fully functioning portable or desktop computers that are designed to be used by a single individual at a time.
- *Midrange servers*—computers that host data and programs available to a small group of users.
- *Mainframe computers*—powerful computers used to host a large amount of data and programs available to a wide group of users.
- *Supercomputers*—extremely powerful computers used for complex computations and processing.

ONLINE VIDEO

Go to the Chapter 1 page of the **UC14 CourseMate** to watch the "How Google Apps Work" video clip.

In practice, classifying a computer into one of these six categories is not always easy or straightforward. For example, some high-end personal computers today are as powerful as midrange servers, and some personal computers today are nearly as small as a mobile phone. In addition, technology changes too fast to have precisely defined categories. For instance, the new trend of small tablet devices (often called *mobile tablets*, *media tablets*, or just *tablets*) has blurred the distinction between personal computers and mobile devices. While these devices are closer in size to a small personal computer than a mobile phone, they are typically used primarily for viewing Web content and displaying multimedia content instead of general-purpose computing, and they usually run a mobile operating system. Consequently, while they resemble a small personal computer, they are more accurately described as a mobile device. However, more powerful tablet computers running a desktop operating system are still considered personal computers. Nevertheless, these six categories are commonly used today to refer to groups of computers designed for similar purposes.

FIGURE 1-12
Embedded computers. This car's embedded computers control numerous features, such as notifying the driver when a car enters his or her blind spot.

Courtesy Volvo Cars of North America

Embedded Computers

An **embedded computer** is a tiny computer embedded into a product designed to perform specific tasks or functions for that product. For example, computers are often embedded into household appliances (such as dishwashers, microwaves, ovens, coffeemakers, and so forth), as well as into other everyday objects (such as thermostats, answering machines, treadmills, sewing machines, DVD players, and televisions), to help those appliances and objects perform their designated tasks. Typically, cars also use many embedded computers to assist with diagnostics, to notify the user of important conditions (such as an underinflated tire or an oil filter that needs changing), to control the use of the airbag and other safety devices (such as cameras that alert a driver that a vehicle is in his or her blind spot—see Figure 1-12—or auto braking systems that engage when a front collision is imminent, as discussed in the Chapter 5 Inside the Industry box), to facilitate the car's navigational or entertainment systems, and to help the driver perform tasks. Embedded computers are designed for specific tasks and specific products and so cannot be used as general-purpose computers.

Mobile Devices

A **mobile device** is loosely defined as a very small (typically pocket-sized) device that has built-in computing or Internet capability. Mobile devices are often based on a mobile phone and can typically be used to make telephone calls, send *text messages* (short text-based messages), view Web pages, take digital photos, play games, download and play music, watch TV shows, and access calendars and other personal productivity features. Most (but not all) mobile phones today include computing and Internet capabilities; these phones (such as the one in Figure 1-13) are often referred to as **smartphones**. Handheld gaming devices (such as the *Nintendo 3DS*) and *portable digital media players* (such as the *iPod Touch*) that include Internet capabilities can also be referred to as mobile devices, though they have less overall capabilities than conventional mobile devices. As previously mentioned, small tablet devices (such as the one shown in Figure 1-13) designed for Web browsing, playing movies and other multimedia content, gaming, and similar activities are also typically considered mobile devices. Mobile devices are almost always powered by a rechargeable battery system.

TIP

The number of Internet-enabled mobile devices in use worldwide is expected to pass 1 billion by 2013, according to IDC.

>**Embedded computer.** A tiny computer embedded in a product and designed to perform specific tasks or functions for that product. >**Mobile device.** A very small communications device that has built-in computing or Internet capability. >**Smartphone.** A mobile device based on a mobile phone.

Today's mobile devices typically have small screens and some, but not all, have keyboards. Because of this, mobile devices are most appropriate for individuals wanting continual access to e-mail, timely Web content (such as breaking news, weather forecasts, driving directions, and updates from Web sites like Facebook), and music collections rather than for those individuals wanting general Web browsing and computing capabilities. This is beginning to change, however, as mobile devices continue to grow in capabilities, as wireless communications continue to become faster, and as mobile input options (such as voice and touch input, and mobile keyboards) continue to improve. For instance, some mobile devices can perform Internet searches and other tasks via voice commands (as discussed in Chapter 6), some can be used to pay for purchases while you are on the go (as discussed in Chapter 11), many can view virtually any Web content, and many can view and edit documents stored in a common format, such as *Microsoft Office* documents. For a look at how tech clothing can be used to organize your mobile devices, see the Inside the Industry box.

SMARTPHONES MOBILE TABLETS

Courtesy of Samsung

FIGURE 1-13
Mobile devices.

Personal Computers (PCs)

A **personal computer** (**PC**) or **microcomputer** is a small computer designed to be used by one person at a time. Personal computers are widely used by individuals and businesses today and are available in a variety of shapes and sizes, as discussed next.

TIP

For tips on buying a personal computer, see the "Guide to Buying a PC" in the References and Resources Guide located at the end of this book.

CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION CAUT

Because many mobile devices and personal computers today are continually connected to the Internet, securing those devices against *computer viruses* and *hackers*—as introduced later in this chapter and discussed in detail in Chapter 9—is an essential concern for both individuals and businesses.

Desktop Computers

Conventional personal computers that are designed to fit on or next to a desk (see Figure 1-14) are often referred to as **desktop computers**. Desktop computers can use a *tower case* (designed to sit vertically, typically on the floor), a *desktop case* (designed to be placed horizontally on a desk's surface), or an *all-in-one case* (designed to incorporate the monitor and system unit into a single piece of hardware).

FIGURE 1-14
Desktop computers.

PC-COMPATIBLE TOWER COMPUTERS MAC ALL-IN-ONE COMPUTERS

Courtesy, Hewlett-Packard Company © iStockphoto.com/ecxon; © iStockphoto.com/seaskylab

>**Personal computer (PC).** A type of computer based on a microprocessor and designed to be used by one person at a time; also called a **microcomputer**. >**Desktop computer.** A personal computer designed to fit on or next to a desk.

INSIDE THE INDUSTRY

Tech Clothing

The extreme popularity of mobile phones, portable digital media players, mobile tablets, and other mobile devices has led to the need to easily and securely carry these devices with you while on the go. While a single device can typically just go in your pocket, individuals carrying multiple devices may find it easier to use *tech clothing.*

Similar to the way many backpacks today have built-in pockets for portable digital media players, along with internal channels to run earbud cords, clothing manufacturers are increasingly designing products with mobile devices in mind, such as including clear pouches for storing and using devices while on the go. The jacket shown in the accompanying illustration goes a step further—it has 24 pockets, including some clear pockets to hold devices as they are being used and a pocket large enough to hold an iPad, as well as a wire management system to organize earbuds and other cords. To use this jacket, first put your devices in the appropriate pockets and then run your cables through the appropriate internal channels—the devices then can be used in the normal fashion. Other items, such as keys, a wallet, a digital camera, or airline tickets, can also be stored securely in a pocket. In addition to just helping you carry your devices, using a tech jacket or vest also has additional advantages. For instance, your devices cannot be accidentally dropped and they are safe from thieves as long as you are wearing the garment. If you are traveling by air, a tech garment can simplify your airport security experience and prevent you from losing or forgetting items at the security checkpoint because you can just take off the garment and have it examined as a single item. So, with tech clothing, at least in the area of mobile devices, you can take it with you.

Scottevest

REGULAR APPEARANCE X-RAY VIEW

Desktop computers typically cost between $350 and $1,500 and usually conform to one of two standards or *platforms*: *PC-compatible* or *Mac* (a typical PC-compatible tower computer and an *iMac* all-in-one computer are shown in Figure 1-14). PC-compatible computers (sometimes referred to as *Windows PCs* or *IBM-compatible PCs*) evolved from the original IBM PC—the first personal computer widely accepted for business use. In general, PC-compatible hardware and software are compatible with all brands of PC-compatible computers—such as those made by Dell, Hewlett-Packard, NEC, Acer, Lenovo, Fujitsu, and Gateway—and these computers typically run the Microsoft Windows operating system. Mac computers are made by Apple, use the Mac OS operating system, and use different software than PC-compatible computers. Although PC-compatible computers are by far the most widely used in the United States, the Mac is traditionally the computer of choice for artists, designers, and others who require advanced graphics capabilities. Extra powerful desktop computers designed for computer users running graphics, music, film, architecture, science, and other powerful applications are sometimes referred to as *workstations.*

ASK THE EXPERT

Courtesy of Jack in the Box, Inc.

Michael Verdesca, Vice President and Chief Information Officer, Jack in the Box Inc.

How long will it be until paying for fast-food purchases by mobile phone is the norm?

The technology exists today to allow for the payment of fast-food purchases by mobile phone and it's being used in Europe and Japan. Though it's being tested in the United States, there are still some hurdles, primarily the adoption of the technology by cell phone providers and retailers, and consumers' willingness to use it. Another hurdle is consumers' concerns about the technology being secure. It will likely be a few years before there is widespread use.

NOTEBOOKS

TABLETS

NETBOOKS

FIGURE 1-15
Portable computers.

Portable Computers

Portable computers are fully functioning computers that are designed to be carried around easily. This portability makes them very flexible. They can be used at home or in the office; they can also be used at school, while on vacation, at off-site meetings, and other locations. Like mobile devices, portable computers are designed to be powered by rechargeable batteries so they can be used while on the go, though many can be plugged into a power outlet as well. While portable computers are essential for many workers, such as salespeople who need to make presentations or take orders from clients off-site, agents who need to collect data at remote locations, and managers who need computing and communications resources as they travel, they are often the computer of choice for students and for individuals buying a new home computer. Portable computers are available in a variety of configurations, as discussed next and shown in Figure 1-15.

- **Notebook computers** (also called **laptop computers**)—computers that are about the size of a paper notebook and open to reveal a screen on the top half of the computer and a keyboard on the bottom. They are typically comparable to desktop computers in features and capabilities. Very thin and very light notebooks are increasingly called *Ultrabooks*.
- **Tablet computers**—typically notebook-sized computers that are designed to be used with a digital pen/stylus or touch input. While most tablet computers are *slate tablets* (one-piece computers with just a screen on top and no keyboard, such as the one shown in Figure 1-15), *convertible tablets* use the same *clamshell* design as notebook computers but the top half of the computer can be rotated and folded shut so it can also be used as either a notebook or a tablet computer.
- **Netbooks** (also called *mini-notebooks*, *mini-laptops*, and *ultraportable computers*)—notebook computers that are smaller (a 10-inch-wide screen is common), lighter (typically less than three pounds), less expensive, and have a longer battery life than conventional notebooks, so they are especially appropriate for students and business travelers. They often don't include a CD or DVD drive and they have a smaller keyboard than a notebook computer.

It is important to realize that while a portable computer offers the convenience of mobility, it typically isn't as comfortable to use for a primary home or work computer as a desktop computer is, without additional hardware. For instance, many individuals find it more

TIP

Small tablet and netbook computers that can fit in one hand are sometimes referred to as *handheld computers* or *ultra-mobile PCs* (*UMPCs*).

TIP

Computers that allow pen input—such as tablet computers—are convenient in crowded situations, as well as in places where the clicking of a keyboard would be annoying to others.

>**Portable computer.** A small personal computer, such as a notebook, tablet, or netbook, that is designed to be carried around easily.
>**Notebook computer.** A fully functioning portable computer that opens to reveal a screen and keyboard; also called a **laptop computer**.
>**Tablet computer.** A portable computer about the size of a notebook that is designed to be used with a digital pen. >**Netbook.** A very small notebook computer.

ASK THE EXPERT

Martin Smekal, President and Founder, TabletKiosk

Will tablet computers ever replace notebooks?

While we have seen a tremendous rise in awareness and popularity of the tablet computer, we believe that traditional notebook PCs will still have a place in the mobile device market going forward. Tablets and tablet PCs are incredibly effective and ergonomically advantageous for mobility purposes, but there will still be certain applications where a more traditional computer with an integrated keyboard makes sense. In the end, it will come down to what is the right tool for the application. That said, there will likely be applications where it makes sense to replace today's notebook with a more mobile-friendly tablet computing solution. We see some portion of market share held today by notebooks shifting in favor of the tablet and tablet PC market over time.

convenient to connect and use a conventional monitor, keyboard, and mouse when using a notebook computer at a desk for a long computer session. This hardware can be connected individually to many portable computers via a wired or wireless connection; there are also *docking stations* and *USB hubs* that can be used to connect a portable computer easily to the hardware devices that are attached to the docking station or USB hub. Docking stations and other *ergonomic*-related topics are discussed in more detail in Chapter 16.

Thin Clients and Internet Appliances

Most personal computers today are sold as stand-alone, self-sufficient units that are equipped with all the necessary hardware and software needed to operate independently. In other words, they can perform input, processing, output, and storage without being connected to a network, although they can be networked if desired. In contrast, a device that must be connected to a network to perform processing or storage tasks is referred to as a *dumb terminal.* Two types of personal computers that may be able to perform a limited amount of independent processing (like a desktop or notebook computer) but are designed to be used with a network (like a dumb terminal) are *thin clients* and *Internet appliances.*

TIP

Virtually any device (such as a smartphone) being used to access a company network or cloud can also be referred to as a "thin client" while it is being used for that purpose.

A **thin client**—also called a *network computer* (*NC*)—is a device that is designed to be used in conjunction with a company network. Instead of using local hard drives for storage, programs are typically accessed from and data is stored on a *network server.* The main advantage of thin clients over desktop computers is lower cost because hardware needs to be replaced less frequently, and costs are lower for computer maintenance, power, and air conditioning. Additional benefits include increased security (since data is not stored on the computer), and easier maintenance (since all software is located on a central server). Disadvantages include having limited or no local storage (although this is an advantage for companies with highly secure data that need to prevent data from leaving the facility) and not being able to function as a stand-alone computer when the network is not working. Thin clients are used by businesses to provide employees with access to network applications; they are also used in school computer labs. For instance, the thin client shown in Figure 1-16 is used, in conjunction with *virtualization* (discussed shortly), to create identical desktops for this computer lab located in the Republic of Macedonia, without requiring the use of individual PCs.

Network computers or other devices designed primarily for accessing Web pages and/or exchanging e-mail are called **Internet appliances** (sometimes referred to as *Internet devices* or *Internet displays*). Some Internet appliances are designed to be located in the home and can be built into another product (such as a refrigerator or telephone console) or can be a stand-alone device (such as the one shown in Figure 1-16) that is designed to deliver news, sports scores, weather, music, and other Web-based information. Gaming consoles (such as the *Nintendo Wii* , the *Xbox 360* shown in Figure 1-16, and the *Sony PlayStation 3*)

>**Thin client.** A personal computer designed to access a network for processing and data storage, instead of performing those tasks locally; also called a network computer (NC). >**Internet appliance.** A specialized network computer designed primarily for Internet access and/or e-mail exchange.


Courtesy of NComputing

THIN CLIENTS


Courtesy of Sony Electronics, Inc.

STAND-ALONE INTERNET DEVICES


Barone Firenze/Shutterstock.com

INTERNET-ENABLED GAMING CONSOLES

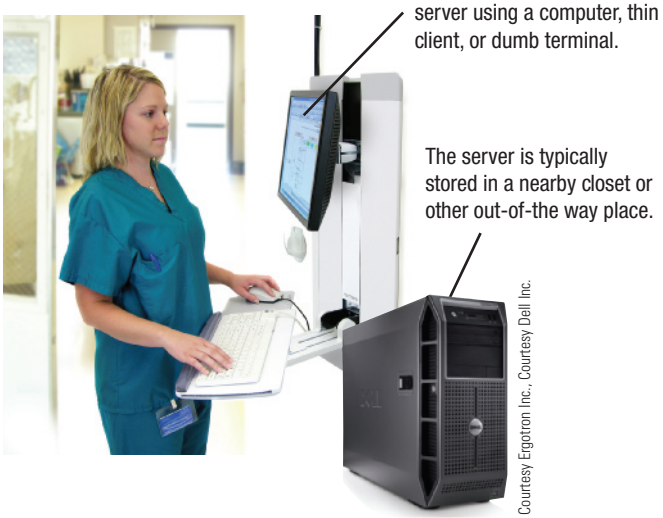
FIGURE 1-16
Thin clients and Internet appliances.

that can be used to view Internet content, in addition to their gaming abilities, can also be classified as Internet appliances when they are used to access the Internet. There are also Internet capabilities beginning to be built into television sets, which make these TVs Internet appliances, as well.

Midrange Servers

A **midrange server**—also sometimes called a *minicomputer* or *midrange computer*—is a medium-sized computer used to host programs and data for a small network. Typically larger, more powerful, and more expensive than a desktop computer, a midrange server is usually located in an out-of-the-way place and can serve many users at one time. Users connect to the server through a network, using their desktop computer, portable computer, thin client, or a dumb terminal consisting of just a monitor and keyboard (see Figure 1-17). Midrange servers are often used in small- to medium-sized businesses (such as medical or dental offices), as well as in school computer labs. There are also special *home servers* designed for home use, which are often used to *back up* (make duplicate copies of) the content located on all the computers in the home automatically and to host music, photos, movies, and other media to be shared via a *home network.*

FIGURE 1-17
Midrange servers. Midrange servers are used to host data and programs on a small network, such as a school computer lab or medical office network.



Courtesy Ergotron Inc., Courtesy Dell Inc.

Some midrange servers consist of a collection of individual compact, modular servers called *blades*; each blade contains the hardware necessary to provide the complete processing power of one computer. These servers—called *blade servers*—are much easier to expand and upgrade than traditional servers (because adding a new server requires adding only a new blade), have lower overall power and cooling costs, and are more secure. With some blade servers, the processing power of the blades is shared among users. With others, each user has an individual blade, which functions as that individual's personal computer, but the blades are locked in a secure location instead of having that hardware located on each employee's desk. In either case, the thin client designed specifically to access a blade server is sometimes called a *blade workstation.*

One trend involving midrange servers (as well as the *mainframe computers* discussed next) today is **virtualization**—creating *virtual* (rather than actual) versions of a computing resource. *Server virtualization* uses separate server environments that, although physically located on the same computer,

>**Midrange server.** A medium-sized computer used to host programs and data for a small network. >**Virtualization.** Creating virtual (rather than actual) versions of a computing resource, such as several separate environments that are located on a single server but act like different servers.

function as separate servers and do not interact with each other. For instance, all applications for an organization can be installed in virtual environments on one or more physical servers instead of using a separate server for each application. Using a separate server for each application often wastes resources since the servers are typically not used to full capacity—one estimate is that about only 10% of server capability is frequently utilized. With virtualization, companies can fulfill their computing needs with fewer servers, which results in lower costs for hardware and server management, as well as lower power and cooling costs. Consequently, one of the most significant appeals of server virtualization today is increased efficiency. Virtualization is also used in other computing areas, such as networking and storage.

Mainframe Computers

A **mainframe computer** is a powerful computer used by many large organizations—such as hospitals, universities, large businesses, banks, and government offices—that need to manage large amounts of centralized data. Larger, more expensive, and more powerful than midrange servers, mainframes can serve thousands of users connected to the mainframe via personal computers, thin clients, or dumb terminals, in a manner similar to the way users connect to midrange servers. Mainframe computers are typically located in climate-controlled *data centers* and connect to the rest of the company computers via a computer network. During regular business hours, a mainframe typically runs the programs needed to meet the different needs of its wide variety of users. At night, it commonly performs large processing tasks, such as payroll and billing. Today's mainframes are sometimes referred to as *high-end servers* or *enterprise-class servers* and they usually cost at least several hundred thousand dollars each.

Courtesy of IBM Corporation

FIGURE 1-18
Mainframe computers. Mainframes are used to perform large processing tasks for businesses.

One issue facing businesses today is the high cost of electricity to power and cool the mainframes, servers, and personal computers used in an organization. Consequently, making the computers located in a business—particularly mainframes and servers—more energy efficient is a high priority today. Virtualization is often used today to utilize a company's mainframes more efficiently. For example, the IBM mainframe shown being installed in Figure 1-18 is IBM's most powerful and energy-efficient mainframe to date and supports more than 100,000 virtual servers. Energy efficiency and other *green computing* topics are discussed in more detail in Chapter 16.

Supercomputers

Some applications require extraordinary speed, accuracy, and processing capabilities—for example, sending astronauts into space, controlling missile guidance systems and satellites, forecasting the weather, exploring for oil, breaking codes, and designing and testing new products. **Supercomputers**—the most powerful and most expensive type of computer available—were developed to fill this need. Some relatively new supercomputing applications include hosting extremely complex Web sites (such as search sites and social networks) and *three-dimensional applications* (such as 3D medical imaging, 3D image projections, and 3D architectural modeling). Unlike mainframe computers, which typically run multiple applications simultaneously to serve a wide variety of users, supercomputers generally run one program at a time, as fast as possible.

Conventional supercomputers can cost several million dollars each. To reduce the cost, supercomputers today are often built by connecting hundreds of smaller and

>**Mainframe computer.** A computer used in large organizations (such as hospitals, large businesses, and colleges) that need to manage large amounts of centralized data and run multiple programs simultaneously. >**Supercomputer.** The fastest, most expensive, and most powerful type of computer.

less-expensive computers (increasingly midrange servers) into a **supercomputing cluster** that acts as a single supercomputer. The computers in the cluster usually contain multiple CPUs each and are dedicated to processing cluster applications. For example, the *Tianhe-1A* supercomputer (shown in Figure 1-19) contains 14,336 CPUs. This supercomputing cluster is installed at China's National Supercomputer Center in Tianjin and is used for a variety of research applications, including petroleum exploration, medical research, and simulation of large aircraft design. At 2.57 *petaflops* (quadrillions of *floating point operations* or calculations *per second*), Tianhe-1A is currently one of the fastest computers in the world. A new IBM supercomputer named *Sequoia* that is currently under development for the Lawrence Livermore National Laboratory is expected to use approximately 1.6 million CPUs and perform at 20 petaflops.

Courtesy of NVIDIA

FIGURE 1-19
The Tianhe-1A supercomputer. Supercomputers are used for specialized situations in which immense processing speed is required.

COMPUTER NETWORKS AND THE INTERNET

A **computer network** is a collection of computers and other devices that are connected together to enable users to share hardware, software, and data, as well as to communicate electronically with each other. Computer networks exist in many sizes and types. For instance, home networks are commonly used to allow home computers to share a single printer and Internet connection, as well as to exchange files. Small office networks enable workers to access company records stored on a *network server*, communicate with other employees, share a high-speed printer, and access the Internet (see Figure 1-20). School networks allow students and teachers to access the Internet and school resources, and large corporate networks often connect all of the offices or retail stores in the corporation, creating a network that spans several cities or states. Public wireless networks—such as those available at some coffeehouses, restaurants, public libraries, and parks—provide Internet access to individuals via their portable computers and mobile devices; mobile telephone networks provide Internet access and communications capabilities to smartphone users. Most computers today connect to a computer network. Chapter 7 discusses networks in greater detail.

What Are the Internet and the World Wide Web?

The **Internet** is the largest and most well-known computer network in the world. It is technically a network of networks, since it consists of thousands of networks that can all access each other via the main *backbone* infrastructure of the Internet. Individual users connect to the Internet by connecting their computers or other devices to servers belonging to an **Internet service provider** (**ISP**)—a company that provides Internet access, usually for a fee. ISPs (which include conventional and mobile telephone companies like AT&T, Verizon, and Sprint; cable providers like Comcast and Time Warner; and stand-alone ISPs like NetZero and EarthLink) function as gateways or onramps to the Internet, providing Internet access to their subscribers. ISP servers are continually connected to a larger network, called a *regional network*, which, in turn, is connected to one of the major high-speed networks within a country, called a *backbone network.* Backbone networks within a country are connected to each other and to backbone networks in other countries. Together they form one enormous network of networks—the Internet. Tips for selecting an ISP are included in Chapter 8.

TIP

Although some people use the terms *Internet* and *Web* interchangeably, technically the Web—the collection of Web pages available over the Internet—is only one resource available via the Internet.

>**Supercomputing cluster.** A group of numerous smaller computers connected together to act as a single supercomputer. >**Computer network.** A collection of computers and other hardware devices that are connected together to share hardware, software, and data, as well as to communicate electronically with one another. >**Internet.** The largest and most well-known computer network, linking millions of computers all over the world. >**Internet service provider (ISP).** A business or other organization that provides Internet access to others, typically for a fee.

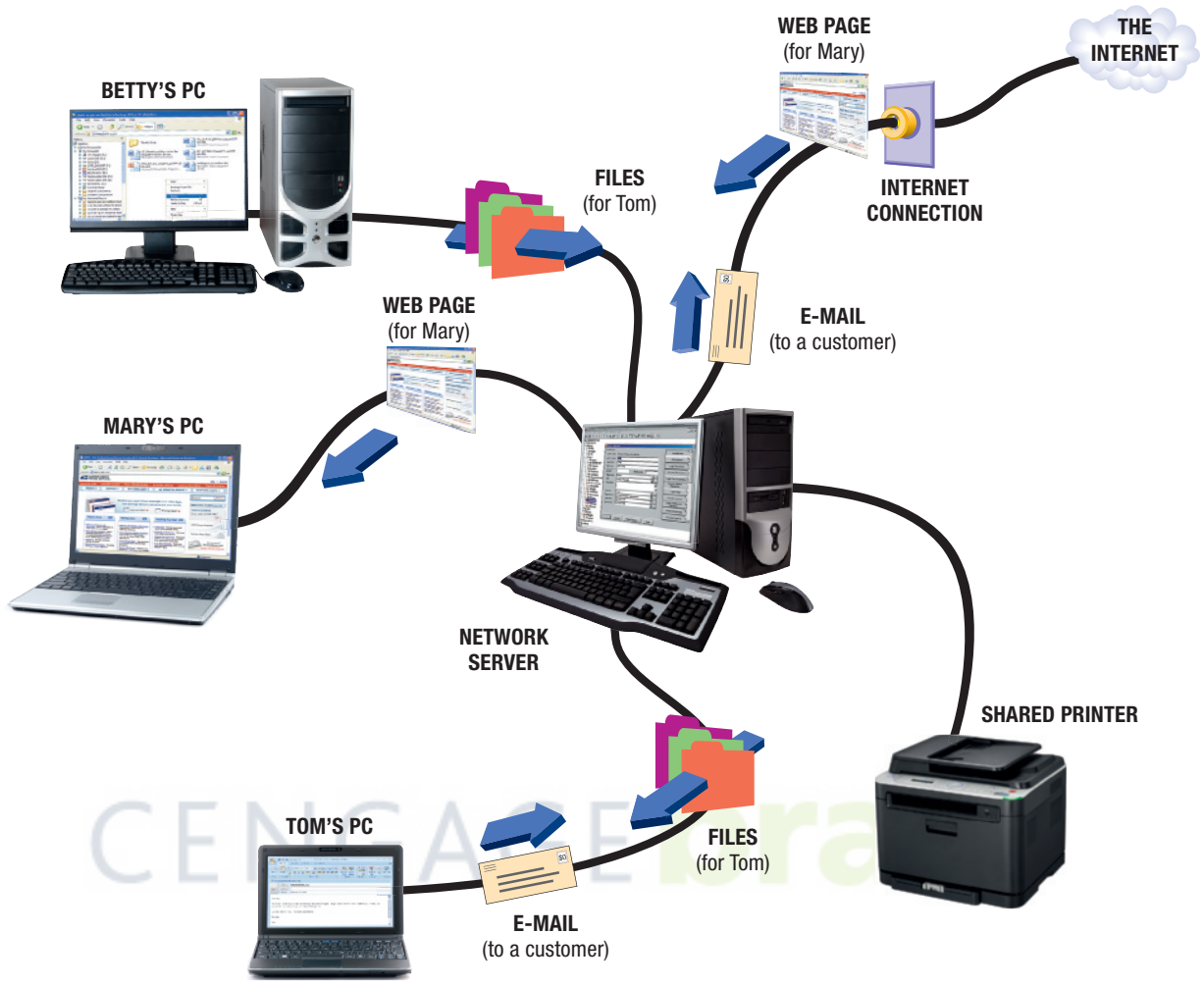


FIGURE 1-20
Example of a computer network.

Millions of people and organizations all over the world are connected to the Internet. The most common Internet activities today are exchanging e-mail messages and accessing content located on *Web pages*. While the term *Internet* refers to the physical structure of that network, the **World Wide Web** (**WWW**) refers to one resource—a collection of documents called **Web pages**—available through the Internet. A group of Web pages belonging to one individual or company is called a **Web site**. Web pages are stored on computers (called **Web servers**) that are continually connected to the Internet; they can be accessed at any time by anyone with a computer (or other Web-enabled device) and an Internet connection. A wide variety of information is available via Web pages, such as company and product information, government forms and publications, maps, telephone directories, news, weather, sports results, airline schedules, and much, much more. You can also use Web pages to shop, bank, trade stock, and perform other types of online financial transactions; access *social networks* like *Facebook* and *MySpace*; and listen to music, play games, watch television shows, and perform other entertainment-oriented activities (see Figure 1-21). Web pages are viewed using a **Web browser**, such as *Internet Explorer* (*IE*), *Chrome*, *Safari*, *Opera*, or *Firefox*.

>**World Wide Web (WWW).** The collection of Web pages available through the Internet. >**Web page.** A document, typically containing hyperlinks to other documents, located on a Web server and available through the World Wide Web. >**Web site.** A collection of related Web pages usually belonging to an organization or individual. >**Web server.** A computer that is continually connected to the Internet and hosts Web pages that are accessible through the Internet. >**Web browser.** A program used to view Web pages.

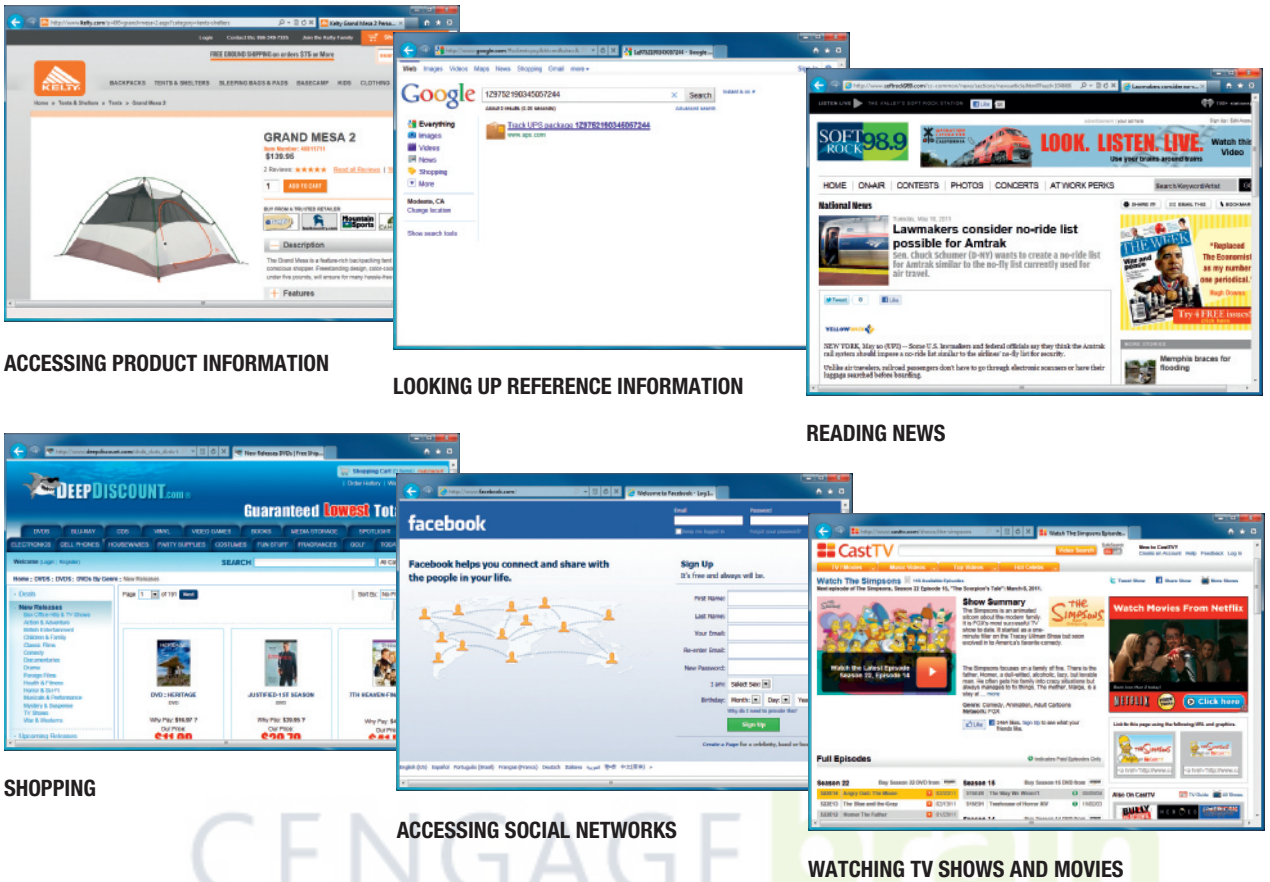


FIGURE 1-21
Some common Web activities.

Accessing a Network or the Internet

To access a local computer network (such as a home network, a school or company network, or a public wireless hotspot), you need to use a network adapter (either built into your computer or attached to it) to connect your computer to the network. With some computer networks you need to supply logon information (such as a *username* and a password) to *log on* to a network. Once you are connected to the network, you can access network resources, including the network's Internet connection. If you are connecting to the Internet without going through a computer network, your computer needs to use a modem to connect to the communications media (such as a telephone line, cable connection, or wireless signal) used by your ISP to deliver Internet content. Network adapters and modems are discussed in more detail in Chapter 7.

Most Internet connections today are *direct* (or *always-on*) *connections*, which means the computer or other device being used to access the Internet is continually connected to the ISP's computer. With a direct connection, you only need to open your Web browser to begin using the Internet. With a *dial-up connection*, however, you must start the program that instructs your computer to dial and connect to the ISP's server via a telephone line, and then open a Web browser, each time you want to access the Internet.

To request a Web page or other resource located on the Internet, its **Internet address**—a unique numeric or text-based address—is used. The most common types of Internet addresses are *IP addresses* and *domain names* (to identify computers), *URLs* (to identify Web pages), and *e-mail addresses* (to identify people).

>**Internet address.** An address that identifies a computer, person, or Web page on the Internet, such as an IP address, domain name, or e-mail address.

IP Addresses and Domain Names

IP addresses and their corresponding **domain names** are used to identify computers available through the Internet. IP (short for *Internet Protocol*) addresses are numeric, such as *207.46.197.32*, and are commonly used by computers to refer to other computers. A computer that hosts information available through the Internet (such as a Web server hosting Web pages) usually has a unique text-based domain name (such as *microsoft.com*) that corresponds to that computer's IP address in order to make it easier for people to request Web pages located on that computer. IP addresses and domain names are unique; that is, there cannot be two computers on the Internet using the exact same IP address or exact same domain name. To ensure this, specific IP addresses are allocated to each network (such as a company network or an ISP) to be used with the computers on that network, and there is a worldwide registration system for domain name registration. When a domain name is registered, the IP address of the computer that will be hosting the Web site associated with that domain name is also registered; the Web site can be accessed using either its domain name or corresponding IP address. When a Web site is requested using its domain name, the corresponding IP address is looked up using one of the Internet's *domain name system* (*DNS*) *servers* and then the appropriate Web page is displayed. While today's IP addresses (called *IPv4*) have 4 parts separated by periods, the newer *IPv6* addresses have 6 parts separated by colons. The transition from IPv4 to IPv6 is necessary because of the vast number of devices connecting to the Internet today.

ORIGINAL TLDS	INTENDED USE
.com	Commercial businesses
.edu	Educational institutions
.gov	Government organizations
.int	International treaty organizations
.mil	Military organizations
.net	Network providers and ISPs
.org	Noncommercial organizations

NEWER TLDS	INTENDED USE
.aero	Aviation industry
.biz	Businesses
.fr	French businesses
.info	Resource sites
.jobs	Employment sites
.mobi	Sites optimized for mobile devices
.name	Individuals
.pro	Licensed professionals
.uk	United Kingdom businesses

FIGURE 1-22
Sample top-level domains (TLDs).

Domain names typically reflect the name of the individual or organization associated with that Web site and the different parts of a domain name are separated by a period. The far right part of the domain name (which begins with the rightmost period) is called the *top-level domain* (*TLD*) and traditionally identifies the type of organization or its location (such as *.com* for businesses, *.edu* for educational institutions, *.jp* for Web sites located in Japan, or *.fr* for Web sites located in France). The part of the domain name that precedes the TLD is called the *second-level domain name* and typically reflects the name of a company or an organization, a product, or an individual. There were seven original TLDs used in the United States; additional TLDs and numerous two-letter *country code TLDs* have since been created (see some examples in Figure 1-22). More than 200 million domain names are registered worldwide.

TIP

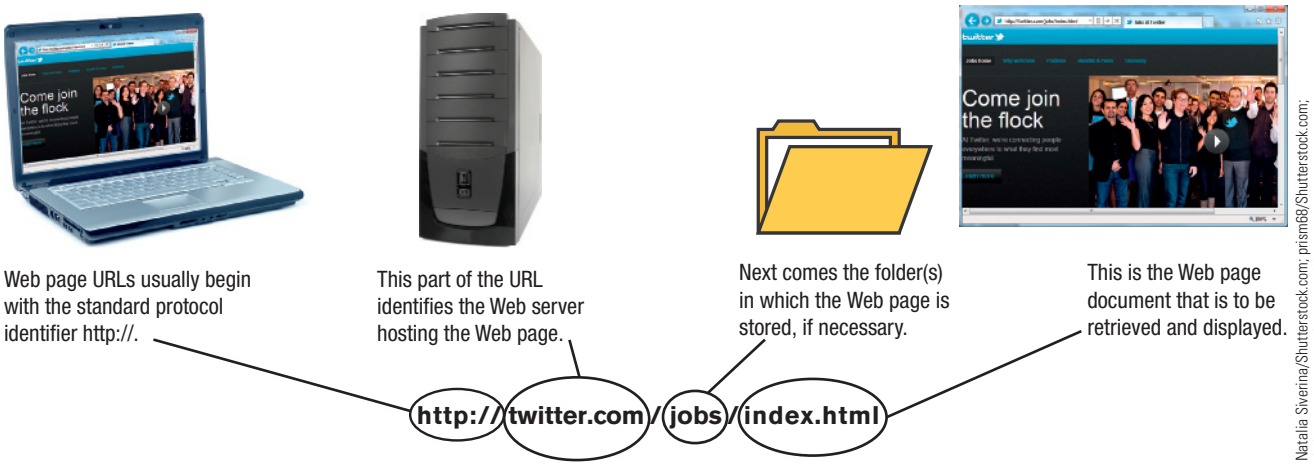
Only the legitimate holder of a trademarked name (such as Microsoft) can use that trademarked name as a domain name (such as microsoft.com); trademarks are discussed in detail in Chapter 16.

Uniform Resource Locators (URLs)

Similar to the way an IP address or domain name uniquely identifies a computer on the Internet, a **Uniform Resource Locator** (**URL**) uniquely identifies a specific Web page (including the *protocol* or standard being used to display the Web page, the Web server hosting the Web page, the name of any folders on the Web server in which the Web page file is stored, and the Web page's filename, if needed).

The most common Web page protocols are *Hypertext Transfer Protocol* (*http://*) for regular Web pages or *Secure Hypertext Transfer Protocol* (*https://*) for *secure Web pages*

>**IP address.** A numeric Internet address used to uniquely identify a computer on the Internet. >**Domain name.** A text-based Internet address used to uniquely identify a computer on the Internet. >**Uniform Resource Locator (URL).** An Internet address (usually beginning with http://) that uniquely identifies a Web page.



Natalia Siverina/Shutterstock.com; prism68/Shutterstock.com; © Cengage Learning, Courtesy of Twitter

FIGURE 1-23
A Web page URL.

that can safely be used to transmit sensitive information, such as credit card numbers. *File Transfer Protocol* (*ftp://*) is sometimes used to upload and download files. The *file extension* used in the Web page filename indicates the type of Web page that will be displayed (such as *.html* and *.htm* for standard Web pages created using *Hypertext Markup Language*, as discussed in Chapter 10). For example, looking at the URL for the Web page shown in Figure 1-23 from right to left, we can see that the Web page is called *index.html*, is stored in a folder called *jobs* on the Web server associated with the *twitter.com* domain, and is a regular (nonsecure) Web page because the standard *http://* protocol is being used.

TIP

Be sure that any Web page used to send sensitive data (such as your Social Security number or credit card information) is secure. Look for a URL that starts with *https* instead of *http* and a locked padlock icon on the Address bar.

E-Mail Addresses

To contact people using the Internet, you most often use their **e-mail addresses**. An e-mail address consists of a **username** (an identifying name), followed by the @ symbol, followed by the domain name for the computer that will be handling that person's e-mail (called a *mail server*). For example,

jsmith@cengage.com
maria_s@cengage.com
sam.peterson@cengage.com

are the e-mail addresses assigned respectively to jsmith (John Smith), maria_s (Maria Sanchez), and sam.peterson (Sam Peterson), three hypothetical employees at Cengage Learning, the publisher of this textbook. Usernames are typically a combination of the person's first and last names and sometimes include periods, underscores, and numbers, but cannot include blank spaces. To ensure a unique e-mail address for everyone in the world, usernames must be unique within each domain name. So, even though there could be a *jsmith* at Cengage Learning using the e-mail address *jsmith@cengage.com* and a *jsmith* at Stanford University using the e-mail address *jsmith@stanford.edu*, the two e-mail addresses are unique. It is up to each organization with a registered domain name to ensure that one—and only one—exact same username is assigned to its domain. Using e-mail addresses to send e-mail messages is discussed later in this chapter; other forms of online communications—such as text messaging and instant messaging (IM)—are covered in Chapter 8. For a look at how online communications are being used to help keep college students safe, see the How It Works box.

>**E-mail address.** An Internet address consisting of a username and computer domain name that uniquely identifies a person on the Internet.
>**Username.** A name that uniquely identifies a user on a specific computer network.

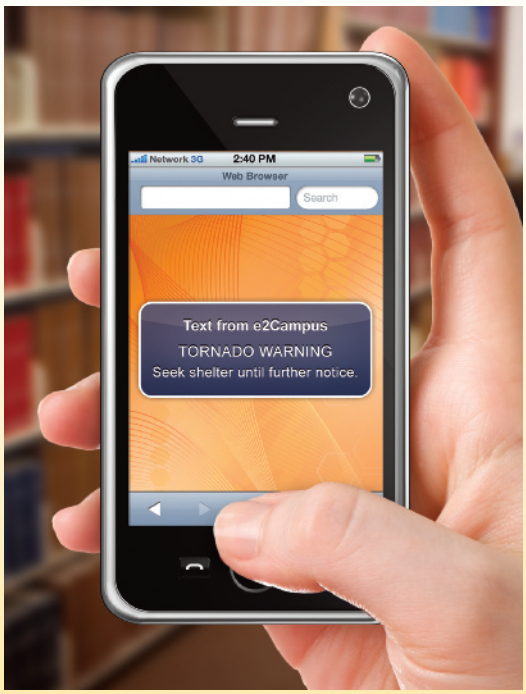
HOW IT WORKS

Campus Emergency Notification Systems

Recent emergencies, such as school shootings and dangerous weather, have increased attention on ways organizations can quickly and effectively notify a large number of individuals. Following the Virginia Tech tragedy in 2007, which involved a shooting rampage lasting about two hours and killing more than 30 individuals, the *Higher Education Opportunity Act* was signed into law. The law provides grants and other assistance to colleges and universities to create an emergency communications system that can be used to contact students when a significant emergency or dangerous situation emerges. In response, colleges across the U.S. are implementing emergency notification systems to notify students, faculty, staff, and campus visitors of an emergency, severe weather condition, campus closure, or other critical event.

Since nearly all college students in the U.S. today have mobile phones, sending emergency alerts via text message is a natural option for many colleges. To be able to send a text message to an entire campus typically requires the use of a company that specializes in this type of mass communications. One such company is *Omnilert*, which has systems installed in more than 750 colleges and universities around the country. With the Omnilert campus notification system—called *e2Campus*—the contact information of the students, faculty, and staff to be notified is entered into the system and then the individuals can be divided into groups, depending on the types of messages each individual should receive. Individuals can also opt in to alerts via text message. When an alert needs to be sent, an administrator sends the message (via a mobile phone or computer) and it is distributed to the appropriate individuals (see the accompanying illustration). In addition to text messages, alerts can also be sent simultaneously and automatically via virtually any voice or text communications medium, such as voice messages, e-mail messages, RSS feeds, instant messages, Twitter feeds, Facebook pages, school Web pages, personal portal pages, desktop pop-up alerts, TTY/TDD devices, digital signage systems (such as signs located inside dorms and the student union), indoor and outdoor campus public address (PA) systems, information hotlines, and more.

To facilitate campus emergency notification systems, some colleges now require all undergraduate students to have a mobile phone. Some campuses also implement other useful mobile services, such as tracking campus shuttle buses, participating in class polls, accessing class assignments and grades, and texting tips about suspicious activities or crimes to campus security. An additional safety feature available at some schools is the ability to use the phones to activate an alert whenever a student feels unsafe on campus; these alerts automatically send the student's physical location (determined via the phone's GPS coordinates) to the campus police so the student can be located quickly.



Courtesy of Omnilert LLC

TIP

The *home page* for a Web site is the starting page of that particular site; the *home page* for your browser is the Web page designated as the first page you see each time the browser is opened.

Pronouncing Internet Addresses

Because Internet addresses are frequently given verbally, it is important to know how to pronounce them. A few guidelines are listed next, and Figure 1-24 shows some examples of Internet addresses and their proper pronunciations.

- If a portion of the address forms a recognizable word or name, it is spoken; otherwise, it is spelled out.
- The @ sign is pronounced *at*.
- The period (.) is pronounced *dot*.
- The forward slash (/) is pronounced *slash*.

TYPE OF ADDRESS	SAMPLE ADDRESS	PRONUNCIATION
Domain name	berkeley.edu	berkeley dot e d u
URL	microsoft.com/windows/ie/default.asp	microsoft dot com slash windows slash i e slash default dot a s p
E-mail address	president@whitehouse.gov	president at white house dot gov

FIGURE 1-24
Pronouncing Internet addresses.

Surfing the Web

Once you have an Internet connection, you are ready to begin *surfing the Web*—that is, using a Web browser to view Web pages. The first page that your Web browser displays when it is opened is your browser's starting page or *home page.* Often this is the home page for the Web site belonging to your browser, school, or ISP. However, you can use your browser's customization options to change the current home page to any page that you plan to visit regularly. From your browser's home page, you can move to any Web page you desire, as discussed next.

TIP

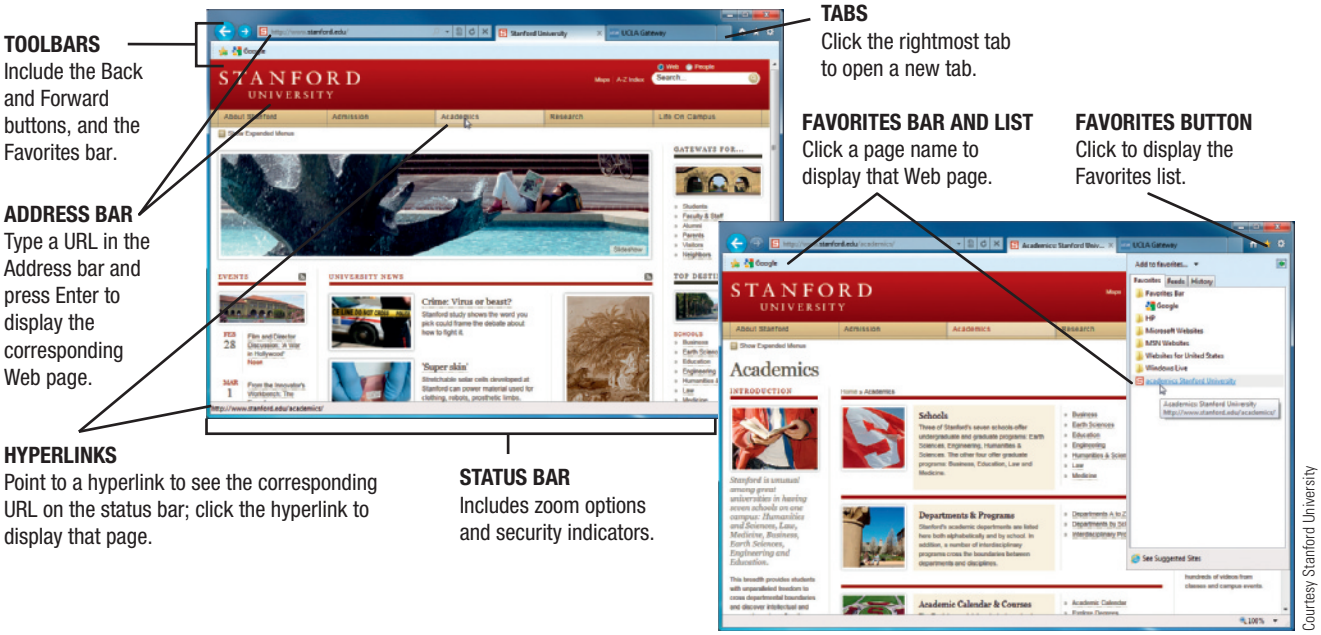
If you get an error message when typing a URL, first check to make sure you typed it correctly. If it is correct, edit the URL to remove any folder or filenames and press Enter to try to load the home page of that site.

Using URLs and Hyperlinks

To navigate to a new Web page for which you know the URL, type that URL in the browser's *Address bar* (shown in Figure 1-25) and press Enter. Once that page is displayed, you can use the *hyperlinks*—graphics or text linked to other Web pages—located on that page to display other Web pages. In addition to Web pages, hyperlinks can also be linked to other types of files, such as to enable Web visitors to view or download images, listen to or download music files, view video clips, or download software programs.

The most commonly used Web browsers include Internet Explorer (shown in Figure 1-25), Chrome (shown in Figure 1-26), Safari, and Firefox. Most browsers today include *tabbed browsing* (which allows you to have multiple Web pages open at the same time and to drag a tab to move that window), the ability to search for Web pages using the Address bar, and tools for *bookmarking* and revisiting Web pages, as discussed shortly. Browsers today also typically include security features to help notify you of possible threats as you browse the Web, *download managers* to help you manage your downloaded files, and *crash recovery* features, such as the ability to open the last set of Web pages that

FIGURE 1-25
Surfing the Web with Internet Explorer. URLs, hyperlinks, and favorites can be used to display Web pages.



Courtesy Stanford University

FURTHER EXPLORATION

Go to the Chapter 1 page of the **UC14 CourseMate** for links to information about search and reference Web sites.

were open before you accidentally closed your browser or before the browser or computer *crashed* (stopped working). In any browser, you can use the Back button on the browser's toolbar to return to a previous page. To print the current Web page, click the browser's Print button or select *Print* from the browser's menu or toolbar.

Using Favorites and the History List

All Web browsers have a feature (usually called *Favorites* or *Bookmarks* and accessed via a Favorites or Bookmarks menu, button, or bar) that you can use to save Web page URLs. Once a Web page is saved as a favorite or a bookmark, you can redisplay that page without typing its URL—you simply select its link from the Favorites or Bookmarks list (refer again to Figure 1-25). You can also use this feature to save a group of tabbed Web pages to open the entire group again at a later time. Web browsers also maintain a *History list*, which is a record of all Web pages visited during the period of time specified in the browser settings; you can revisit a Web page located on the History list by displaying the History list and selecting that page.

Most Web browsers today allow you to delete, move into folders, and otherwise organize your favorites/bookmarks, as well as to search your favorites/bookmarks or History list to help you find pages more easily. Chrome goes one step further by displaying thumbnails of your most visited sites, a list of your most recent bookmarks, and a history search box each time you open a new browser tab.

TIP

Pin (lock) a Web page in your browser to have it handy to visit regularly. Chrome allows you to pin sites to the New Tab page; Internet Explorer pins sites to the Windows taskbar.

Because many individuals use multiple devices (such as a personal computer and a mobile phone) to surf the Web today, it is becoming more common to want to *sync* your browser settings (such as bookmarks, history, passwords, and so forth) across all of your devices. Most browsers today have synching capabilities; typically an online account (such as your Google account for Chrome or your Windows Live account for Internet Explorer) is used to securely sync the devices.

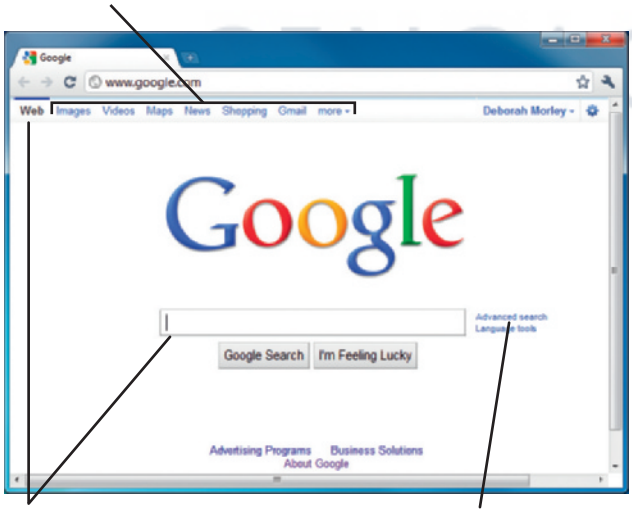


FIGURE 1-26
The Google search site displayed in the Chrome browser.

Searching the Web

People typically turn to the Web to find specific types of information. There are a number of special Web pages, called *search sites*, available to help you locate what you are looking for on the Internet. One of the most popular search sites—*Google*—is shown in Figure 1-26. To conduct a search, you typically type one or more *keywords* into the search box on a search site, and a list of links to Web pages matching your search criteria is displayed. There are also numerous *reference sites* available on the Web to look up addresses, phone numbers, ZIP codes, maps, and other information. To find a reference site, type the information you are looking for (such as "ZIP code lookup" or "topographical maps") in a search site's search box to see links to sites containing that information. Searching the Web is discussed in more detail in Chapter 8.

E-Mail

Electronic mail (more commonly called **e-mail**) is the process of exchanging electronic messages between computers over a network—usually the Internet. E-mail is one of the

>**Electronic mail (e-mail).** Electronic messages sent from one user to another over the Internet or other network.

most widely used Internet applications—Americans alone send billions of e-mail messages daily and use of *mobile e-mail* (e-mail sent via a mobile device) is growing at an astounding rate. You can send an e-mail message from any Internet-enabled device (such as a desktop computer, portable computer, or mobile device) to anyone who has an Internet e-mail address. As illustrated in Figure 1-27, e-mail messages travel from the sender's computer to his or her ISP's *mail server*, and then through the Internet to the mail server being used by the recipient's ISP. When the recipient's computer retreives new e-mail (typically on a regular basis as long as the computer is powered up, connected to the Internet, and the e-mail program is open), it is displayed on the computer he or she is using. In addition to text, e-mail messages can include attached files, such as documents, photos, and videos.

E-mail can be sent and received via an *e-mail program*, such as *Microsoft Outlook* or *Microsoft Mail*, installed on the computer being used (sometimes referred to as *conventional e-mail*) or via a Web page belonging to a Web mail provider such as *Gmail* or *Windows Live Mail* (referred to as *Web-based e-mail* or just *Web mail*). Using an installed e-mail program is convenient for individuals who use e-mail often and want to have copies of sent and received e-mail messages stored on their computer. To use an installed e-mail program, however, it must first be set up with the user's name, e-mail address, incoming mail server, and outgoing mail server information. Web-based e-mail does not require this setup and a user's e-mail can be accessed from any computer with an Internet connection by just displaying the appropriate Web mail page and logging on. Consequently, Web-based e-mail is more flexible than conventional e-mail since it can be accessed easily from any computer or other device with an Internet connection. However, Web-based e-mail is typically slower than conventional e-mail and messages can only be viewed when the user is online and logged on to his or her Web mail account, unless an e-mail program is used to download the e-mail messages to a computer.

Web-based e-mail is typically free and virtually all ISPs used with personal computers include e-mail service in their monthly fee. Mobile e-mail may require a fee, depending on the data plan being used. Other types of mobile communications, such as text messages and multimedia messages that typically use the *Short Message Service* (*SMS*) and *Multimedia Message Service* (*MMS*) protocols, respectively, may also incur a fee. Messaging and other types of online communications that can be used in addition to e-mail are discussed in Chapter 8.

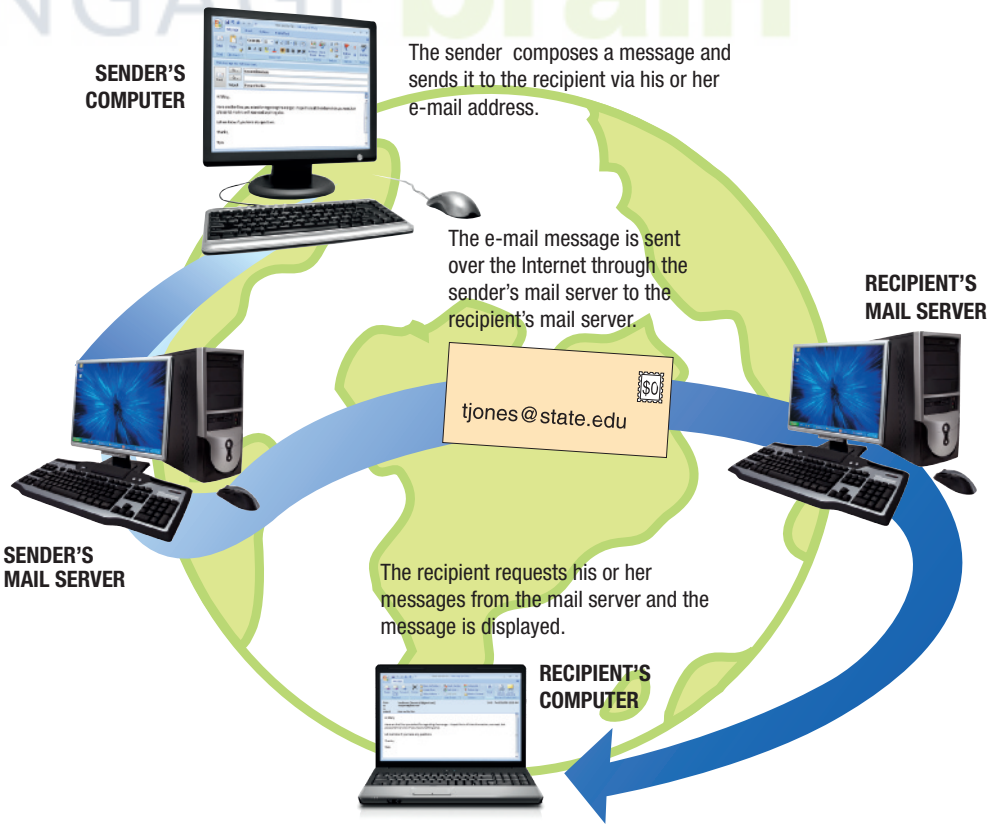
ONLINE VIDEO

Go to the Chapter 1 page of the **UC14 CourseMate** to watch the "Searching the Web on Your iPhone" video clip.

VIDEO PODCAST

Go to the Chapter 1 page of the **UC14 CourseMate** to download or listen to the "How To: Send Text Messages via E-Mail" video podcast.

FIGURE 1-27
How e-mail works.



Ruslan Ivantsov/Shutterstock.com; 300dpi/Shutterstock.com; tatniz/Shutterstock.com; © Cengage Learning

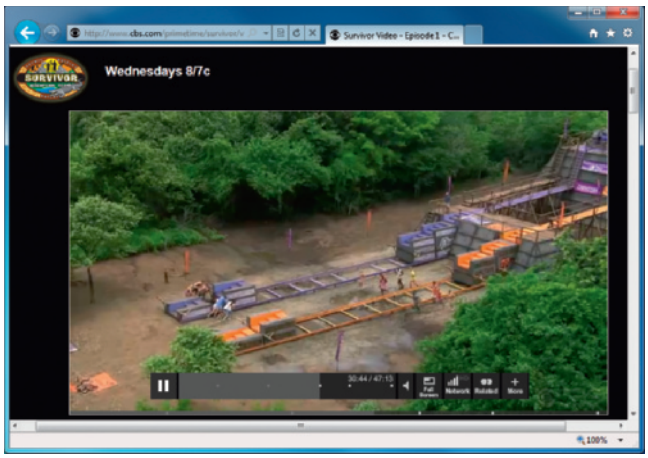
COMPUTERS AND SOCIETY

The vast improvements in technology over the past decade have had a distinct impact on daily life, both at home and at work. Computers have become indispensable tools in our personal and professional lives, and related technological advancements have changed the way our everyday items—cars, microwaves, coffeepots, toys, exercise bikes, telephones, televisions, and more—look and function. As computers and everyday devices become smarter, they tend to do their intended jobs faster, better, and more reliably than before, as well as take on additional capabilities. In addition to affecting individuals, computerization and technological advances have changed society as a whole. Without computers, banks would be overwhelmed by the job of tracking all the transactions they process, moon exploration and the space shuttle would still belong to science fiction, and some scientific advances—such as DNA analysis and gene mapping—would be nonexistent. In addition, we as individuals are getting accustomed to the increased automation of everyday activities, such as shopping and banking, and we depend on having fast and easy access to information via the Internet and rapid communications via e-mail and messaging. In addition, many of us would not think about making a major purchase without first researching it online. In fact, it is surprising how fast the Internet and its resources have become an integral part of our society. But despite all its benefits, *cyberspace* has some risks. Some of the most important societal implications related to computers and the Internet are introduced next; many of these issues are covered in more detail in later chapters of this text.

Benefits of a Computer-Oriented Society

The benefits of having such a computer-oriented society are numerous, as touched on throughout this chapter. The capability to virtually design, build, and test new buildings, cars, and airplanes before the actual construction begins helps professionals create safer end products. Technological advances in medicine allow for earlier diagnosis and more effective treatment of diseases than ever before. The benefit of beginning medical students performing virtual surgery using a computer instead of performing actual surgery on a patient is obvious. The ability to shop, pay bills, research products, participate in online courses, and look up vast amounts of information 24 hours a day, 7 days a week, 365 days a year via the Internet is a huge convenience. In addition, a computer-oriented society generates new opportunities. For example, technologies—such as *speech recognition software* and Braille input and output devices—enable physically- or visually-challenged individuals to perform necessary job tasks and to communicate with others more easily.

FIGURE 1-28
Episodes of many televisions shows are available online to be viewed at the user's convenience.



The Survivor: Redemption Island Logo is a registered trademark of Survivor Productions, LLC. CBS.com website contents © CBS Broadcasting Inc. Used by permission.

In general, technology has also made a huge number of tasks in our lives go much faster. Instead of experiencing a long delay for a credit check, an applicant can get approved for a purchase, loan, or credit card almost immediately. Documents and photographs can be e-mailed or faxed in mere moments, instead of taking at least a day to be mailed physically. We can watch many of our favorite TVs shows online (see Figure 1-28) and access up-to-the-minute news at our convenience. And we can download information, programs, music files, movies, and more on demand when we want or need them, instead of having to order them and then wait for delivery or physically go to a store to purchase the desired items.

Risks of a Computer-Oriented Society

Although there are a great number of benefits from having a computer-oriented society and a *networked economy*, there are risks as well. A variety of problems have emerged from our extensive computer use, ranging from stress and health concerns, to the proliferation of *spam*

(unsolicited e-mails) and *malware* (harmful programs that can be installed on our computers without our knowledge), to security and privacy issues, to legal and ethical dilemmas. Many of the security and privacy concerns stem from the fact that so much of our personal business takes place online—or at least ends up as data in a computer database somewhere—and the potential for misuse of this data is enormous. Another concern is the repercussions of collecting such vast amounts of information electronically. Some people worry about creating a "Big Brother" situation, in which the government or another organization is watching everything that we do. Although the accumulation and distribution of information is a necessary factor of our networked economy, it is one area of great concern to many individuals. And some Internet behavior, such as downloading music or movies from an unauthorized source or viewing pornography on an office computer, can get you arrested or fired.

INT

TIP

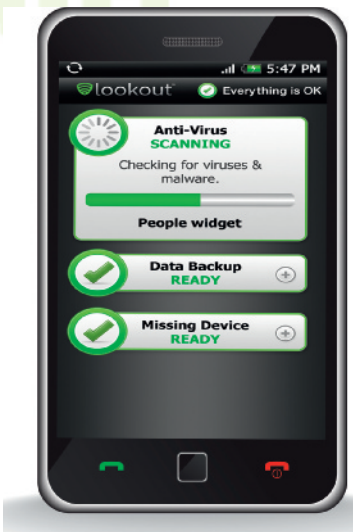
Don't rely on the file extension to determine if a file attachment is safe to open—hackers can now disguise Windows file extensions to make them appear different than they really are.

Security Issues

One of the most common online security risks today is your computer becoming infected with a malware program, such as a *computer virus*—a malicious software program designed to change the way a computer operates. Malware often causes damage to the infected computer, such as erasing data or bogging down the computer so it does not function well. It can also be used to try to locate sensitive data on your computer (such as Web site passwords or credit card numbers) and send that data to the malware creator or to take control of your computer to use as part of a *botnet* (a network of computers used without their owners' knowledge) for criminal activities. Malware is typically installed by downloading a program that secretly contains malware or by clicking a link on a Web page or in an e-mail message that then installs malware. In addition to computers, malware and other security threats are increasingly being directed toward mobile phones and other mobile devices. To help protect your computer or mobile device, never open an e-mail attachment from someone you do not know or that has an executable *file extension* (the last three letters in the filename preceded by a period), such as *.exe*, *.com*, or *.vbs*, without checking with the sender first to make sure the attachment is legitimate. You should also be careful about what files you download from the Internet. In addition, it is crucial to install *security software* on your computer and mobile devices and to set up the program to monitor your devices on a continual basis (see Figure 1-29). If a virus or other type of malware attempts to install itself on your computer or mobile device (such as through an e-mail message attachment or a Web link), the security program will block it. If malware does find its way onto your computer or mobile device, the security program will detect it during a regular scan, notify you, and attempt to remove it.

Another ongoing security problem is *identity theft*—in which someone else uses your identity, typically to purchase goods or services. Identity theft can stem from personal information discovered from offline means—like discarded papers or stolen mail—or from information found online, stolen from an online database, or obtained via a malware program. *Phishing*—in which identity thieves send fraudulent e-mails to people masquerading as legitimate businesses to obtain Social Security numbers or other information needed for identity theft—is also a major security issue today. Common security concerns and precautions, such as protecting your computer from malware and protecting yourself against identity theft and phishing schemes, are discussed in detail in Chapter 9.

FIGURE 1-29
Security software. Security software is crucial for protecting your computer and mobile devices from malware and other threats.



hfng/Shutterstock.com; Courtesy of Lookout Mobile Security

Privacy Issues

Some individuals view the potential risk to personal privacy as one of the most important issues regarding our networked society. As more and more data about our everyday activities is collected and stored on computers accessible via the Internet, our privacy is at risk because the potential for privacy violations increases. Today, data is collected about practically anything we buy online or offline, although offline purchases may not be associated with our identity unless we use a credit card or a membership or loyalty card. At issue is not that data is collected—with virtually all organizations using computers for recordkeeping, that is unavoidable—but rather how the collected data is used and how secure it is. Data collected by businesses may be used only by that company or, depending on the businesses'

privacy policy, may be shared with others. Data shared with others often results in *spam*—unsolicited e-mails. Spam is an enormous problem for individuals and businesses today, and it is considered by many to be a violation of personal privacy. Privacy concerns and precautions are discussed in detail in Chapter 15.

CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION CAUT

Using your primary e-mail address when shopping online or signing up for a sweepstake or other online activity will undoubtedly result in spam being sent to that e-mail address. Use a *throw-away e-mail address* (a free e-mail address from Gmail or another free e-mail provider that you can change easily) for these activities instead to help protect your privacy and cut back on the amount of spam delivered to your regular e-mail account.

Differences in Online Communications

There is no doubt that e-mail and other online communications methods have helped speed up both personal and business communications and have made them more efficient (such as avoiding the telephone tag problem). As you spend more and more time communicating online, you will probably notice some differences between online communications methods (such as e-mail and social networking updates) and traditional communications methods (such as telephone calls and written letters). In general, online communications tend to be much less formal and, in fact, many people compose and send e-mail messages quickly, without taking the time to reread the message content or check the spelling or grammar. However, you need to be careful not to be so casual—particularly in business—that your communications appear unprofessional or become too personal with people you do not know.

To help in that regard, a special etiquette—referred to as *netiquette*—has evolved to guide online behavior. A good rule of thumb is always to be polite and considerate of others and to refrain from offensive remarks. This holds true whether you are asking a question via a company's e-mail address, posting a message on someone's *Facebook Wall*, or IMing a friend. When the communication involves business, you should also be very careful with your grammar and spelling, to avoid embarrassing yourself. Some specific guidelines for what is considered to be proper online behavior are listed in Figure 1-30.

FIGURE 1-30
Netiquette. Use these netiquette guidelines and common sense when communicating online.

RULE	EXPLANATION
Use descriptive subject lines	Use short, descriptive subject lines for e-mail messages and online posts. For example, "Question regarding MP3 downloads" is much better than a vague title, such as "Question."
Don't shout	SHOUTING REFERS TO TYPING YOUR ENTIRE E-MAIL MESSAGE OR ONLINE POST USING CAPITAL LETTERS. Use capital letters only when it is grammatically correct to do so or for emphasizing a few words.
Watch what you say	Things that you say or write online can be interpreted as being sexist, racist, ethnocentric, xenophobic, or in just general bad taste. Also check spelling and grammar—typos look unprofessional and nobody likes wading through poorly written materials.
Avoid e-mail overload	Don't send spam, which is unsolicated bulk e-mail and the Internet equivalent of junk mail. The same goes for forwarding e-mail chain letters or every joke you run across to everyone in your address book.
Be cautious	Don't give out personal information—such as your real name, telephone number, or credit card information—to people you meet online.
Think before you send	Once you send an e-mail or text message or post something online, you lose control of it. Don't send messages that include content (such as compromising photos) that you would not want shared with others.

Another trend in online communications is the use of abbreviations and *emoticons*. Abbreviations or *acronyms*, such as BTW for "by the way," are commonly used to save time in all types of communications today. They are being used with increased frequency in text messaging and e-mail exchanged via mobile phones to speed up the text entry process. Emoticons are illustrations of faces showing smiles, frowns, and other expressions that are created with keyboard symbols—such as the popular :-) smile emoticon—and allow people to add an emotional tone to written online communications. Without these symbols, it is sometimes difficult to tell if the person who sent the online communication is serious or joking, since you

cannot see the individual's face or hear his or her tone of voice. While most people would agree that using abbreviations and emoticons with personal communications is fine, they are not usually viewed as appropriate for formal business communications.

The Anonymity Factor

By their very nature, online communications lend themselves to *anonymity.* Since recipients usually do not hear senders' voices or see their handwriting, it is difficult to know for sure who the sender is. Particularly on *message boards* (online discussions in which users post messages and respond to other posts), in *virtual worlds* (online worlds that users can explore), and other online activities where individuals use made-up names instead of real names, there is an anonymous feel to being online.

Being anonymous gives many individuals a sense of freedom, which makes them feel able to say or do anything online. This sense of true freedom of speech can be beneficial. For example, a reserved individual who might never complain about a poor product or service in person may feel comfortable lodging a complaint by e-mail. In online discussions, many people feel they can be completely honest about what they think and can introduce new ideas and points of view without inhibition. Anonymous e-mail is also a safe way for an employee to blow the whistle on a questionable business practice, or for an individual to tip off police to a crime or potential terrorist attack.

But, like all good things, online anonymity can be abused. Using the Internet as their shield, some people use rude comments, ridicule, profanity, and even slander to attack people, places, and things they do not like or agree with. Others may use multiple online identities (such as multiple usernames on a message board) to give the appearance of increased support for their points of view. Still others may use multiple identities to try to manipulate stock prices (by posting false information about a company to drive the price down, for instance), to get buyers to trust an online auction seller (by posting fictitious positive feedback about themselves), or to commit other illegal or unethical acts.

It is possible to hide your true identity while browsing or sending e-mail by removing personal information from your browser and e-mail program or by using privacy software that acts as a middleman between you and Web sites and hides your identity, as discussed in more detail in Chapter 15. But, in fact, even when personal information is removed, ISPs and the government may still be able to trace communications back to a particular computer when a crime has occurred, so it is difficult—perhaps impossible—to be completely anonymous online.

Information Integrity

The Web contains a vast amount of information on a wide variety of topics. While much of the information is factual, other information may be misleading, biased, or just plain wrong. As more and more people turn to the Web for information, it is crucial that they take the time to determine if the information they obtain and pass on to others is accurate. There have been numerous cases of information intended as a joke being restated on a Web site as fact, statements being quoted out of context (which changed the meaning from the original intent), and hoaxes circulated via e-mail. Consequently, use common sense when evaluating what you read online, and double-check information before passing it on to others.

One way to evaluate online content is by its source. If you obtain information from a news source that you trust, you should feel confident that the accuracy of its online information is close to that of its offline counterpart. For information about a particular product, go to the originating company. For government information, government Web sites are your best source for fact checking. There are also independent Web sites (such as the *Snopes* Web site shown in Figure 1-31) that report on the validity of current online rumors and stories.

FIGURE 1-31
Snopes.com. This Web site can be used to check out online rumors.

Courtesy www.snopes.com

SUMMARY

COMPUTERS IN YOUR LIFE

Chapter Objective 1: Explain why it is essential to learn about computers today and discuss several ways computers are integrated into our business and personal lives.

Computers appear almost everywhere in today's world, and most people need to use a computer or a computerized device frequently on the job, at home, at school, or while on the go. **Computer literacy**, which is being familiar with basic computer concepts, helps individuals feel comfortable using computers and is a necessary skill for everyone today.

Computers abound in today's homes, schools, workplaces, and other locations. Most students and employees need to use a computer for productivity, research, or other important tasks. Individuals often use computers at home and/or carry portable computers or mobile devices with them to remain in touch with others or to use Internet resources on a continual basis. Individuals also frequently encounter computers while on the go, such as *consumer kiosks* and *point-of-sale* (*POS*) *systems.*

WHAT IS A COMPUTER AND WHAT DOES IT DO?

Chapter Objective 2: Define a computer and describe its primary operations.

A **computer** is a *programmable* electronic device that accepts **input**; performs **processing** operations; **outputs** the results; and provides **storage** for data, programs, or output when needed. Most computers today also have **communications** capabilities. This progression of input, processing, output, and storage is sometimes called the *information processing cycle.*

Data is the raw, unorganized facts that are input into the computer to be processed. Data that the computer has processed into a useful form is called **information**. Data can exist in many forms, representing *text*, *graphics*, *audio*, and *video.*

Chapter Objective 3: List some important milestones in computer evolution.

One of the first calculating devices was the *abacus.* Early computing devices that predate today's computers include the *slide rule*, the *mechanical calculator*, and Dr. Herman Hollerith's *Punch Card Tabulating Machine and Sorter. First-generation computers*, such as *ENIAC* and *UNIVAC*, were powered by *vacuum tubes*; *second-generation computers* used *transistors*; and *third-generation computers* were possible because of the invention of the *integrated circuit* (*IC*). Today's *fourth-generation computers* use *microprocessors* and are frequently connected to the *Internet* and other *networks.* Some people believe that *fifth-generation computers* will likely be based on *artificial intelligence.*

Chapter Objective 4: Identify the major parts of a personal computer, including input, processing, output, storage, and communications hardware.

A computer is made up of **hardware** (the actual physical equipment that makes up the computer system) and **software** (the computer's programs). Common hardware components include the *keyboard* and *mouse* (*input devices*), the *CPU* (a *processing device*), *monitors/display screens* and *printers* (*output devices*), and *storage devices* and *storage media* (such as *CDs*, *DVD drives, hard drives, USB flash drives*, and *flash memory cards*). Most computers today also include a *modem*, *network adapter*, or other type of *communications device* to allow users to connect to the Internet or other network.

Chapter Objective 5: Define software and understand how it is used to instruct the computer what to do.

All computers need *system software*, namely an **operating system** (usually *Windows*, *Mac OS*, or *Linux*), to function. The operating system assists with the **boot** process, and then controls the operation of the computer, such as to allow users to run other types of software and to manage their files. Most software programs today use a variety of graphical objects that are selected to tell the computer what to do. The basic workspace for Windows' users is the **Windows desktop**.

Application software consists of programs designed to allow people to perform specific tasks or applications, such as word processing, Web browsing, photo touch-up, and so on. Software programs are written using a *programming language.* Programs are written by *programmers*; *computer users* are the people who use computers to perform tasks or obtain information.

INT

COMPUTERS TO FIT EVERY NEED

Chapter Objective 6: List the six basic types of computers, giving at least one example of each type of computer and stating what that computer might be used for.

Embedded computers are built into products (such as cars and household appliances) to give them added functionality. **Mobile devices** are small devices with computing or Internet capabilities; a mobile device based on a mobile phone is called a **smartphone**.

Small computers used by individuals at home or work are called **personal computers** (**PCs**) or **microcomputers**. Most personal computers today are either **desktop computers** or **portable computers** (**notebook computers**, **laptop computers**, **tablet computers**, and **netbooks**) and typically conform to either the *PC-compatible* or *Mac* standard. Tablet computers come in both *slate tablet* and *convertible tablet* formats. **Thin clients** are designed solely to access a network; **Internet appliances** are designed specifically for accessing the Internet and e-mail.

Medium-sized computers, or **midrange servers**, are used in many businesses to host data and programs to be accessed via the company network. A growing trend is **virtualization**—creating separate virtual environments on a single server that act as separate servers. The powerful computers used by most large businesses and organizations to perform the information processing necessary for day-to-day operations are called **mainframe computers**. The very largest, most powerful computers, which typically run one application at a time, are **supercomputers**. A group of numerous smaller computers connected together to act as a single supercomputer is a **supercomputing cluster**.

COMPUTER NETWORKS AND THE INTERNET

Chapter Objective 7: Explain what a network, the Internet, and the World Wide Web are, as well as how computers, people, and Web pages are identified on the Internet.

Computer networks are used to connect individual computers and related devices so that users can share hardware, software, and data as well as communicate with one another. The **Internet** is a worldwide collection of networks. Typically, individual users connect to the Internet by connecting to computers belonging to an **Internet service provider** (**ISP**)—a company that provides Internet access, usually for a fee. One resource available through the Internet is the **World Wide Web** (**WWW**)—an enormous collection of **Web pages** located on **Web servers**. The starting page for a **Web site** (a related group of Web pages) is called the *home page* for that site. Web pages are viewed with a **Web browser**, are connected with *hyperlinks*, and can be used for many helpful activities.

Chapter Objective 8: Describe how to access a Web page and navigate through a Web site.

To access a computer network, you need some type of *modem* or *network adapter*. To access the Internet, an Internet service provider (ISP) is also used. **Internet addresses** are used to identify resources on the Internet and include numerical **IP addresses** and text-based **domain names** (used to identify computers), **Uniform Resource Locators** or **URLs** (used to identify Web pages), and **e-mail addresses** (a combination of a **username** and domain name that is used to send an individual e-mail messages).

Web pages are displayed by clicking hyperlinks or by typing appropriate URLs in the browser's *Address bar*. *Favorites*/*Bookmarks* and the *History list* can be used to redisplay a previously visited Web page and *search sites* can be used to locate Web pages matching specified criteria. **Electronic mail** (**e-mail**) is used to send electronic messages over the Internet.

COMPUTERS AND SOCIETY

Chapter Objective 9: Discuss the societal impact of computers, including some benefits and risks related to their prominence in our society.

Computers and devices based on related technology have become indispensable tools for modern life, making ordinary tasks easier and quicker than ever before and helping make today's worker more productive than ever before. In addition to the benefits, however, there are many risks and societal implications related to our heavy use of the Internet and the vast amount of information available through the Internet. Issues include privacy and security risks and concerns (such as *malware*, *identity theft*, *phishing*, and *spam*), the differences in online and offline communications, the anonymity factor, and the amount of unreliable information that can be found on the Internet.

REVIEW ACTIVITIES

KEY TERM MATCHING

a. computer

b. hardware

c. Internet

d. netbook

e. processing

f. software

g. storage

h. supercomputer

i. Uniform Resource Locator (URL)

j. Web site

Instructions: Match each key term on the left with the definition on the right that best describes it.

1. _____ A collection of related Web pages usually belonging to an organization or individual.

2. _____ An Internet address, usually beginning with http://, that uniquely identifies a Web page.

3. _____ A programmable, electronic device that accepts data input, performs processing operations on that data, and outputs and stores the results.

4. _____ A very small notebook computer.

5. _____ Performing operations on data that has been input into a computer to convert that input to output.

6. _____ The operation of saving data, programs, or output for future use.

7. _____ The fastest, most expensive, and most powerful type of computer.

8. _____ The instructions, also called computer programs, that are used to tell a computer what it should do.

9. _____ The largest and most well-known computer network, linking millions of computers all over the world.

10. _____ The physical parts of a computer system, such as the keyboard, monitor, printer, and so forth.

SELF-QUIZ

Instructions: Circle **T** if the statement is true, **F** if the statement is false, or write the best answer in the space provided. **Answers for the self-quiz are located in the References and Resources Guide at the end of the book.**

1. **T** **F** A mouse is one common input device.

2. **T** **F** Software includes all the physical equipment in a computer system.

3. **T** **F** A computer can run without an operating system if it has good application software.

4. **T** **F** One of the most common types of home computers is the midrange server.

5. **T** **F** An example of a domain name is *microsoft.com.*

6. _____ is the operation in which data is entered into the computer.

7. A(n) _____ computer can come in convertible or slate form.

8. _____ is frequently used with servers today to create several separate environments on a single server that act as separate servers.

9. Electronic messages sent over the Internet that can be retrieved by the recipient at his or her convenience are called _____.

10. Write the number of the term that best matches each of the following descriptions in the blank to the left of its description.

a. _____ Allows access to resources located on the Internet.

b. _____ Supervises the running of all other programs on the computer.

c. _____ Enables users to perform specific tasks on a computer.

d. _____ Allows the creation of application programs.

1. Application software
2. Operating system
3. Programming language
4. Web browser

INT

EXERCISES

1. For the following list of computer hardware devices, indicate the principal function of each device by writing the appropriate letter—I (input device), O (output device), S (storage device), P (processing device), or C (communications device)—in the space provided.

a. CPU _____ **d.** Keyboard _____ **g.** Speakers _____

b. Monitor _____ **e.** Hard drive _____ **h.** DVD drive _____

c. Mouse _____ **f.** Modem _____ **i.** Microphone _____

2. Supply the missing words to complete the following statements.

a. The Internet is an example of a(n) _____, a collection of computers and other devices connected together to share resources and communicate with each other.

b. The starting page for a Web site is called the site's _____.

c. For the e-mail address *jsmith@cengage.com*, *jsmith* is the _____ and *cengage.com* is the _____ name.

d. The e-mail address pronounced *bill gee at microsoft dot com* is written _____.

3. What are three differences between a desktop computer and a portable computer?

4. List two reasons why a business may choose to network its employees' computers.

5. If a computer manufacturer called Apex created a home page for the Web, what would its URL likely be? Also, supply an appropriate e-mail address for yourself, assuming that you are employed by that company.

DISCUSSION QUESTIONS

1. There is usually a positive side and a negative side to each new technological improvement. Select a technology you use every day and consider its benefits and risks. What benefits does the technology provide? Are there any risks involved and, if so, how can they be minimized? If you chose not to use this technology because of the possible risks associated with it, how would your life be affected? Who should determine if the benefits of a new technology outweigh the potential risks? Consumers? The government?

2. The ubiquitous nature of mobile phones today brings tremendous convenience to our lives, but will misuse of new improvements to this technology result in the loss of that convenience? For instance, camera phones are now banned in many fitness centers, park restrooms, and other similar facilities because some people have used them inappropriately to take compromising photos, and mobile phones are banned in many classrooms because of the disruption of constant text messaging and the use of the phone by dishonest students to cheat on exams. Do you think these reactions to mobile phone misuse are justified? Is there another way to ensure the appropriate use of mobile phones without banning their use for all individuals? Should there be more stringent consequences for those who use technology for illegal or unethical purposes?