15th Edition

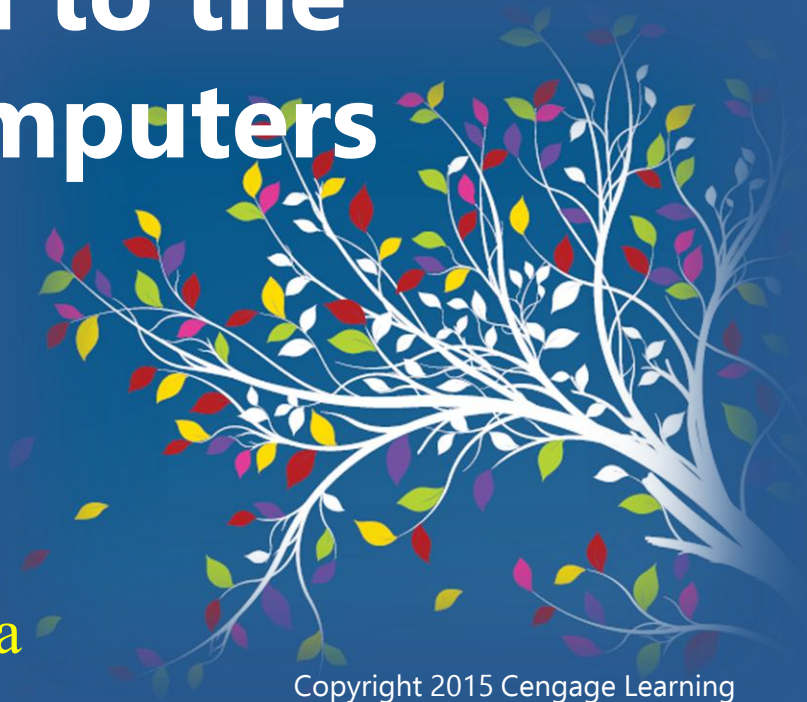
Understanding Computers

Today and Tomorrow

Comprehensive

Chapter 1

Introduction to the World of Computers



updated by

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Learning Objectives

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.

Learning Objectives

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.

Overview

- This chapter covers:
  - What computers are, how they work, and how they are used
  - Computer terminology
  - An overview of the history of computers
  - The basic types of computers in use today
  - How to access resources on the Internet
  - Societal impacts of computers

Computers in Your Life

- Why learn about computers?
  - Pervasive computing
    - Also known as ubiquitous computing
    - Computers have become an integral part of our lives
  - Basic computer literacy
    - Understanding what a computer is and how it works

Computers in Your Life

- Before 1980
  - Computers were large and expensive
  - Very few people had access to them
  - Computers were mostly used for high-volume processing tasks
- Microcomputers in the early 1980s
  - Inexpensive personal computers
  - Computer use increased dramatically

Computers in Your Life

- Today
  - Nearly 90% of US households include a computer, and most use computers at work
  - Electronic devices are converging into single units with multiple capabilities
    - Check e-mail on living room television
    - View Internet content on mobile devices
  - Computer literacy is an essential skill for everyone

Computers in Your Life

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

Courtesy Netflix

TELEVISIONS
Can be used to access Web pages, e-mail, streaming movies, and otther Internet content, in addition to viewing TV content.

Used with permission from Microsoft Corporation

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

Computers in the Home

- Computers used for a variety of tasks:
  - Looking up information and news
  - Exchanging e-mail
  - Shopping and paying bills
  - Watching TV and videos
  - Downloading music and movies
  - Organizing digital photographs
  - Playing games
  - Making vacation plans

Computers in the Home

- Used for reference, productivity, and entertainment
- Wireless networking
  - Computers can be used in nearly any location
- Smart appliances
  - Traditional appliances with built-in computer or communication technology
- Smart homes
  - Household tasks are monitored and controlled by a main computer in the house

Computers in Education

- Youth today: the computing generation
- Computer labs and classrooms
  - Most students today have access to computers at school
  - Some schools integrate e-books into the curriculum
- Wireless hotspots
  - Colleges and universities are even more integrated
  - Some have computer requirements for enrollment
    - Supplied or Bring Your Own Device (BYOD)
- Distance learning
  - Students participate from locations other than the traditional classroom setting using computers and Internet access

Computers in Education

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

© iStockphoto.com/sturti

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

Denver Makle, 7th Army JMTC

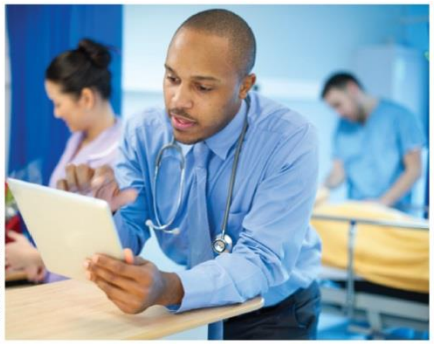
DISTANCE LEARNING
With distance learning, students—such as these U.S. Army soldiers—can take classes from home or wherever they happen to be at the moment.

FIGURE 1-3
Computer use in education.

Computers on the Job

- Computers have become a universal on-the-job tool for decision-making, productivity, and communication
  - By all types of employees
  - For access control and other security measures
  - For service professional use
  - Extensively by the military
  - Requires continually refreshing computer skills
- Common uses:
  - Decision making, productivity, off-site communications, and authentication

Computers on the Job



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

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

© iStockphoto.com/fstop123

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 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 Go

- Computers are encountered in nearly every aspect of daily life
  - Consumer kiosks
  - ATM transactions
  - POS systems at retail stores
  - Self-checkout systems
  - Consumer authentication systems
  - Portable computers or mobile devices
  - GPS systems

Technology and You Box

Restaurant iPad Ordering Systems

- Used in conjunction with e-menus
- Customers can place and pay for orders
- Can provide more resources to customers

What Is a Computer and What Does It Do?

- Computer
  - A programmable, electronic device that accepts data, performs operations on that data, and stores the data
  - Follows instructions, called programs, which determine the tasks the computer will perform
- Basic Operations
  - Input: Entering data into the computer
  - Processing: Performing operations on the data
  - Output: Presenting the results
  - Storage: Saving data, programs, or output for future use
  - Communications: Sending or receiving data

What Is a Computer and What Does It Do?

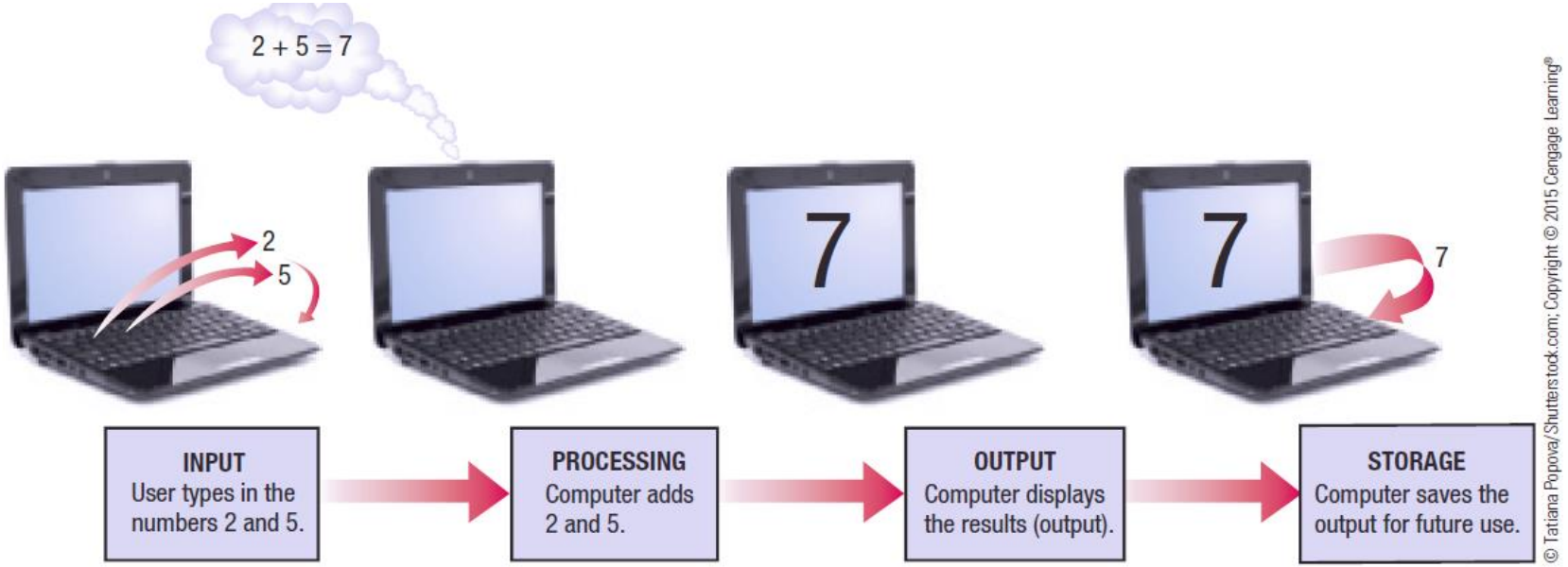


FIGURE 1-6
The information processing cycle.

Data vs. Information

- Data
  - Raw, unorganized facts
  - Can be in the form of text, graphics, audio, or video
- Information
  - Data that has been processed into a meaningful form
- Information Processing
  - Converting data into information

Computers Then and Now

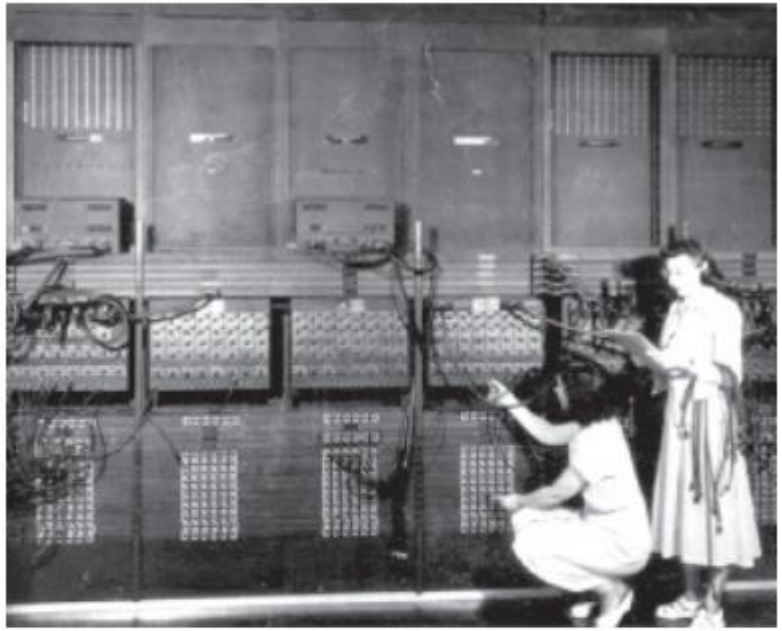
- The computer as we know it is a fairly recent invention
- The history of computers is often referred to in terms of generations
- Each new generation is characterized by a major technological development
- Precomputers and early computers (before approx. 1946)
  - Abacus, slide rule, mechanical calculator
  - Punch Card Tabulating Machine and Sorter

Computers Then and Now

- First-generation computers (1946-1957)
  - Enormous and powered by vacuum tubes
  - Used a great deal of electricity and generated a lot of heat
  - ENIAC and UNIVAC
- Second-generation computers (1958-1963)
  - Used transistors
  - Computers were smaller, more powerful, cheaper, more energy-efficient, and more reliable
  - Punch cards and magnetic tape were used to input and store data

Computers Then and Now

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.

Computers Then and Now

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.

Computers Then and Now

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.

FIFTH-GENERATION COMPUTERS
Some aspects of fifth-generation computers, such as the natural language input and artificial intelligence used by the IBM Watson computer shown competing on *Jeopardy!* here, already exist.

Computers Then and Now

- Fifth-generation (now and the future)
  - Infancy stage
  - May be based on artificial intelligence (AI)
  - Will likely use voice and touch input
  - May be based on optical computers and utilize nanotechnology

Computers Then and Now

FIFTH-GENERATION COMPUTERS
Some aspects of fifth-generation computers, such as the natural language input and artificial intelligence used by the IBM Watson computer shown competing on *Jeopardy!* here, already exist.

Courtesy IBM Corporate Archives, Courtesy U.S. Army, Courtesy of IBM Corporation

FIGURE 1-7
A brief look at computer generations.

Hardware

- Hardware: The physical parts of a computer
  - Internal hardware
    - Located inside the main box (system unit) of the computer
  - External hardware
    - Located outside the system unit
    - Connect to the computer via a wired or wireless connection
  - Hardware devices are associated with all five computer operations

Hardware

- Input Devices
  - Used to input data into the computer
  - Keyboards, mice, scanners, cameras, microphones, touch pads, touch screens, fingerprint readers, etc.
- Processing Devices
  - Perform calculations and control computer's operation
  - Central processing unit (CPU) and memory
- Output Devices
  - Present results to the user
  - Monitors, printers, speakers, projectors, etc.

Hardware

- Storage Devices
  - Used to store data on or access data from storage media
  - Hard drives, CD/DVD discs and drives, USB flash drives, etc.
- Communications Devices
  - Allow users to communicate with others and to electronically access remote information
  - Modems, network adapters, routers, etc.

Hardware

FIGURE 1-9
Typical computer hardware.

Software

- Software
  - The programs or instructions used to tell the computer hardware what to do
- System Software
  - Operating system starts up the computer and controls its operation
  - Without OS, computer cannot function
  - Boots the computer and launches programs at the user's direction
  - Most use a GUI to interact with the user via icons, buttons, tiles, etc.
  - Windows, Mac OS, Linux, Android, etc.

Software

- Windows 8 interface
  - Start button, Start screen, tiles, charms, etc.

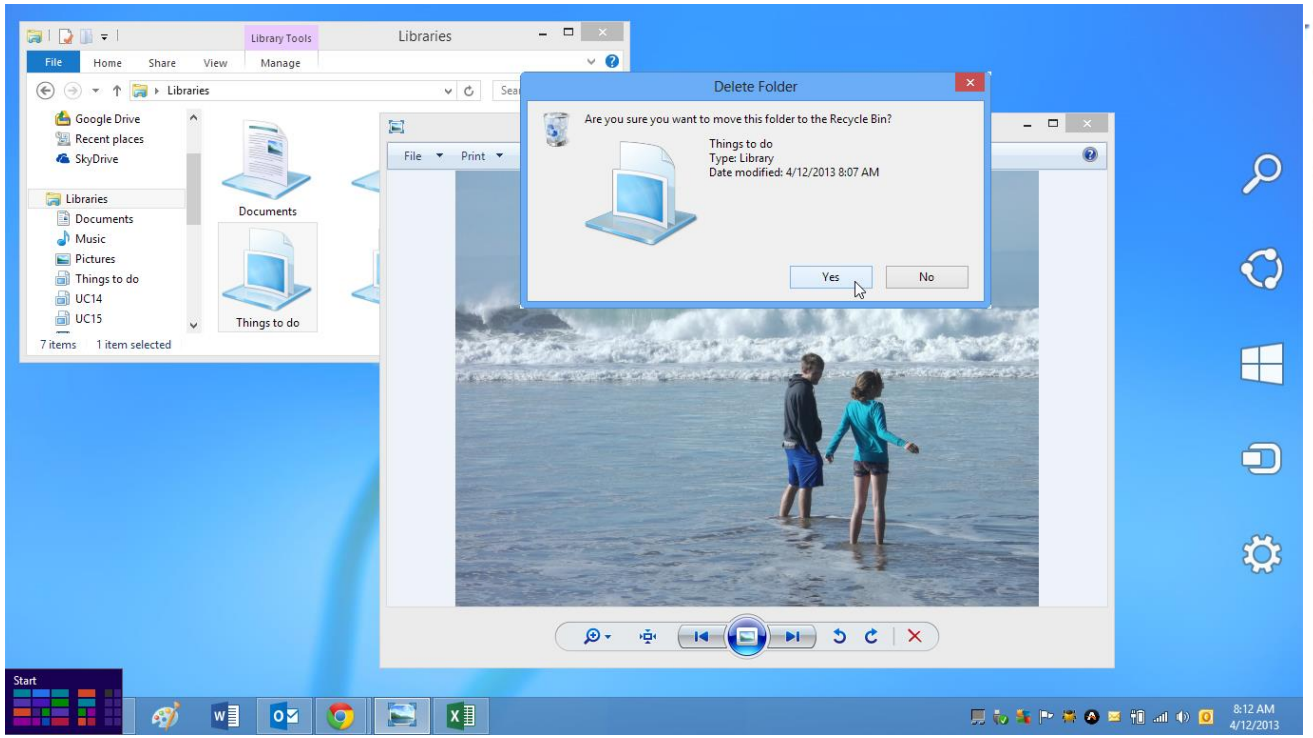


FIGURE 1-10
The Windows desktop.

Application Software

- Application Software
  - Performs specific tasks or applications
    - Creating letters, budgets, etc.
    - Managing inventory and customer databases
    - Editing photographs
    - Scheduling appointments
    - Viewing Web pages
    - Exchanging e-mail
    - Burning DVDs
    - Designing homes
    - Playing games

Application Software

- Examples of application software
  - Word processing programs
  - Multimedia programs
  - Web browsers
  - E-mail programs

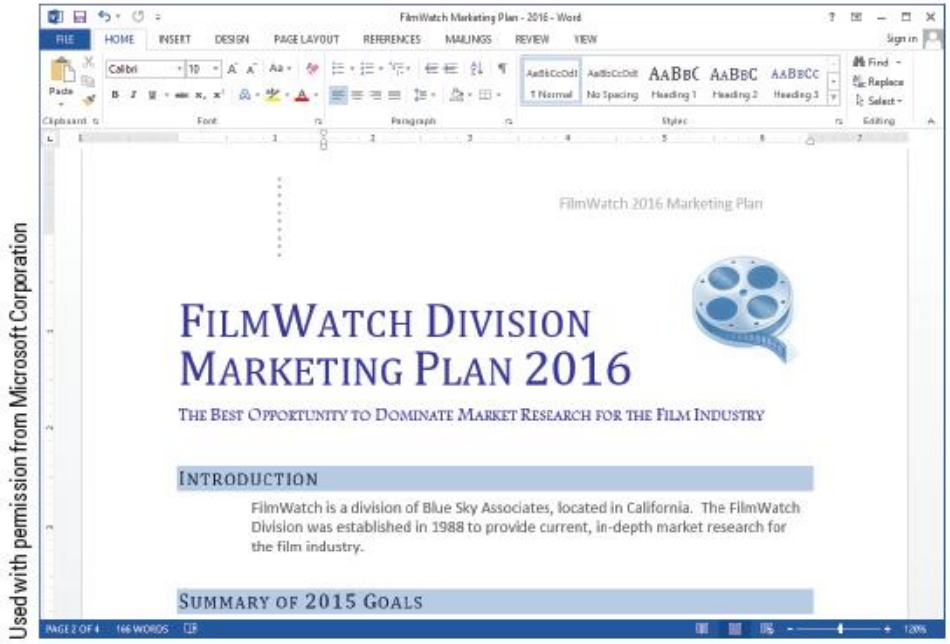


FIGURE 1-11
Examples of application software.

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

Computer Users and Professionals

- Computer Users (end users)
  - People who use a computer to obtain information
- Computer professionals include:
  - Programmers
    - Write programs computers use
  - Systems analysts
    - Design computer systems
  - Computer operations personnel
    - Manage day-to-day computer operations
  - Security specialists
    - Secure computers and networks against hackers

Quick Quiz

1. Which of the following was not a first generation computer?
   a. IBM PC
   b. UNIVAC
   c. ENIAC
2. True or False: A window displayed when the computer needs more information from the user is called a dialog box.
3. Speakers are an example of a(n) _____ device.

Answers:

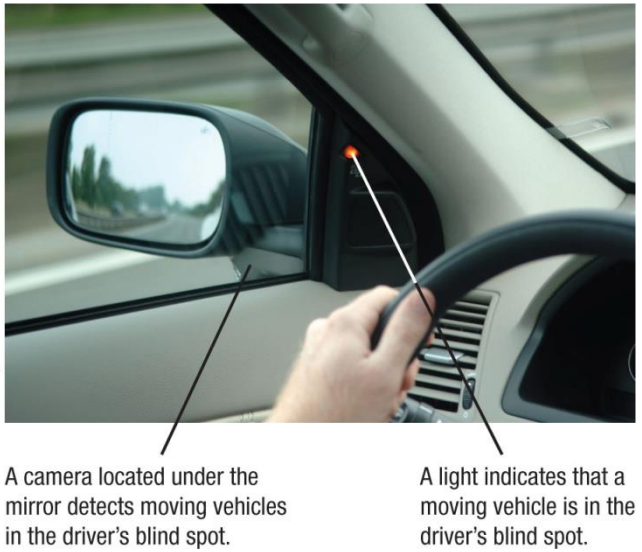
1) a; 2) True; 3) output

Computers To Fit Every Need

- Six basic categories of computers:
  - Embedded computers
  - Mobile devices
  - Personal computers
  - Servers
  - Mainframe computers
  - Supercomputers

Embedded Computers

- Embedded Computers
  - Embedded into a product and designed to perform specific tasks or functions for that product
  - Cannot be used as general-purpose computers
  - Often embedded into:
    - Household appliances
    - Thermostats
    - Sewing machines
    - Treadmills
    - Answering machines
    - Cars



Courtesy Volvo Cars of North America

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.

Trend Box

Tiny PCs

- Can look like a USB flash drive or small circuit board
- Typically connect your TV to the Internet to display Web content
- Some are full computers

Mobile Devices

- Mobile Device
  - A very small device with some type of built-in computing or Internet capability
  - Typically has a small screen and keyboard
  - Examples:
    - Smartphones
    - Handheld gaming devices
    - Portable digital media players
    - Media tablets

FIGURE 1-13
Mobile devices.

Personal Computers (PCs)

- Personal Computer (PC)
  - Small computer designed to be used by one person at a time
  - Also called a microcomputer
  - Available in different sizes and shapes
- Desktop Computers
  - On or next to a desk
  - Tower case, desktop case, or all-in-one
  - PC or Macintosh
  - Not portable

FIGURE 1-14
Desktop computers.

TOWER COMPUTERS

ALL-IN-ONE COMPUTERS

Portable Computers

- Portable Computers
  - Designed to be carried around easily
  - Fully functional computers
  - Notebook (laptop) computers
    - Typically use a clamshell design
  - Tablet computers
    - Usually use a digital pen/stylus or touch screen
    - No physical keyboard; can use on-screen or attached keyboard
  - Hybrid notebook-tablet computers
  - Netbooks
    - Smaller and have more limited features than conventional notebooks

Portable Computers

NOTEBOOKS

TABLETS

HYBRID NOTEBOOK-TABLETS

FIGURE 1-15
Portable computers.

Thin Client and Internet Appliances

- Thin Client
  - Designed to utilize a network for much of its processing
  - Lower cost, increased security and easier maintenance
  - Limited or no local storage
  - Not able to function as a computer if network is down
- Internet Appliance
  - Specialized network computer designed for Internet access
  - Some use apps to deliver news, sports scores, weather, music, and other Web-based information

Inside the Industry Box

Tech Clothing

- Allows you to carry multiple devices safely
- Can use devices while they are being worn
- Make airport checkpoints easier

Servers

- Server
  - A medium-sized computer used to host programs and data for a small network
  - Sometimes referred to as a minicomputer
  - Users connect via a network with a computer, thin client, or dumb terminal
  - Virtualization
    - Creating virtual rather than actual environments (often used to share a server for increased efficiency)

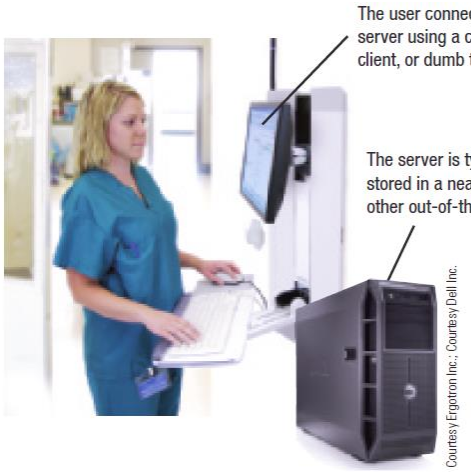


FIGURE 1-17
Servers. Servers are used to host data and programs on a small network, such as a school computer lab or medical office network.

Mainframe Computers

- Mainframe Computer
  - Powerful computer used by many large organizations to manage large amounts of centralized data
  - Standard choice for hospitals, universities, large businesses, banks, government offices
  - Located in climate-controlled data centers and connected to the rest of the company computers via a network
  - Larger, more expensive, and more powerful than servers
  - Usually operate 24 hours a day
  - Also called high-end servers or enterprise-class servers

Mainframe Computers

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

Supercomputers

- Supercomputer
  - Fastest, most expensive, most powerful type of computer
  - Generally run one program at a time, as fast as possible
  - Can cost several million dollars each
  - Tend to be very large and contain a large number of CPUs
  - Titan is one of the fastest computers in the world

Supercomputers

Courtesy of Oak Ridge National Laboratory

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

Quick Quiz

1. A tablet PC is an example of a(n) _____.
   a. Desktop computer
   b. Portable PC
   c. Internet appliance
2. True or False: The terms mainframe computer and supercomputer are interchangeable; both refer to the largest, most powerful computers.
3. A smartphone is an example of a(n) _____.

Answers:

1) b; 2) False; 3) mobile device

Computer Networks and the Internet

- Computer Network
  - A collection of hardware and other devices that are connected together
  - Users can share hardware, software, and data
  - Users can communicate with each other
- Network Servers
  - Manage resources on a network

Computer Networks and the Internet

- Computer networks exist in many sizes and types
  - Home networks
  - School and small office networks
  - Large corporate
  - Public wireless networks
  - Mobile telephone networks

Computer Networks and the Internet

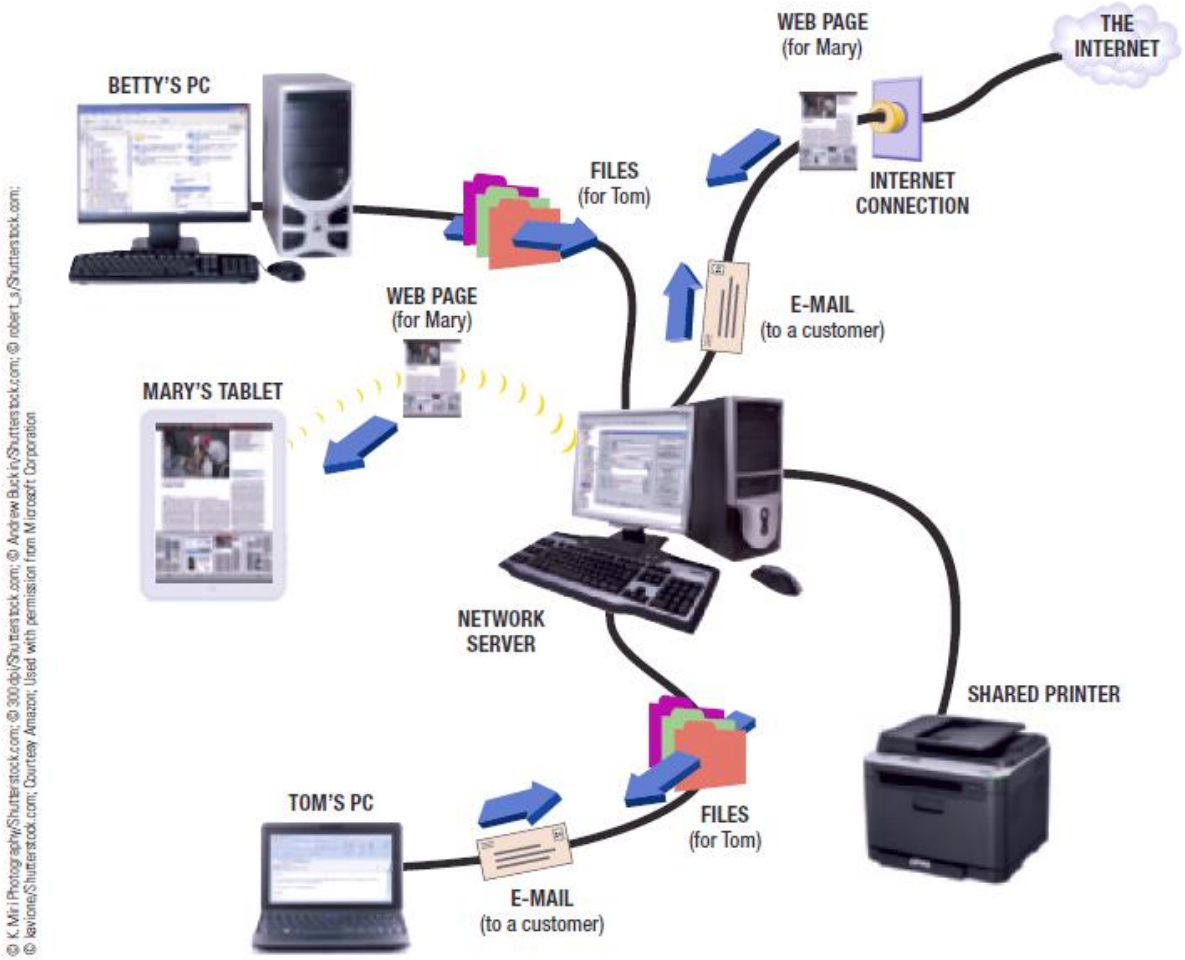


FIGURE 1-20
Example of a computer network.

What Are the Internet and the World Wide Web?

- Internet
  - The largest/most well-known computer network in the world
  - Individuals connect using an Internet service provider (ISP)
- World Wide Web
  - One resource (a vast collection of Web pages) available through the Internet
  - Web sites contain Web pages stored on Web servers
  - Viewed using a Web browser (Internet Explorer, Chrome, Safari, Firefox, Opera, etc.)
  - Offers a wide variety of information

What Are the Internet and the World Wide Web?

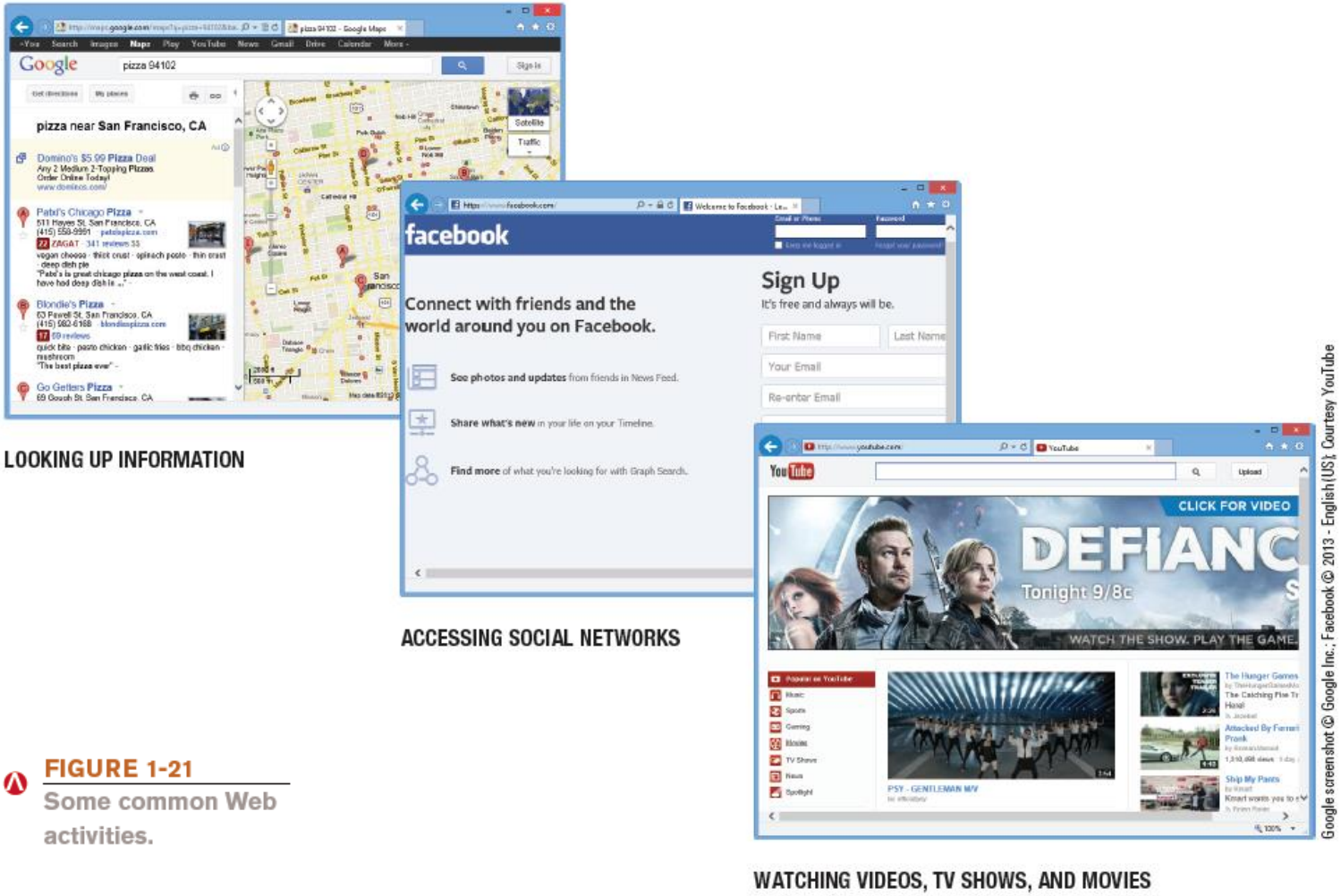


FIGURE 1-21
Some common Web activities.

Accessing a Network or the Internet

- Need a modem or network adapter to connect
- Some networks require a username and password
- Internet connections can be:
  - Direct (always-on) connections
  - Dial-up connections
- Internet addresses are used to access resources on the Internet
  - IP (Internet Protocol) address
    - Numeric address that identifies computers (207.46.197.32)

IP Addresses and Domain Names

- IP Addresses
  - Are numeric and unique
- Domain Names
  - Correspond to IP addresses
  - Top-level domains (TLDs)
  - Identifies type of organization or its location

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).

Uniform Resource Locators (URLs)

- Uniform Resource Locators (URLs)
  - Uniquely identifies a Web page, including
    - Protocol or standard being used
    - Web server hosting the page
    - Names of folders in which the Web page file is stored
    - Web page's filename

Uniform Resource Locators (URLs)

- Protocols:
  - Hypertext Transfer Protocol (http://) is typically used to display Web pages (https:// is used for secure Web pages)
  - File Transfer Protocol (ftp://) is often used for file exchange

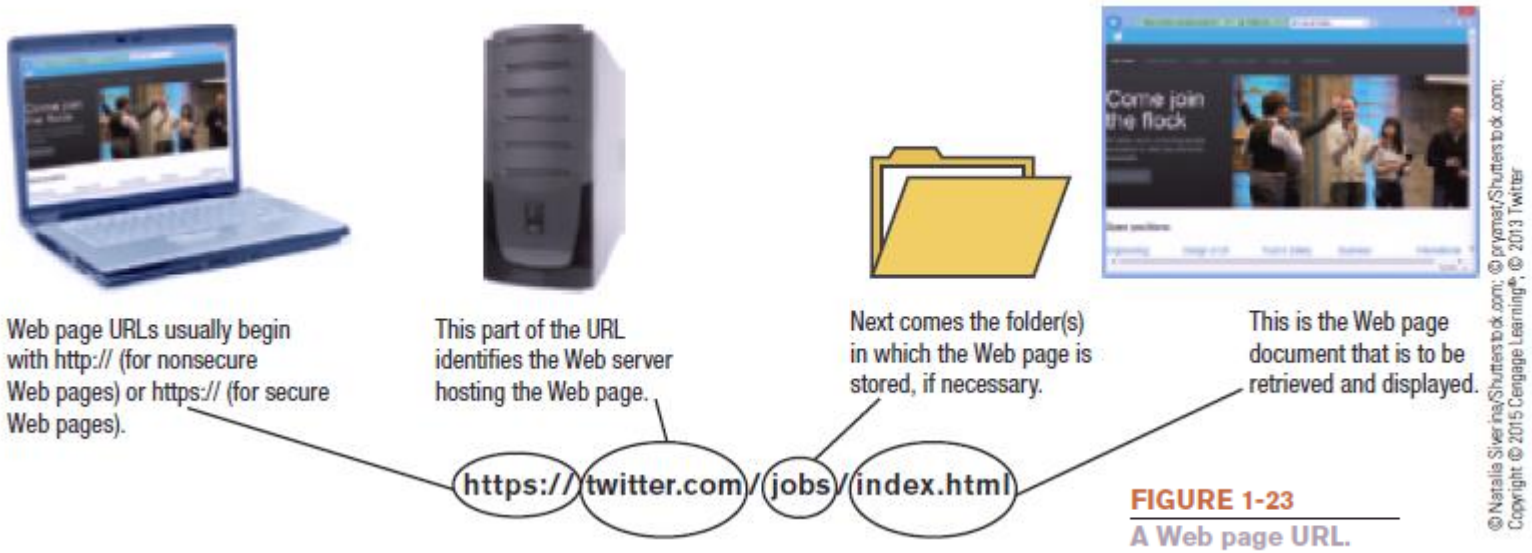


FIGURE 1-23
A Web page URL.

E-mail Addresses

- E-mail addresses consist of:
  - Username
    - An identifying name
  - The @ symbol
  - Domain name for the computer that will be handling the person's e-mail (mail server)
- Pronouncing Internet addresses

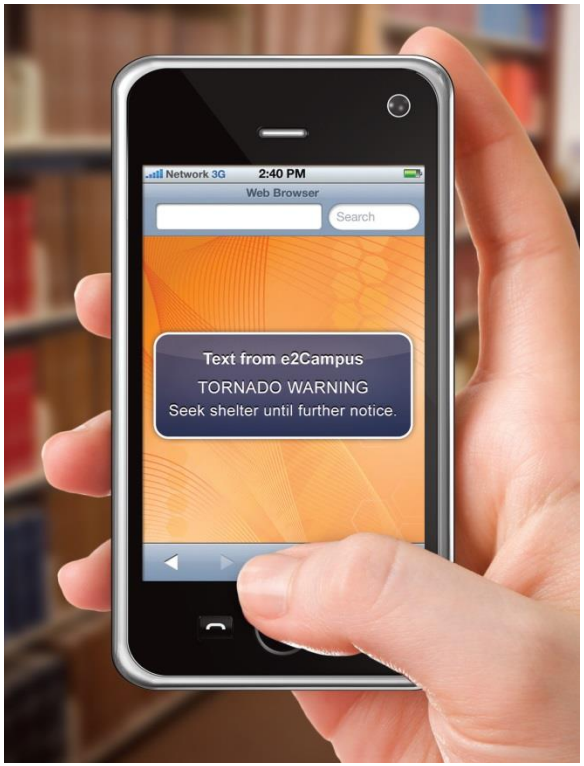
TYPE OF ADDRESS	SAMPLE ADDRESS	PRONUNCIATION
Domain name	berkeley.edu	berkeley dot e d u
URL	microsoft.com/windows/ie/default.asp	microsoft dot com slash windows slash i e slash default dot a s p
E-mail address	president@whitehouse.gov	president at white house dot gov

FIGURE 1-24
Pronouncing Internet addresses.

How It Works Box

Campus Emergency Notification Systems

- Enable students and teachers to be notified of dangerous activity, weather, etc. in a timely manner
- Can be sent via text messages, e-mail messages, Facebook pages, Twitter feeds, digital signage systems, etc.



Surfing the Web

- Web browser
  - Used to display Web pages
- Browser starting page or home page
  - The first page displayed when the browser is opened
- To navigate to a Web page, you can:
  - Type a URL in the Address bar
  - Click a hyperlink – graphics or text linked to other Web pages
  - Select a Favorite/Bookmark or page from the History list

Searching the Web

- Search site:
  - Helps you locate what you are looking for
  - Typically search using keywords
- Reference sites
  - Look up addresses, telephone numbers, ZIP codes, maps, etc.

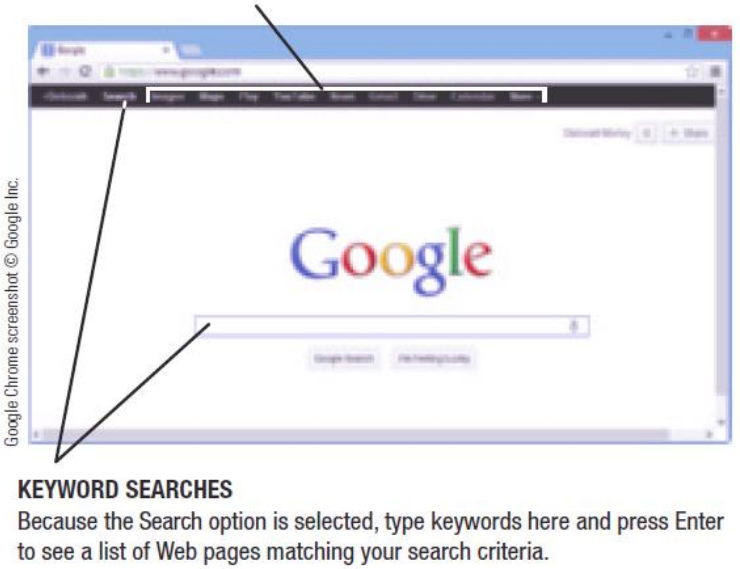


FIGURE 1-26
The Google search site displayed in the Chrome browser.

E-Mail

- Electronic mail (e-mail)
  - Electronic messages exchanged between computers on a network
- One of the most widely used Internet applications
- Can be conventional e-mail program, Web-based, or mobile-based

Conventional	Web-based
Microsoft Outlook	Gmail
Mac OS X Mail	Outlook.com

E-Mail

- Can contain photos, attached files, etc.
- Mobile e-mail may require a fee
- Other types of mobile communications
  - Short Message Service (SMS)
  - Multimedia Message Service (MMS)

E-Mail

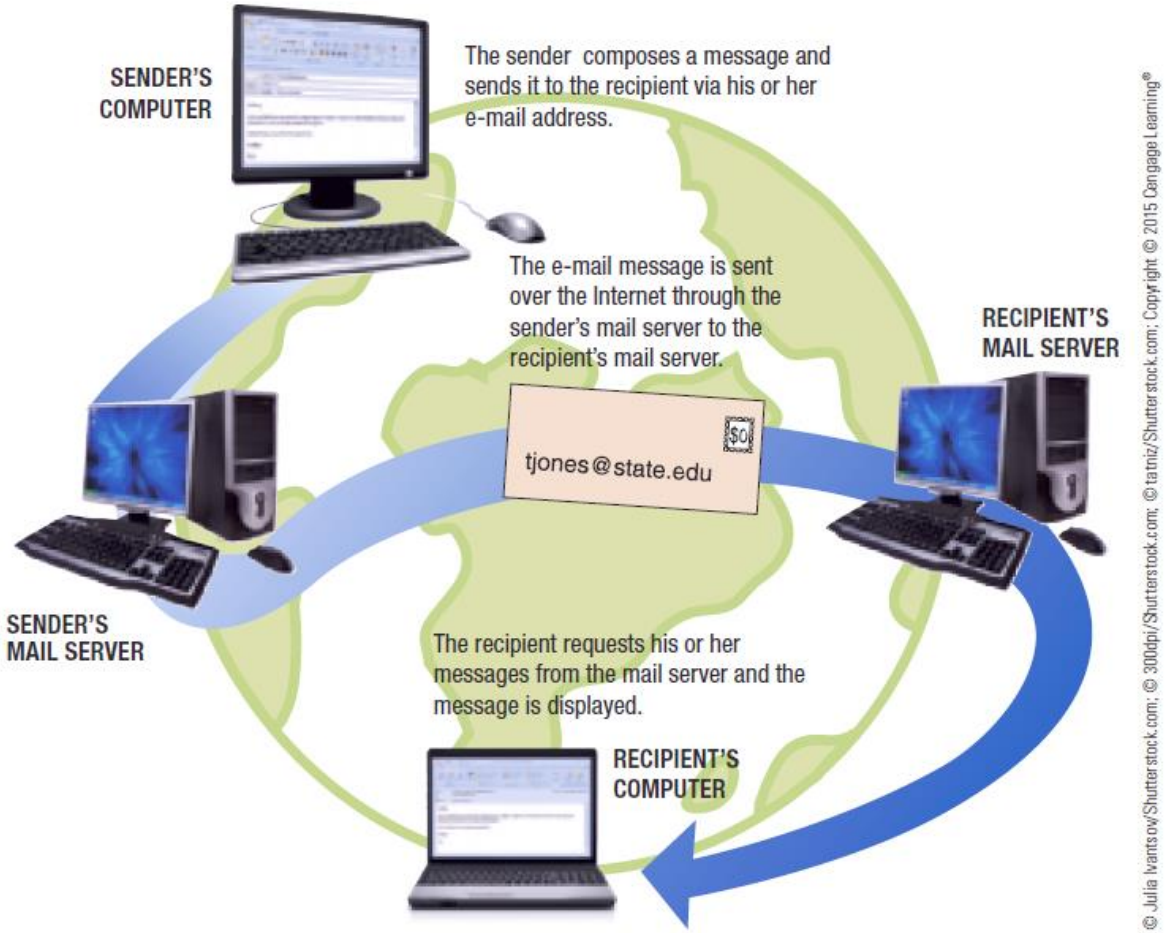


FIGURE 1-27
How e-mail works.

Computers and Society

- The vast improvements in technology over the past decade have had a distinct impact on daily life, at home and at work
- Many benefits of a computer-oriented society
  - Ability to design products before construction leads to safer products
  - Earlier medical diagnoses and more effective treatment
  - Devices that allow physically and/or visually challenged individuals to perform job tasks
  - Documents e-mailed or faxed in moments
  - Download information, music, programs, movies, and more on demand

Computers and Society

- Computer-oriented society also has risks
  - Stress and health concerns
  - Spam
  - Computer viruses and malware
  - Identity theft and phishing
  - Privacy issues
    - How data is collected
    - How secure is the collected data

Computers and Society

- Differences in online communications
  - Less formal than traditional
  - Netiquette
    - Be polite and considerate of others
    - Refrain from offensive remarks
  - Abbreviations (acronyms) and emoticons
    - Acronyms, such as BTW (by the way)
    - Illustrations of faces, such as ☺

Computers and Society

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, or in just general bad taste. Also check spelling and grammar—typos look unprofessional and nobody likes wading through poorly written materials.
Don't spam your contacts	Don't hit *Reply All* to an e-mail when a simple *Reply* will do. The same goes for forwarding e-mail chain letters, *retweeting* every joke you run across, or sending every funny YouTube video you find—to everyone you know.
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 or post	Once you send an e-mail or text message or post something online, you lose control of it. Don't include content (such as compromising photos of yourself) that you would not want shared with others, and don't tag people in photos that are unflattering to them. In addition, don't e-mail or post anything if emotions are running high—wait until you calm down.

FIGURE 1-30

Netiquette. Use these netiquette guidelines and common sense when communicating online.

Computers and Society

- The Anonymity Factor
  - Gives many individuals a sense of freedom
  - Can also be abused
- Information Integrity
  - Use common sense when evaluating online content
  - Check your source--not all information on the Internet is accurate

Quick Quiz

1. Index.html is an example of a(n) _____.
   a. URL
   b. IP address
   c. Web page filename
2. True or False: All information published to Web pages is accurate.
3. In the e-mail address jsmith@abc.com, abc.com is the _____.

Answers:

1) c; 2) False; 3) domain name

Summary

- Computers in Your Life
- What is a Computer and What Does It Do?
- Computers to Fit Every Need
- Computer Networks and the Internet
- Computers and Society