Week 01 - Introduction to the World of Technology

GE-161 Introduction to Information and Communication Technologies

Department of Information Technology

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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
  - An overview of networks and 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
    - Knowing about and understanding computers and their uses is an essential skill today for everyone

Computers in Your Life

- Before 1980
  - Computers were large, expensive and very few people had access to them
  - Computers were mostly used for high-volume processing tasks
- Microcomputers in the early 80s
  - Inexpensive personal computers has increased use dramatically
- Today
  - More than 80% of US households include a computer and most use computers at work
  - Electronic devices are converging into single units with multiple capabilities

Computers in the Home

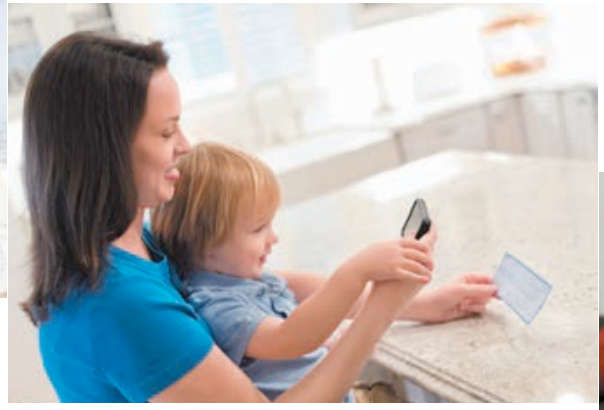
- Computers used for a variety of tasks:
  - Looking up information and news
  - Exchanging e-mail
  - Shopping and paying bills
  - Watching TV and videos
  - Downloading music and movies
  - Organizing digital photographs
  - Playing games
  - Telecommuting

Computers in the Home

- Convergence
  - The computer has become the central part of home entertainment
  - Dual-mode mobile phones
- 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 the Home

REFERENCE
Retrieving information, obtaining news, viewing recipes, shopping online, and exchanging e-mail are popular reference activities.



PRODUCTIVITY
Online banking and shopping, editing and managing digital photos and home videos, creating and editing work-related documents, and paying bills are common productivity tasks.

ENTERTAINMENT
Watching online TV and movies, viewing photos and videos, playing games, and viewing Web content are popular entertainment activities.

Computers in Education

- Many students today have access to computers either in a classroom or a computer lab
- Colleges and universities are even more integrated
  - Wireless hotspots allow usage of personal laptops to connect to the college network
  - Some colleges require a computer for enrollment
- Distance learning
  - Students participate from locations other than the traditional classroom setting using computers and Internet access

Computers in Education

COMPUTER LABS AND CLASSROOMS
Computers and Internet access are often available in the classroom and/or a computer lab for student use.

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

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.

Computers on the Job

- Computers have become a universal on-the-job tool for decision-making, productivity, and communication
  - Used by all types of employees
  - Used for access control and other security measures
  - Use by service professionals is growing
  - Used extensively by the military
  - Employees in all lines of work need to continually refresh their computer skills

Computers on the Job

DECISION MAKING
Computers are used to help make on-the-job decisions.

PRODUCTIVITY
Computers are used to perform on-the-job tasks efficiently and accurately.

OFF-SITE COMMUNICATIONS
Portable devices are used to record data, access data, or communicate with others.

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
  - Portable computers or mobile devices
  - M-commerce systems
  - GPS systems

Computers on the Go

MOBILE DEVICES
Enable individuals to remain in touch with others and to access Internet resources while on the go.

CONSUMER KIOSKS
Are widely available to view conference or gift registry information, print photographs, order products or services, and more

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

WEARABLE DEVICES
Enable individuals to easily view smartphone messages or their fitness activities while on the go.

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 or results as needed
  - Computers follow 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

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 1946)
  - Abacus, slide rule, mechanical calculator
  - Punch Card Tabulating Machine and Sorter

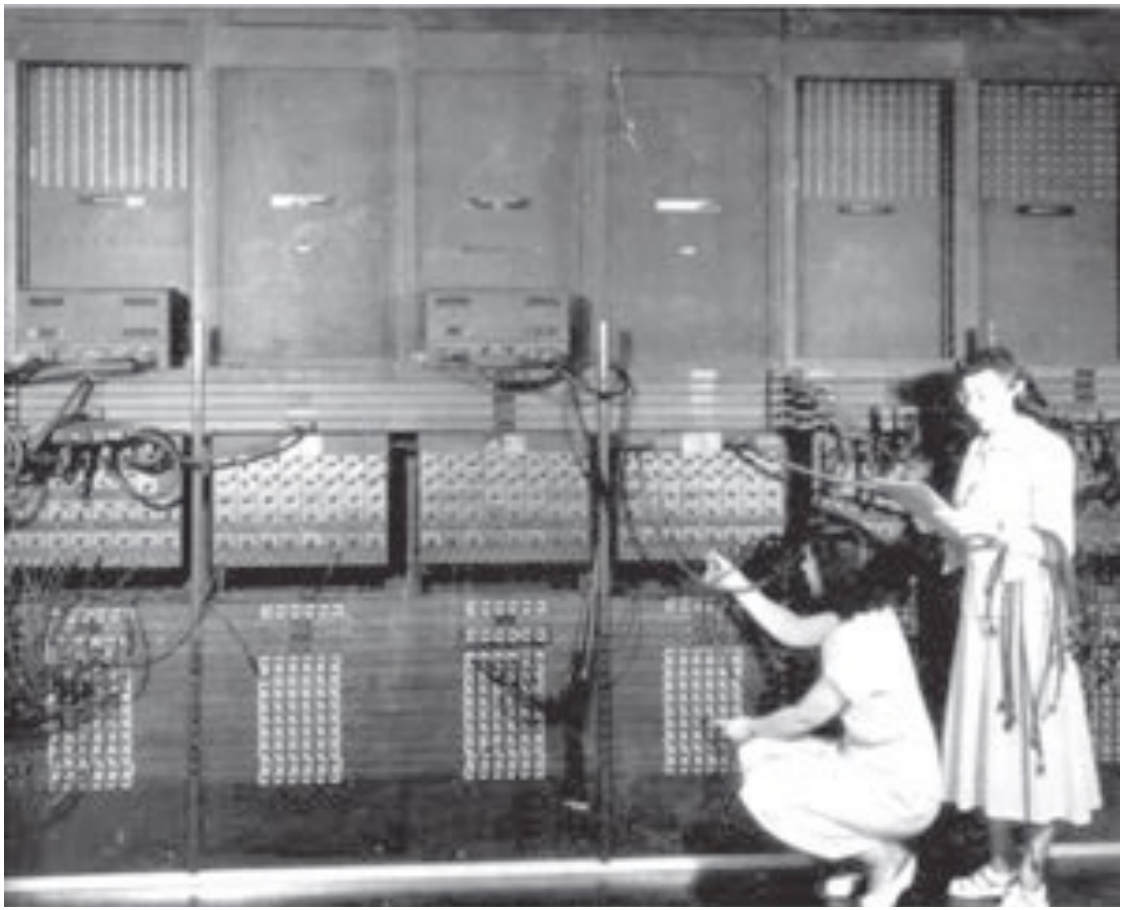
Computers Then and Now

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.

Computers Then and Now

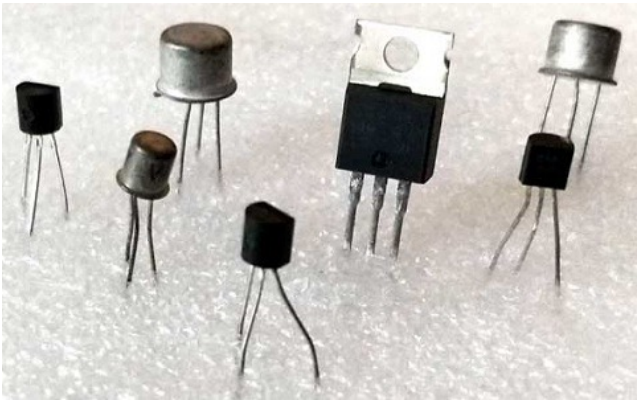
- First-generation computers (1946-1957)
  - Enormous and powered by vacuum tubes
  - Used a great deal of electricity, and generated a lot of heat
  - ENIAC and UNIVAC
- Second-generation computers (1958-1963)
  - Used transistors
  - Computers were smaller, more powerful, cheaper, more energy-efficient,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

Computers Then and Now



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 in order to run programs.

Computers Then and Now

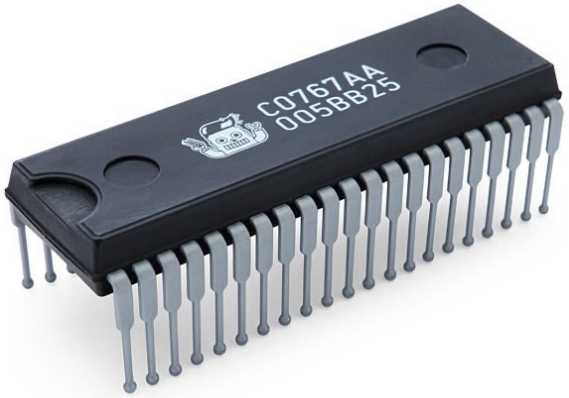


SECOND-GENERATION COMPUTERS
Second-generation computers, such as the IBM 1401 mainframe shown here, used transistors instead of vacuum tubes so they were smaller, faster, and more reliable than first-generation computers.

Computers Then and Now

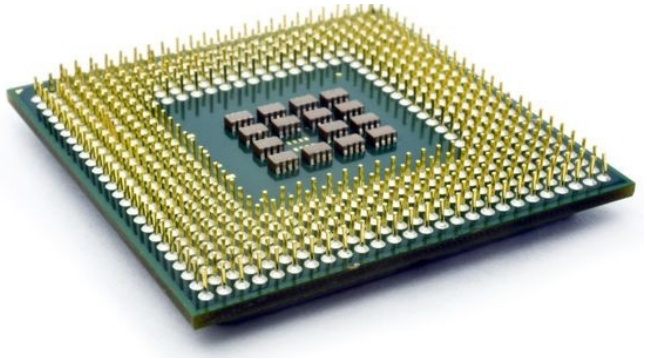
- Third-generation computers (1964-1970)
  - Used integrated circuits (ICs)
  - Keyboards and monitors introduced
- Fourth-generation computers (1971-present)
  - Use microprocessors
  - IBM PC, Apple Macintosh
  - Use keyboards, mice, monitors, and printers
  - Use magnetic disks, flash memory, and optical disks for storage
  - Computer networks, wireless technologies, Internet introduced

Computers Then and Now



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.

Computers Then and Now

- Fifth-generation (now and the future)
  - Infancy stage
  - No precise classification
  - May be based on artificial intelligence (AI)
  - 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.

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
  - There is hardware associated with all five computer operations

Hardware

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

Hardware

- Input devices
  - Used to input data into the computer
  - Keyboards, mice, scanners, cameras, microphones, joysticks, touchpads, 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, 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 windows, icons, menus, buttons, etc.
    - Windows, Mac OS, Linux, etc.

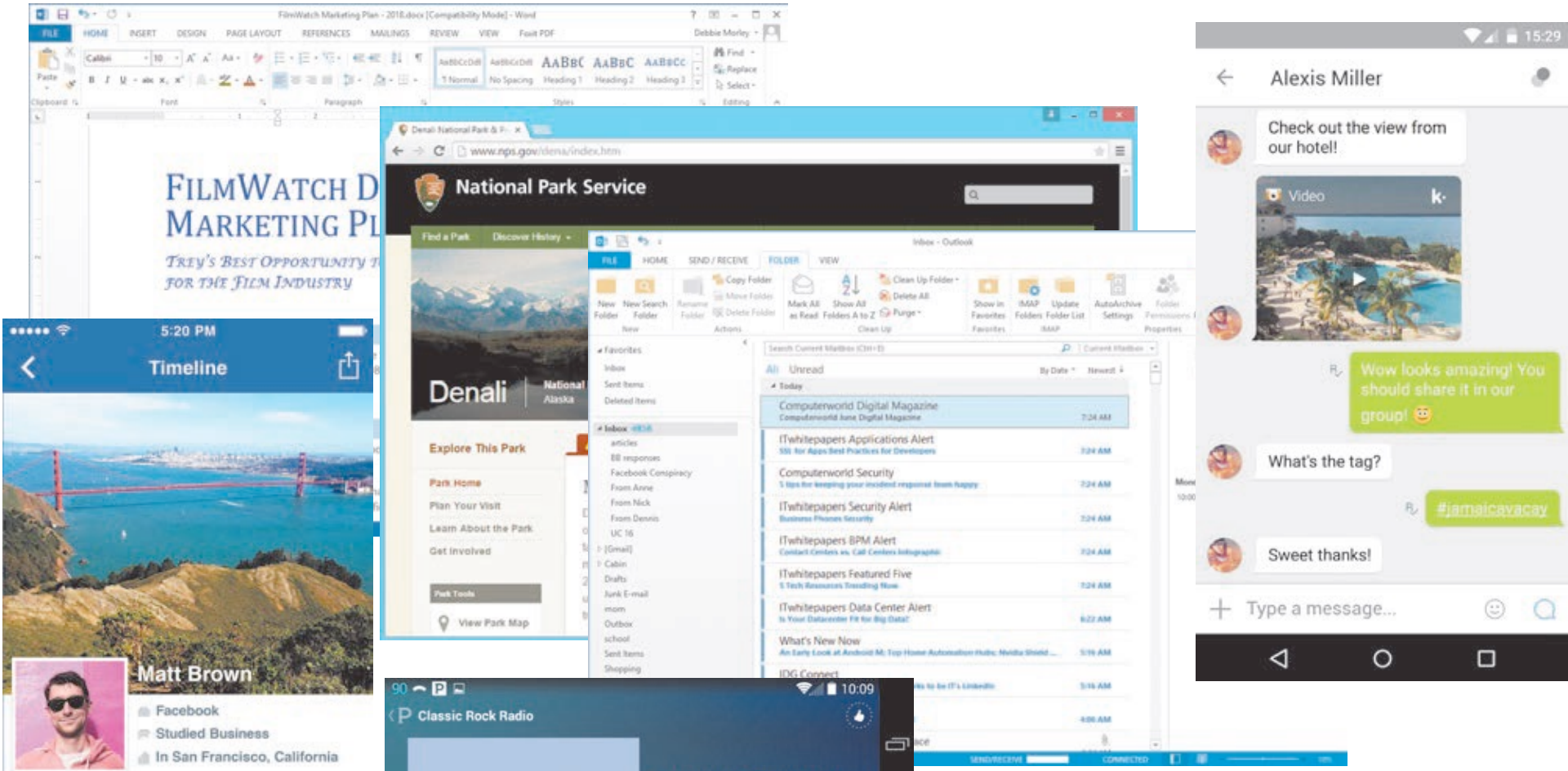
Software

FIGURE 1-10

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
  - Sending and receiving e-mail
  - Recording / playing CDs/DVDs
  - Designing homes
  - Playing games

Application Software



Computer Users and Professionals

- Computer users (end users): People who use a computer to obtain information
- Computer professionals include:
  - Programmers
  - Systems analysts
  - Computer operations personnel
  - Security specialists

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
  - Midrange servers
  - Mainframe computers
  - Supercomputers

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
  - A/V equipment
  - Cars

Figure 1-12
Google's self-driving car prototype.

Mobile Devices

- Mobile device: A very small device with some type of built-in computing or Internet capability
- Typically based on mobile phones
- Typically have small screens and keyboards
- Examples:
  - Smartphones
  - Handheld gaming devices
  - Portable digital media players

Figure 1-13
Mobile devices.

Personal Computers (PCs)

- A small computer designed to be used by one person at a time
  - Also called a microcomputer
  - Range in size
- Desktop computers: Fit on or next to a desk
  - Can use tower case, desktop case, or all-in-one
  - Can be PC-compatible or Macintosh
  - Not designed to be portable

Portable Computers

- Laptop computers: Typically use clamshell design
- Tablet computers: Can be slate tablets or convertible tablets
- Netbooks: Small notebooks; rapidly growing type of PC
- Ultra-mobile PCs (UMPCs): Handheld computers

Thin Clients and Internet Appliances

- Thin client or network computer (NC): Device designed to access a network for processing and data storage
  - Lower cost, increased security, and easier maintenance
  - Limited or no local storage
  - Not able to function as a computer if the network is down
- Internet appliance: Specialized network computer designed for Internet access and/or e-mail exchange
  - Often set-top boxes
  - Can include Internet-enabled gaming consoles

Thin Clients and Internet Appliances

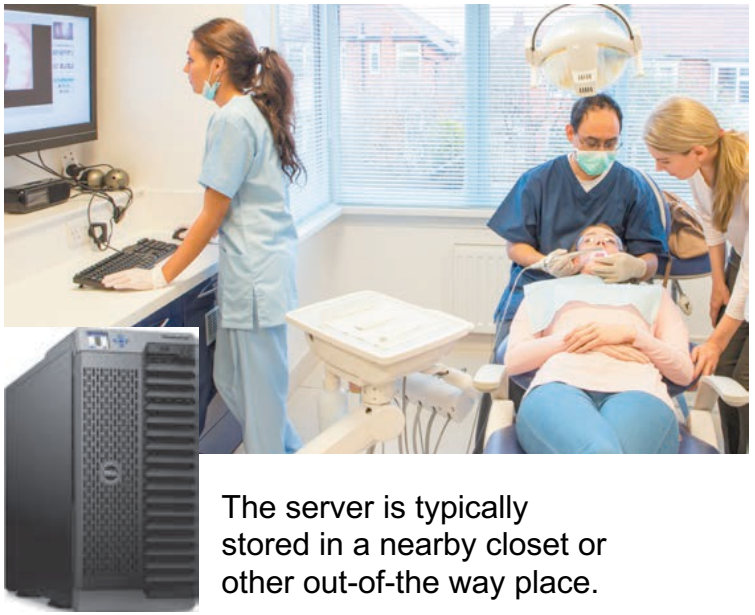
THIN CLIENTS

CHROMEBOOK MOBILE

SMART FRIDGES

Midrange Servers

- Midrange server*:* A medium-sized computer used to host programs and data for a small network
  - Users connect via a network with a computer, thin client, or dumb terminal
  - May consist of a collection of individual circuit boards called blades
  - Virtualization: Creating virtual environments (often used to share a server for increased efficiency)



Mainframe Computers

- Mainframe computer: Powerful computer used by several large organizations to manage large amounts of centralized data
  - Standard choice for large organizations, 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 midrange servers
  - Usually operate 24 hours a day
  - Also called high-end servers or enterprise-class servers

Mainframe Computers

IBM Z Series - IBM New Mainframe Computer | EM360

Supercomputers

- Supercomputer: Fastest, most expensive, most powerful type of computer
  - Generally run one program at a time, as fast as possible
  - Commonly built by connecting hundreds of smaller computers, supercomputing cluster
  - Used for space exploration, missile guidance, satellites, weather forecast, oil exploration, scientific research, complex Web sites, decision support systems, 3D applications, etc.

Supercomputers

The IBM Blue Gene/P supercomputer "Intrepid" at Argonne National Laboratory runs 164,000 processor cores using normal data center air conditioning, grouped in 40 racks/cabinets connected by a high-speed 3D torus network.

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) _____.

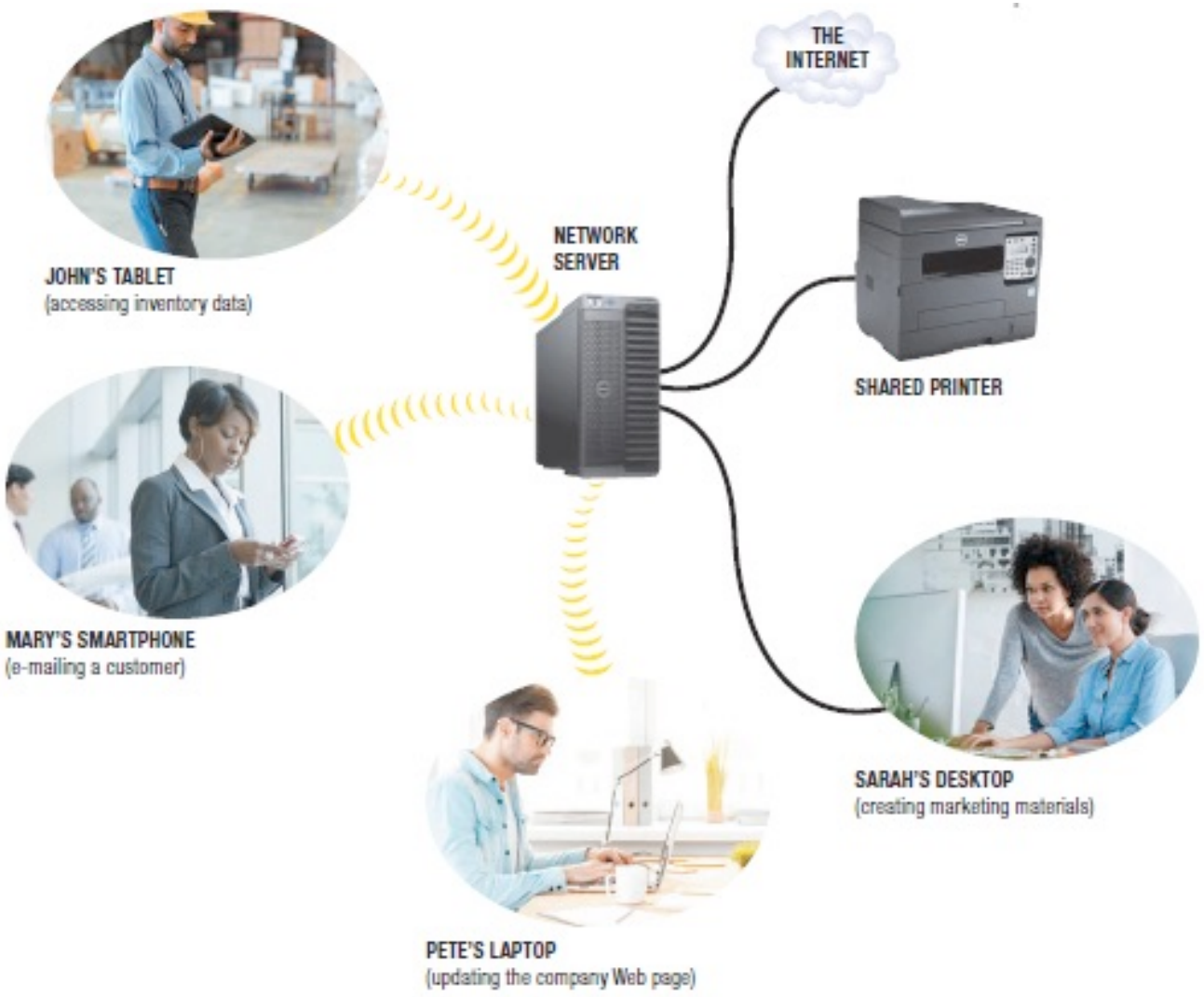
Answers:

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
- Clients: Access resources through the network server
- Computer networks exist in many sizes and types
  - Home networks
  - School and small business networks
  - Large corporate
  - Public wireless networks
  - The Internet

Computers to Fit Every Need



What Are the Internet and the World Wide Web?

- Internet: The largest and most well-known computer network in the world
- Individuals connect to the Internet 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
  - Web pages viewed using a Web browser (Internet Explorer, Chrome, Safari, Firefox, Opera, etc.)
- A wide variety of information is available through the Web

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
- 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 address: Numeric address that identifies computers (207.46.197.32)
  - Domain name: Text-based address that identifies computers (microsoft.com)
  - Uniform resource locator (URL): Identifies Web pages (http://twitter.com/jobs/index.html)
  - E-mail address: Identifies people for e-mail exchange (jsmith@cengage.com)

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
  - Custom TLDs may soon be allowed

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	Entrepreneurs and growing businesses
.expert	Individuals branding themselves as an expert
.fr	French businesses
.info	Resource sites
.jobs	Employment sites
.name	Individuals (personal branding)
.nyc	New York City businesses
.us	United States businesses

Uniform Resource Locators (URLs)

- URL: Uniquely identifies a Web page
  - Consists of:
    - Protocol or standard being used
    - Identification of the Web server
    - Names of folders in which the Web page file is stored
    - Web page's filename
- 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

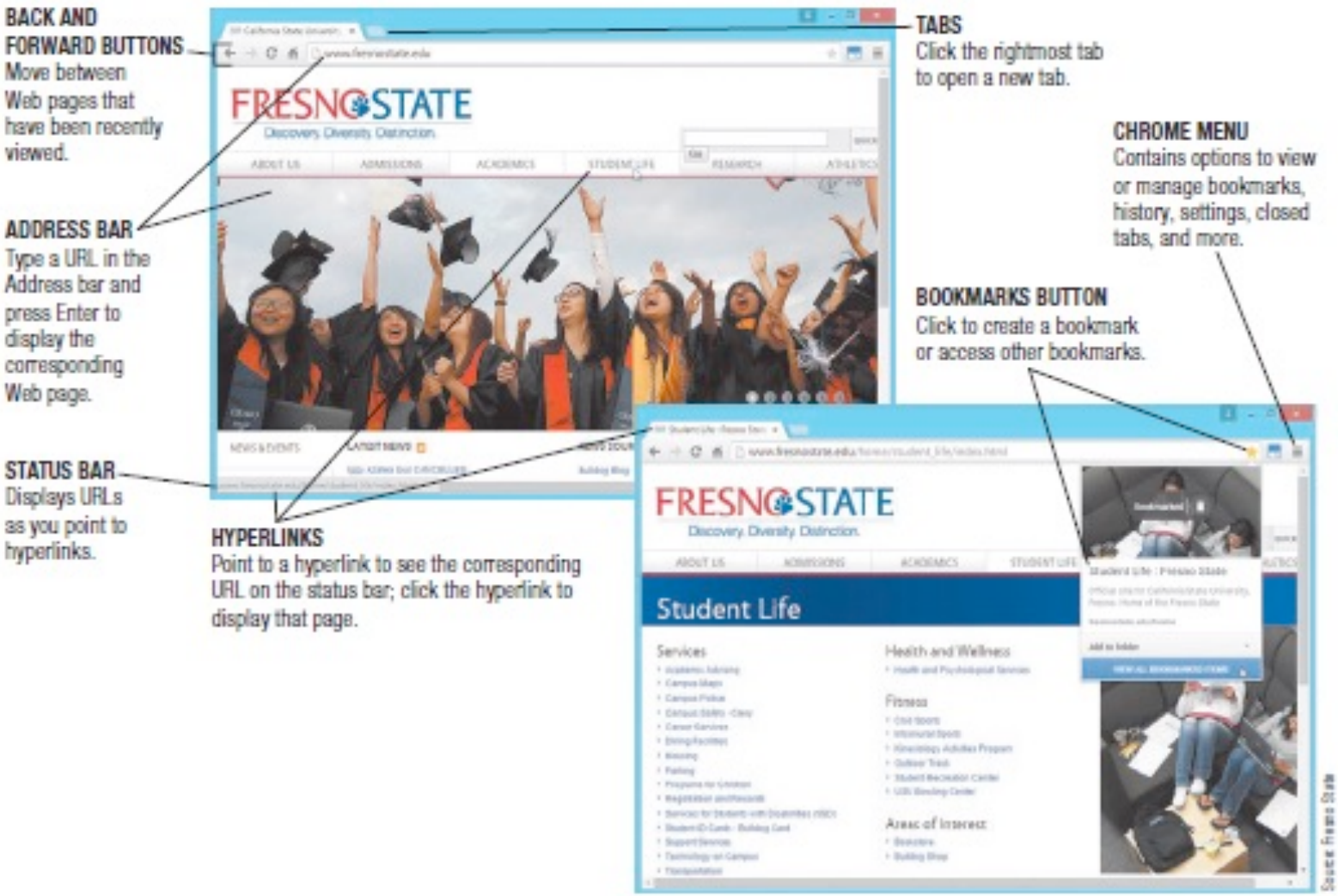
- E-mail addresses consist of:
  - Username: A person's identifying name for a particular domain
  - The @ symbol
  - Domain name for the computer that will be handling the person's e-mail (mail server)
- Pronouncing Internet addresses

TYPE OF ADDRESS	SAMPLE ADDRESS	PRONUNCIATION
Domain name	berkeley.edu	berkeley dot e d u
URL	irs.gov/freefile	i r s dot gov slash free file
E-mail address	president@whitehouse.gov	president at white house dot gov

Surfing the Web

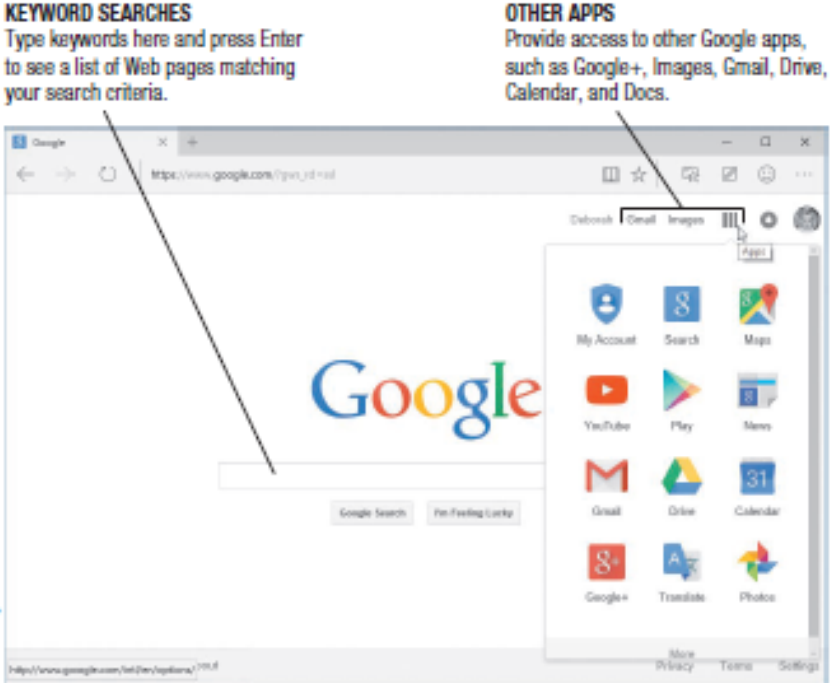
- Web browser: Used to display Web pages
- Browser starting or home page: The first page displayed when the browser is opened
- To navigate to a Web page, you can:
  - Type a URL in the Address bar
  - Click a hyperlink on a displayed Web page
  - Select a Favorite/Bookmark or page from the History list

Surfing the Web



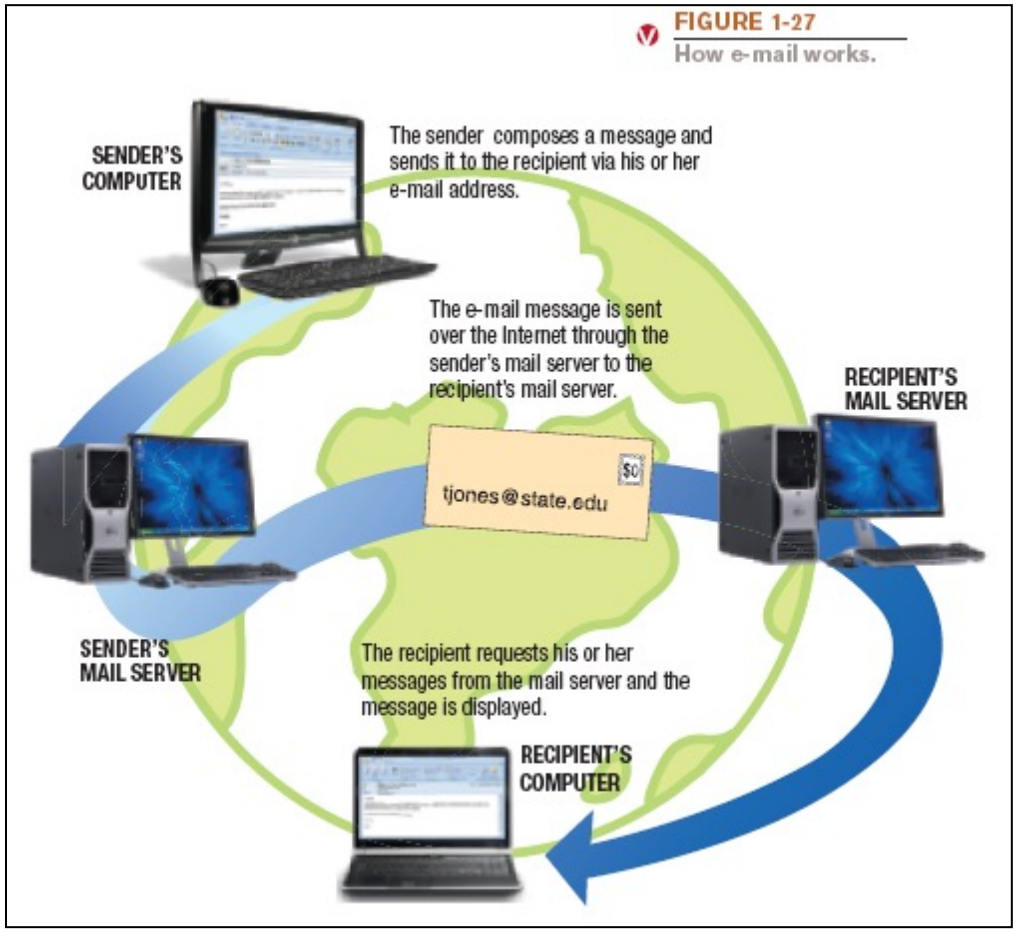
Searching the Web

- Search site: Web page that helps you find Web pages containing the information you are seeking
  - Typically search using keywords



E-Mail

- Electronic mail (e-mail): electronic messages exchanged between computers on a network
  - Can be conventional or Web-based
  - Can contain photos, attached files, etc.



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
- Many benefits of a computer-oriented society:
  - Ability to design products before construction leads to safer products
  - Earlier medical diagnoses
  - Devices that allow challenged people 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
  - Computer viruses and malware
  - Identity theft and phishing
  - Privacy issues
- Differences in online communications
  - Less formal than traditional
  - Netiquette
  - Emoticons
- The anonymity factor
- Information Integrity
  - 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


BREAK