Input and Output

Because learning changes everything.™
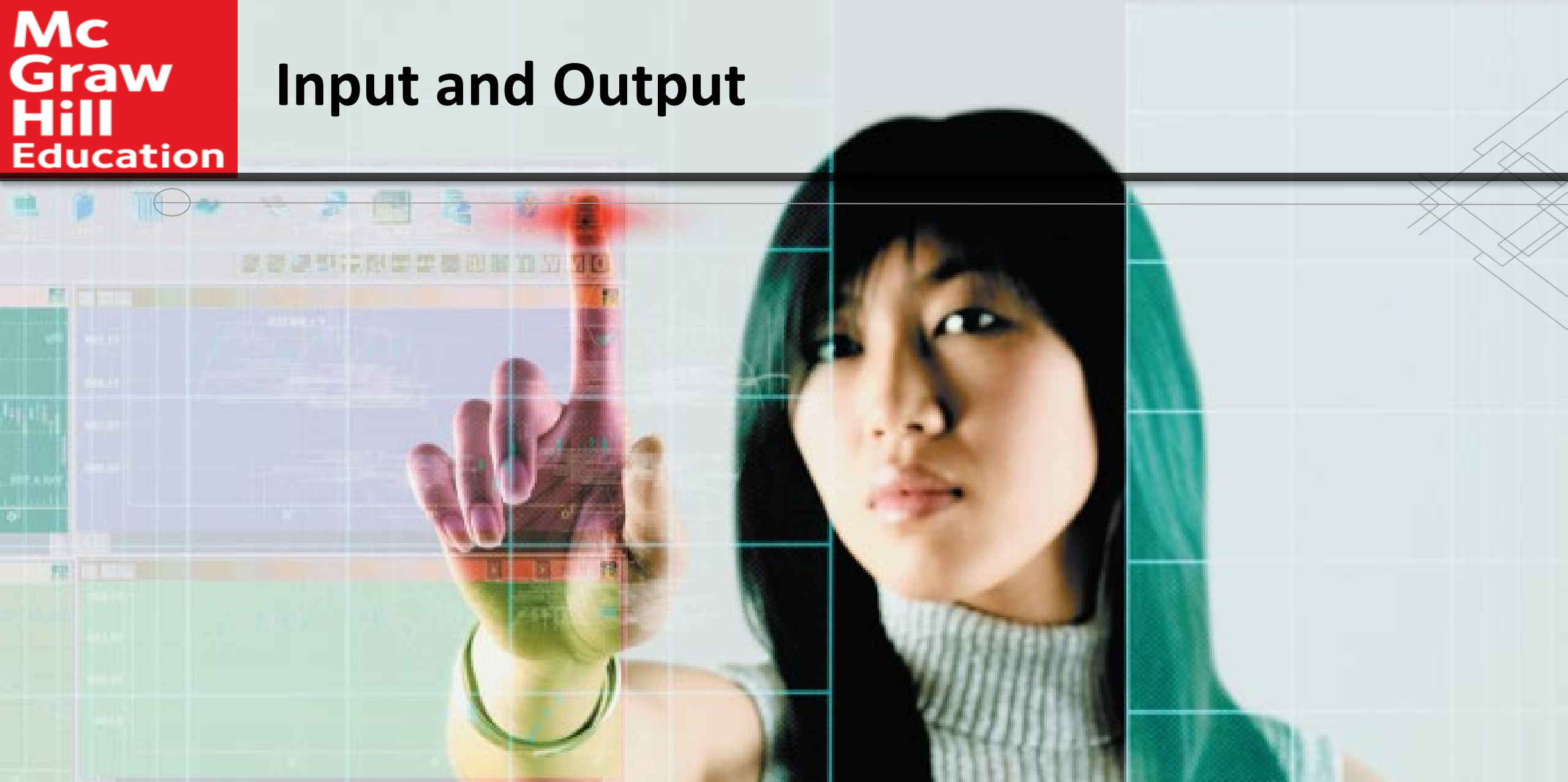
Introduction

- Have you ever wondered how information gets into your computer and comes out in a form you can use?

  - Input devices convert what we understand into what the system unit can process

  - Output devices convert what the system unit has processed into a form that we can understand

What is Input?

- Any data or instructions entered into a computer
- Input devices translate data into a form that the system unit can process
- Some hardware input devices include:
  - Keyboards
  - Mice
  - Pointing
  - Scanning
  - Image capturing
  - Audio-input

Keyboard Entry

- Keyboards
  - Traditional keyboards

Function keys are shortcuts for specific tasks; F1, for example, typically displays Help.

Numeric keypad enters numbers and arithmetic symbols and controls cursor or insertion point.

Start key displays the Start menu.

Navigation keys control the cursor or insertion point on the screen.

  - Laptop keyboards

  - Virtual keyboard

  - Thumb keyboard

Pointing Devices

Provide an intuitive interface by accepting pointing gestures and converting them into machine-readable input

- Wide variety of devices such as:
  – Mouse
  – Touch screen
  – Game controller
  – Stylus

Mouse Types

- Optical mouse
  - Has no moving parts
  - Emits and senses light to detect mouse movement
  - Can be used on any surface
- Wireless mouse
  - Battery operated
  - Uses radio waves or infrared light waves
- Touch pads
  - Controls pointer by moving and tapping your fingers on the surface of the pad

Touch Screen

- Can be touched with more than one finger

- Stylus is a pen-like device
  - Used on tablets
  - Uses handwriting recognition software

Gaming Controllers

Provide input to computer games

- Joysticks use pressure and direction of the stick

- Gaming mice are similar to a mouse but high precision

- Game pads use both hands

- Motion sensing device control games by user movement

Scanning Devices

Scanners convert scanned data into a form the system unit can process

- Optical scanners
  - Flatbed scanners
  - Document scanners
  - Portable scanners
  - 3D scanners

Card Readers

Interpret encoded information that is stored on debit, credit and identification cards

- Magnetic card reader
  - Information read from strip when swiped through reader
- Chip card reader
  - Information read from a chip when inserted in reader
  - Smart cards hold additional security information

Bar Code Readers

Contain photo-electric cells that scan or read bar codes or the zebra striped marks printed on product containers

- Wand readers
  - Hand –held readers
- UPCs and MaxiCode readers
  - UPC are heavily used in grocery stores for automated checkout and inventory control
  - MaxiCode used by shipping companies for routing packages

RFID Readers

Radio-frequency identification

Tiny chips embedded in most anything contain electronically stored information that can be read using an **RFID reader** located several yards away.

- Tracking pets
- Update and control inventories
- Read passports

Character & Mark Recognition Readers

Recognize special characters and marks

- Character and mark recognition devices
  - Magnetic-ink character recognition (MICR)
    - Used by banks to read encoded characters on checks
  - Optical-character recognition (OCR)
    - Reads preprinted characters such as wand scanners
  - Optical-mark recognition (OMR)
    - Sense the presence of absence of marks used for test scoring

Image Capturing Devices

Create or capture original images

- Digital Camera
  - Capture images digitally and store in memory

- Webcams
  - Capture images and send to a computer
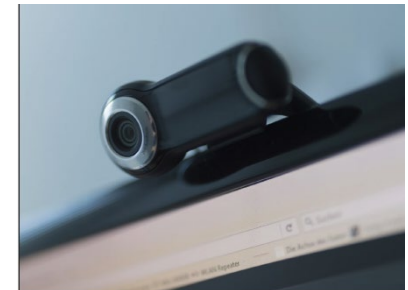
- Voice recognition systems
  - Use a microphone, sound card, and special software
  - Users can operate computers and create documents using voice commands
  - Included in many smart phones
    - Siri in iPhones
    - Cortana in Windows phones
    - Google Now in Google phones

Output

Processed data or information

- Types of output
  - Text
  - Graphics/photos
  - Audio & video
- Output devices
  - Monitors
  - Printers
  - Audio-output devices

Monitors

Known as screens or display screens and present visual images of text and graphics

- Features
  - Clarity
  - Resolution/pixels
  - Dot pitch
  - Contrast ratios
  - Size
  - Aspect ratio

Monitor Types

- Flat-panel monitors
  - Require less power to operate
  - Portable and thin
  - Most are backlit

Three types:
  - Liquid Crystal Display (LCD)
    - Older monitors
  - Light Emitting Diode (LED)
    - More advanced backlighting
  - Organic Light Emitting Diode (OLED)
    - Thin layer organic compound that produces light

E-book Readers

An e-book is a traditional books printed in electronic form

E-book readers are dedicated mobile devices for storing and displaying e-books

- Use e-ink technology
  - Produce images that reflect light
    - Kindle
    - Nook

Other Monitor Types

- Other monitors
  - Digital/interactive whiteboards
    - Connects to a computer or project
    - Controlled using a special pen or even your finger
      - Classrooms and corporate boardrooms
  - Ultra High-definition television (UHDTV)
    - Digital output delivering a much clearer and more detailed image that regular HDTV
  - Digital Projector
    - Project the images from a traditional monitor onto a screen or wall

Printers

- Translates information that has been processed by the system unit

- Features
  - Resolution
  - Color
  - Speed
  - Memory
  - Duplex printing

Printer Types

- Ink-jet printers spray ink at a high speed
  - Reliable, quite and inexpensive
- Laser printers uses a laser light beam to produce images
  - Fast, excellent quality
  - Personal or shared
- 3D Printers create 3-D shapes with a thin layer of material repeatedly until created
  - Additive manufacturing
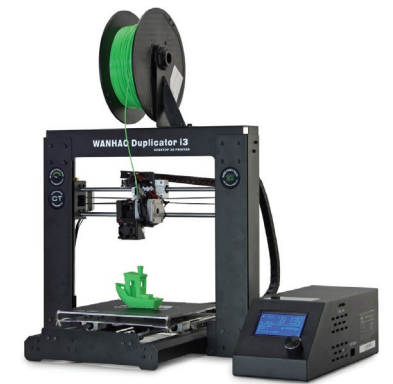
Other Printers

- Cloud printers
  - Connected to the Internet to provide services to others on the Internet
  - Thermal printers
  - Plotters

Audio and Video Devices

- Translates audio information from the computer into sounds that people can understand
  - Speakers and headphones
- Bluetooth Technology
  - Wireless technology
    - Used to connect to speakers and headsets

Combination Input and Output Devices

- Headsets
  - Combine a microphone and headphones
- Multifunctional devices (MFD)
  - Cost efficient but lower quality
  - All-in-one printers are a good example
- Virtual Reality (VR)
  - Artificial or simulated reality
- Virtual head-mounted displays and controllers

Drones

Drones or unarmed aerial vehicles

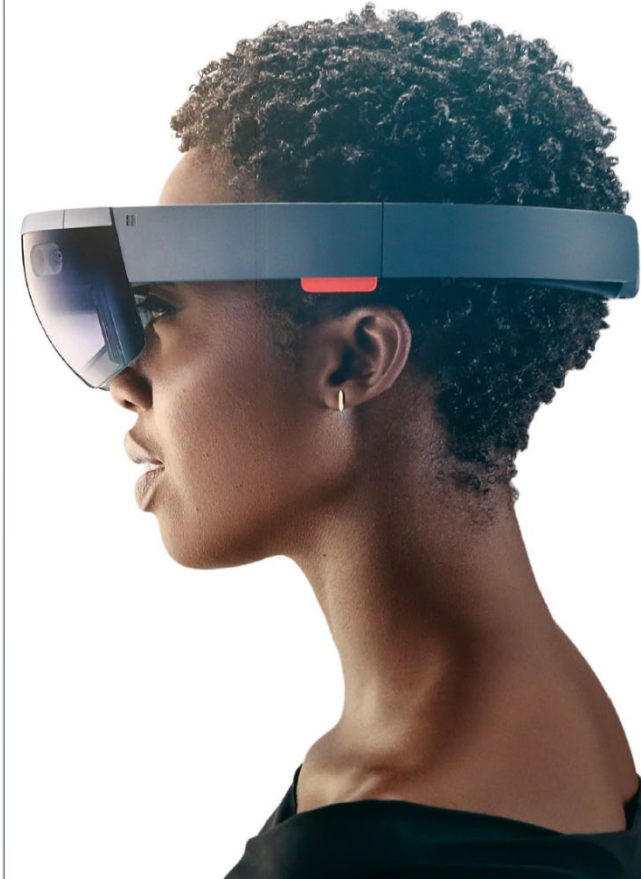- Take input from a controller and the output device is the drone
- Very cost effective now

Robots

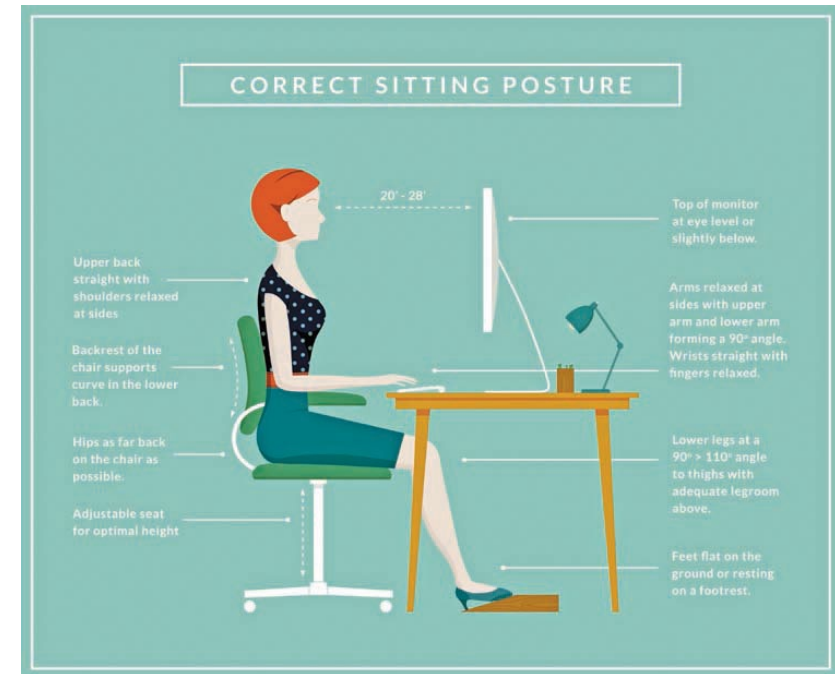- Use cameras, microphones, and other sensors as inputs
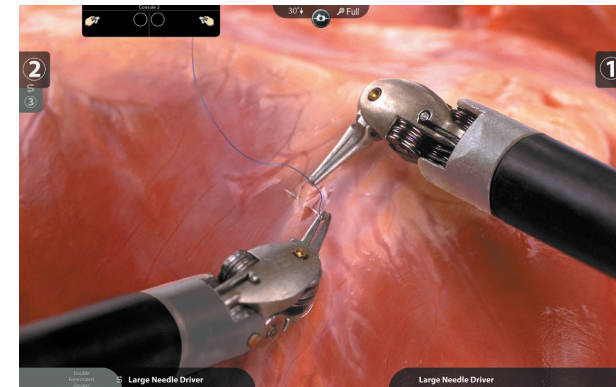
- Two types of head-mounted displays
  - Virtual Reality (VR)
  - Augmented Reality (AR)
  - Can be expensive

Ergonomics

- Study of human factors related to things people use

- Fit the task to the user to avoid:
  - Eyestrain and headache
  - Back and neck pain
  - Repetitive strain injury

CORRECT SITTING POSTURE

Upper back straight with shoulders relaxed at sides

Backrest of the chair supports curve in the lower back.

Hips as far back on the chair as possible.

Adjustable seat for optimal height

20' - 28'

Top of monitor at eye level or slightly below.

Arms relaxed at sides with upper arm and lower arm forming a 90° angle. Wrists straight with fingers relaxed.

Lower legs at a 90° > 110° angle to thighs with adequate legroom above.

Feet flat on the ground or resting on a footrest.

Ergonomic Challenged Devices

Portable devices are not set up for ergonomics

- Laptops
  - Because the keyboard and monitor are connected, they cannot be set up ergonomically

- Tablets
  - Tablet hunch is caused by the users head being improperly aligned to the viewing surface

- Smartphones
  - Blackberry thumb results from using thumbs to type on a tiny keyboard

Secondary Storage

Introduction

- Data storage has expanded from text and numeric files to include digital music files, photographic files, video files, and much more.

- These new types of files require secondary storage devices with much greater capacity.

- In this chapter, you learn about the many types of secondary storage devices, including their capabilities and limitations.

Storage

- Primary storage is:
  - Volatile storage
    - Loses content when the computer loses power
  - Temporary storage
  - Random Access Memory (RAM)
- Secondary storage is:
  - Nonvolatile storage
    - Stores programs and data regardless of power
  - Permanent storage
    - Permanently saves information for future use

Secondary Storage Characteristics

- Secondary storage characteristics
  - Media
    - Physical material that holds data and programs
  - Capacity
    - Measures how much the media can hold
  - Storage devices
    - Hardware that reads data and programs
  - Access speed
    - Amount of time required to retrieve data from storage
  - Writing is the process of saving information to storage
  - Reading is the process of accessing information from storage

Hard Disks

Save files by altering the magnetic charges of the disk's surface to represent 1s and 0s

- Use rigid, metallic platters that are stacked one on top of one another
- Store and organize files using tracks, sectors, and cylinders

Disk

Electromagnetic charges

0 1 0 0 0 0 0 1 Binary representation

A

How charges on a disk surface store the letter A

Track

Sector

Tracks and Sectors
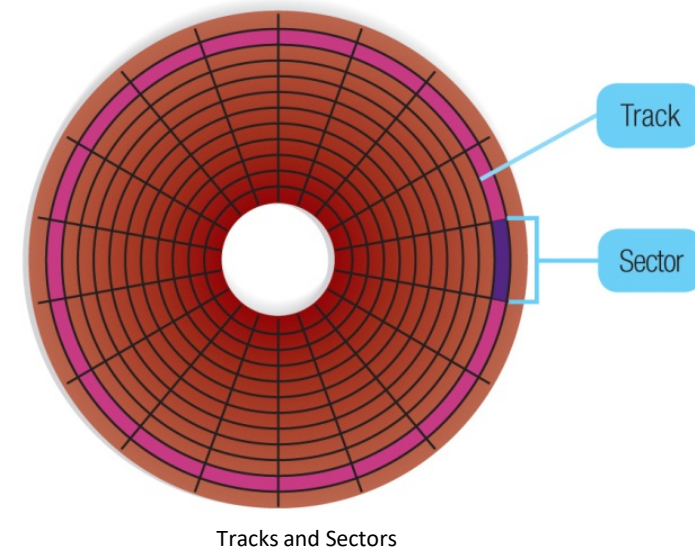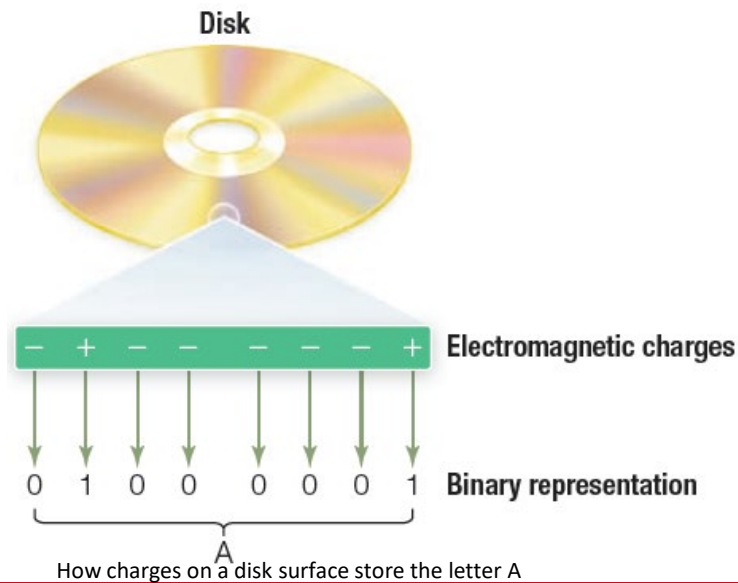
Head Crash

Occurs when read-write head makes contact with the hard disk's surface or with particles on its surface

- Disastrous

Human hair · Dust particle · Fingerprint · Smoke particle · Disk head
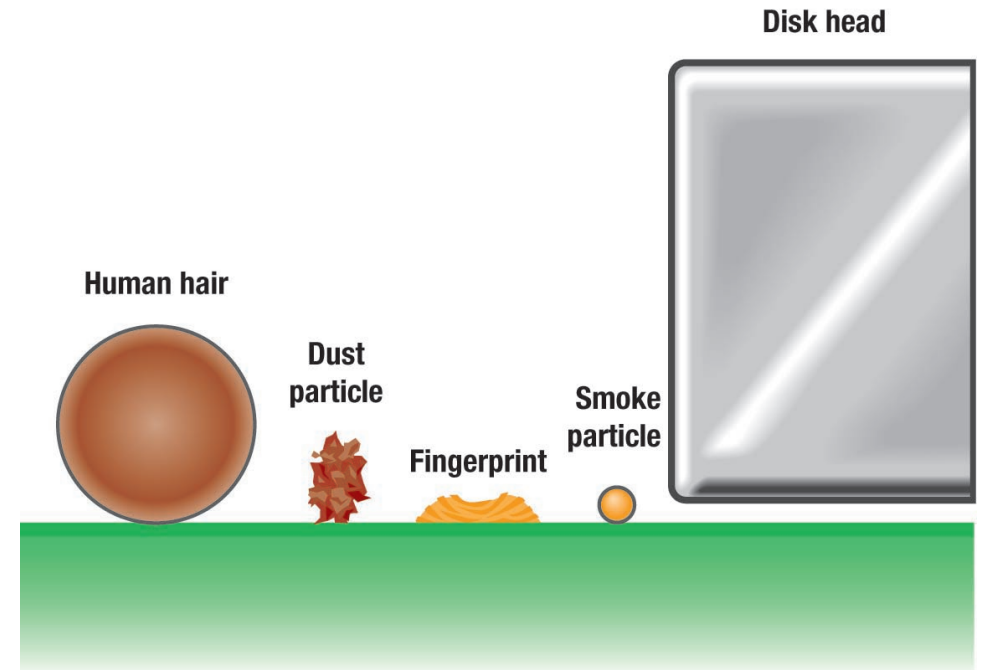
Types of Hard Disks

- Internal

  - Located inside the system unit

  - Used to store programs and data files

  - You should perform routine maintenance and periodically backup all important files

- External

  - Removable

  - Used to complement internal hard disk

  - Used to back up the contents of the internal hard disk

Performance Enhancements

There are 3 ways to enhance performance.

Technique	Description
Disk caching	Users cache and anticipates data needs
RAID	Linked, inexpensive hard-disk drives
File compression	Reduces file size
File decompression	Expands compressed files

Solid-State Storage

Solid–state storage devices (SSDs) have no moving parts

- Solid-state drives
  - Faster and more durable than hard disks
  - Access to slash memory or solid state storage

- Flash memory cards
  - Widely used in laptops, smartphones, GPS navigation systems

- USB Drives (or Flash Drives)
  - Connect to USB port
  - Capacity of 1 GB to 256 GB
  - Portable

Optical Discs

- Hold over 128 gigabytes (GB) of data
- Use reflected light to represent data
  - Lands represent 1s and 0s on the disc
  - Pits are bumpy areas on the disc that, when light is reflected, determine the 1s and 0s
  - Use tracks and sectors to organize and store files but only use a single track unlike the hard drive
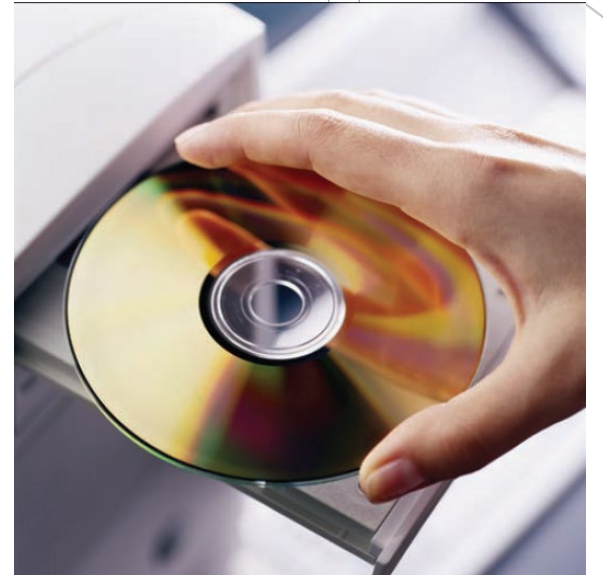
Optical Disc Formats and Types

Format	Total Capacity	Description
CD	700 MB	Once the standard optical disc
DVD	4.7 GB	Current standard
BD	50 GB	Hi-def format, large capacity

Type	Access	Description
ROM	Read only-memory	Cannot be written to or erased
R	Recordable	Can be written to
RW or RAM	Rewritable or random-access memory	Can be written to and erasable

Cloud Storage

The Internet acts as a "cloud" of servers

- Applications provided as a service rather than a product
- Supplied by servers that provide cloud storage or online storage
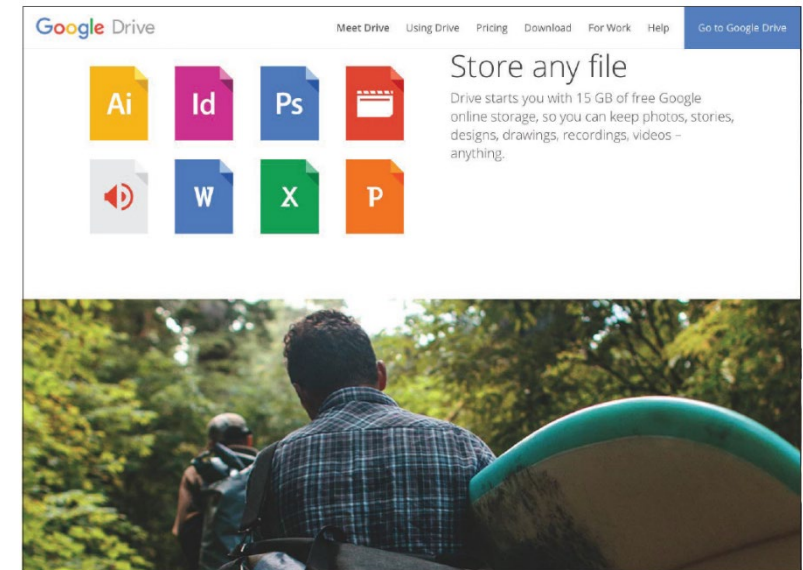
Cloud Storage Services

Advantages

- Maintenance
- Hardware upgrades
- File sharing and collaboration

Disadvantages

- Access speed
- File security

Company	Location
Dropbox	www.dropbox.com
Google	Drive.google.com
Microsoft	onedrive.live.com
Amazon	Amazon.com/cloud
Apple	www.icloud.com

Using a cloud storage service makes it easy to upload and share files with anyone.
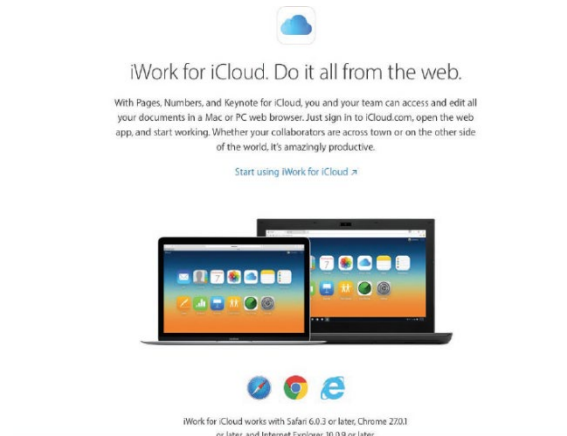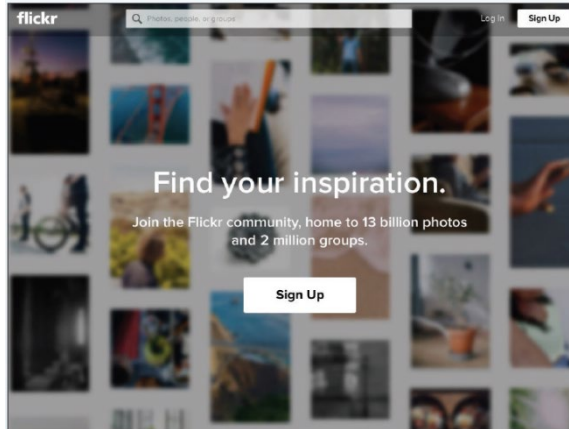
Mass Storage Devices

To meet the needs of organizations requiring large amounts of secondary storage requirements

- Enterprise storage system
  - Safe use of data across an organizational network
- Devices include:
  - File servers
  - Networked attached storage (NAS)
  - RAID systems
 - Organizational cloud storage
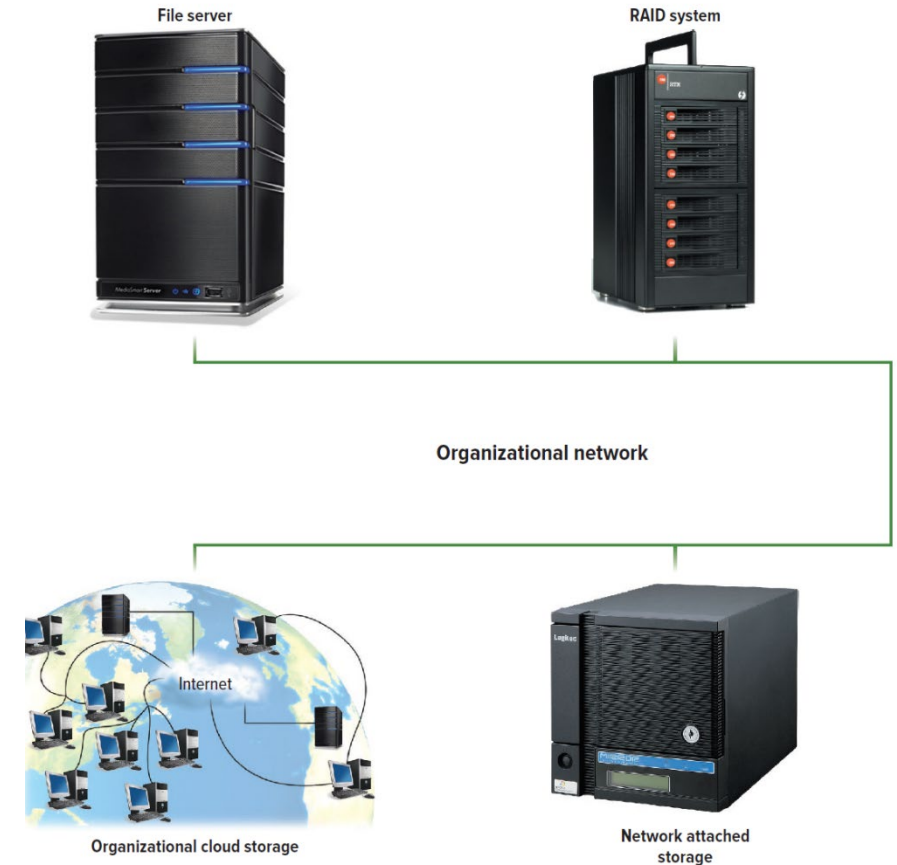
Storage Area Network (SAN)

- Architecture to link remote computer storage devices

- User's computer provides file system, but SAN provides disk space

- House data in remote locations and still allow efficient and secure access

Introduction

- We live in a truly connected society.

- Increased connectivity potentially means increased productivity, especially in business.

- You will learn more about the concept of connectivity and the impact of the wireless revolution in this chapter.
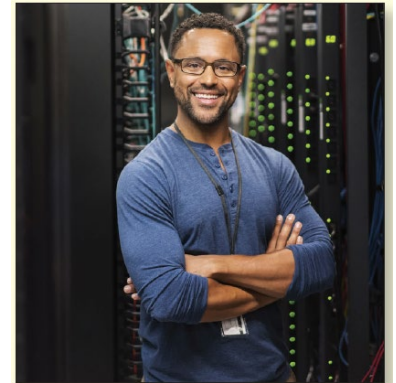
Communications

- Computer communications is the process of sharing data, programs, and information between two or more computers

- Numerous applications depend on communication systems, including

  - E-mail
  - Texting
  - Videoconferencing
  - Electronic commerce

Connectivity

- Connectivity uses computer networks to link people and resources
- Connects your personal computer to other computers and resources on a network and the Internet
- The Wireless Revolution
  - Single most dramatic change in connectivity in the past decade
  - Allows individuals to connect to the Internet and share information from almost anywhere in the world

The Revolution is just beginning

Communication Systems

Electronic systems that transmit data from one location to another
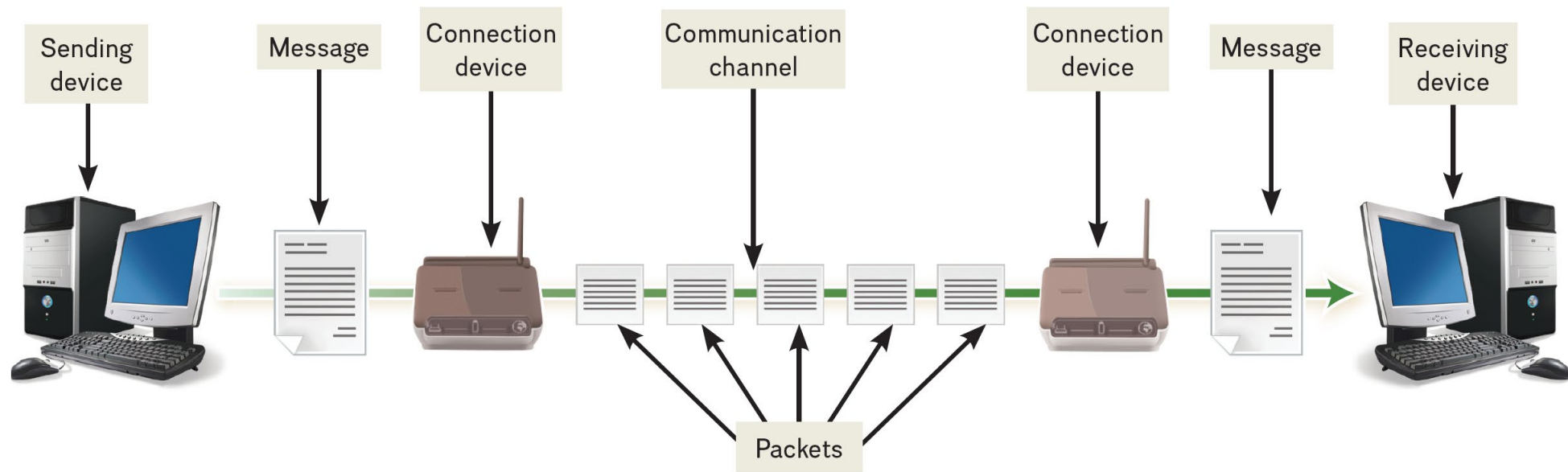
Basic Elements of Communication

- Four basic elements of communication systems
  - Sending and receiving devices
    - Computer or a specialized communication device
  - Connection devices
    - Interface between sending and receiving device
  - Data transmission specifications
    - Rules and procedures that coordinate the devices
 - Communication channel
    - Carries the message

Communication Channels

- Communication channels carry the data from one computer to another; essential element of every communication system

- Two categories of communication channels
  - Physical Connections using wire or cable
  - Wireless Connections

Physical Connections

Physical connection between sending and receiving device include

- Twisted pair cable: two pairs of copper wire twisted together
  - Telephone lines
  - Ethernet cables
- Coaxial cable: single solid copper core
  - Cable TV
- Fiber-optic cable: tiny glass tubes
  - Faster and more reliable than coax
  - Speeds as high as 1 petabit per second
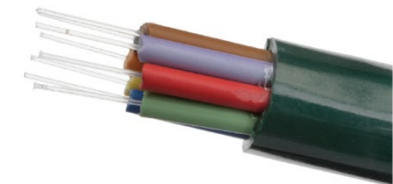
Wireless Connections

Wireless connections do not use a solid substance to connect; uses the air itself. Most use radio waves to communicate

| Standard	Maximum Speed
802.11g	54 mps
802.11n	600 mps
802.11ac	2.6 Gbps
802.11ax	10.5 Gbps

Primary Wireless Technology

- Bluetooth (short-range)
  - Radio communication standard
- Wi-Fi (wireless fidelity)
  - Uses high frequency radio
- Microwave
  - Uses high frequency radio wave signals
- WiMax (extends Wi-Fi)
  - New standard that uses microwave to extend WiFi range

- Cellular
  - Use multiple antennae to communication
- Satellite
  - Uses satellites as microwave relay stations
- Infrared
  - Use infrared light wants to communication over short distances
- GPS
  - Determine geographic location of the devices

Connection Device Signals

- Types of signals
  - Analog (telephone)
  - Digital (computer)
- Transfer rates
  - Mbps – million bits per second
  - Gbps – billion bits per second
  - Tbps – trillion bits per second
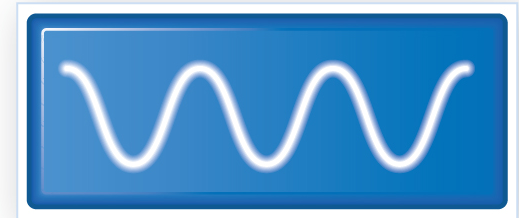
Analog

Digital

Connection Devices

- Modem – *modulator-demodulator*
  - Modulation is the process of converting from digital to analog
  - Demodulation is the process of converting from analog to digital
- Transfer rate
  - Speed in which modems transfer data
  - Usually measured in megabits per second (Mbps)

- Types of Modems
  - Digital subscriber line (DSL)
    - High speed telephone lines
  - Cable
    - Uses coaxial cable
  - Wireless
    - Also known as WWAN

DSL

Cable

Wireless

Connection Services

- Leased lines
  - T1 combined to form T3 and DS3
  - Have been replaced by OC lines
    - Faster optical carrier lines
 - Higher capacity
    - Not affordable for individuals

- Digital subscriber line (DSL)
  - Uses phone lines
  - ADSL is most widely used type of DSL
- Cable
  - Uses existing TV cable
  - Faster than DSL
- Fiber Optic Service (FiOS)
  - New technology
    - Google and Verizon
- Satellite connection services
  - Use almost anywhere
- Cellular Services
  - 3G and 4G cellular network connectivity

- Can telecommute from anywhere

- Become a one-man workforce
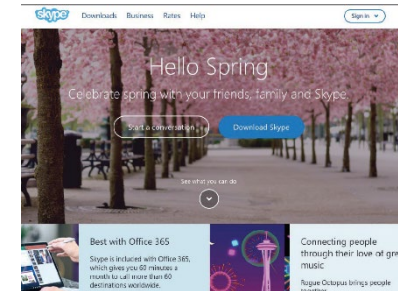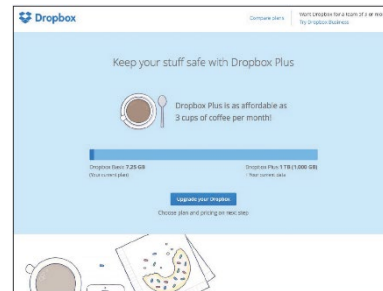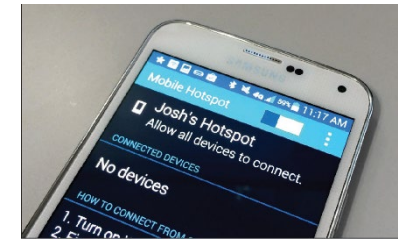
Data Transmission

Factors that affect data transmission

- Bandwidth is how much information can move across the communication channel in a given amount of time
  - Measurement of the width or capacity of the communication channel
  - Categories of bandwidth
    - Voiceband (or low bandwidth) – standard telephone
    - Medium band – leased lines for high-speed
      - Mid-range computer and mainframes
    - Broadband for DSL, cable, satellite connections to the Internet
    - Baseband for individual connections for computers in close range

Protocols

Communication rules for exchanging data between computers

- HTTPS – Hypertext Transfer Protocol Secure
  - Widely used to protect the transfer of sensitive data
- TCP/IP (Transmission control protocol/Internet protocol)
  - Most widely used protocol
  - Each computer is identified with unique IP (Internet Protocol) address
  - DNS – Domain name service resolves IP addresses to names
  - Packetization – information broken down into small parts (packets) and then reassembled

Networks

A communication system that connects two or more computers so they can exchange information and share resources
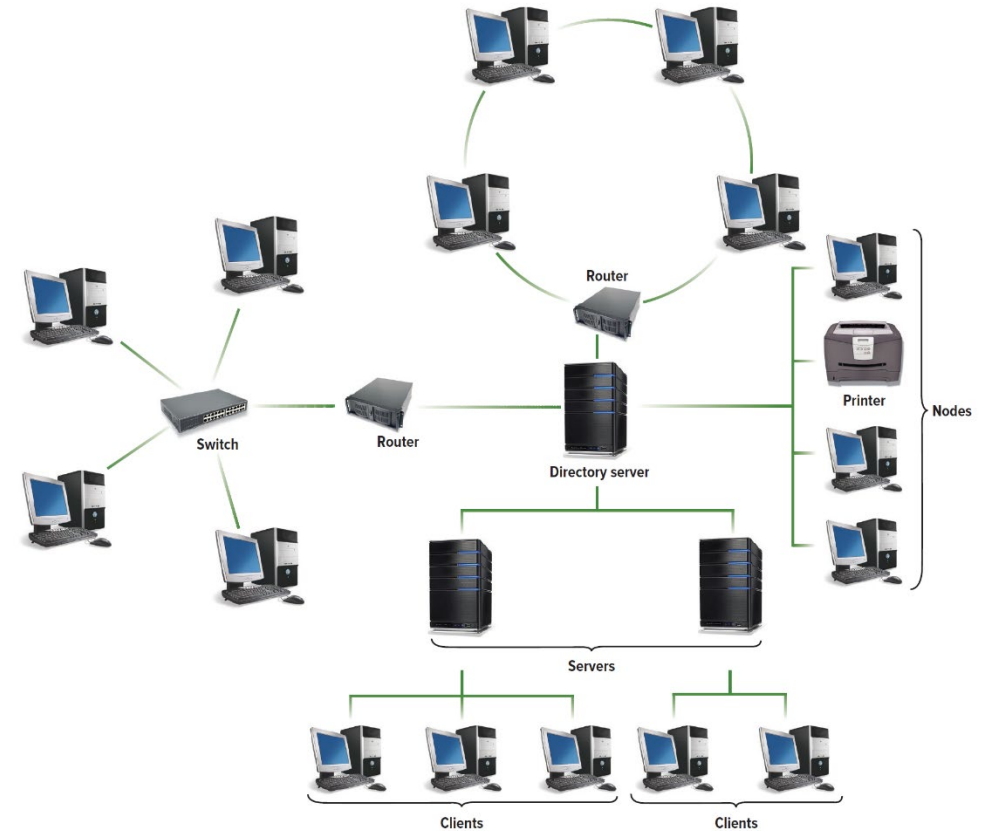
Specialized Terms in a Network

- Nodes
  - Any device connected to a network
- Client
  - A node that requests and uses resources from other nodes
- Server
  - A node that shares resources with other nodes
- Directory Server
  - Specialized server that managers resources
- Host
  - Computer system that can be accessed over a network

- Router
  - Node that forwards or routes data packets
- Switch
  - Central node that coordinates the flow of data
- Network Interface Cards (NIC)
  - Expansion card that connects a computer to a network
- Network Operating System
  - Control activities of all computers on the network
- Network Administrator
  - Computer specialists responsible for network operations

Network Types

| Type	Description
LAN	Local area network; located within close proximity
Home	Local area network for home use; typically wireless
WLAN	Wireless local area network; all communication passes through an access point
PAN	Personal area network; connects digital devices , such as PDAs
MAN	Metropolitan area network; typically spans cities with coverage up to 100 miles
WAN	Wide area network for countrywide or worldwide coverage

Network Architecture

How the network is arranged and resources are shared

- Network Topology
  - Physical arrangement of the network
- Network Strategy
  - How the information and resources are shared
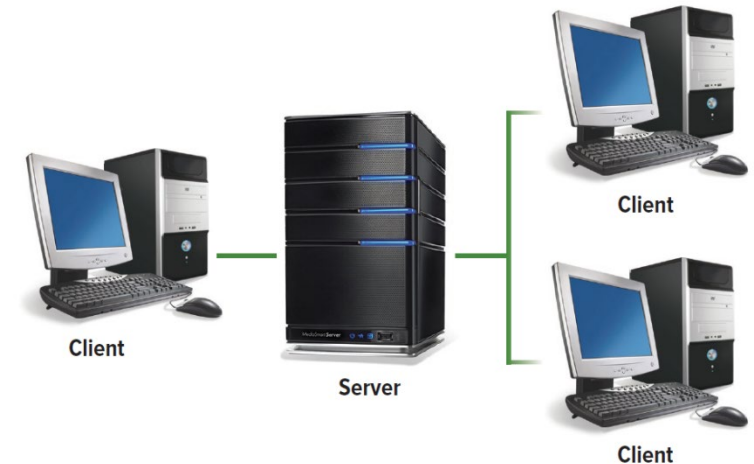
Ring Network

Star Network
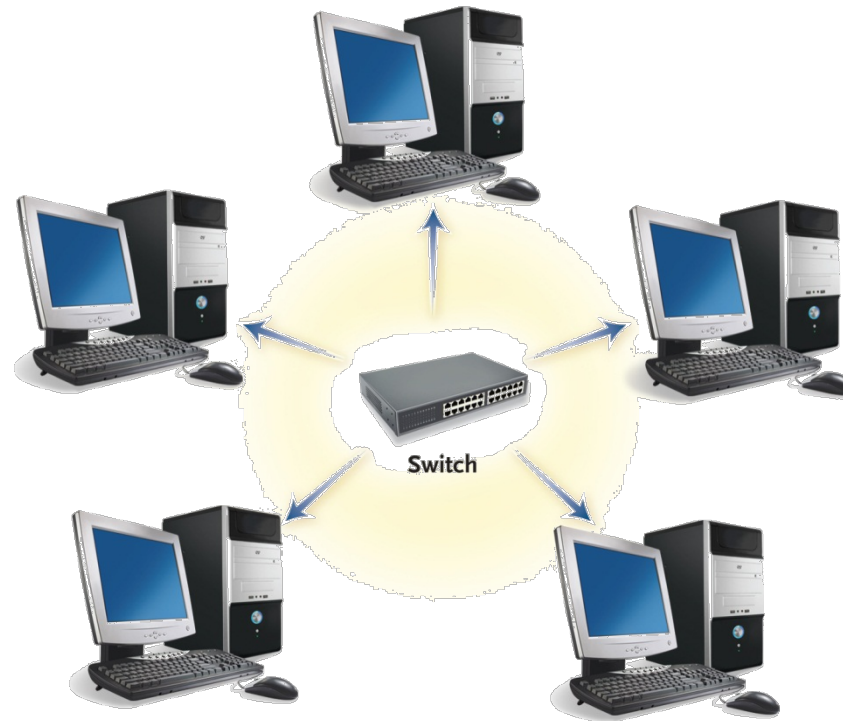
Tree Network

Mesh Network

Network Strategies

- Client/Server Network
  - Central computers coordinate and supply services to other nodes on the network
  - Server provides access
- Peer-to-Peer (P2P) Network
  - All nodes have equal authority
  - Can act as both client and server

Client

Client

Server

Client

Organizational Networks

Internet technologies support effective communication within and between organizations

- Intranet
  - Private network within an organization
  - Works like the Internet
- Extranet
  - Private network that connects more than one organization
  - Works like the Internet, but provides suppliers and other trusted partners with limited access to the organization's networks

Network Security
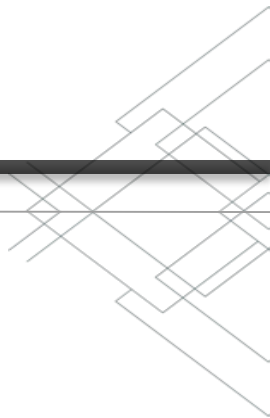
Commonly used technologies to ensure network security

- Firewall
    - Hardware and software that controls access to network
    - Proxy server provides pass-through access
    - Protects against external threats
- Intrusion detection system (IDS)
    - Works with firewall to protect organization's network
    - Analyzes all incoming and outgoing network traffic
- Virtual private network (VPN)
    - Creates a secure private network connection between your computer and the organization

See the graphic on the next slide demonstrating network security
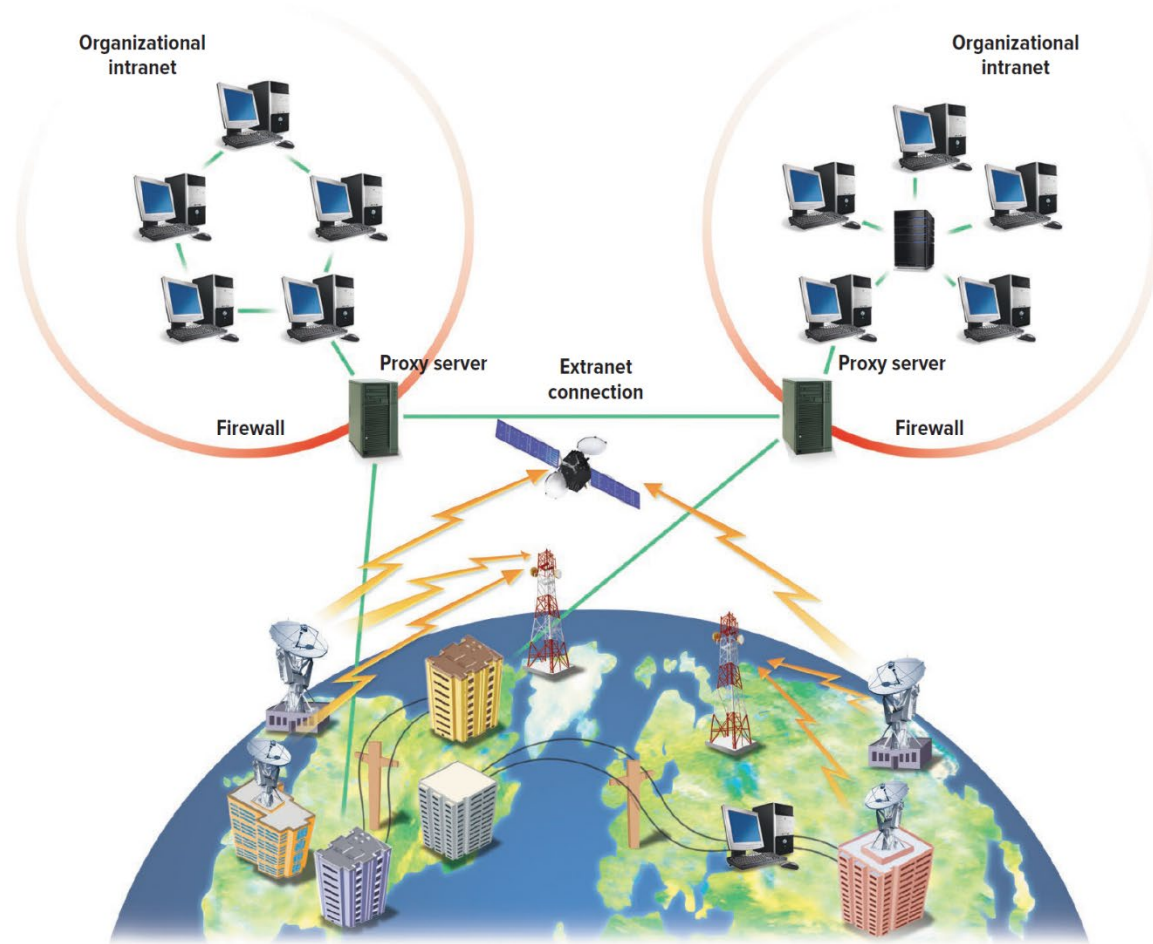
Privacy, Security, and Ethics

Because learning changes everything.™

Introduction

- The ubiquitous use of computers and technology prompts some very important questions about the use of personal data and our right to privacy.

- To efficiently and effectively use computers, you need to be aware of the potential impact of technology on people and how to protect yourself on the web.

People

Technology has had a very positive impact on people, but some of the impact could be negative.

- Most significant concerns:

  - Privacy – What are the threats to personal privacy and how can we protect ourselves?
  - Security – How can access to sensitive information be controlled and how can we secure hardware and software?
  - Ethics – How do the actions of individual users and companies affect society?

Privacy

- Privacy – concerns the collection and use of data about individuals

- Accuracy – responsibility of those who collect data
  - Must be secure and correct

- Property – relates to who owns the data

- Access – responsibility of those who control data and use that data

Large Databases

Large organizations compile information about us daily

- Big Data is exploding and ever-growing
  – 90% of the data collected has been collected over the last 2 years

- Information Resellers/Brokers
  – Collect and sell personal data
  – Create electronic profiles

Large Databases (Cont.)

Personal information is a marketable commodity, which raises many issues:

- Collecting public, but personally identifying information (e.g., Google's Street View)
- Spreading information without personal consent, leading to identity theft
- Spreading inaccurate information
  - Mistaken identity
- Freedom of Information Act
  - Entitlement to look at your records held by government agencies

Private Networks

Employee monitoring software

- Employers can monitor e-mail legally
  - A proposed law could prohibit this type of electronic monitoring or at least require the employer to notify the employee first

The Internet and the Web

- Illusion of anonymity
  - People are not concerned about privacy when surfing the Internet or when sending e-mail
- When browsing the web, critical information is stored on the hard drive in these locations:
  - History Files
  - Temporary Internet Files
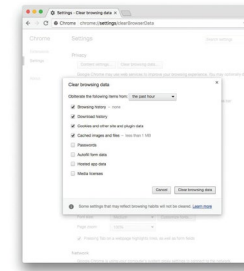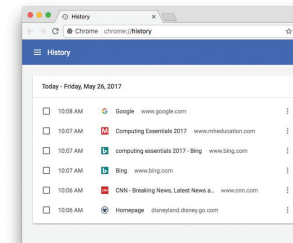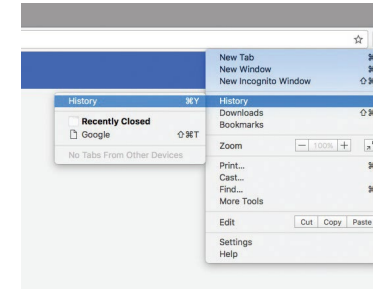   - Browser cache
  - Cookies
  - Privacy Mode
  - Spyware

History Files

- Include locations or addresses of sites you have recently visited

## Temporary Internet Files / Browser Cache

- Saved files from visited websites
- Offers quick re-display when you return to the site

Cookies

Small data files that are deposited on your hard disk from web sites you have visited

- First-party cookies - generated only by websites you are visiting

- Third-party cookies - generated by an advertising company that is affiliated with the website

  - Also known as tracking cookies that keep track of your Internet activities through 3rd party cookies
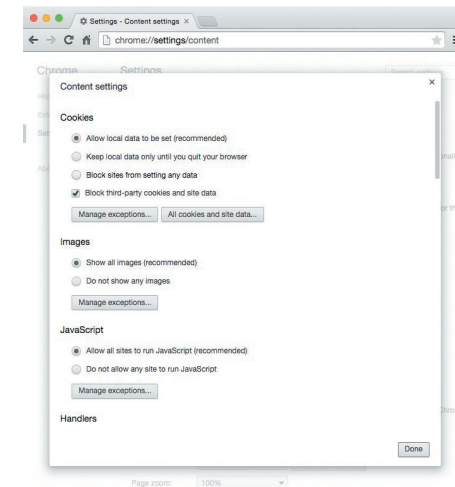
Privacy Modes

- Ensures your browsing activity is not recorded on your hard drive
    - Incognito Mode
        - Google Chrome
    - Private Browsing
        - Safari

Privacy Threats

- Web bugs
  - Invisible images or HTML code hidden within an e-mail message or web page
- Spyware
  - Record and report Internet activities
  - Change browser to manipulate what you view
- Computer monitoring software
  - Most invasive and dangerous
  - Keystroke Loggers
    - Record activities and keystrokes
- Anti-Spyware programs
  - Detect and remove privacy threats
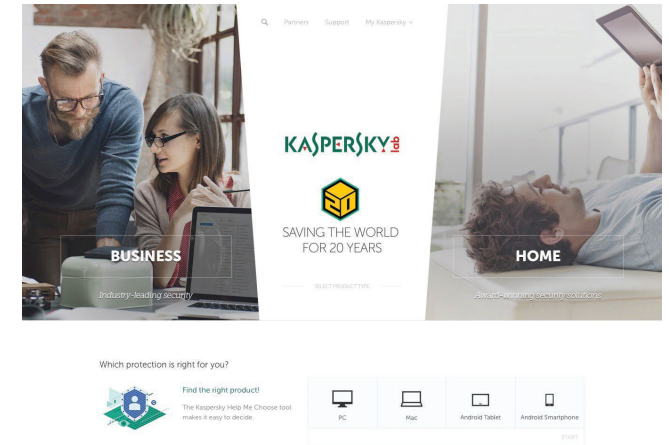
Program	Website
Ad-Aware	www.adaware.com
Kaspersky Anti-Virus	www.kaspersky.com
Windows Defender	www.microsoft.com

Online Identity

The information that people voluntarily post about themselves online

- Archiving and search features of the Web make it available indefinitely
- Major Laws on Privacy
  - **Gramm-Leach-Bliley Act** protects personal financial information
  - **Health Insurance Portability and Accountability Act (HIPAA)** protects medical records
  - **Family Educational Rights and Privacy Act (FERPA)** resists disclosure of educational records

Security

Involves protecting individuals or organizations from theft and danger

- Hackers
  - Gain unauthorized access with malicious intent
  - Not all hackers are illegal

Cybercrime / Computer Crime

- Criminal offense that involves a computer and a network
  - Effects over 400 million people annually
  - Costs over $400 billion each year

Forks of Computer Crime

Computer Crime	Description
Identity theft	Illegal assumption of a person's identity for economic gain
Internet scams	Scams over the Internet
Data manipulation	Unauthorized access of a computer network and copying files to or from the server
Ransomware	Malicious software that encrypts your computer's data and ransoms the password to the user
DoS, Denial of service	Attempts to slow down or stop a computer system or network by flooding a computer or network with requests for information and data
DDoS, Distributed denial of service	Coordinates several computers making repeated requests for service

Internet Scams

Scams using the Internet.

- Internet scams have created financial and legal problems for many thousands of people
- Majority are initiated by a mass mailing to unsuspecting individuals

Common Internet Scams

Type	Description
Advance fee loans	Guaranteed low-rate loans available to almost anyone. After applicant provides personal loan-related information, the loan is granted subject to payment of an "insurance fee."
Auction fraud	Merchandise is selected and payment is sent. Merchandise is never delivered.
Fake antivirus software	A website or e-mail warns you that you are at risk of being infected by a computer virus and you need to download and install the security software they recommend. Ironically, the security software is fake and will install malicious software on your computer.
Nigerian Scam	A classic e-mail scam. The recipient receives an e-mail from a wealthy foreigner in distress who needs your bank account information to safely store their wealth, and for your troubles you will receive a large amount of money. Of course, once the scammer has your bank account information, your accounts will be drained and they will disappear

Social Engineering

Practice of manipulating people to divulge private data.

Played a key role in:

- Identity theft
- Internet scams
- Data manipulation

- Phishing
  - Attempts to trick Internet users into thinking a fake but official-looking website or e-mail is legitimate

Malicious Programs - Malware

- Malicious Programs or Malware
  - Designed by crackers, computer criminals, to damage or disrupt a computer system
  - Computer Fraud and Abuse Act makes spreading a virus a federal offense
  - 3 most common programs
    - Viruses – migrate through networks and attach to different programs
    - Worms – fills the computer with self-replicating information
    - Trojan horse – programs disguised as something else

Malicious Hardware

Criminals use hardware for crimes.

Most common are:
- Zombies
  - Computers infected by a virus, worm, or Trojan Horse
  - Botnet or Robot Network is a collection of Zombies
- Rogue Wi-Fi Hotspots
  - Imitating legitimate free Wi-Fi
  - Capture data coming through the Rogue Wi-Fi
- Infect USB Flash Drives
  - Left on purpose in hopes for people to pick up and use
  - Have malicious software contained on them

# Measures to Protect Computer Security

Principle measures to ensure computer security

- Computer Fraud and Abuse Act
  - Crime for unauthorized person to view, copy or damage data using computers across state lines
  - Prevents use of any government or federally insured financial institution computers

Measure	Description
Restricting access	Limit access to authorized persons using such measures as passwords, gestures, and biometric scanning.
Encrypting data	Code all messages sent over a network.
Anticipating disasters	Prepare for disasters by ensuring physical security and data security through a disaster recovery plan.
Preventing data loss	Routinely copy data and store it at a remote location.

Restricting Access

- Passwords
  - Dictionary attack
    - Uses software to try thousands of common words sequentially in an attempt to gain unauthorized access to a user's account
- Biometric scanning
  - Fingerprint scanners
  - Iris (eye) scanners
 - Facial recognition
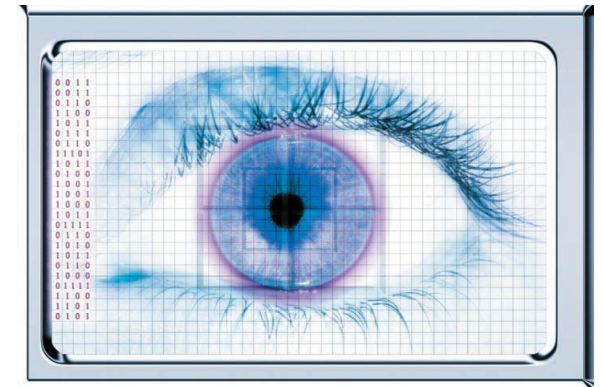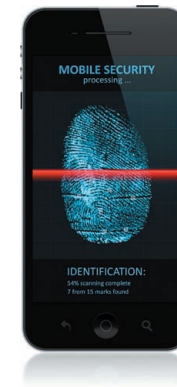
Automated Security Tasks

Ways to perform and automate important security tasks

- Security Suites
  - Provide a collection of utility programs designed to protect your privacy and security
- Firewalls
  - Security buffer between a corporation's provide network and all external networks
- Password Managers
  - Helps to create strong passwords

Encryption

Coding information to make it unreadable, except to those who have the encryption key or key

- The key will decrypt the information into a readable format

- Common uses for encryption:

- E-mail encryption

- File encryption

- Website encryption

- HTTPS – hypertext transfer protocol secured

- Virtual private networks (VPNs)

- Wireless network encryption restricts access to authorized users

- WPA2 – Wi-Fi Protected Access
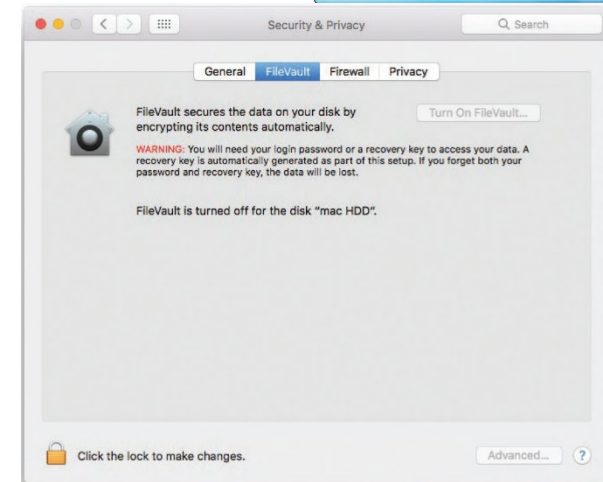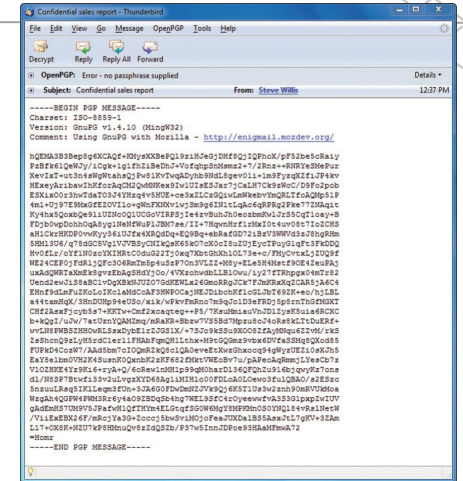
Anticipating Disasters and Preventing Data Loss

Anticipating Disasters

- Physical Security protects hardware
- Data Security protects software and data from unauthorized tampering or damage
- Disaster Recovery Plan describes ways to continue operating in the event of a disaster

Preventing Data Loss

- Frequent backups
- Redundant data storage
  - Store off-site in case of loss of equipment

Precautions you as an individual can and should take to make sure that you aren't the victim of high-tech criminals

- Update software

- Be careful when browsing

- Be alert to e-mail scams

- Use antivirus software

- Strong passwords

Ethics

Standards of moral conduct

- Computer Ethics – guidelines for the morally acceptable use of computers
  - Copyright and Digital Rights Management
  - Cyberbullying
  - Plagiarism

- ## Copyright
  - Gives content creators the right to control the use and distribution of their work
  - Paintings, books, music, films, video games
- ## Software piracy
  - Unauthorized copying and distribution of software
    - Digital rights management (DRM) controls access to electronic media
    - Digital Millennium Copyright Act protects against piracy
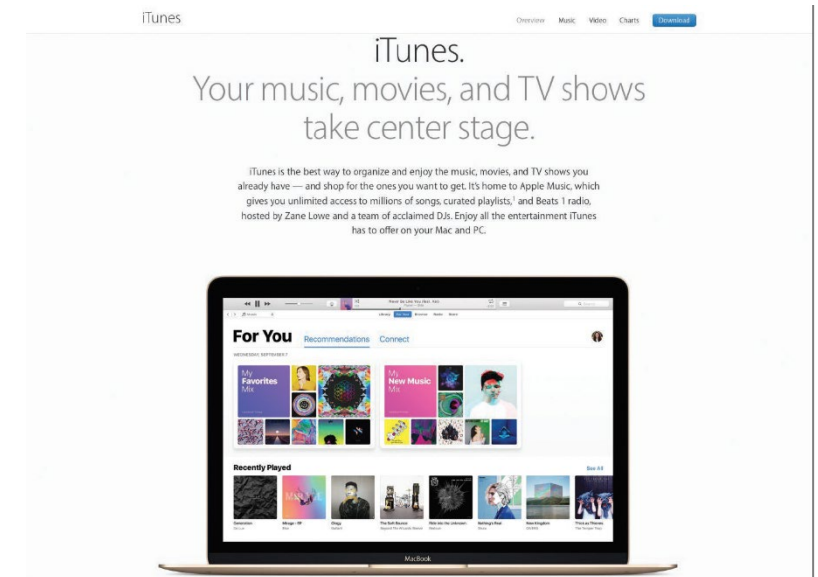
Cyberbullying and Plagiarism

Cyberbullying

- Use of the Internet to send or post content intended to harm another person

Plagiarism

- Representing some other person's work and ideas as your own without giving credit to the original person's work and ideas