COMPUTER HARDWARE AND SOFTWARE

Student Learning Outcomes

1. Define IT and its two basic categories: hardware and software.
2. Describe the categories of computers based on size.
3. Compare the roles of personal productivity, vertical market, and horizontal market software.

Student Learning Outcomes

1. Describe the roles of operating system software and utility software as components of system software.
2. Define the purpose of each of the six major categories of hardware.

Introduction

- ***Information technology*** – any computer-based tool that people use to work with information and support the information and information-processing needs of an organization

Technology Quick Tour

- ***Hardware*** – physical devices that make up a computer (or computer system)
- ***Software*** – set of instructions that hardware executes to carry out a specific task for you

Six Categories of Hardware

1. ***Input devices*** – used to enter information and commands






Six Categories of Hardware

1. ***Output devices*** – hear, see, or otherwise recognize the results of information-processing requests

Six Categories of Hardware

1. ***Storage devices*** – store information for use at a later time (magnetic, optical, flash)

Six Categories of Hardware

1. **Processing**
   - ***CPU*** – hardware that interprets and executes software and coordinates all hardware

   - ***RAM*** – temporary holding area for information and software

Six Categories of Hardware

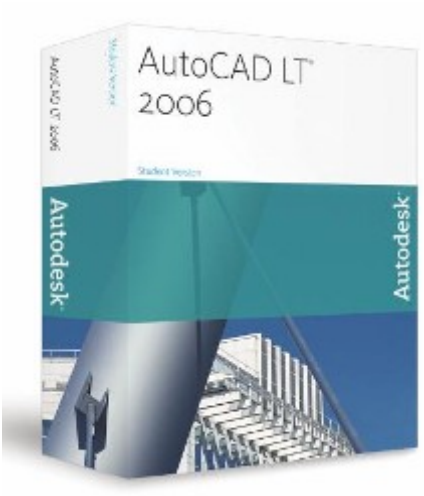
1. ***Telecommunications devices*** – send information to and receive it from another person or computer in a network

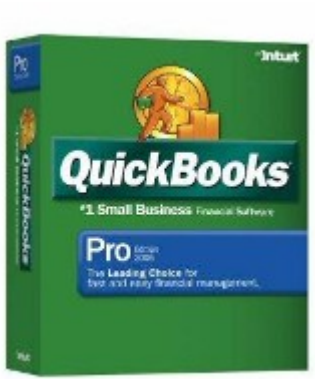
Six Categories of Hardware

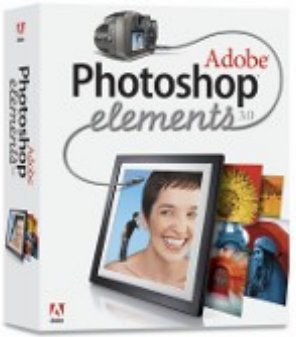
1. **Connecting devices** – lets you connect peripherals to your computer, such as
   - Cables
   - Ports
   - Expansion boards
   - Etc.

Two Major Categories of Software

1. ***Application software*** – enables you to solve specific problems or perform specific tasks







Two Major Categories of Software

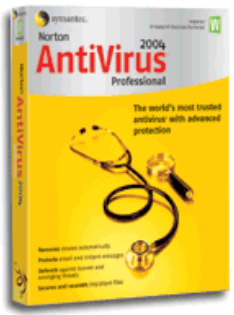
1. ***System software*** – handles tasks specific to technology management and coordinates the interaction of all technology devices

- Two main types of system software
  - Operating system software
  - Utility software

Types of System Software

- ***Operating system software*** – controls application software and manages hardware devices

- ***Utility software*** – provides additional functionality to your operating system
  - Anti-virus
  - Screen saver
  - Etc.



Personal Productivity Software

- ***Personal productivity software*** – helps you perform personal tasks
  - Writing memos (word processing)
  - Creating graphs (spreadsheet)
  - Creating slide presentations (presentation)
- ***Software suite*** – several applications bundled together (usually productivity software)

Vertical & Horizontal Market Software

- ***Vertical market software*** **–** application software for a specific industry
  - Patient-scheduling software
  - Restaurant management software
- ***Horizontal market software*** – application software suitable for use in many industries
  - Payroll, inventory, and billing

Computer Categories (by size)

- ***Personal digital assistant (PDA)*** – small handheld computer for personal tasks like appointment scheduling and address book maintenance
- ***Tablet PC*** – pen-based computer with the functionality of a notebook or desktop
- ***Notebook computer*** – small, portable, fully functional, battery-powered computer
- ***Desktop computer*** – most popular type of personal computer

Computer Categories (by size)

PDA

Notebook

Desktop

Tablet PC

Computer Categories (by size)

- ***Minicomputer (mid-range computer)*** – meets needs of several people simultaneously in a small or medium-sized business
- ***Mainframe computer*** – meets needs of hundreds of people in a large business
- ***Supercomputer*** – fastest, most powerful, and most expensive type of computer

Computer Categories (by size)

Minicomputers

Mainframe

Supercomputer

Grid Computing at GSU

Posted: August 31, 2006

Associated Press

Southern Schools Form Computer Grid

ATLANTA (AP) - It traces the shape of star systems millions of miles away, magnifies the inner workings of the tiny molecules in prescription drugs, and can perform billions of calculations per second. It's a high-speed supercomputer grid that's being assembled by a group of Southern universities starting with Georgia State University in Atlanta and Louisiana State University in Baton Rouge. Texas A&M will join the list by the fall, and eventually, 24 colleges in 15 states will be connected through the network. The project was announced August 11.

Whole article at:
http://www2.gsu.edu/~wwwexa/news/archive/general/06_0831-c

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Software – Intellectual Interface

- ***Personal productivity software*** – helps you perform personal tasks
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  - Creating slide presentations (presentation)
- ***Software suite*** – several applications bundled together (usually productivity software)

Personal Productivity Software

- ***Word processing*** – helps you create letters, memos, and other basic documents
- ***Spreadsheet*** – helps you work with numbers, perform calculations and create graphs
- ***Presentation*** – helps you create and edit information that will appear in slides
- ***Desktop publishing*** – extends word processing by including design and formatting techniques to enhance the appearance of the document

Personal Productivity Software

- ***Personal information management (PIM)*** – helps you create and maintain to-do lists, appointments, calendars, etc.
- ***Personal finance*** – helps you maintain your checkbook and handle other personal finance tasks
- ***Web authoring*** – helps you design and develop Web sites
- ***Graphics*** – helps you create and edit photos and art
- ***Communications*** – helps you communicate with others

Personal Productivity Software

- ***Database management system (DBMS)*** – helps you specify the logical organization for a database; access and use the information within a database
- The focus of…
  - Chapter 3
  - Extended Learning Module C
  - Extended Learning Module J

Vertical & Horizontal Market Software

- ***Vertical market software*** **–** application software for a specific industry
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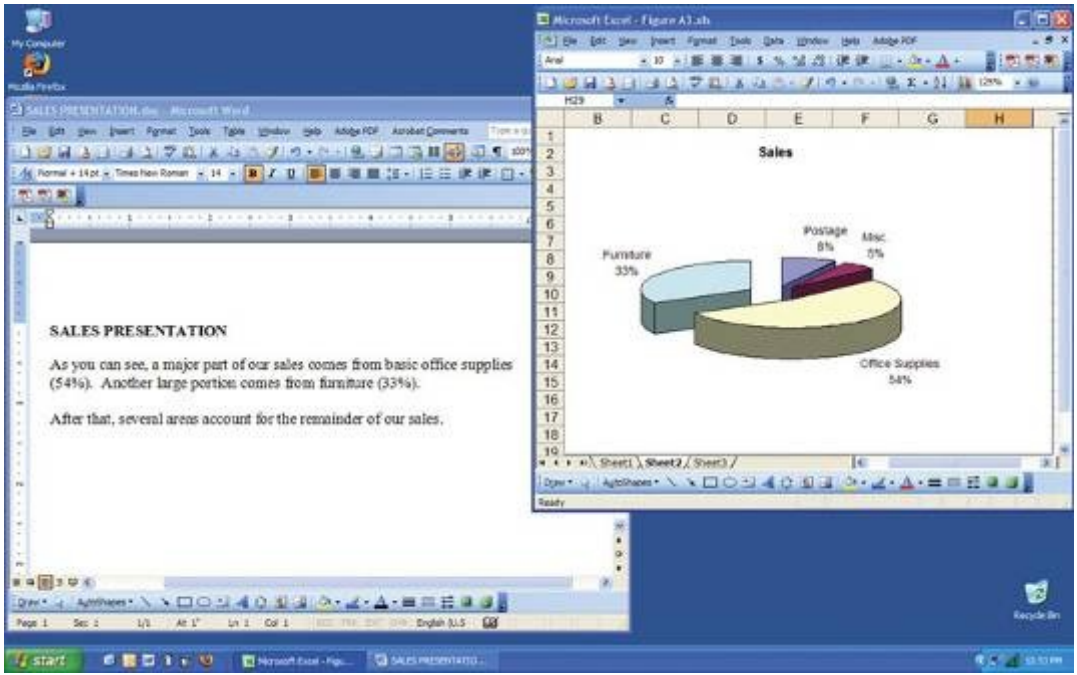
System Software

- Operating system software
  - ***Microsoft Windows Vista***
  - ***Mac OS***
  - ***Linux*** – open-source operating system

Multitasking

- ***Multitasking*** – working with more than one application at a time



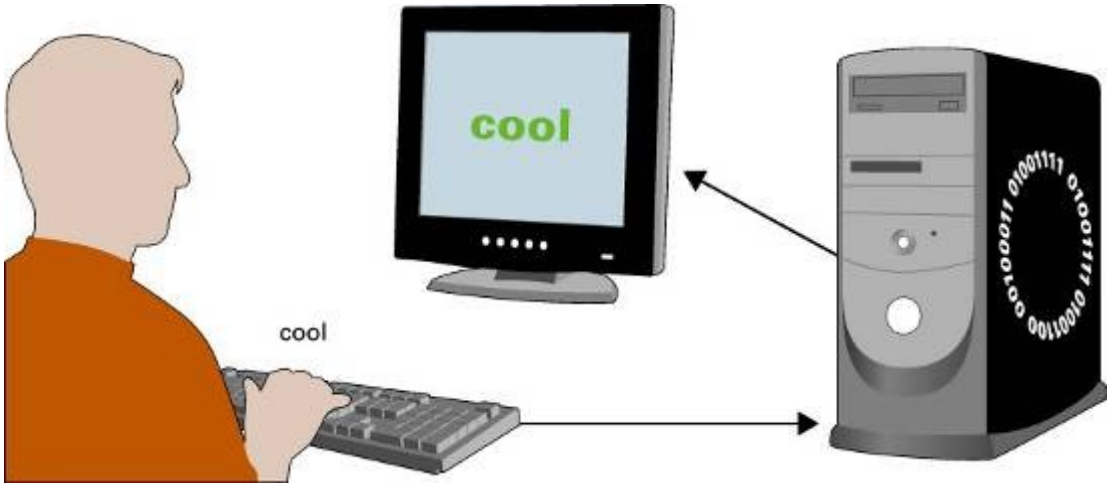
Utility Software

- ***Utility Software*** **–** adds functionality to operating system software
  - ***Anti-virus software*** – detects and removes or quarantines computer viruses
  - ***Crash-proof software*** – helps save information if your system crashes
  - ***Uninstaller software*** – removes software from your hard disk
  - ***Disk optimization software*** – organizes information on your hard disk
  - ***Spam blocker*** – filters unwanted e-mail

Hardware – Physical Interface

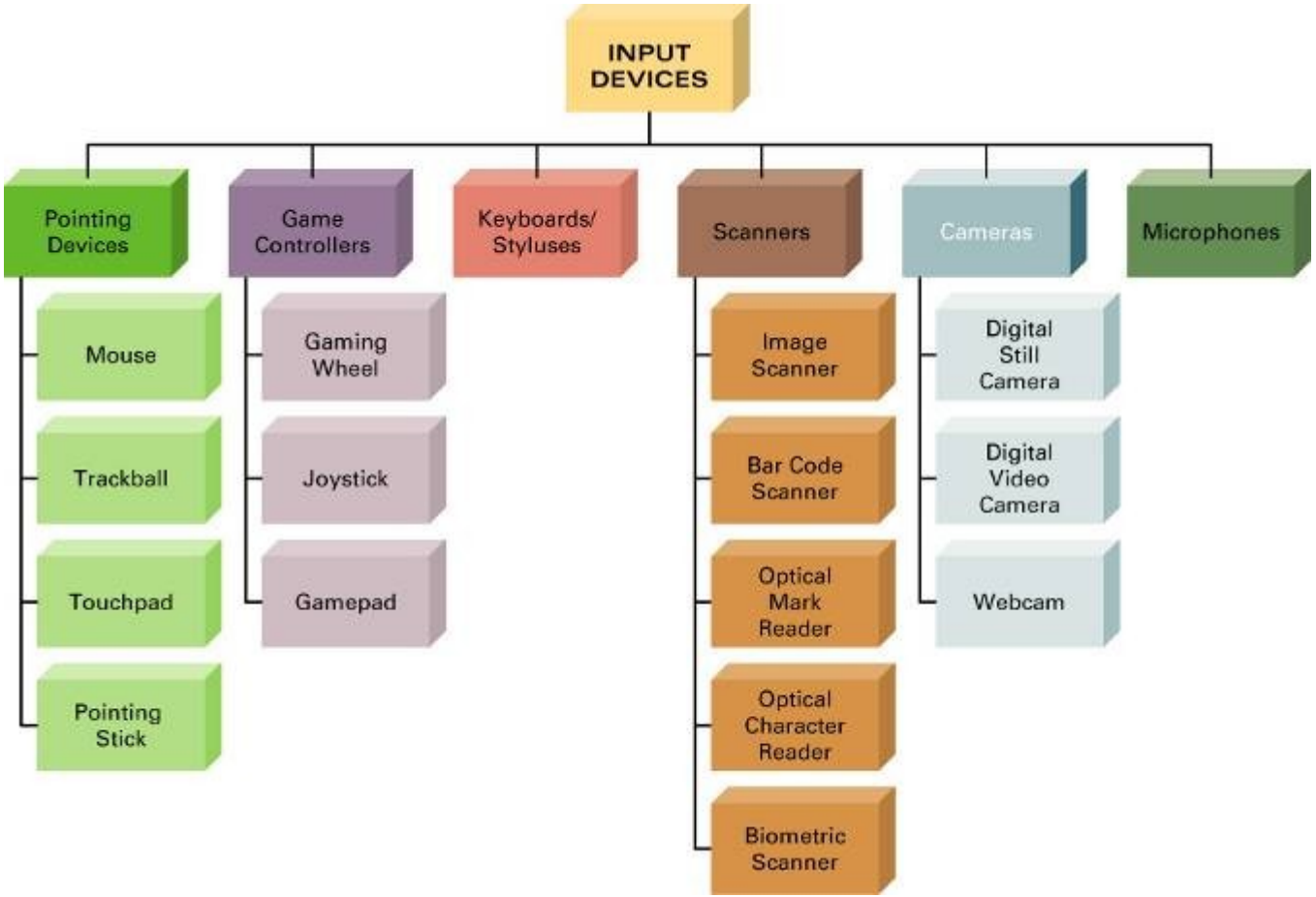
- Representation of information
  - ***Binary digit (bit)*** – smallest unit of information your computer can process
  - ***Byte*** – eight bits or the number of bits it takes to represent one natural character
  - ***ASCII (American Standard Code for Information Interchange)*** – coding system that personal computers use

Information Representation



Common Input Devices

Common Input Devices



Input Devices – Information & Commands

- ***Keyboards*** – most frequently input devices for notebooks and desktops to enter information and commands
- ***Stylus*** – most frequently used input devices for PDAs and tablet PCs to enter information and commands

Input Devices – Commands

- ***Pointing Device*** **–** used to input commands
  - ***Mouse*** – device you use to click on icons and buttons
  - ***Trackball*** – similar to a mechanical mouse, but with the ball on top

Input Devices – Commands

- ***Touchpad*** – dark rectangle you use to move the cursor with your finger
- ***Pointing stick*** – a little rod, used mostly on notebooks

Photo from wikipedia.com

Input Devices – Game Controllers

- ***Game controller*** **–** used for gaming to control screen action
  - ***Gaming wheel*** – steering wheel and foot pedals for virtual driving

Photo from logitech.com

Input Devices – Game Controllers

- ***Joystick*** – controls action with a vertical handle and programmable buttons
- ***Gamepad*** – device with programmable buttons, thumb sticks, and a directional pad

Photo from wikipedia.com

Scanners

- ***Scanners*** – used to convert information that exists in visible form into electronic form
  - ***Image scanner*** – captures images, photos, text, and artwork
  - ***Bar code scanner*** – reads information in the form of vertical bars

Photo from wikipedia.com

Scanners

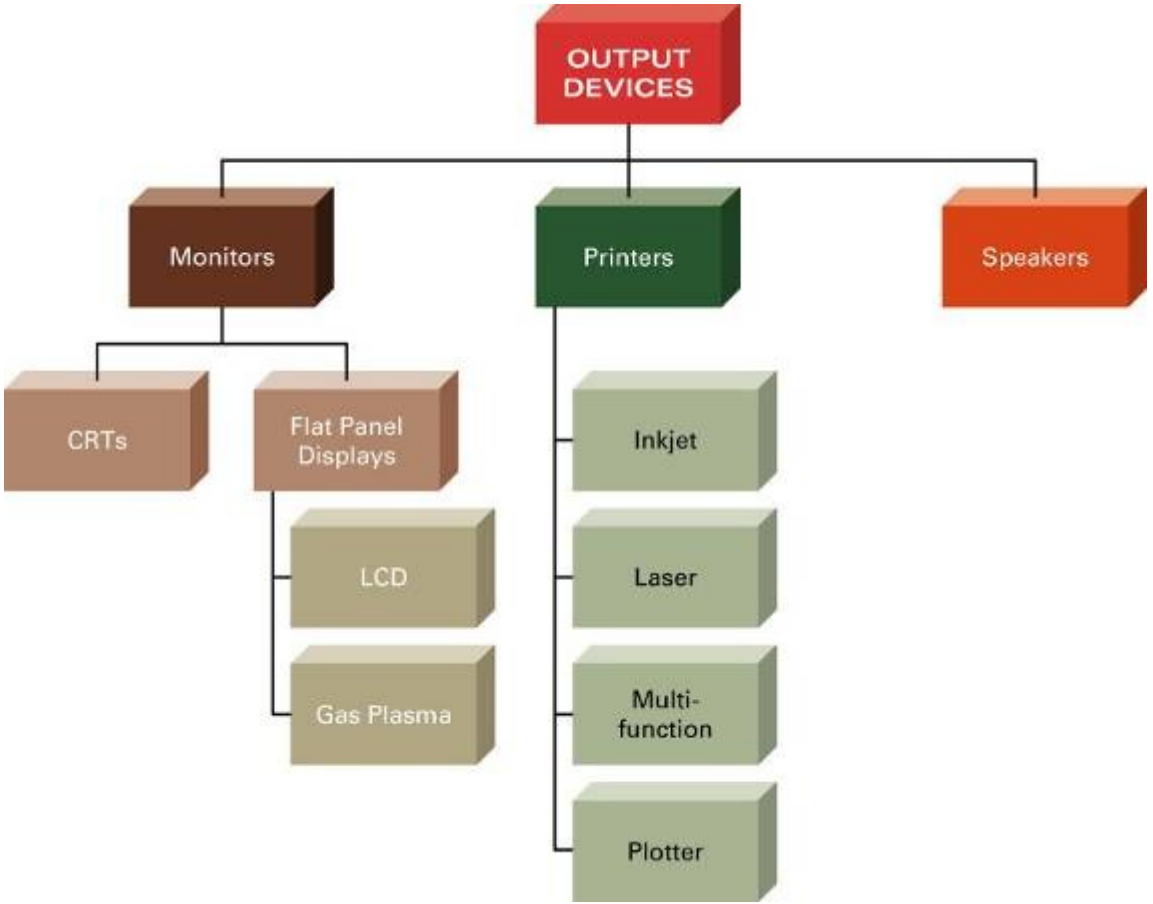
- ***Optical mark reader*** – detects the presence or absence of a mark
- ***Optical character reader*** – reads characters that appear on paper or sales tag (used in POS systems)
- ***Biometric scanner*** – scans a human physical attribute, like a fingerprint or iris, for security purposes

Photo from iris.com

Digital Cameras

- ***Digital camera*** – captures still image or video as a series of 1s and 0s
  - ***Digital still camera*** – digitally captures still images in varying resolutions
  - ***Digital video camera*** – captures video digitally
  - ***Webcam*** – captures digital video for the Web

Common Output Devices



Common Output Devices - Monitors

Monitors

- ***CRT*** – monitors that look like traditional TV sets
- ***Flat-panel display*** – thin, lightweight monitors that take up much less space than CRTs

Monitors

- Two types of flat-panel displays
  1. ***Liquid crystal display (LCD) monitor*** – sends electricity through crystallized liquid between layers of glass or plastic
  2. ***Gas plasma display*** – sends electricity through gas trapped between layers of glass or plastic

Monitor Considerations

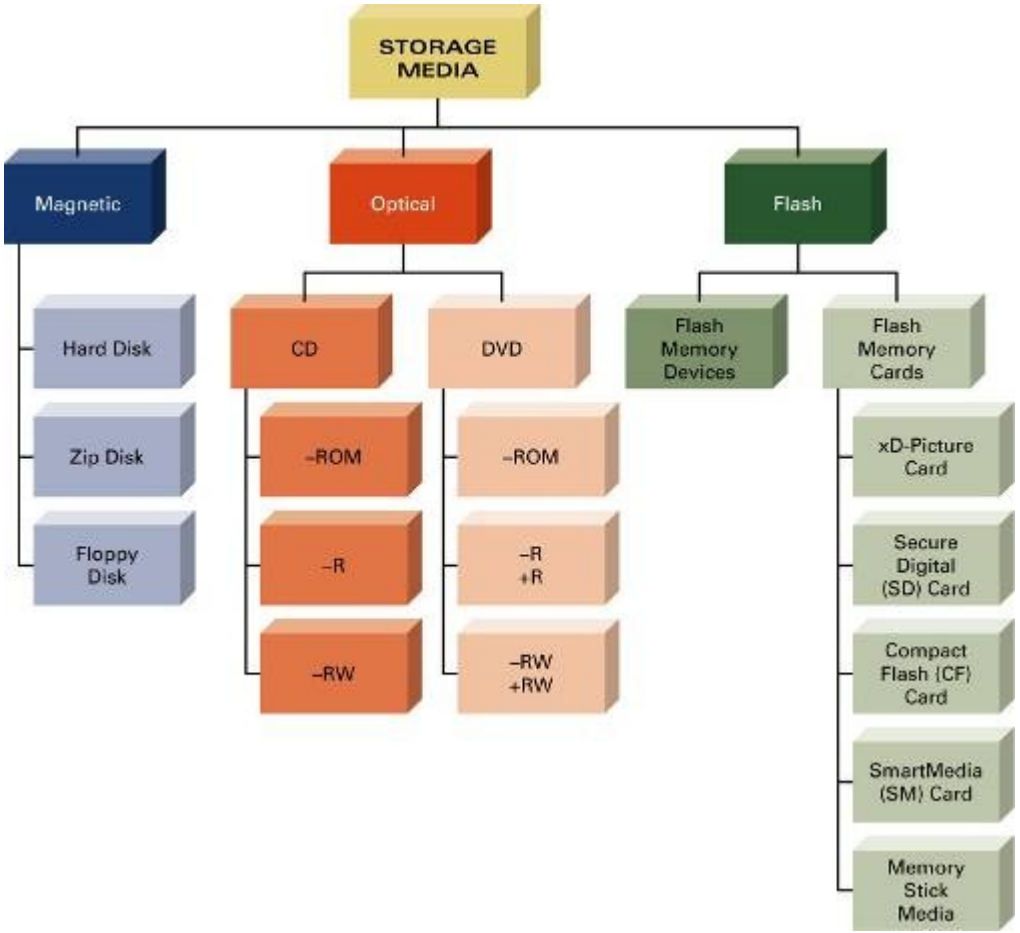
- ***Viewable image size (VIS)*** – the size of the image on a monitor
- ***Resolution of a screen*** – the number of pixels it has
- ***Pixels (picture elements)*** – the dots that make up the image
- ***Dot pitch*** – the distance between the centers of two like-colored pixels

Printers

Printers

- ***Resolution of a printer*** – the number of dots per square inch (dpi) it produces
- Types
  - ***Inkjet printer*** – makes images by forcing ink through nozzles
  - ***Laser printer*** – forms images using the same electrostatic process that photocopiers use
  - ***Multifunction printer*** – scan, copy, and fax, as well as print
  - ***Plotter*** – forms output by moving pen across paper

Common Storage Devices



Capacity of Storage Devices

- ***Megabyte (MB or M or Meg)*** – about 1 million bytes
- ***Gigabyte (GB or Gig)*** – about 1 billion bytes
- ***Terabyte (TB)*** – about 1 trillion bytes

Magnetic Storage Media

- ***Hard disk*** – magnetic storage with one or more thin metal platters sealed inside the drive

Optical Storage Media

Optical Storage Media

- ***Optical storage media*** – plastic discs on which information is stored, deleted, and changed using laser technology
- Two types
  - CDs
  - DVDs

CDs

- ***CD-ROM (compact disc read-only memory)*** – information cannot be changed
- ***CD-R (compact disc – recordable)*** – write one time only
- ***CD-RW (compact disc – rewritable)*** – save, change, and delete files repeatedly

DVDs

- ***DVD-ROM*** – high capacity; information cannot be changed
- ***DVD-R or DVD+R (DVD – recordable)*** – high capacity; write one time only
- ***DVD-RW or DVD+R*** (depending on manufacturer) – save, change, delete repeatedly

Flash Memory Devices & Cards

- ***Flash memory device*** – very small storage device that plugs into USB port
- ***Flash memory card*** – high capacity storage laminated inside a small piece of plastic

Photo from wikipedia.com

Common Types of Flash Memory

Flash Memory Cards

- ***xD-Picture (xD) card*** – rectangular; smaller than a penny and about as thick with one curved side
- ***Secure Digital (SD) card*** and ***MultiMediaCard (MMC***) – look the same but SD has copy protection; are both larger and thicker than a quarter (but rectangular)

Flash Memory Cards

- ***CompactFlash (CF) card*** – almost square; larger than a half-dollar
- ***SmartMedia (SM) card*** – rectangular; longer than CF
- ***Memory Stick Media card*** – elongated card as wide as a penny developed by Sony

CPU and RAM

CPU and RAM

- CPU and RAM work together to form the brain of your computer
- CPU speed measured in gigahertz (GHz)
  - ***GHz*** – number of billions of CPU cycles per second
  - ***CPU (machine) cycle*** – retrieve, decode, and execute instruction, then return result to RAM if necessary

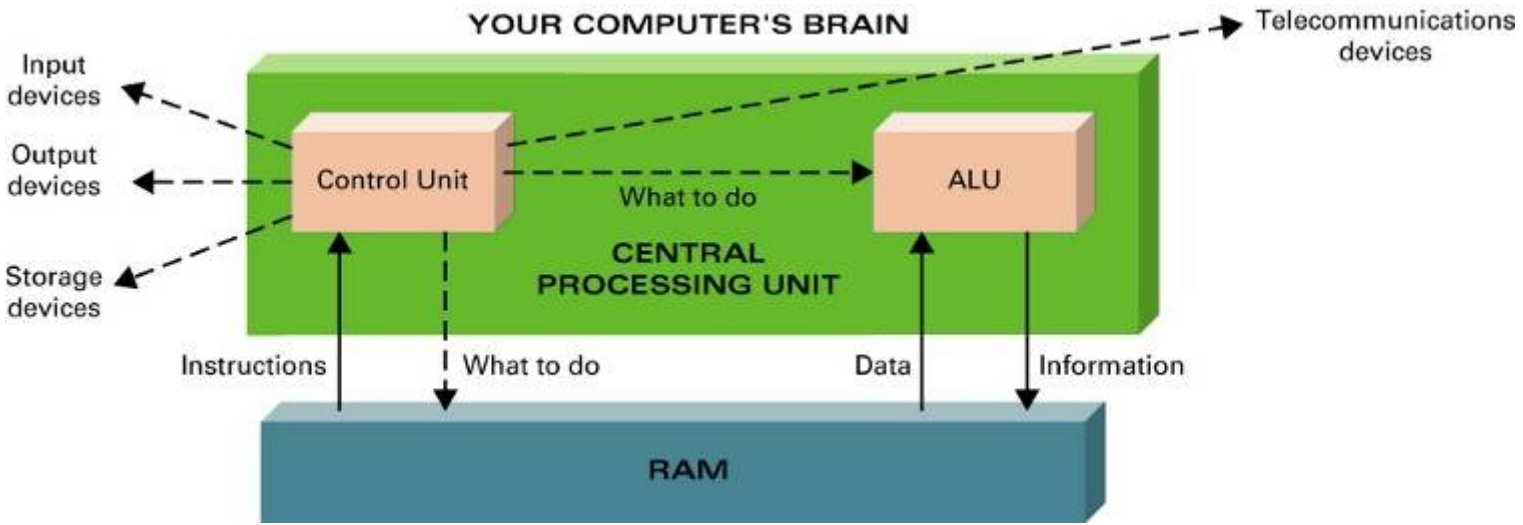
CPU Components

- ***Control unit*** – directs what happens in the CPU and the rest of your computer
- ***Arithmetic logic unit (ALU)*** – performs arithmetic, comparison, and logic operations
- ***CPU cache*** – CPU memory where instructions wait until they're needed
- ***CPU clock*** – beats to keep instructions and information moving in synchronized fashion

System Bus

- ***System bus*** – electrical pathways that move information between motherboard components, especially between CPU and RAM

CPU and Ram at Work



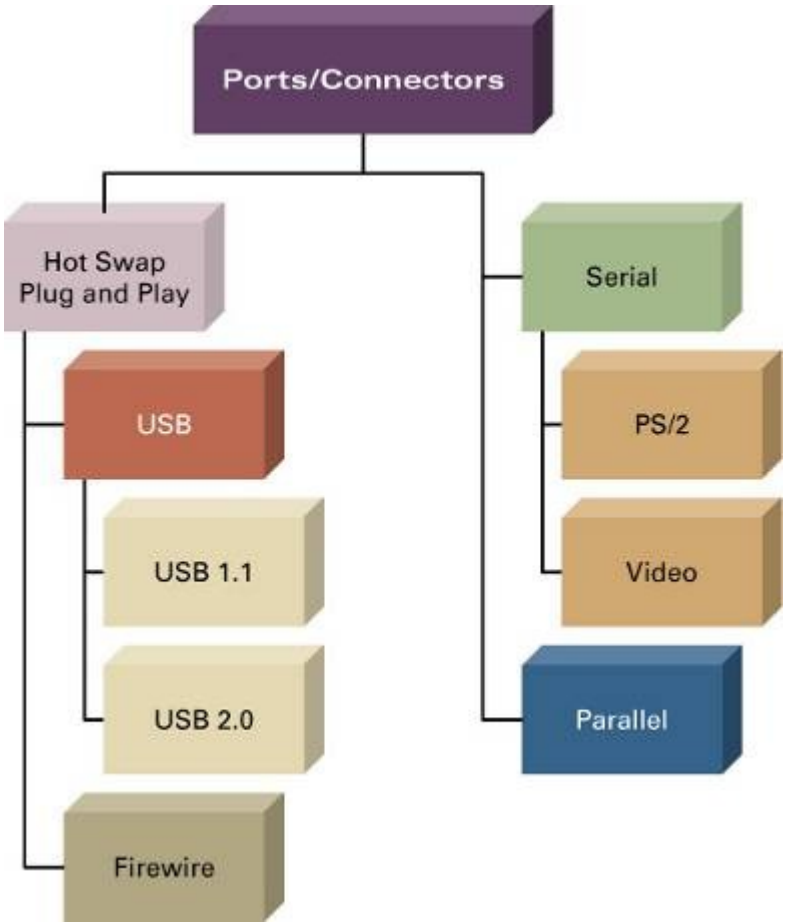
CPU (Machine Cycle)

1. *Retrieve*: The control unit sends to RAM for the instructions and information it needs
2. *Decode*: CPU gets the instruction out of cache and examines it to see what to do
3. *Execute*: Does what the instruction says to do
4. *Store*: Sends the result of processing to be stored in RAM if necessary

Notebook CPUs and RAM

- ***Mobile CPU*** – type of CPU that changes speed, and therefore power consumption, in response to fluctuation in use
- RAM for notebooks comes in smaller modules than RAM for desktops

Connectors and Ports



Ports and Connectors

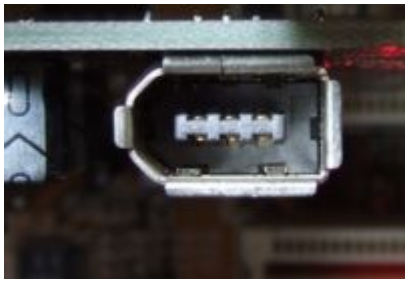
- ***Port*** – place on your system unit, monitor, or keyboard through which information and instructions flow to and from computer
- Connector – something like a cable; can also be wireless

Ports and Connectors

- Some ports work with plug-and-play and hot-swap ports and devices
  - ***Plug and play*** – operating system feature that finds and installs the driver for the device
  - ***Hot swap*** – operating system feature that allows you to plug or unplug a device while the computer is running

Ports

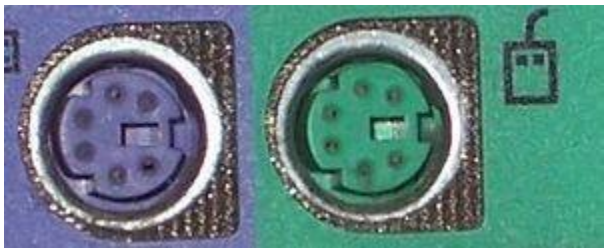
- ***USB (universal serial bus) port*** – fits small, flat, plug-and-play, hot-swap USB connectors
- ***Firewire port (IEEE1394 or I-Link)*** – fits hot-swap, plug-and-play Firewire connectors



Photos from wikipedia.com

Ports

- ***PS/2 port*** – fits PS/2 connectors (used for keyboards and mice)
- ***Parallel port*** – fits parallel large flat parallel connectors found on printers



Photos from wikipedia.com

Common Ports & Connectors

Serial

Ethernet

Parallel

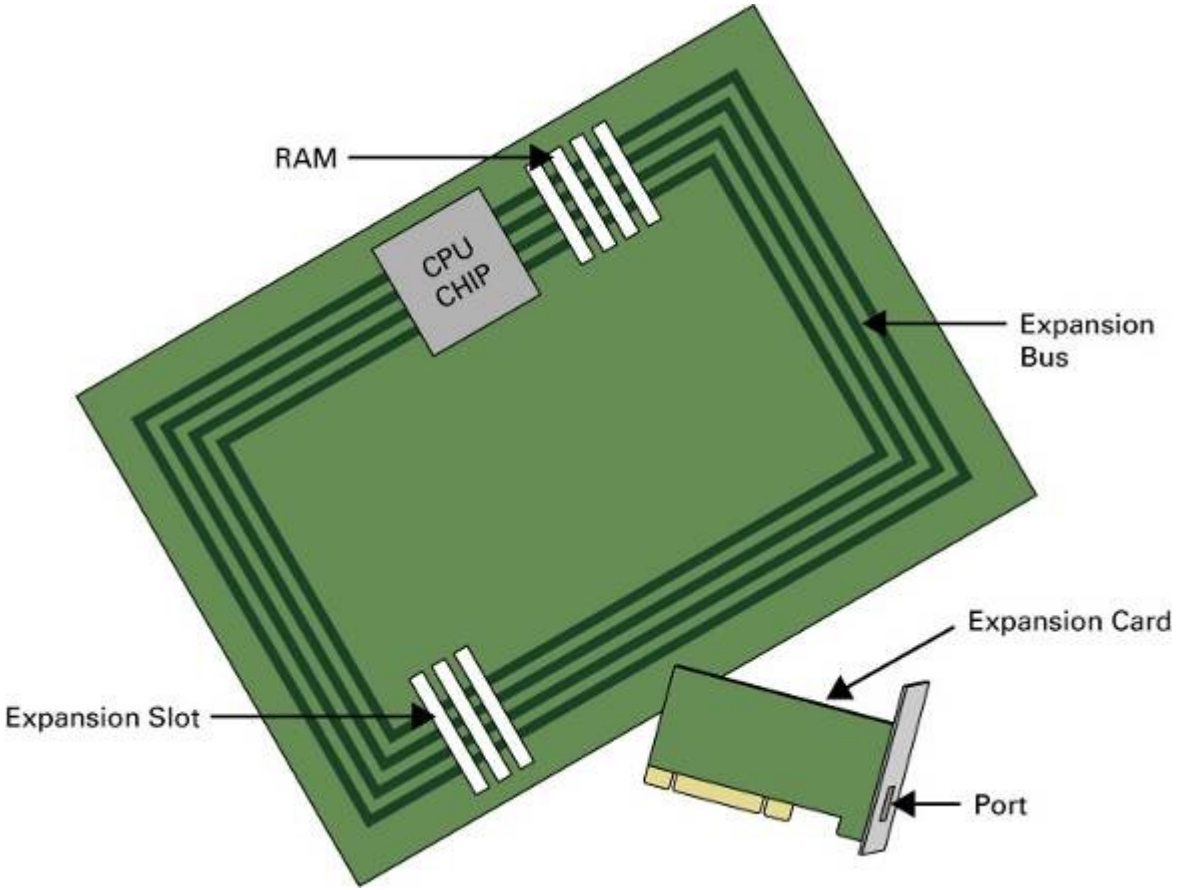
Firewire

USB

Wireless Connections

- ***Infrared IR or IrDA (infrared data association)*** – uses red light to send and receive information
- ***Bluetooth*** – transmits information as radio waves for a distance of 30 feet
- ***WiFi (wireless fidelity) or IEEE 802.11a, b, or g*** – transmits information as radio waves for a distance of up to several miles

Expansion Cards, Slots, & Bus



Expansion Cards, Slots, & Bus

- ***Expansion card (board)*** – circuit board that you insert into the expansion slot and connect to a peripheral device
- ***Expansion slot*** – long skinny socket on the motherboard for expansion card
- ***Expansion bus*** – pathways along which information moves between devices (outside the motherboard) and the CPU

Expansion for Notebooks

- ***PC Card*** – expansion card for a notebook
- ***PC Card slot*** – opening on side or front of a notebook, into which you plug a PC Card

PC Card for a Notebook

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