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Computer System Components

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Comp 230

GRADING CRITERIA

- **Mid Term Exam** **30 %**
- **Lab (Quizzes + Final Practical Exam)** **25 %**
- **Assignments** **10 %**
- **Final Exam** **35 %**

What is a Computer?

❖ a *computer* is a machine that can be programmed to accept data, process it into useful information, and store it away.

(a *computer* is a machine that **receives**, **stores**, and **processes** information)

Data VS. Information ???

Data VS. Information

❖ Data: raw facts representing people and events.

❖ Information: data that is organized, meaningful and useful.

Types of Computers

- *supercomputers:* powerful but expensive; used for complex computations
  - (e.g., weather forecasting, engineering design and modeling)

- *desktop computers:* less powerful but affordable; used for a variety of user applications
  - (e.g., email, Web browsing, document processing)

- *laptop computers:* similar functionality to desktops, but mobile
- *palmtop computers:* portable, but limited applications and screen size

Types of Computers

(a) Notebook Computer (HP Pavilion dv5©, Courtesy of Hewlett-Packard).

(b) Palmtop Computer (iPhone 3G©, Courtesy of Apple, Inc.)

(c) Desktop Computer (iMac©, Courtesy of Apple, Inc.)

(a)

(b)

(c)

Characteristics of Computers

- ❖ Speed
- ❖ Reliability
- ❖ Storage Capability

Benefits of Computers

❖ Productivity

❖ Decision Making

❖ Cost Reduction

Computer System Components.

Hardware : Equipment associated with the system (the physical components of a computer system).

e.g., monitor, keyboard, mouse, hard drive

Computer System Components

Software : the programs that execute on the computer.

e.g., word processing program, Web browser

Computer System Components

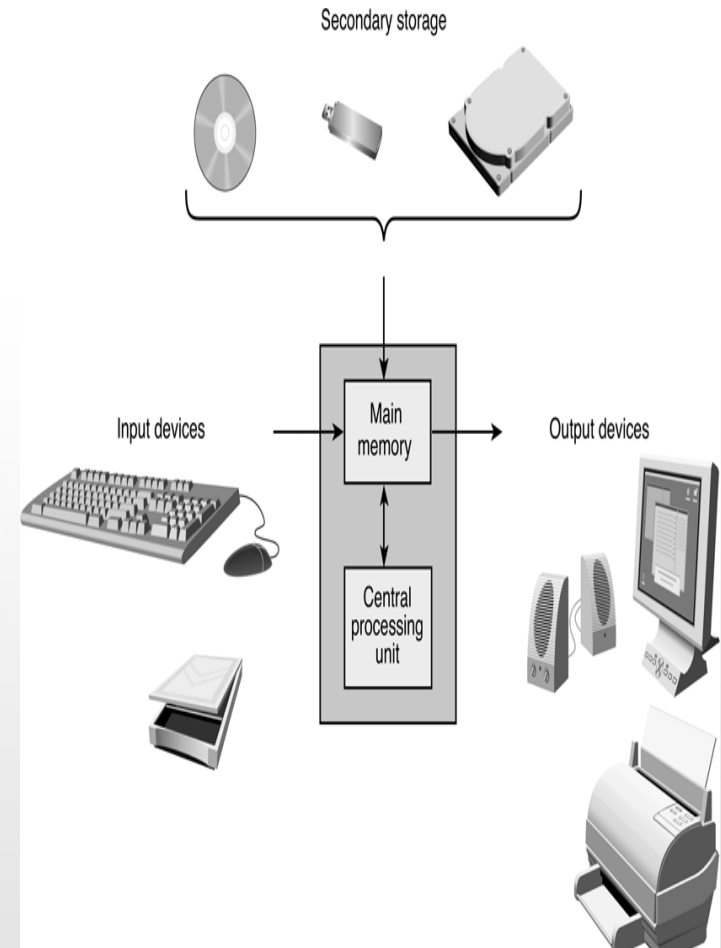*Software* : the programs that execute on the computer.

e.g., word processing program, Web browser

Computer System Components

People: 1. Computer Programmer: writes software

2. User: purchases and uses software (end-user)

Four primary Components.

1. Input devices
2. The Processor and Memory
3. Output devices
4. Storage

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Input Devices

Input: the data put into the computer for processing.

Common input devices:

❑ Keyboard

❑ Mouse

❑ Scanner

Central Processing Unit (CPU) or (Processor)

❖ the CPU is the "brains" of the computer

❖ Coordinate all computer operations

❖ Interprets and execute program instructions

❖ Communicates with input, output, and storage devices

❖ Transform data into information

Central Processing Unit (CPU) or (Processor)

The CPU is made up of three main parts:

Control Unit (CU)

Arithmetic Logic Unit (ALU)

Registers

Central Processing Unit (CPU) or (Processor)

Control Unit :

1) Directs the computer system to execute stored program instructions.

2) Communicate with memory and ALU

3) Sends data and instructions from secondary storage to memory as needed.

Central Processing Unit (CPU) or (Processor)

Arithmetic Logic Unit :

1) Execute all arithmetic and logical operations

Arithmetic operation:

   Addition, Subtraction , Multiplication, Division

Logical operations:

   Compare numbers, letters or special characters

   (Equal, Less than, Greater than,..)

Central Processing Unit (CPU) or (Processor)

Registers (Temporary storage area):

❖ High-speed temporary storage areas

❑ Storage locations located within the CPU

❖ Work under direction of control unit

❑ Accept, hold, and transfer instructions or data

❑ Keep track of where the next instruction to be executed or needed data is stored

Memory

- The memory is that part of a computer that stores programs and data.

- Content of a memory cells:
  (Program, instruction or data)

Memory

Address	Contents
0	−27.2
1	354
2	0.005
3	−26
4	H
.	.
.	.
.	.
998	X
999	75.62

Memory

- modern computers use a combination of memory types, each with its own performance and cost characteristics

- *Main memory* (or *primary memory*) is fast and expensive
  - memory is volatile – data is lost when the computer is turned off
  - examples: Random Access Memory (RAM), cache
  - Temporary storage
- *Secondary memory* is slower but cheaper
  - use different technologies (magnetic signals on hard disk, reflective spots on CD)
  - Non-volatile
  - memory is permanent – useful for storing long-term data
  - examples: hard disk, flash drive, compact disk (CD)
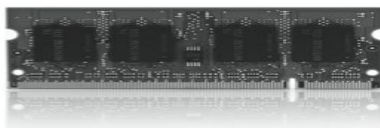
RAM chips   Hard disk   Flash drive   Compact disk (CD)

Main memory

Used to temporarily hold data :

1. After it is retrieved from input device and before it is processed.

2. After it is processed and before it is released to output device.

RAM VS **ROM**

- **RAM**: Random Access Memory
  2. Volatile
  3. Temporary storage
  4. Read and Write

  Allows the computer to read data quickly to run applications. It allows reading and writing
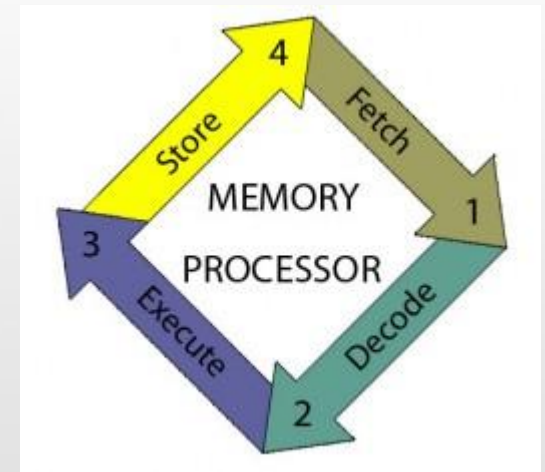
- **ROM**: Read only memory
  2. Non-volatile
  3. Permanent storage
  4. Read only

  Stores the program required to initially boot the computer.

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Primary functions of a CPU

Steps of the CPU machine :

1. Fetch : get next instruction from memory

2. Decode: analyze instruction

3. Execute: run instructions

4. Store: save result to memory

The CPU and Memory

❑ CPU cannot process data from disk or input device

❖ It must first reside in memory

❖ Control unit retrieves data from disk and moves it into memory.

❑ Items sent to ALU for processing

❖ Control unit sends items to ALU, then sends back to memory after processing.

❑ Data and instructions held in memory until sent to an output or storage device or program shut down

Output devices

Output: the result produced by the CPU .

Common forms of output : text, numbers, graphics, and sound.

Common output devices:

❑Screen (monitor)

❑Printer

Storage

Provides long-term storage
   Separate from memory

Common media:
- ❑Magnetic disks (Diskette, Hard Disk)
- ❑Optical disks (CD-ROM, DVD-ROMs)
- ❑Magnetic tape

Networking

Network : a system that uses communications equipment to connect computers and their resources

(A group two or more of devices connected together and communicating with each other.)

Networking

Common network tools:
- ❑ Local Area Network
  (area is limited, geographical area
  Example: lab)
  share resources and exchange data
- ❑ Modem (over telephone lines)
  (binary to audio signals)
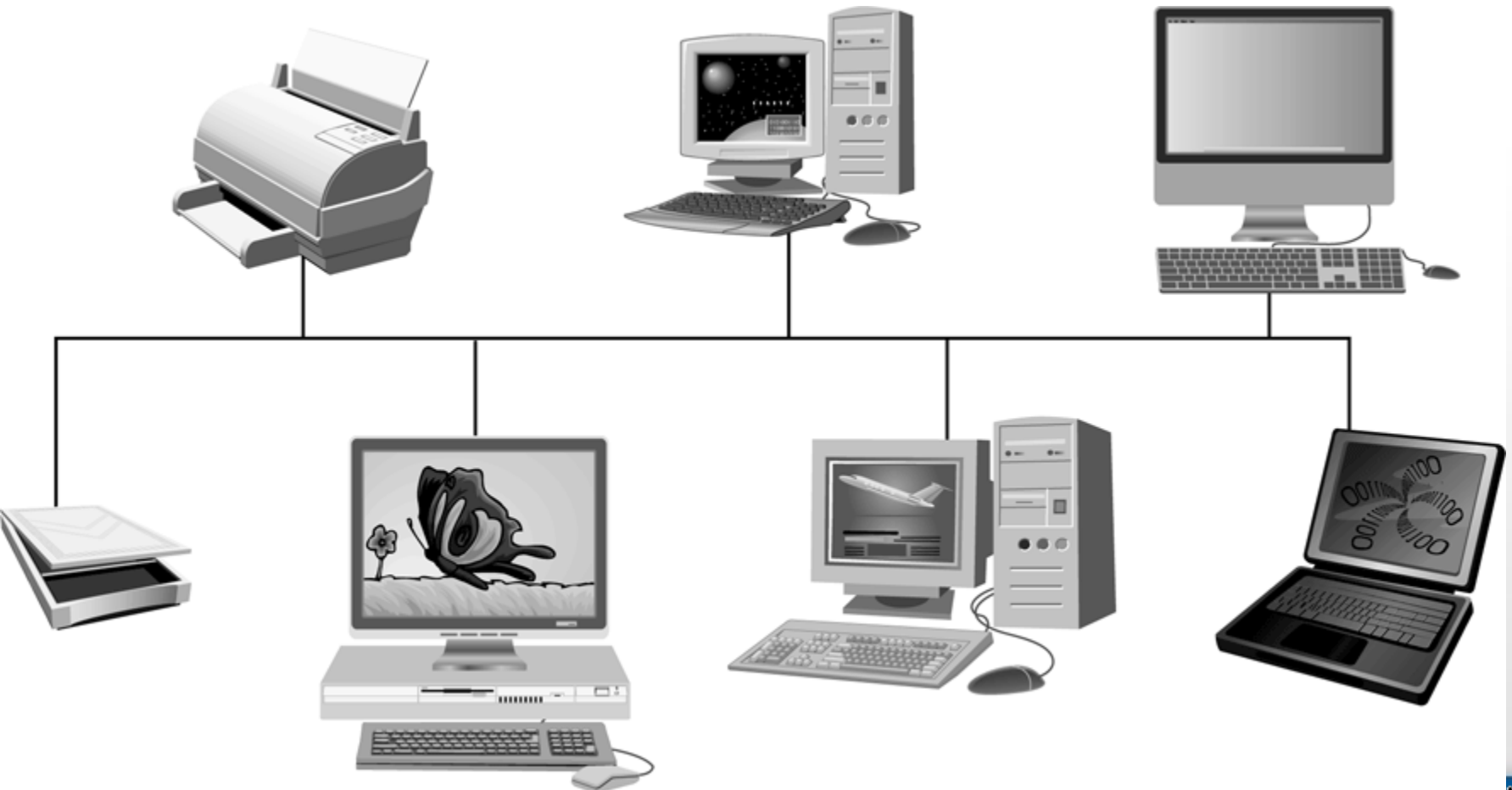- ❑ Electronic mail
  Send and receive message electronically
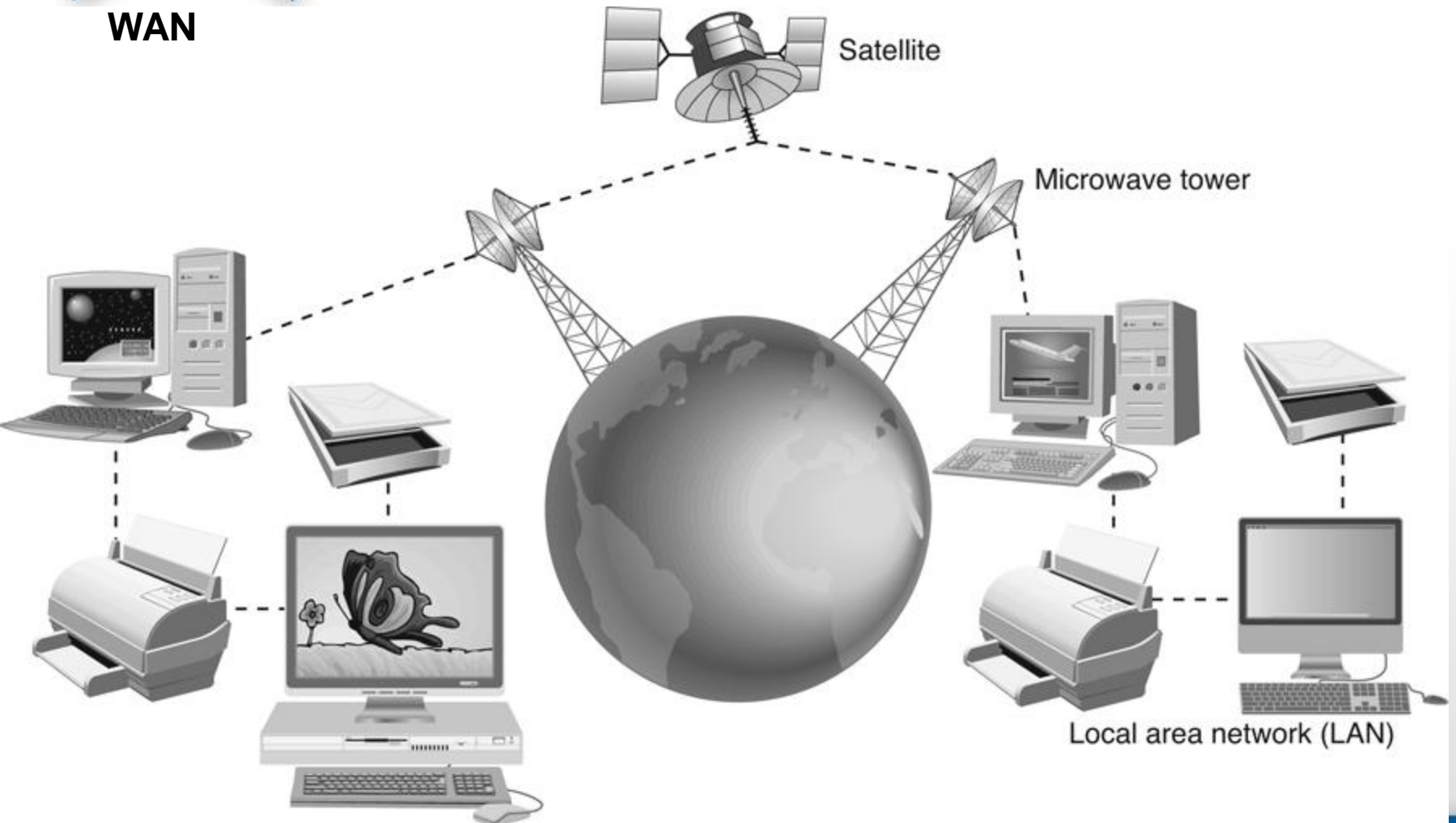 Message stored in computer "mailbox"

Networking

LAN:

Networking

WAN (wide area network):
Ex: Internet that connects computer and LANs
Over a large geographic area

Networking

Satellite

Microwave tower

Local area network (LAN)

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Definitions

Operating system (OS):
Software that controls interaction of user and computer hardware and that manage allocation of computer resources.

Booting computer:
Loading the operating system from disk into memory.