



Computer System Components

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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).



(a)

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



(b)

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



(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.

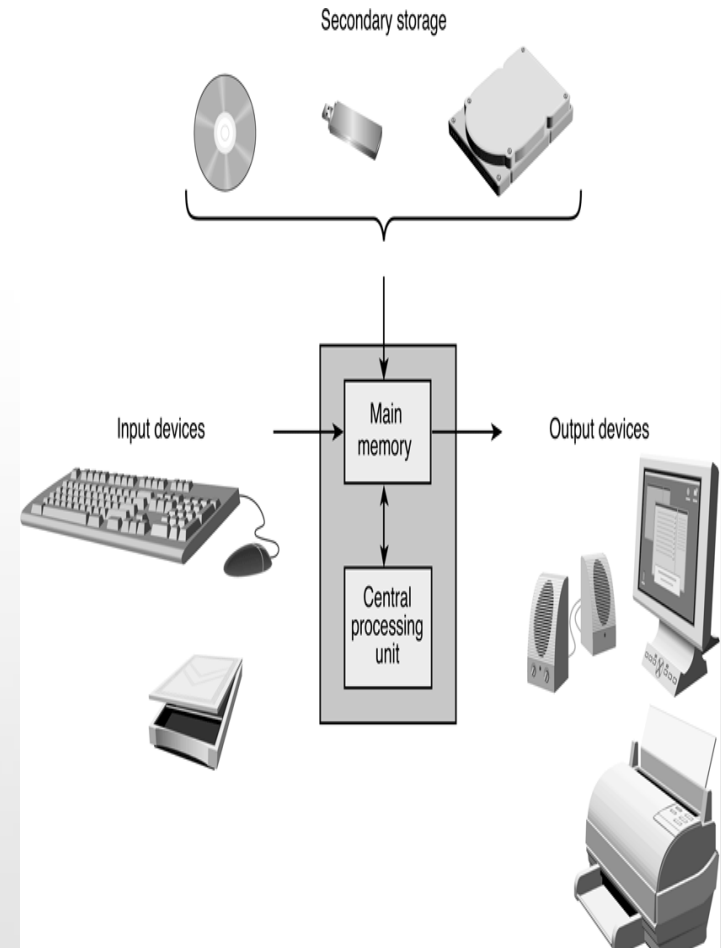
e.g., word processing program, Web browser

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



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

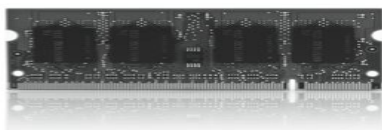
- The memory is that part of a computer that stores programs and data.

- 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

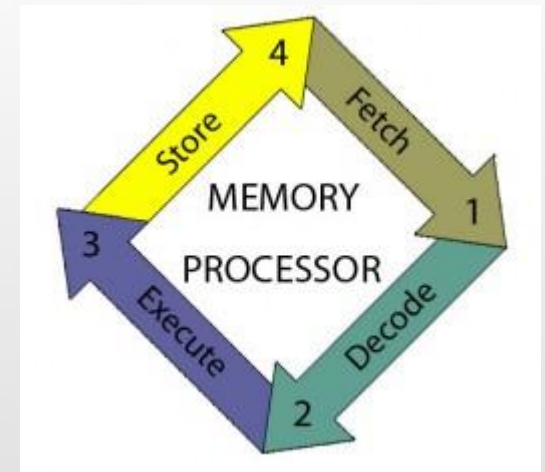
2. **Non-volatile**
3. **Permanent storage**
4. **Read only**

Stores the program required to initially boot the computer.

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)

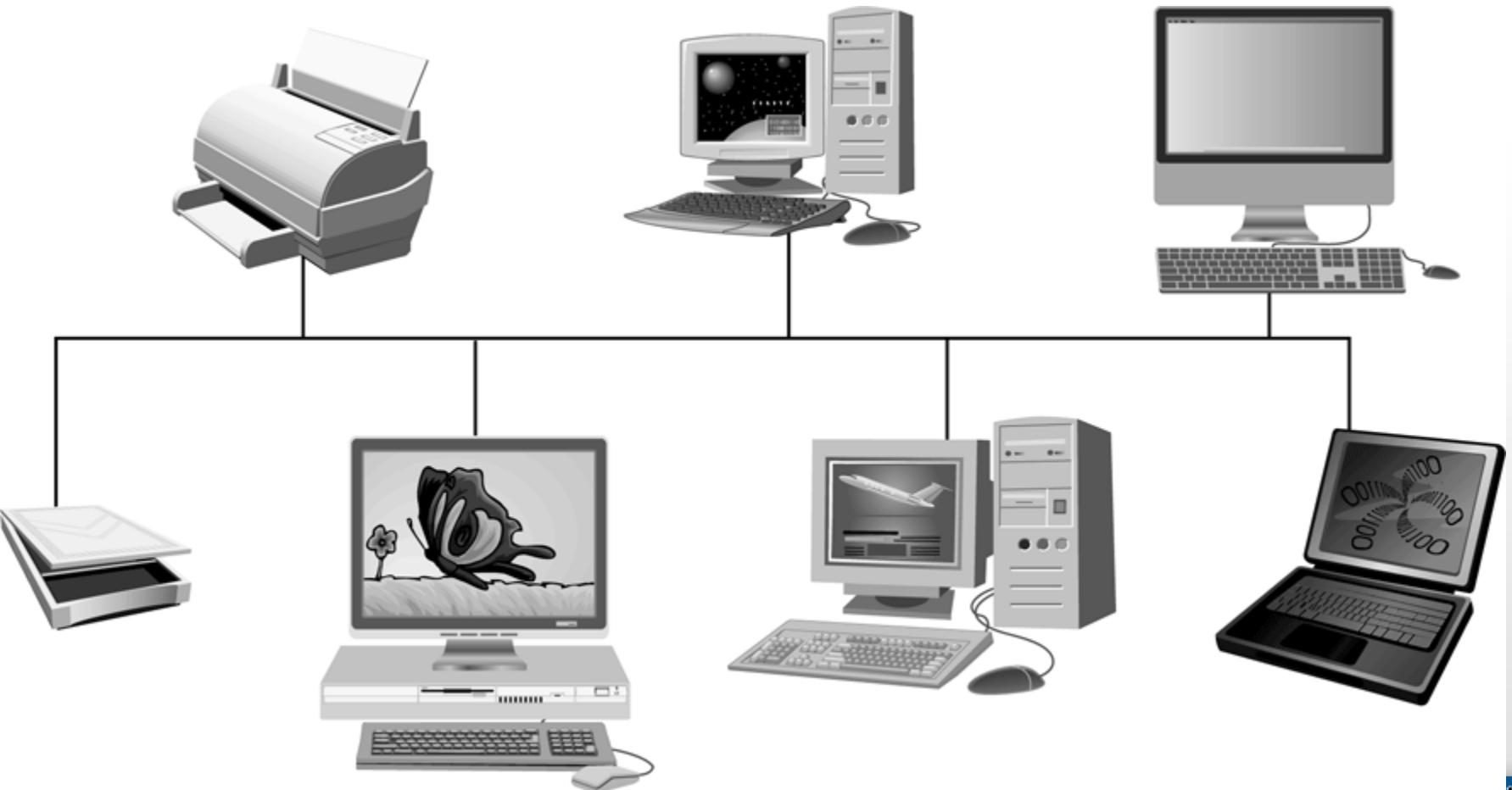
- ❑ Electronic mail

 - Send and receive message electronically

 - Message stored in computer “mailbox”

Networking

LAN:



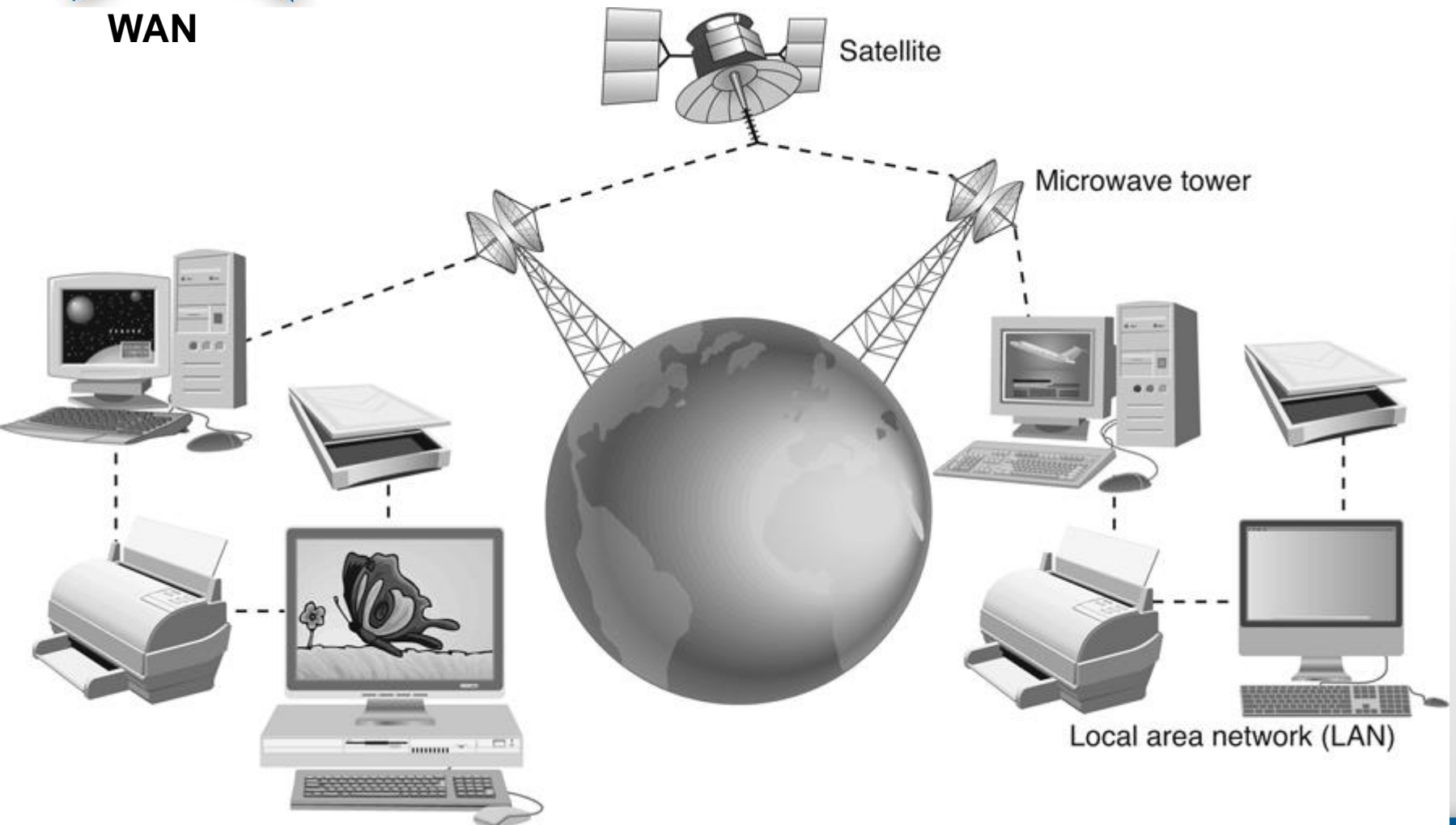
Networking

WAN (wide area network):

Ex: Internet that connects computer and LANs
Over a large geographic area

Networking

WAN



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.