Computer System Components

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Comp 230

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GRADING CRITERIA

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

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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

???

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Data VS. Information

- Data: raw facts representing people and events.
- Information: data that is organized, meaningful and useful.

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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

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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)

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Characteristics of Computers

- Speed
- Reliability
- Storage Capability

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Benefits of Computers

- Productivity
- Decision Making
- Cost Reduction

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Computer System Components.

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

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

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Computer System Components

Software : the programs that execute on the computer.

e.g., word processing program, Web browser

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Software : the programs that execute on the computer.

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Computer System Components

People: 1. Computer Programmer: writes software

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

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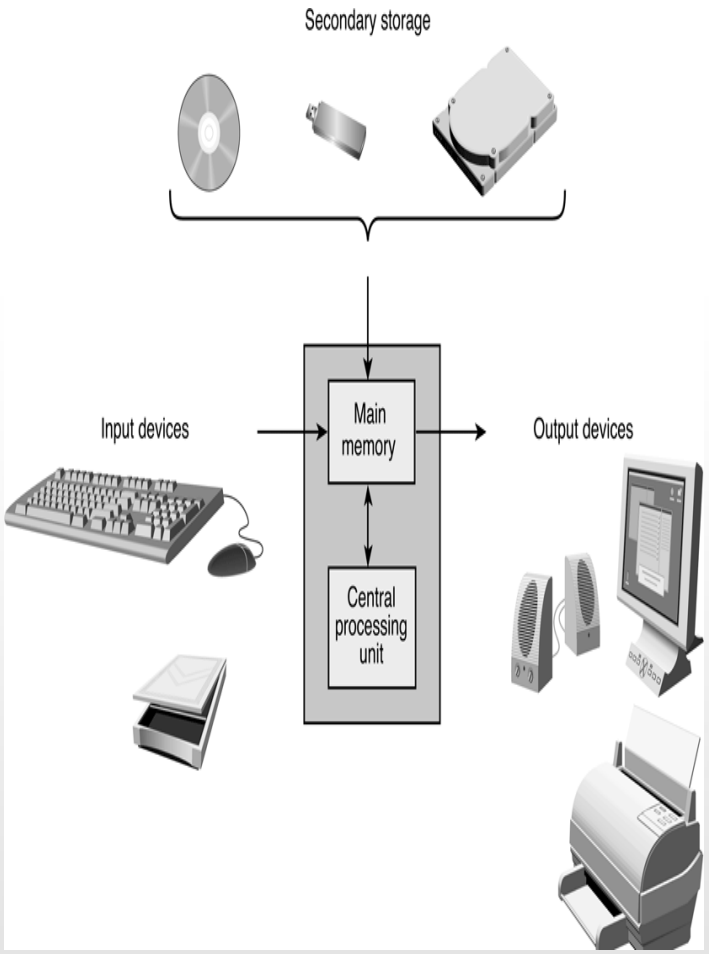
Four primary Components.

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

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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

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Central Processing Unit (CPU) or (Processor)

The CPU is made up of three main parts:

- **Control Unit (CU)**
- **Arithmetic Logic Unit (ALU)**
- **Registers**

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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.

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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,..)

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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

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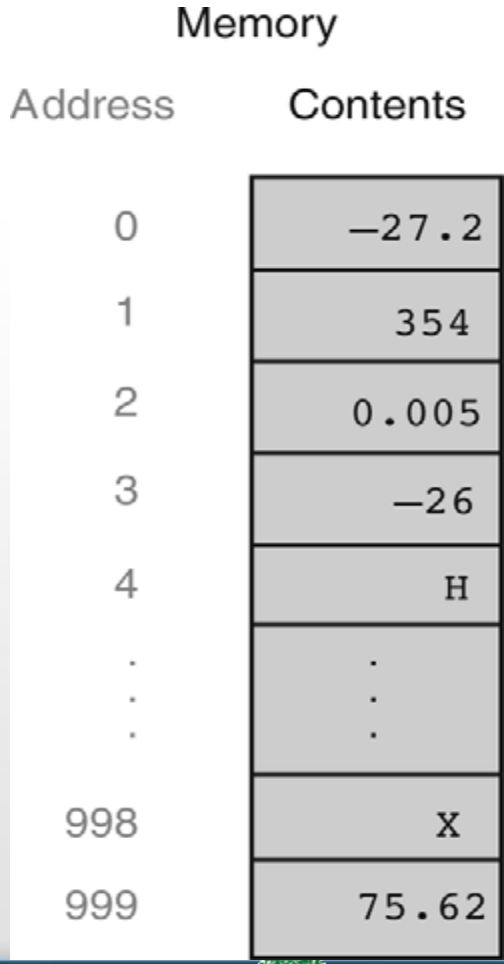
Memory

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

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



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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)

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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.

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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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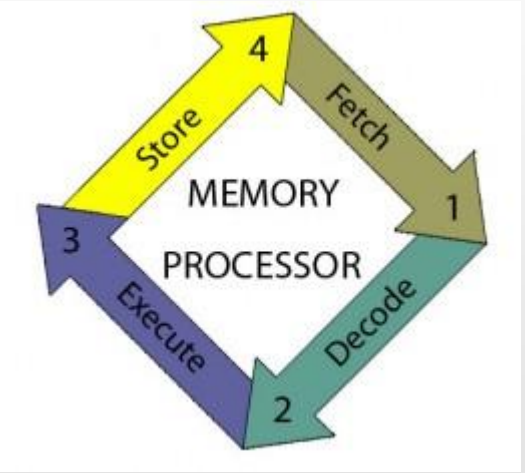
Primary functions of a CPU

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



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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

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Output devices

Output: the result produced by the CPU .

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

Common output devices:

- Screen (monitor)
- Printer

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Storage

Provides long-term storage

Separate from memory

Common media:

- Magnetic disks (Diskette, Hard Disk)
- Optical disks (CD-ROM, DVD-ROMs)
- Magnetic tape

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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.)

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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”

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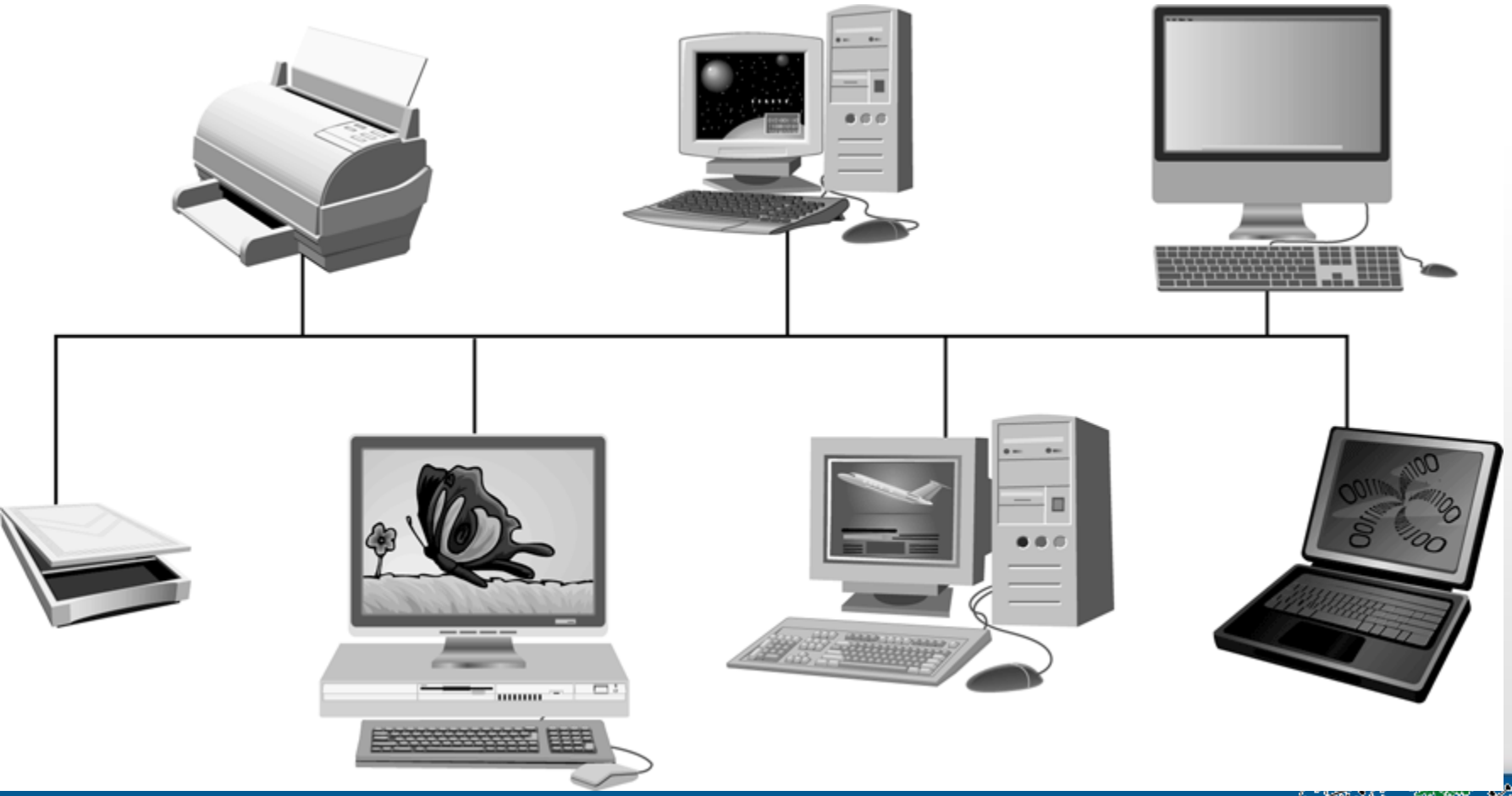
Networking

LAN:



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Networking

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

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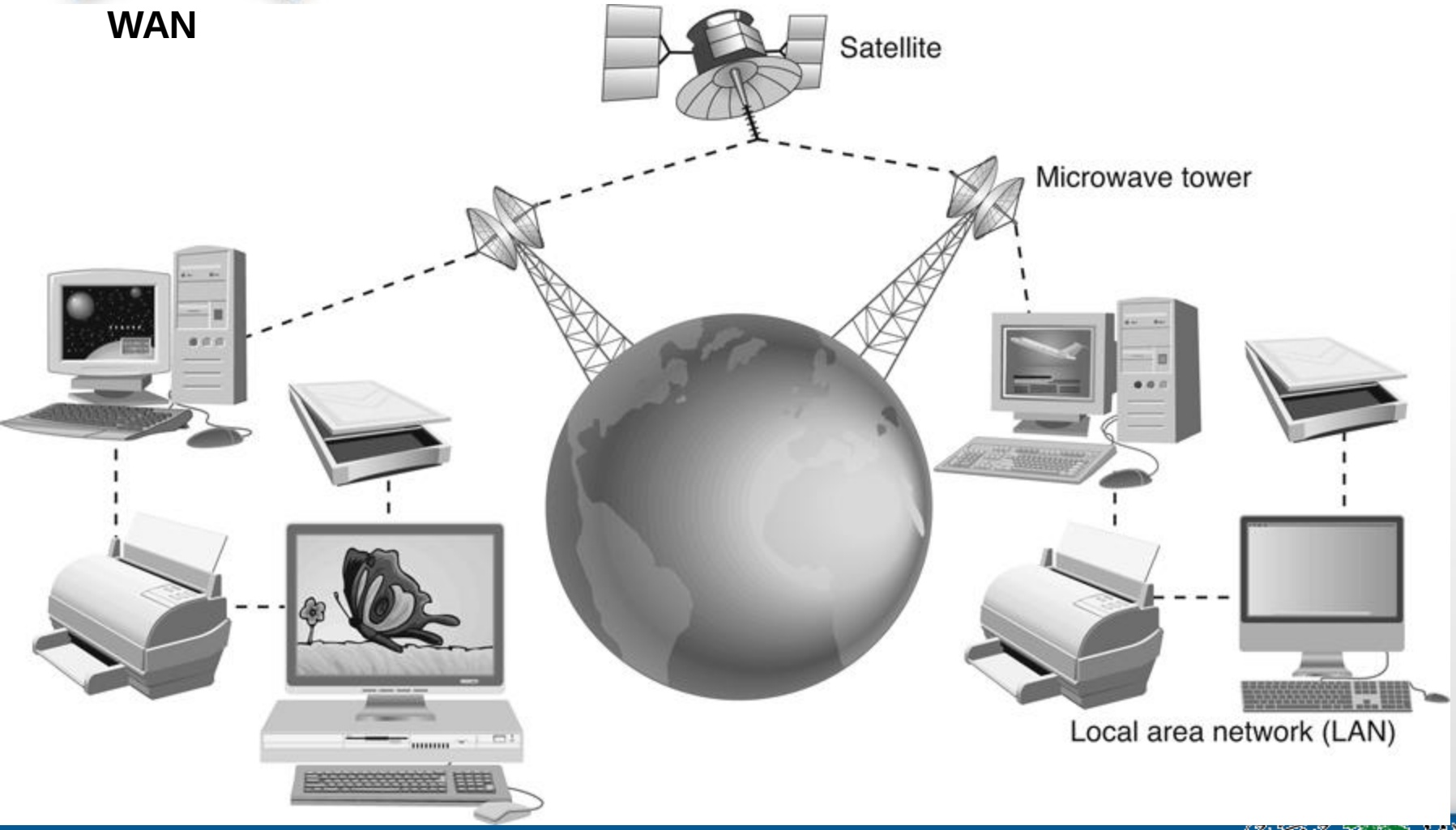
Networking

WAN



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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.

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