

# Computer Applications

-Guru Gokul AR

AP/IT

# UNIT 1 COMPUTER BASICS

Characteristics of a computer - Classification of Computers – Computer Organization and Architecture – Central Processing Unit – Communication among various units – Inside a Computer – Data Representation – Number System.

Computer Memory and Storage: Memory Hierarchy – Primary and Secondary Storage – Importance of Input and Output Hardware, Types of Input and Output Devices – Computer Terminals.

# Introduction

- Early age computing??
- Digitus & Calculus
- Mechanism for Lengthy Calculations
- Compute  $\rightarrow$  Calculate
- Computer is an electronic machine devised for performing calculations and controlling operations that can be expressed either in numerical or logical terms.

# History of Computers



Abacus - 1100 BC



Slide rule - 1617  
Mechanical calculator - 1642  
Automatic loom (punched cards) - 1804



Babbage's computer - 1830s  
Boolean logic - 1850s



Hollerith's electric tabulator - 1880  
Analog computer - 1927  
EDVAC - 1946  
ENIAC - 1947



Transistor - 1947



Integrated circuit - late 1950s  
UNIVAC - 1951  
Microprocessor - 1971  
Altair 8800 - 1975  
Apple II - 1977  
IBM PC - 1981  
World Wide Web - 1990s

# Characteristics of Computer

- Operations done by Computer:
  - Calculation
  - Data Processing
  - Entertainment
- Characteristics:
  - Speed
  - Accuracy
  - Diligence
  - Reliability
  - Storage
  - Versatility
  - Resource Sharing

- Speed
  - Extremely fast
  - Million Instructions per Second (Mega Hertz)
  - Billion Instructions per Second
- Accuracy
  - Accurate Results
  - Hardware and Type of Instruction
  - GIGO
- Diligence
  - No Tired or loss of concentration
  - First and Last Calculation

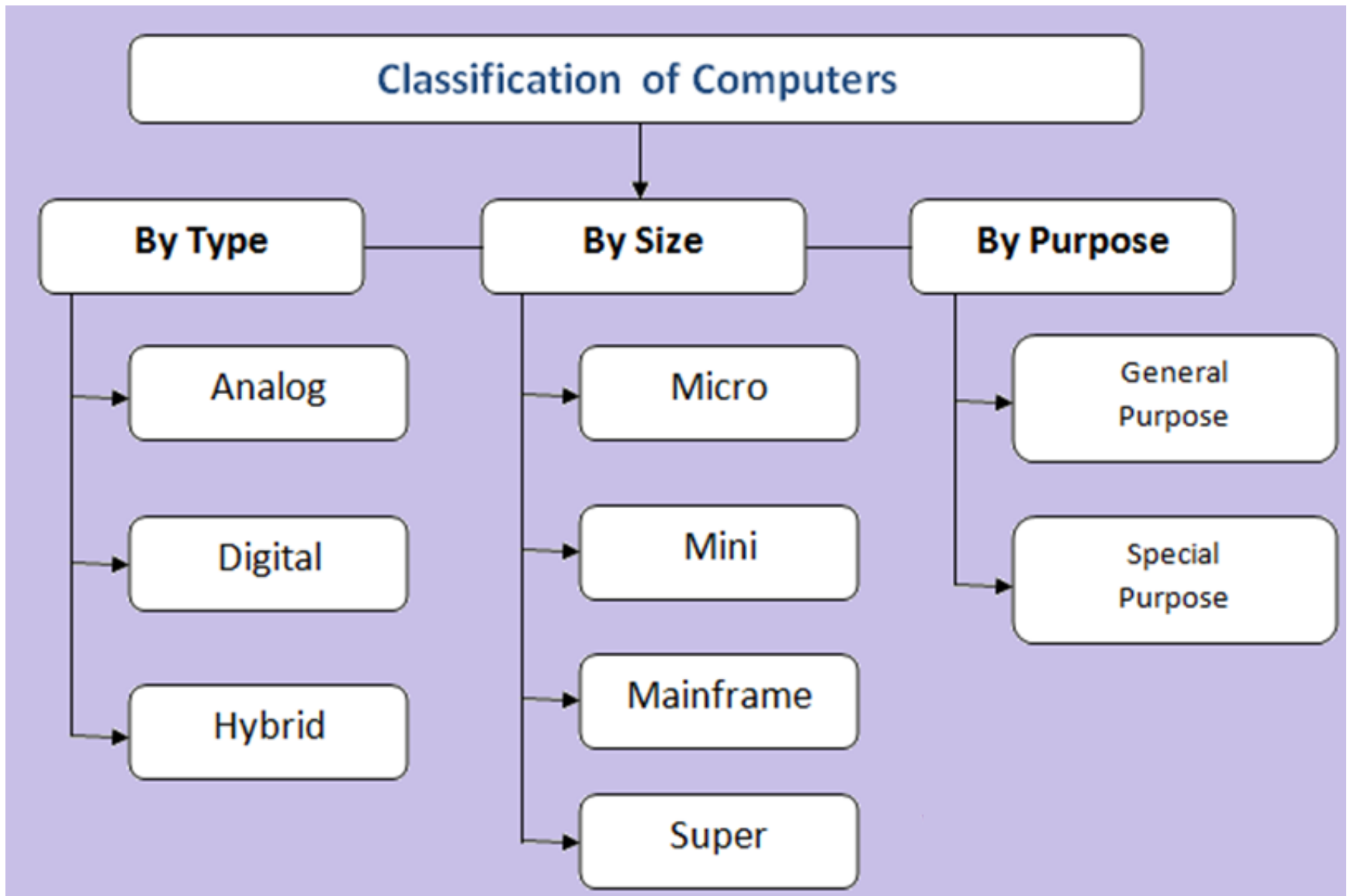
- Reliability
  - Measure of Performance
  - Predetermined Standards
  - Built-in Diagnostic Capabilities
- Storage
  - Large amount of data & Instant Recall
  - Main Memory and Secondary Storage
  - Data Processing Steps
- Versatility
  - Multiple Task simultaneously
- Resource Sharing
  - Data and Devices can be shared

UNIT	ABBREVIATION	STORAGE
Bit	B	Binary Digit, Single 1 or 0
Nibble	-	4 bits
Byte/Octet	B	8 bits
Kilobyte	KB	1024 bytes
Megabyte	MB	1024 KB
Gigabyte	GB	1024 MB
Terabyte	TB	1024 GB
<u>Petabyte</u>	PB	1024 TB
<u>Exabyte</u>	EB	1024 PB
<u>Zettabyte</u>	ZB	1024 EB
<u>Yottabyte</u>	YB	1024 ZB

Storage units ([www.byte-notes.com](http://www.byte-notes.com))



# Classification of Computers



# Micro Computer

- Small low cost digital computer.
- Components
  - Microprocessor
  - Storage unit
  - Input Channel
  - Output Channel
- Requires Power supply, peripherals, OS
- IBM PC, Apple Mac
- Classifications
  - Desktop, Laptop and Hand Held

# Micro Computer

- Desktop Computer (PC)
  - System unit, Monitor, Keyboard, Hard disk
  - Not much expensive
  - Apple, IBM, Dell, HP
- Laptop Computer
  - Portable Computer
  - Rechargeable battery
  - Resemble Notebooks
- Hand Held Computer
  - Personal Digital Assistant
  - Small cards for storage
  - Apple Newton, Franklin eBookMan



# Mini Computer

- Mid range between Micro and Main frame computers
- Size of two drawer cabinet
- Supports 4 to 200 users at a time
- Central server or Cluster of computers
- Real time applications in industries, universities, hospitals etc.,
- PDP 1, IBM 8000 series, VAX 7500



# Mainframe Computer

- Ultra high performance computer for intensive computing
- Large volume of data processing, online transactions, extensive data storage and retrieval
- Maintain large information at central location and high speed processing
- IBM ES000, CDC 6600

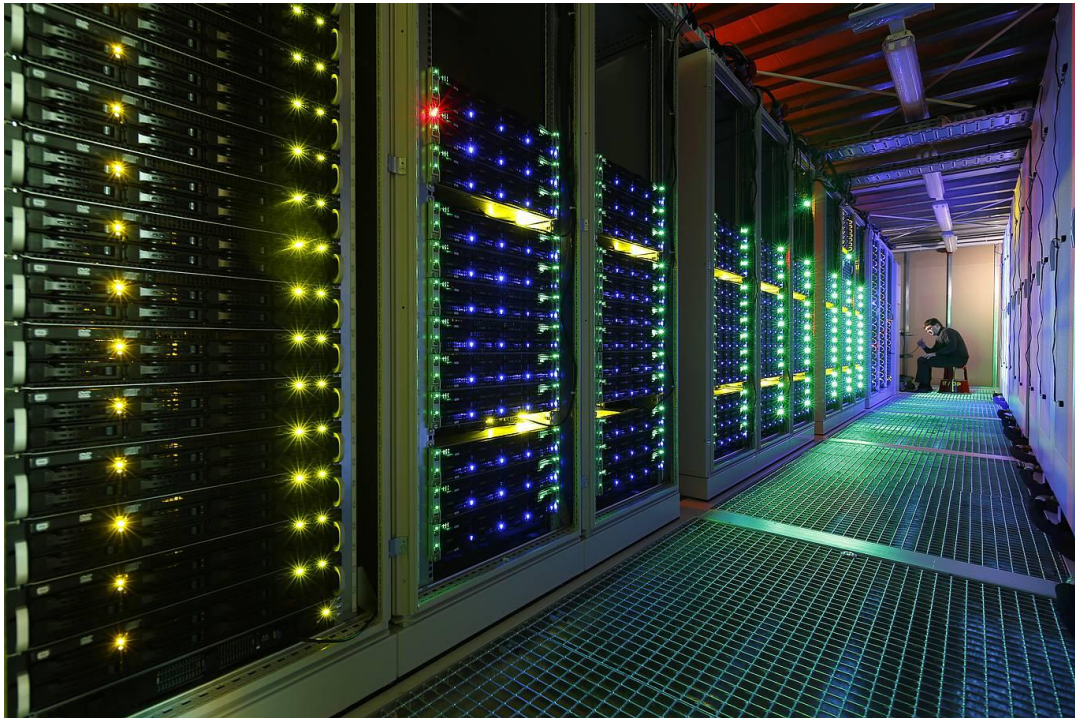






# Super Computer

- Designed to maximize FLOPS
- Contains set of CPU for parallel processing
- 400 – 10000 FLOPS per second
- Fastest, Costliest and solve complex mathematical and scientific problems
- CRAY-3, CYBER 205, PARAM



## **NETWORK TOPOLOGIES**

Network Topology is the schematic description of a network arrangement, connecting various nodes(sender and receiver) through lines of connection.

### **Network Topologies**

**BUS Topology** Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called Linear Bus topology.

**Number of cables = n**

#### **Features of Bus Topology**

- It transmits data only in one direction
- Every device is connected to a single cable

#### **Advantages of Bus Topology**

- It is cost effective.
- Cable required is least compared to other network topology.
- Used in small networks.
- It is easy to understand.
- Easy to expand joining two cables together.

#### **Disadvantages of Bus Topology**

- Cables fails then whole network fails.
- If network traffic is heavy or nodes are more the performance of the network decreases.
- Cable has a limited length.
- It is slower than the ring topology.

### **RING Topology**

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbours for each device.

**Number of cables = n-1**

#### **Features of Ring Topology**

A number of repeaters are used for Ring topology with large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.

The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called Dual Ring Topology. In Dual Ring Topology, two ring networks are formed, and data flow is in opposite direction in them. Also, if one ring fails, the second ring can act as a backup, to keep the network up. Data is transferred in a sequential manner that is bit by bit. Data transmitted, has to pass through each node of the network, till the destination node.

### **Advantages of Ring Topology**

- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
- Cheap to install and expand

### **Disadvantages of Ring Topology**

- Troubleshooting is difficult in ring topology.
- Adding or deleting the computers disturbs the network activity.
- Failure of one computer disturbs the whole network.

### **STAR Topology**

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.

**Number of cables = n**

### **Features of Star Topology**

- Every node has its own dedicated connection to the hub.
- Hub acts as a repeater for data flow.
- Can be used with twisted pair, Optical Fibre or coaxial cable.

### **Advantages of Star Topology**

- Fast performance with few nodes and low network traffic.
- Hub can be upgraded easily.
- Easy to troubleshoot.
- Easy to setup and modify.
- Only that node is affected which has failed, rest of the nodes can work smoothly.

### **Disadvantages of Star Topology**

- Cost of installation is high.
- Expensive to use.
- If the hub fails then the whole network is stopped because all the nodes depend on the hub.

- Performance is based on the hub that is it depends on its capacity

**MESH Topology** It is a point-to-point connection to other nodes or devices. All the network nodes are connected to each other. Mesh has  $n(n-1)/2$  physical channels to link  $n$  devices.

#### **Features of Mesh Topology**

- Fully connected.
- Robust.
- Not flexible.

#### **Advantages of Mesh Topology**

- Each connection can carry its own data load.
- It is robust.
- Fault is diagnosed easily.
- Provides security and privacy.

#### **Disadvantages of Mesh Topology**

- Installation and configuration is difficult.
- Cabling cost is more.
- Bulk wiring is required.

#### **TREE Topology**

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.

#### **Features of Tree Topology**

- Ideal if workstations are located in groups.
- Used in Wide Area Network.

#### **Advantages of Tree Topology**

- Extension of bus and star topologies.
- Expansion of nodes is possible and easy.
- Easily managed and maintained.
- Error detection is easily done.

#### **Disadvantages of Tree Topology**

- Heavily cabled.
- Costly.
- If more nodes are added maintenance is difficult.
- Central hub fails, network fails.

#### **HYBRID Topology**

It is two different types of topologies which is a mixture of two or more topologies. For example if in an office in one department ring topology is used and in another star topology is used, connecting these topologies will result in Hybrid Topology (ring topology and star topology).

### Features of Hybrid Topology

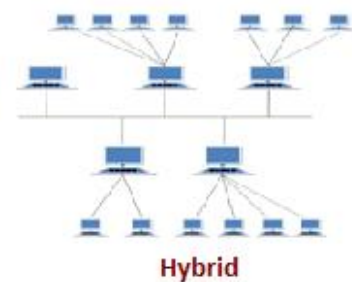
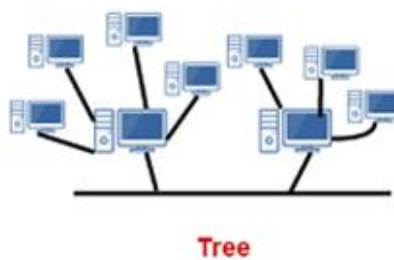
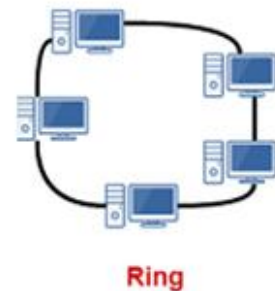
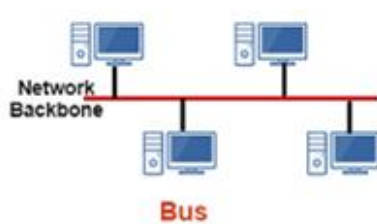
- It is a combination of two or topologies
- Inherits the advantages and disadvantages of the topologies included

### Advantages of Hybrid Topology

- Reliable as Error detecting and trouble shooting is easy.
- Effective.
- Scalable as size can be increased easily.
- Flexible.

### Disadvantages of Hybrid Topology

- Complex in design.
- Costly.



# Components of Computer

Guru Gokul AR

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# Revision

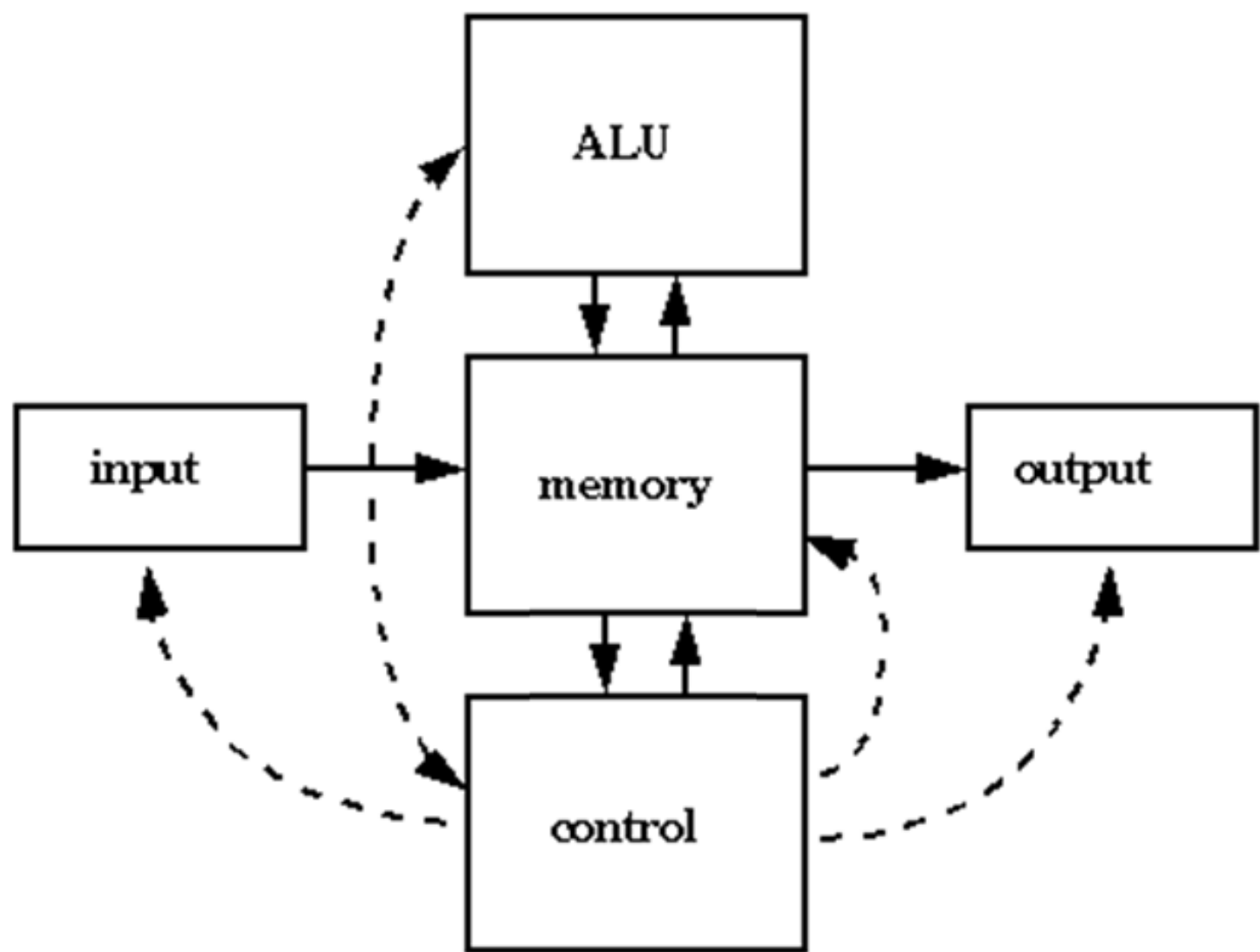
- The types of computers based on size are
- The first device used for calculation is
- \_\_\_\_\_ is a computer used for online transactions
- The super computers are mainly used for \_\_\_\_\_ purposes
- \_\_\_\_\_ property allows the computer to perform multiple tasks at the same time



# Components of Computer

- Central Processing Unit (CPU)
  - Arithmetic Logic Unit (ALU)
  - Control Unit
  - Memory Unit
- Input Unit
- Output Unit
- Storage Unit

## Original “von Neumann” Architecture



# Central Processing Unit

- Brain of the Computer
- Data as 1 or 0
- Work of CPU
  - Count, compare, rearrange the data as required
  - Convert them back to source data
- Circuits are fabricated in Microprocessor

# Arithmetic Logic Unit

- Arithmetic and logical operation on data
- Data:
  - Memory unit to ALU
  - Process
  - ALU to Memory unit
  - To output unit

# Control Unit

- Correct sequence of operation
- Get instruction from primary storage
- Verifies sequence and execute
- Control Input/Output devices
- Controls overall functioning

# Memory Unit

- Primary memory
  - Get data from input device
  - Process the data
  - Holds intermediate results
  - Provide results to output device

# Simple Calculator

- $1 + 2 + 3$

- $1 + 2 * 3$

- $(1 + 2) * 3$

# Input/ Output Unit

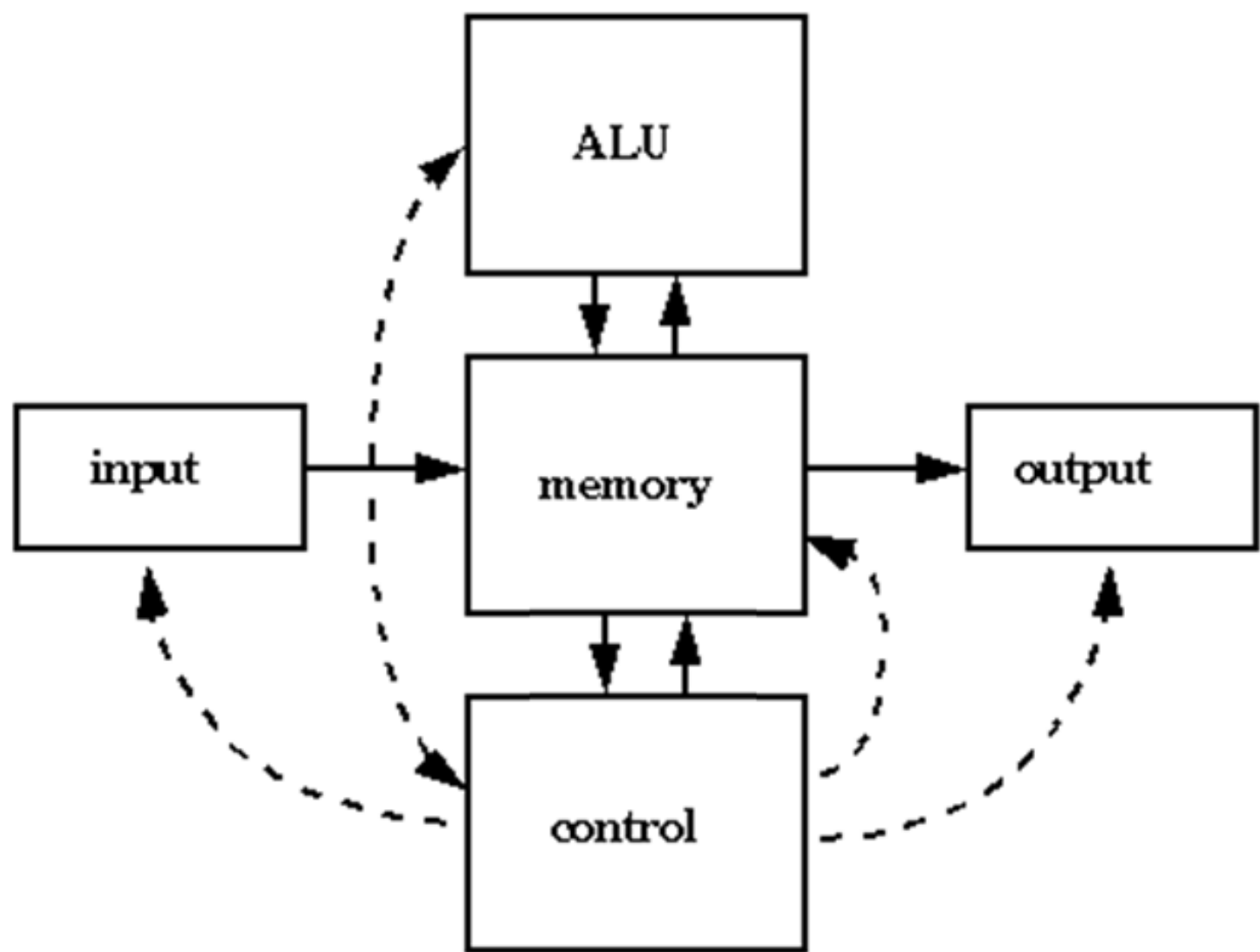
- Input/ Output unit:
  - Communication media between computer and human
  - Convert the data back and forth
  - Keyboard, Mouse, Joystick
  - Monitor, Speaker, Printer



# Storage Unit

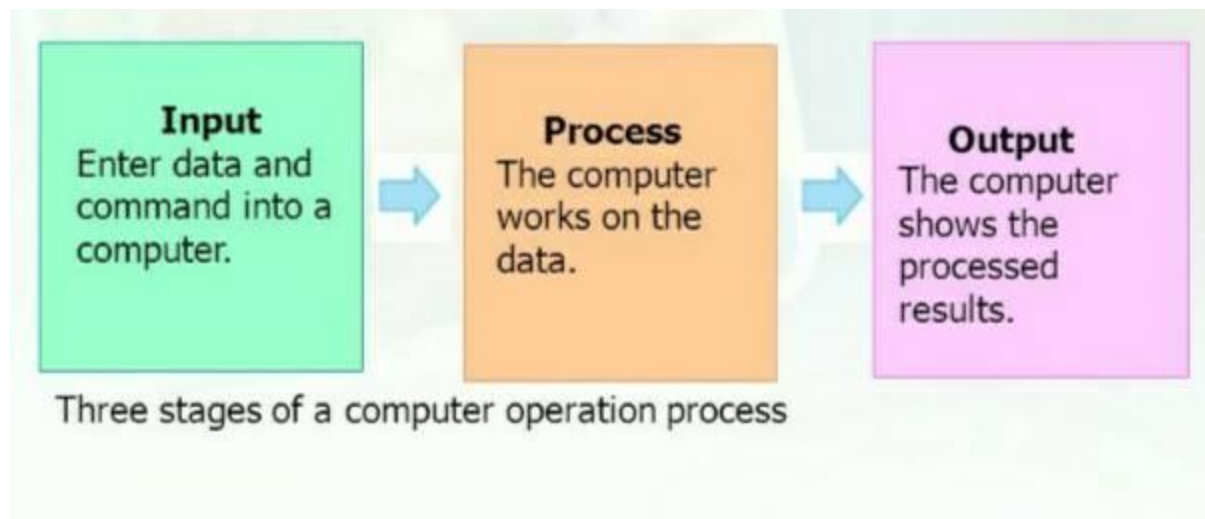
- Extensive storage of data and information
- Permanent storage
- Supply data to devices when required
- Main memory vs Secondary memory
- Floppy disk, Hard disk, Pendrive

## Original “von Neumann” Architecture



# Working of a Computer

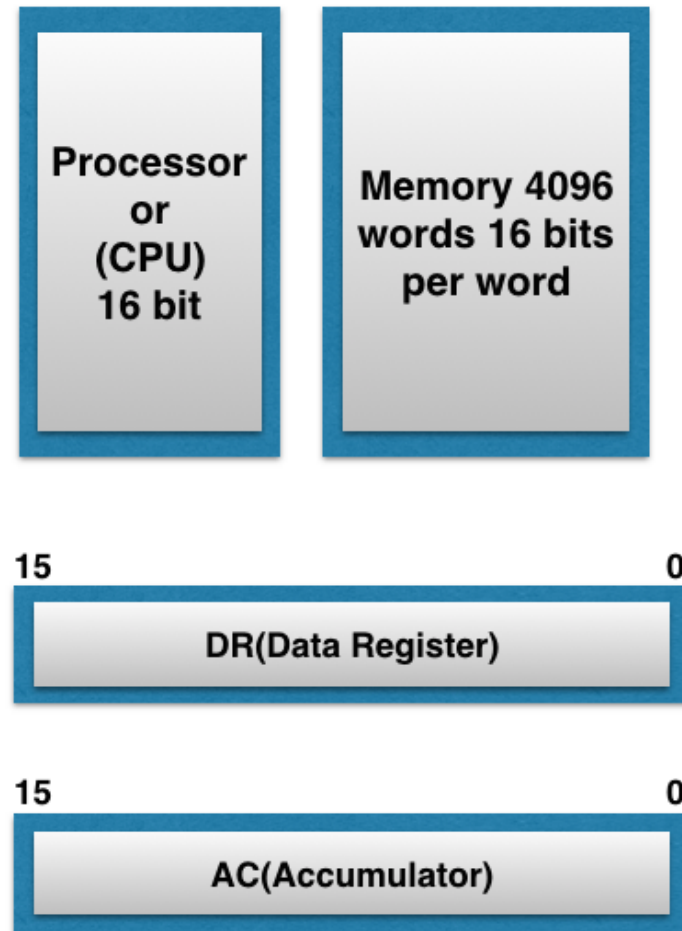
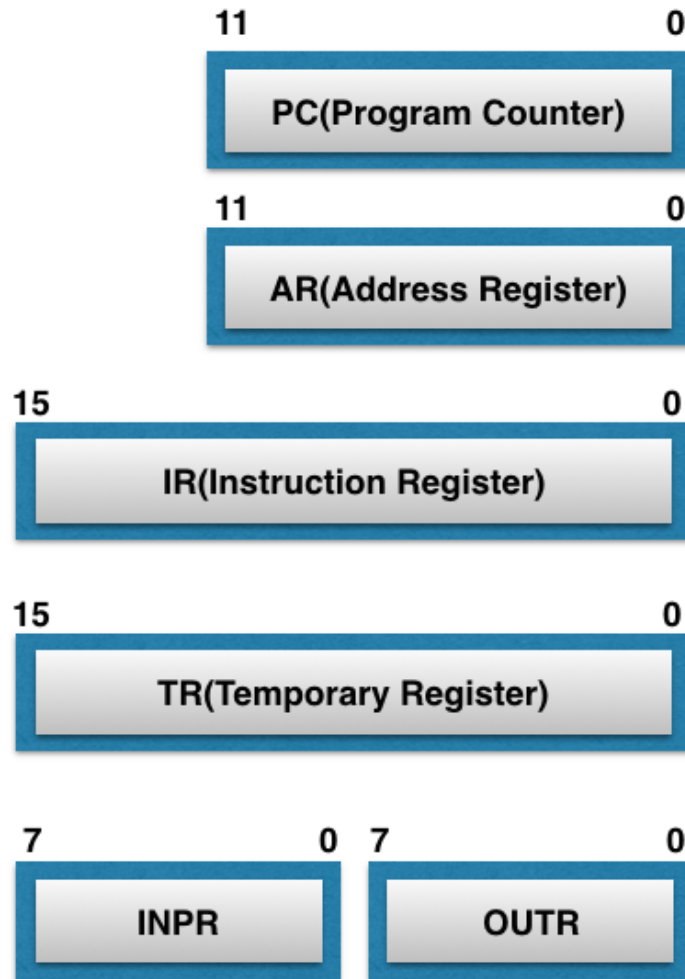
- Three basic stages



- Store the results

# Arithmetic Logic Unit

- Arithmetic and Logical operations on the data from registers
- Arithmetic unit
  - Basic Arithmetic Operations
- Logic unit
  - Equal to, Less than, Greater than
- Registers
  - High speed memory



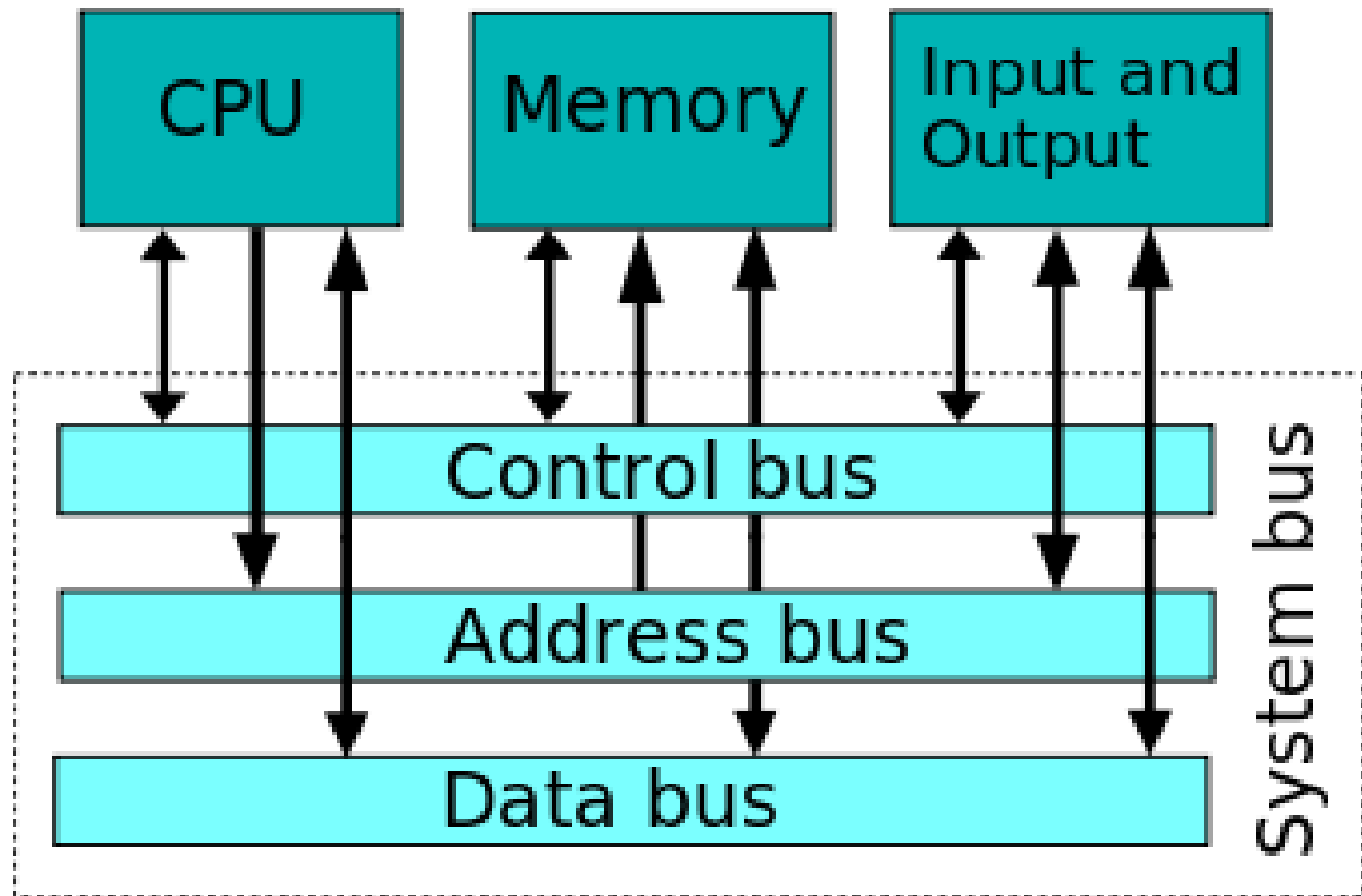
### Basic Computer Registers and Memory

Register	Purpose
Program Counter	Tracks the next instruction
Instruction Register	Currently executed instruction for decoding
Memory Address Register	Address of next location to be accessed
Temporary Register	Stores data to and from CPU
Accumulator	Stores temporary results and results
Memory Data Register	Stores operands and data

# Control Unit

- Uses electrical signals to control the computer system Eg: Coach of the team
- Controls I/O devices and other data transfer to and from main memory
- Controls the data flow like storage, retrieval and execution
- Just controls does not perform!

# System Bus





# System Bus

- Set of connection between two or more components
- Multiple lines at 1 bit per line
- Data lines
  - Moving data between modules (8,16,32)
- Address lines
  - Designate the source of data
- Control lines
  - Used to control access to data and address bus
  - Timing and control signals

# Memory Unit

- Main memory
  - RAM
  - ROM
- Cache memory
  - L1 cache
  - L2 cache
  - L3 cache

## Primary Memory:

It is used to store data temporary.

## RAM

- Random Access Memory
- It is possible to randomly select and use any location of the memory.
- It is a **volatile** memory i.e. It loose their content when the power is switched off
- Static vs Dynamic

# ROM

- Read Only Memory
- The data in the ROM is permanent .
- It is a **non-volatile** memories i.e. It does not loose their content when the power is switched off .

# PROM

- Programmable Read Only Memory
- It is supplied in blank by the manufacturer.
- It is possible to store program in PROM chip.
- Once the programmes are written it cannot be changed and remain even if power is switched off.

# **EPROM**

- Erasable Programmable Read Only Memory.
- Information stored in EPROM can be erased by exposing the chip in ultraviolet light and it is reprogrammed using a special programming facility.

# **EEPROM**

- Electrically Erasable Programmable Read Only Memory.
- Information stored in EEPROM can be erased by applying some voltage.

## Microsoft Word

Word processing is the manipulation of character, word, text, numbers, sentences and paragraphs in the document so that it is error free and looks attractive.

### To open Microsoft word:

Click **Start** -> **All Programs** -> **Microsoft Word**

Double click on the **Microsoft Word** icon located on the **Desktop**

### Word Environment:

It has a Title bar, Tool bar, Status bar, Menu bar and ruler with various options to manipulate the document.

Help in Microsoft Word:

Press **F1** or select **Microsoft Word Help** from Help menu.

### Features of Word Processing:

#### Creating, Opening and Closing a document:

To create a new document, Select **New** from **File** menu and click on **Blank Document**.

To open an existing document, Select **Open** from **File** menu and click on the required document to be opened.

To close a document, Select **Close** from **File** menu or click on the **close icon** on the top right corner.

#### Key board Shortcuts:

Process to select	Mouse Action	Key board shortcut
A word	Double click anywhere on the word	Ctrl + Shift + Right or Left Arrow
A line	Click on the left margin next to the line	Shift + End or Shift + Home
Multiple Lines	Click on the left margin and keep on dragging till the desired lines to be selected	Shift + Up or Down Arrow
Paragraph	Triple click anywhere in the paragraph	Ctrl + Shift + Up or Down Arrow
Entire Document	Triple click on left margin	Ctrl + A

#### Cut, Copy and Paste in word:

Process to do	Mouse Action	Key board shortcut
Cut a Text	Select the Text, Right click and select Cut	Ctrl + X

Copy a Text	Select the Text, Right click and select Copy	Ctrl + C
Paste a Text	Place the cursor in the required place, Right click and select Paste	Ctrl + V

### Finding and Replacing Text:

Find and replace option is used to locate a particular word, phrase or set of characters in the word document and replace it with some other characters.

#### Steps to find and replace:

Select **Find** from **Edit** menu to open the dialog box.

Click on **Find** tab, if you just want to find the desired text.

Click on **Replace** tab, if you want to find and replace a text.

In the **Find what** box, enter the text to find and enter the replacement text in the **replace with** text box.

Click **Find next** to find the first occurrence of the text and **Replace** to replace the first occurrence and **Replace All** to replace all the occurrences in the word document.

### Undo and Redo:

Word processing application remembers all the actions that are performed on a file. These actions can be reversed at anytime by the user.

To undo the last action, click on the **undo icon** on standard tool bar or select **Undo** from **Edit** menu. Clicking on the arrow near the undo icon displays the set of actions that can be selected.

To reverse an undo action, click on the **Redo icon** on standard tool bar or select **Redo** from **Edit** Menu. Certain action like saving a file, printing a document, closing a file cannot be undone.

### Bullets and Numbering:

To use bullets and numbering in the text, select the required text and click on **bullets button** or **numbering button** in the **Formatting tool bar**.

Select the required text and select **Bullets and Numbering** from **Format** menu, select the required type from the dialog box and click **ok**.

To remove the bullets and numbering, select the text and click on the **Bullets or Numbering icon** respectively.

### Table:

To insert a Table, select **Table** from the **Insert** menu, select the required number of rows and columns and click **ok**.

Select the **Insert table icon** on **standard tool bar** and select the required cells from the grid displayed.

A lot of formatting options are available to format the table in the Tables and Borders toolbar.

Table properties like size, alignment and others formatting options can be selected from this toolbar.

#### **Pictures:**

To insert a picture in the document, Click on **Picture** from **Insert** menu and select **from file** and click on the desired picture to be inserted in the document.

To insert a clipart, select **Clipart** from the **Insert** menu and select the desired clipart to be inserted.

To insert a Shape, select **Shapes** from **Insert** menu and click on the desired shape to be inserted.

These can be resized by clicking on the down right corner and dragging it for the desired size.