

Computer Fundamentals



➤ Input Output Devices

- Devices which are connected to the motherboard externally through ports referred as peripheral devices or peripherals.
- An IO Devices are also referred as an external devices.

❖ Input Devices :

- Keyboard, Mouse, Scanner, Bar Code Reader, Eye Recognition System, Voice Recognition System, Touch Pad, Touch Screen etc...

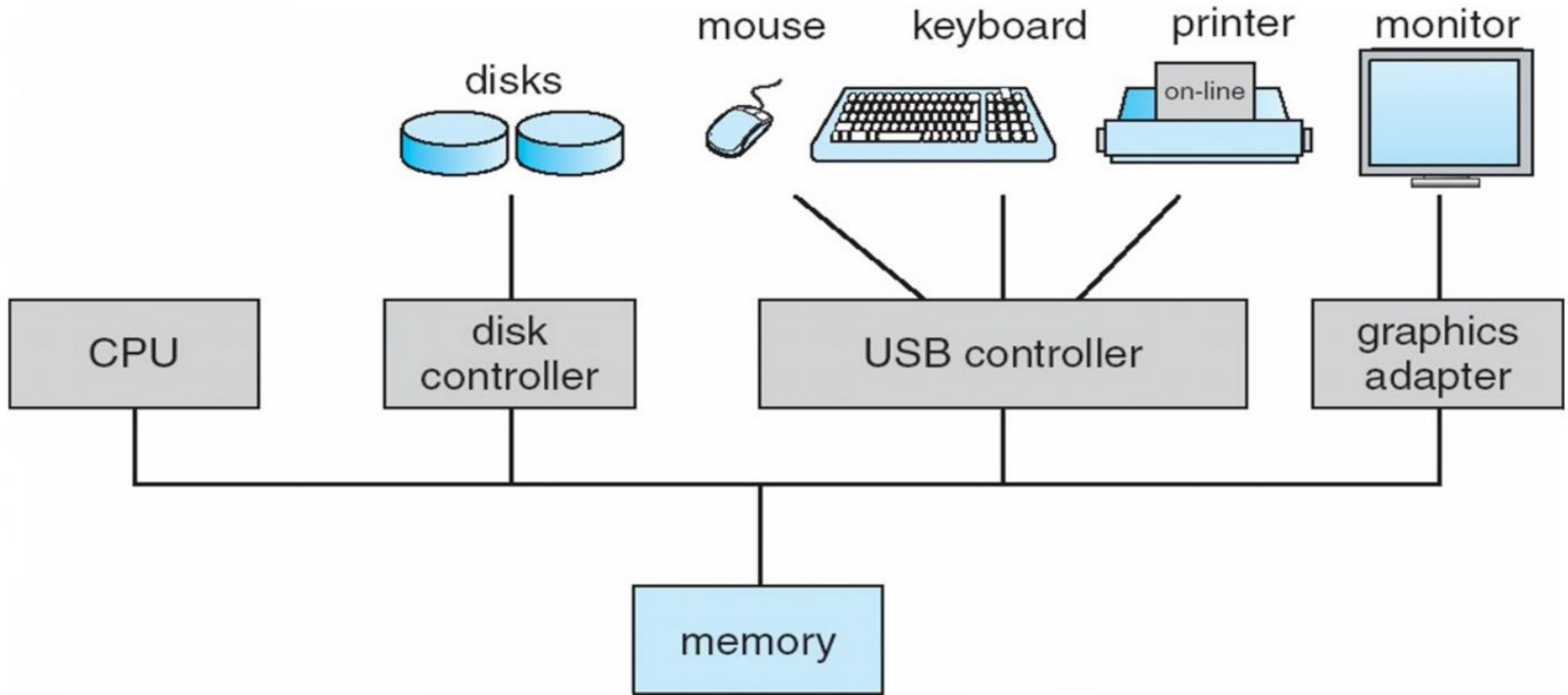
❖ Output Device :

- Monitor, Printer, Speakers, Projector etc...

- 1. Hardware** – provides basic computing resources (CPU, Memory, I/O devices, Communication).
- 2. Operating System** – controls and coordinates use of the hardware among various application programs for various users.
- 3. System & Application Programs** – ways in which the system resources are used to solve computing problems of the users (Word processors, Compilers, Web browsers, Database systems, Video games).
- 4. Users** – (People, Machines, other computers).



Operating Systems



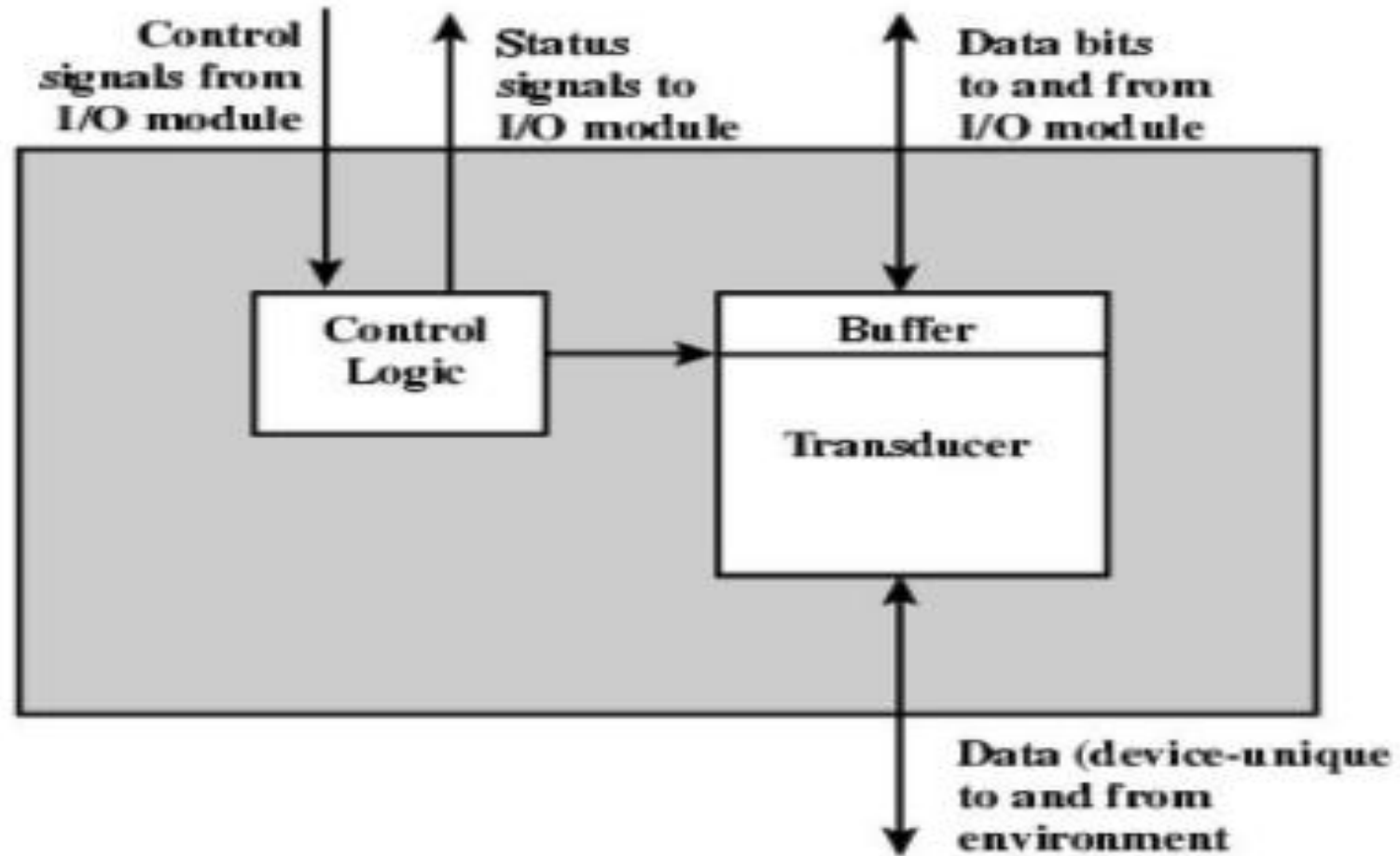
➤ Structure of an External Device

○ External Device has three major blocks:

1. **Control Logic Block(Controller):** controls all the operations of that device.
2. **Buffer:** each device has got's its own memory in which data can be stored temporarily referred as a buffer.
3. **Transducer:** this component converts any other form of energy into an electrical enery and converts an electrical energy into another form, this block of an external device is used to do communication with the outside world.

Computer Fundamentals and Operating Systems

➤ External Device Block Diagram :



Computer Fundamentals and Operating Systems

➤ IO Modules/IO Ports:

- Core Computer system is not able to communicate directly with any external device and hence I/O modules act as an interface between the core computer system and an I/O device.
- Each I/O device has its own internal dedicated processing unit called ' as **IO module**
- I/O Modules contain all the logic to communicate with an I/O device.
- A single I/O module can be used for communication between one device or with more than one devices as well

❖ **Device Driver** - is a program within the operating system that sends/receives data / commands to/from I/O device controller and also handles interrupts sent from the device



❖ Functions Of IO Module :

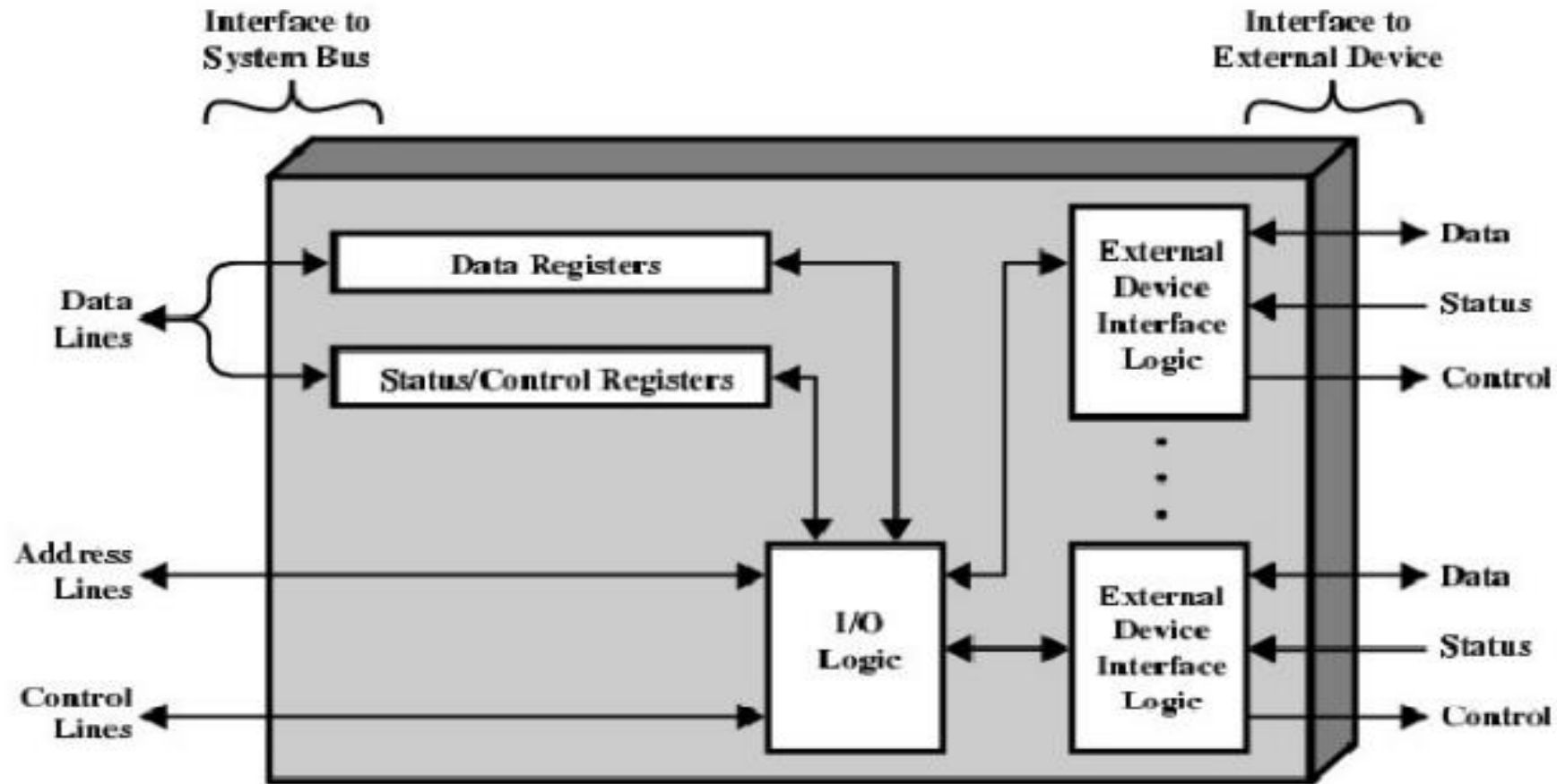
1. Control and Timing
2. CPU communication
3. Device communication
4. Data Buffering
5. Error Detection.

SUNBEAM



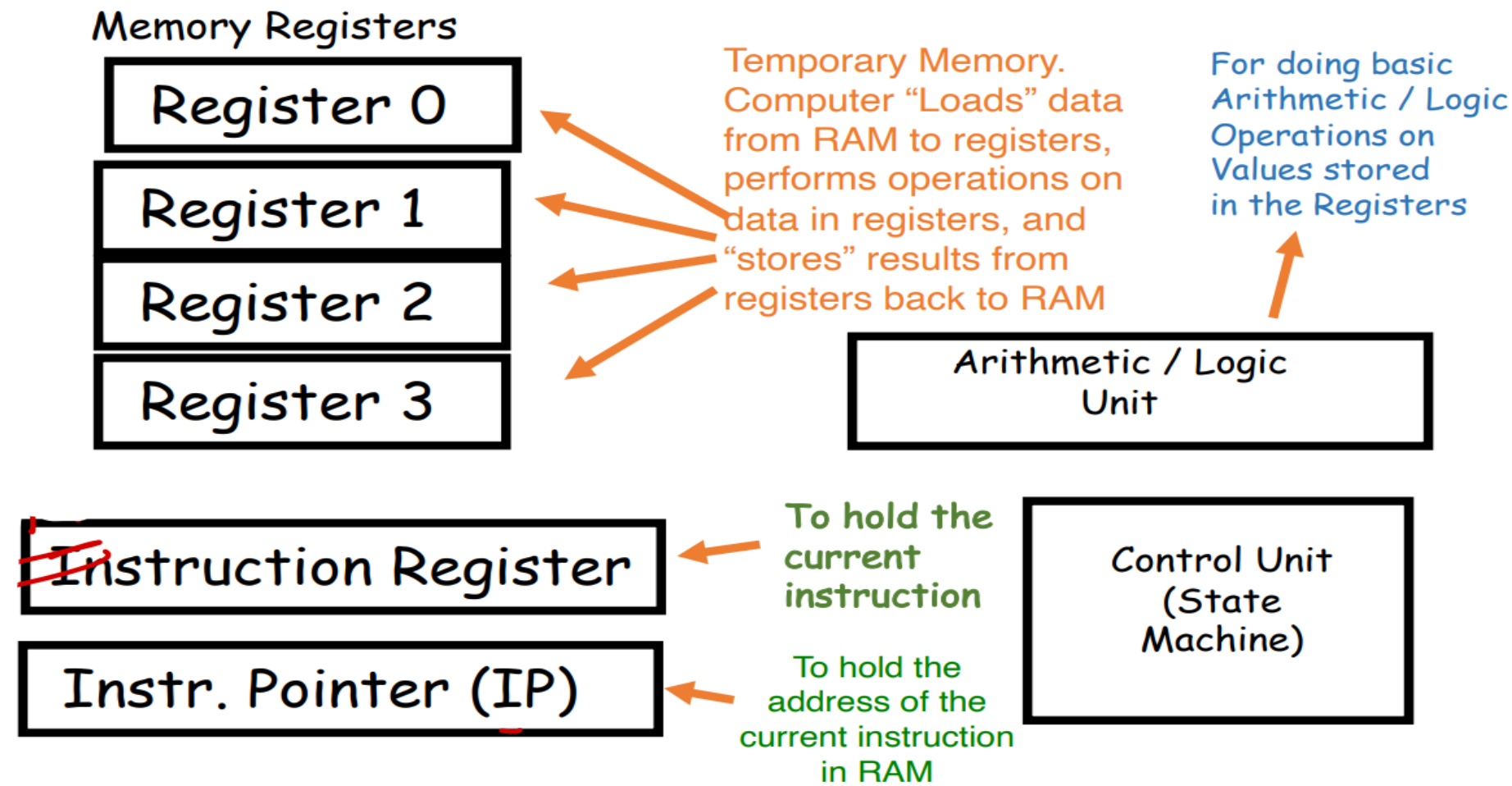
Computer Fundamentals and Operating Systems

➤ I/O Module Structure Diagram :



Computer Fundamentals and Operating Systems

CPU



Computer Fundamentals and Operating Systems

Bus, CU, ALU, Memory

Bus

- It is a simplified way for many devices to communicate to each other.
- It is internal arrangement of computer system which includes design of the processor , memory and input/output units.

Control Unit

- Control is responsible for determining what action is to be performed on what data.
- controls all operations and it controls devices which are connected to the computer system by coordinating with device controllers.
- Fetch-Decode-Execute

ALU (Arithmetic Logic Unit)

- ALU is mainly comprised of logic gates, circuits made from transistors that take inputs.
- ALU performs all arithmetic and logical operations.

Memory

- Memory consists of circuits whose primary purpose is to **hold information**, but only temporarily.
- When you talk about the memory of a computer, most often you're talking about its RAM.

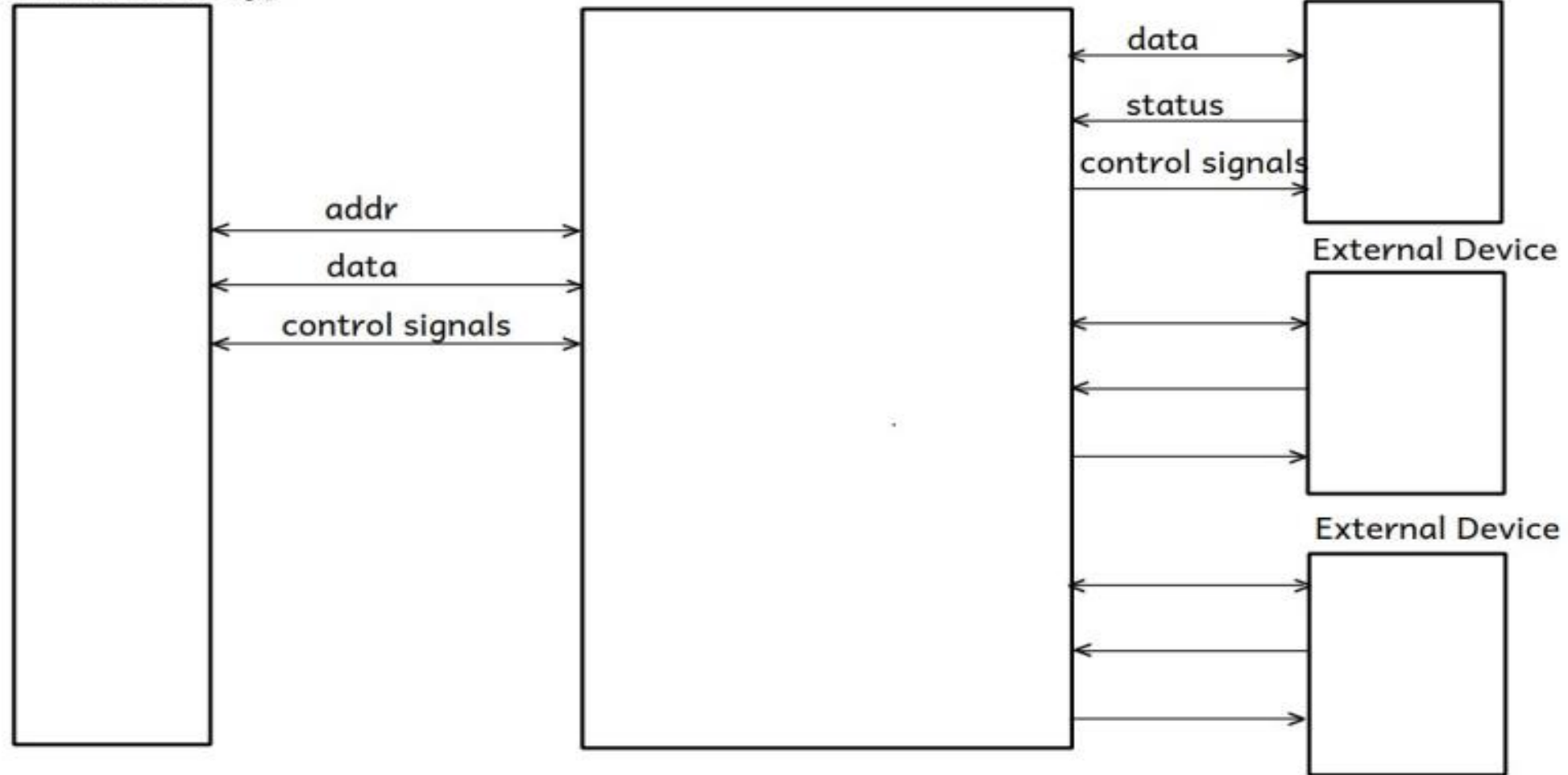


Computer Fundamentals and Operating Systems

Core Computer System:
[CPU, Main Memory]

IO Module

External Device



Computer Fundamentals and Operating Systems

➤ Whenever there is transfer of data either from core computer system (i.e. Bus) to an IO devices or vice-versa, it is referred as an **I/O**.

❖ There are three IO techniques:

1. Program driven IO
2. Interrupt IO
3. DMA i.e. Direct Memory Access



1. Program driven IO:

- All the logic/steps required for an I/O is there into one program, and by means of executing that program by the CPU I/O can be done.
- It done by Polling Method.

❖ Advantages:

- Simple

❖ Disadvantages:

- As the CPU remains wholly involved in an IO, less CPU utilization, and hence system performance is low.



2. Interrupt IO:

❖ What is an interrupt?

- An interrupt is a signal received by the CPU due to which it stops an execution of one job and starts an execution of another job.

❖ Advantages:

- In this IO, the CPU remains involved in an IO whenever gets interrupted, and hence its utilization can be maximized.

❖ Disadvantages:

- When there is a data transfer between main memory & secondary memory unnecessary involvement of the CPU is there.



❖ Interrupt Handling :

- Interrupt handling function is also called as **interrupt service routine(ISR)**.
- There are many IO devices in system , so there interrupt handling process also different like keyboard , mouse , disk etc..
- So there are Table maintain by OS that store all device interrupt function starting address . This table is called as **Interrupt Vector Table(IVT)**.

SUNBEAM



3. DMA (Direct Memory Access):

- Whenever there is a transfer of data between core computer system and IO devices (e.g. main memory and secondary memory), the CPU initiates an IO and gives control of an IO process to the DMA controller, and hence onwards that IO process is controlled by the DMC controller till the end i.e. the DMA controller will work on behalf of the CPU and after finishing an IO it sends acknowledgement to the CPU, and by the time the CPU can execute another jobs, and utilization of the CPU can be maximized further.
- e.g. 8237 DMA controller





Thank you!

Kiran Jaybhavne

email – kiran.jaybhavne@sunbeaminfo.com

