Computer Fundamentals: Memory Technologies

There are four methods by which data can be accessed from the computer memory:

1. Sequential Access: e.g. Magentic Tape
2. Direct Access: e.g. Magnetic Disk
3. Random Access: e.g. RAM Memory
4. Associative Access: e.g. Cache Memory

Magnetic Disk : Hard Disk Drive Structure

- HDD is made up of one or more circular platters arranged like CD rack.
- A Circular platter is a made up of non-magnetic substance like alluminium or alluminium alloy, which is coated with a magnetic substance.

Magnetic Disk : Hard Disk Drive Structure

- HDD is made up of one or more circular platters arranged like CD rack.

- A Circular platter is a made up of non-magnetic substance like alluminium or alluminium alloy, which is coated with a magnetic substance.

- Coating of magentic substance is either from one side to the platter or from both the sides (for increasing its capacity) and hence platter in a magnetic disk may be either **single sided platter** or **double sided platter.**

- Circular platter is divided into the hundred’s of concetric rings called as **tracks** whereas each track is divided into thousands of same size of blocks called as **sectors**.

- Usually the size of each sector is 512 bytes.

Magnetic Disk : Hard Disk Drive Structure

- There is one conductiong coil reffered as head which is used to access data from the sector i.e. head can read and write data from and into a sector at a time.

- Head writes and read data sector by sector i.e. block by block, and magnetic disk is also called as block device.

- All the operations like read, write, control etc... in a HDD are controlled by disk controller, and hence movement of the head also controlled by it.

- **Seek Time:** time required for the disk controller to move head from its current position to the desired track.

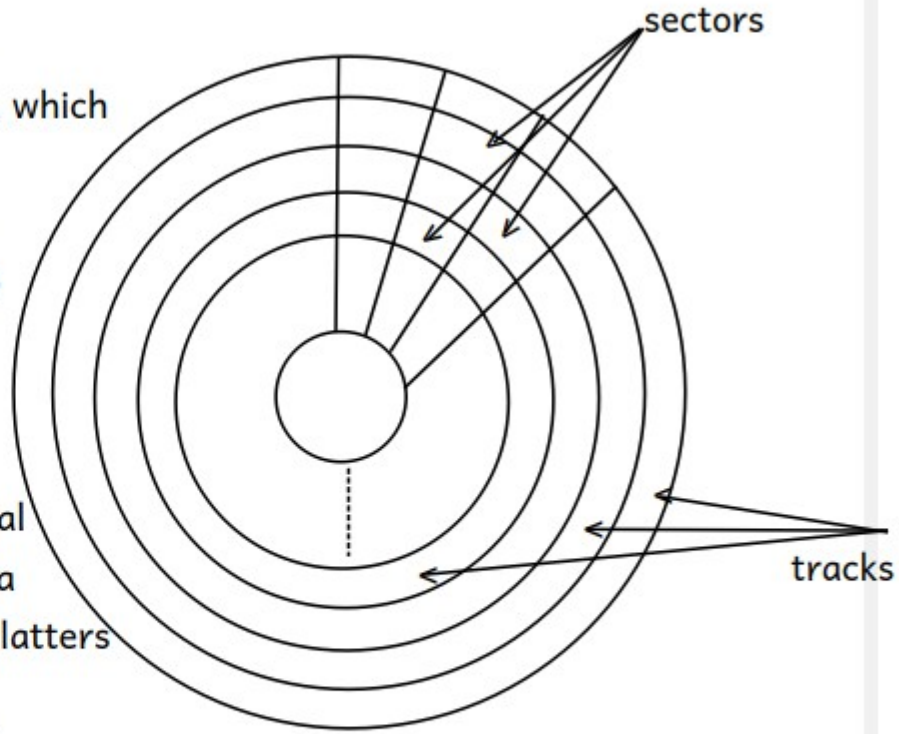
- Rotational Latency: after reaching head at desired track, circular platter gets rotated till the head does not comes alligned with the desired sector, and time required for this rotation is reffered as rotational latency.

- Access Time = Seek Time + Rotational Latency.

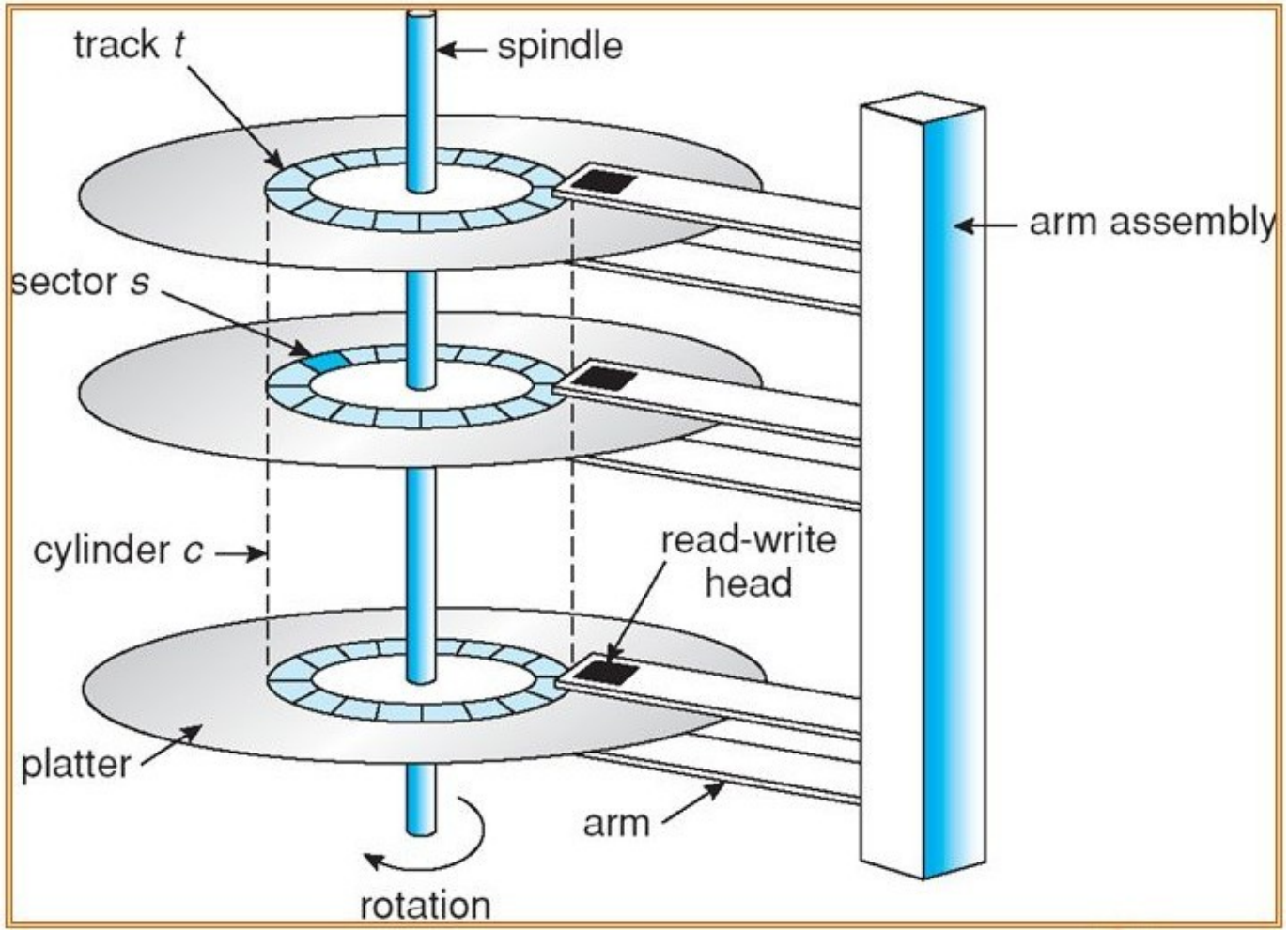
Magnetic Disk : Hard Disk Drive Structure

Hard Disk Drive:(HDD)

- It contains a "circular platter"(s) made up of non-magnetic material like alluminum or alluminium alloy, which is coated with a magnetic substance.
- Each platter is divided into hundreds of concentric rings called as "tracks" and each track is divided into fixed size of blocks called as "sectors".
- Size of each sector on each track is same usually size of the sector = 512 bytes.
- Cylinder: A cylinder is any set of all of tracks of equal diameter in a hard disk drive. It can be visualized as a single, imaginary, circle that cuts through all of the platters (and both sides of each platter) in the drive.
- Seek Time: it is the time required for a disk controller to move head from its current position to desired cylinder.
- Rotational Latency: Once head moved at desired cylinder, time required to rotate the platter to get alligned with desired sector is called as rotational latency.



Moving-head Disk Machanism



Computer Fundamentals: IO Devices

Input Output Devices

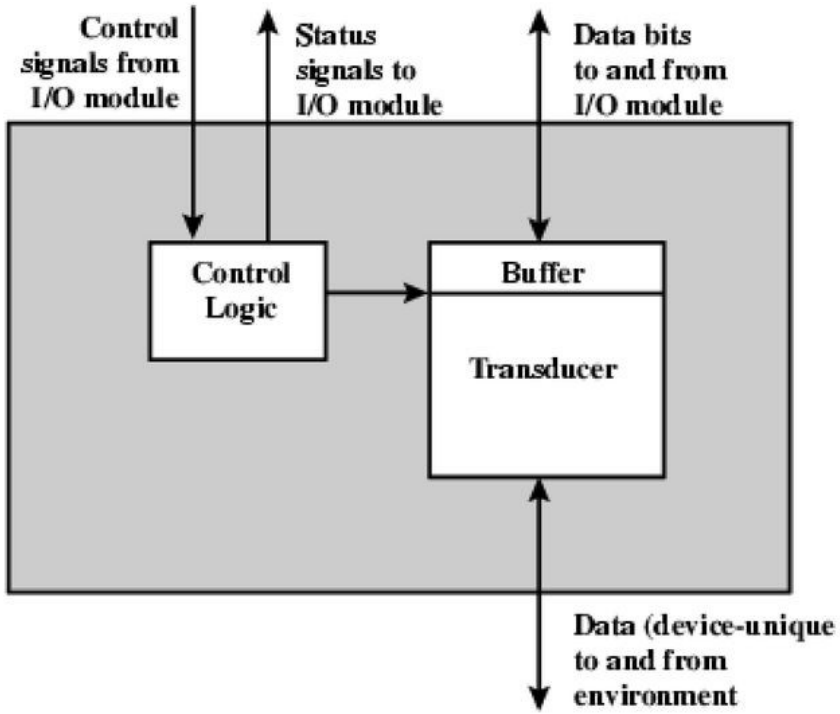
- Devices which are connected to the motherboard externally through ports reffered as **peripheral devices** or **peripherals**.

- An IO Devices are also reffered 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...

External Device Block Diagram



Structure of an External Device:

- External Device has three major blocks:

1. Control Logic Block(Controller): controlls all the operations of that device.

2. Buffer: each device has gots its own memory in which data can be stored temporarily reffered 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 commuincation with the outside world.

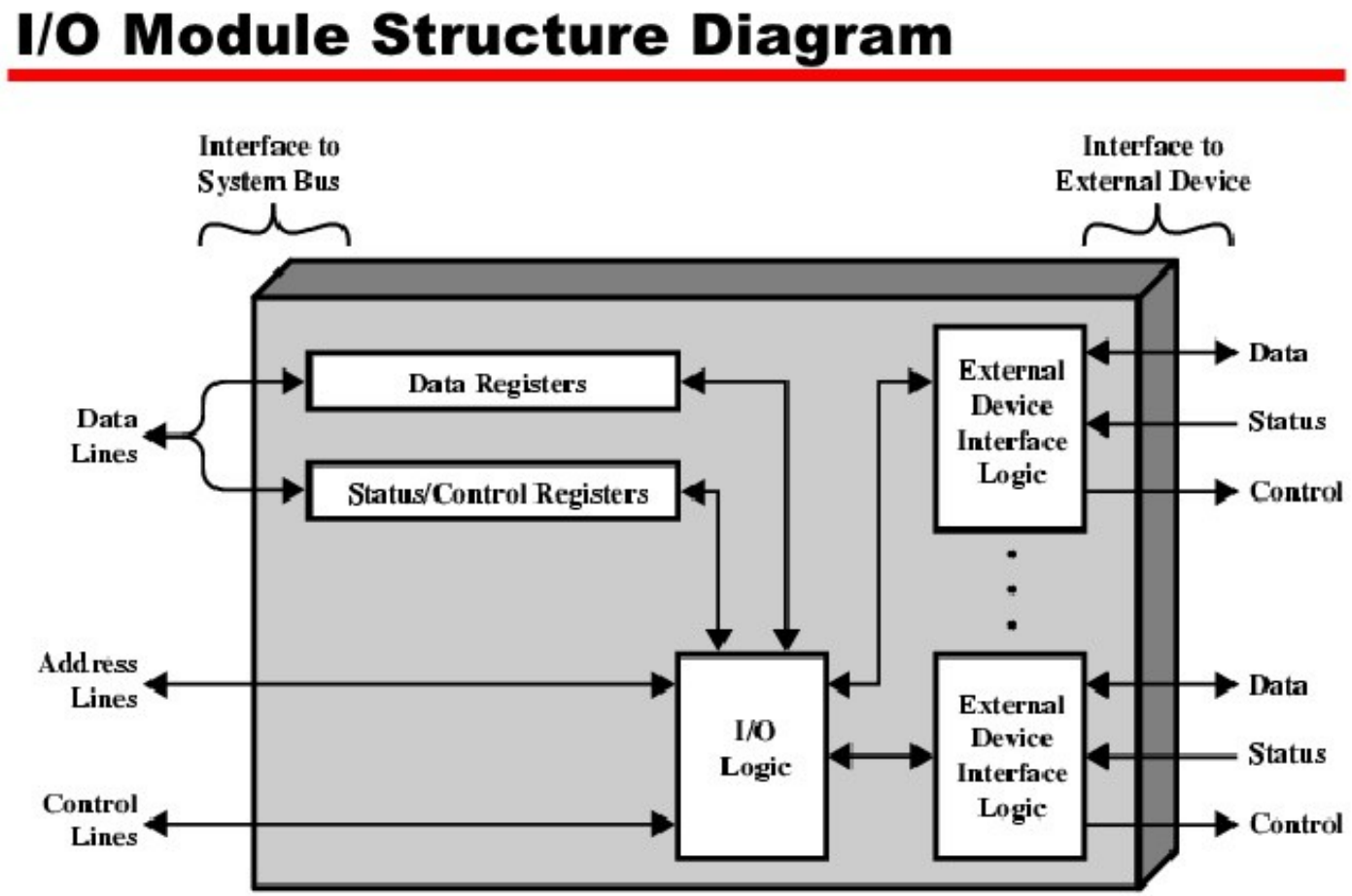
IO Modules/IO Ports:

- Core Computer system is not able to communicates directly with any external device and hence IO modules acts as an interface between core computer system and an io devices.

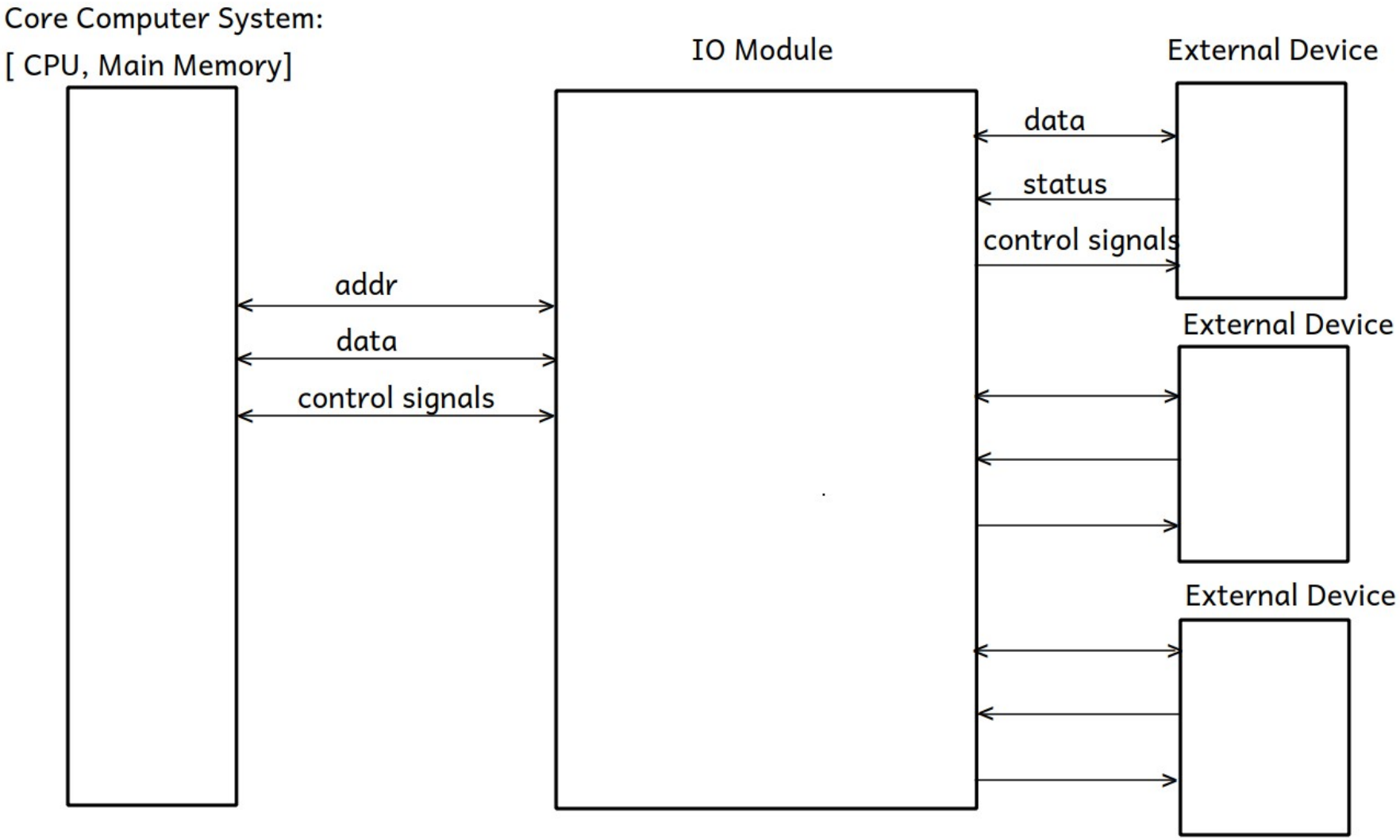
- IO Modules contains all the logic to communicates with an io devices.

- Single IO module can be used for communication between one device or with more one devices as well.

Computer Fundamentals: IO Devices



Computer Fundamentals: IO Devices



Computer Fundamentals: IO Techniques

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

- 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 IO is there into one program, and by means of executing that program by the CPU io can be done.

 # Advantages:

- Simple

 # Disadvantages:

- As the CPU remains wholely 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 recieved 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 unneccessary involvement of the CPU is there.

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.