

Overview of Computer Workshop

Instructor

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Outline

- Basic Computer Organization
- Processors and its organization
- CPU
- Memory
- Storage Devices
- Interfaces
- Number System (Binary)
- Types of Memories
- Channel and Bus Architectures
- Standard buses
- Devices and Controllers
- Ports and Connectors
- Bootstrap Loaders
- Inside of a typical desktop/laptop
- Motherboard and Switch settings and Jumpers
- Servers

MEMORY

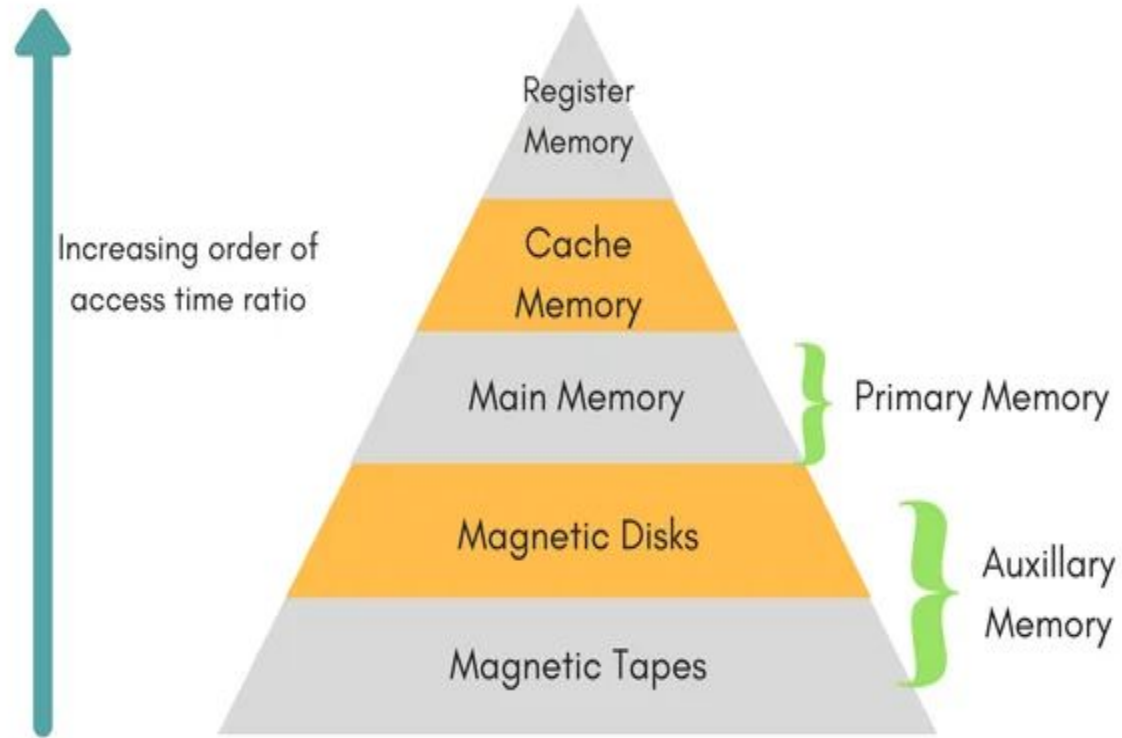
Purpose of Storage :

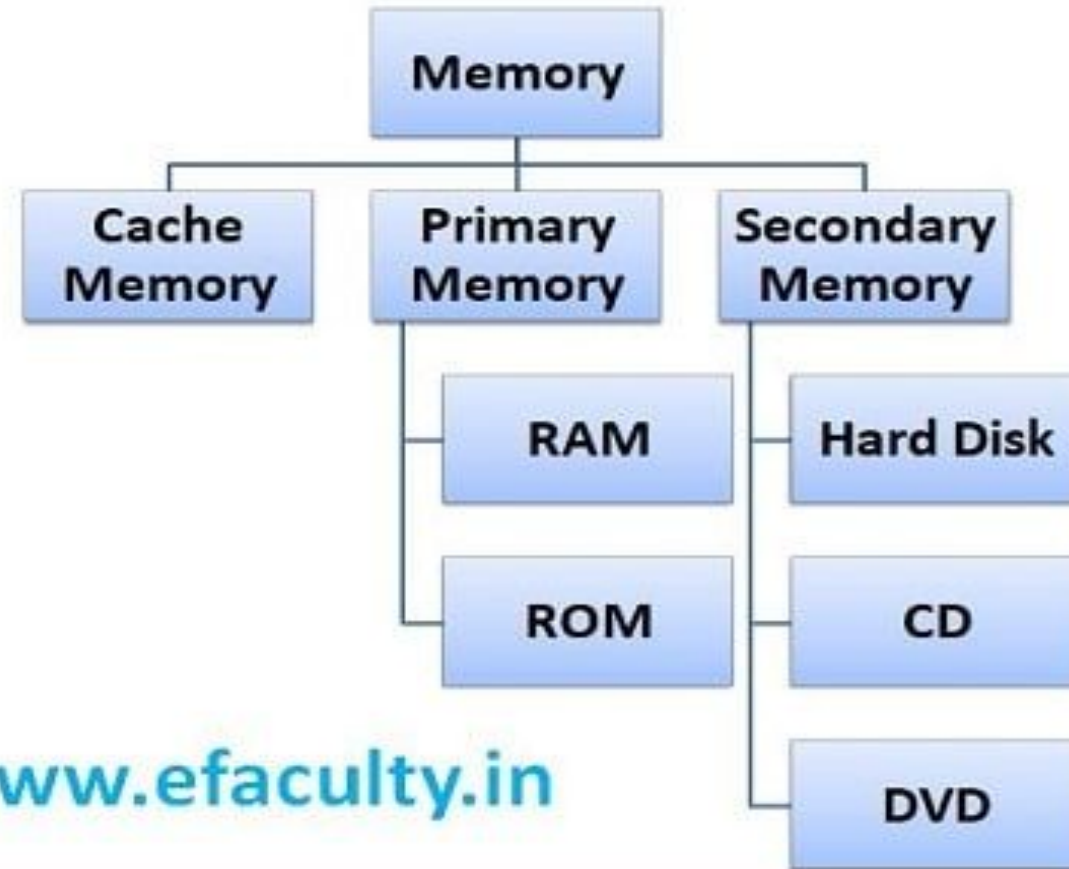
- The fundamental components of a general-purpose computer are arithmetic and logic unit, control circuitry, storage space, and input/output devices.
- If storage was removed, the device we had would be a simple calculator instead of a computer.
- The ability to store instructions that form a computer program, and the information that the instructions manipulate is what makes stored program architecture computers versatile.

MEMORY

- A memory unit is the collection of storage units or devices together.
- The memory unit stores the information in the form of bits.
- Bit is either 0 or 1.
- Generally, memory/storage is classified into 2 categories:
- Volatile Memory: This loses its data, when power is switched off.
- Non-Volatile Memory: This is a permanent storage and does not lose any data when power is switched off.

Memory Hierarchy





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Registers

- Primary storage is directly connected to the central processing unit of the computer.
- It must be present for the CPU to function correctly.
- Processors Register:
 - It is the internal to the central processing unit.
 - Registers contain information that the arithmetic and logic unit needs to carry out the current instruction.
 - They are technically the fastest of all forms of computer storage.

Cache memory-SRAM

- It is a special type of internal memory used by many central processing units to increase their performance or "throughput".
- Some of the information in the main memory is duplicated in the cache memory, which is slightly slower but of much greater capacity than the processor registers, and faster but much smaller than main memory.



Cache memory-SRAM

Advantages

- Cache memory is faster than main memory.
- It consumes less access time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

Disadvantages

- The disadvantages of cache memory are as follows –
- Cache memory has limited capacity.
- It is very expensive.

Main Memory

- It contains the programs that are currently being run in the CPU.
- The arithmetic and logic unit can very quickly transfer information between a processor register and locations in main storage, also known as a "memory addresses".
- In modern computers, electronic solid-state random access memory is used for main storage, and is directly connected to the CPU via a "memory bus" and a "data bus".
- Main or Primary memory uses two technologies
 - RAM(Volatile)
 - ROM(Non-Volatile)

Main Memory-DRAM

Characteristics of Main Memory

- These are semiconductor memories.
- Usually volatile memory.
- Data is lost in case power is switched off.
- It is the working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without the primary memory.



Main Memory-ROM

- Stores crucial information essential to operate the system, like the program essential to boot the computer.
- It is not volatile.
- Always retains its data.
- Used in embedded systems or where the programming needs no change.
- Used in calculators and peripheral devices.
- ROM is further classified into 4 types- *MROM*, *PROM*, *EPROM*, and *EEPROM*.

Types of ROM

1. **PROM (Programmable read-only memory)** – It can be programmed by the user. Once programmed, the data and instructions in it cannot be changed.
2. **EPROM (Erasable Programmable read only memory)** – It can be reprogrammed. To erase data from it, expose it to ultraviolet light. To reprogram it, erase all the previous data.
3. **EEPROM (Electrically erasable programmable read only memory)** – The data can be erased by applying an electric field, with no need for ultraviolet light. We can erase only portions of the chip.
4. **MROM(Marked ROM)** – The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs, which are inexpensive.

Secondary or Auxiliary Memory

- This type of memory is also known as external memory or non-volatile.
- It is slower than the main memory. These are used for storing data/information permanently.
- CPU directly does not access these memories, instead they are accessed via input-output routines.
- The contents of secondary memories are first transferred to the main memory, and then the CPU can access it. For example, disk, CD-ROM, DVD, etc.



Secondary or Auxiliary Memory

Characteristics of Secondary Memory

- These are magnetic and optical memories.
- It is known as the backup memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of data in a computer.
- Computer may run without the secondary memory.
- Slower than primary memories.

Storage Devices

- The purpose of storage devices in a computer is to hold data or information and get that data to the CPU as quickly as possible when it is needed.
- Computers use disks for storage: hard disks that are located inside the computer, and floppy or compact disks that are used externally.
- Computers method of storing data & information for long term basis i.e. even after PC is switched off.

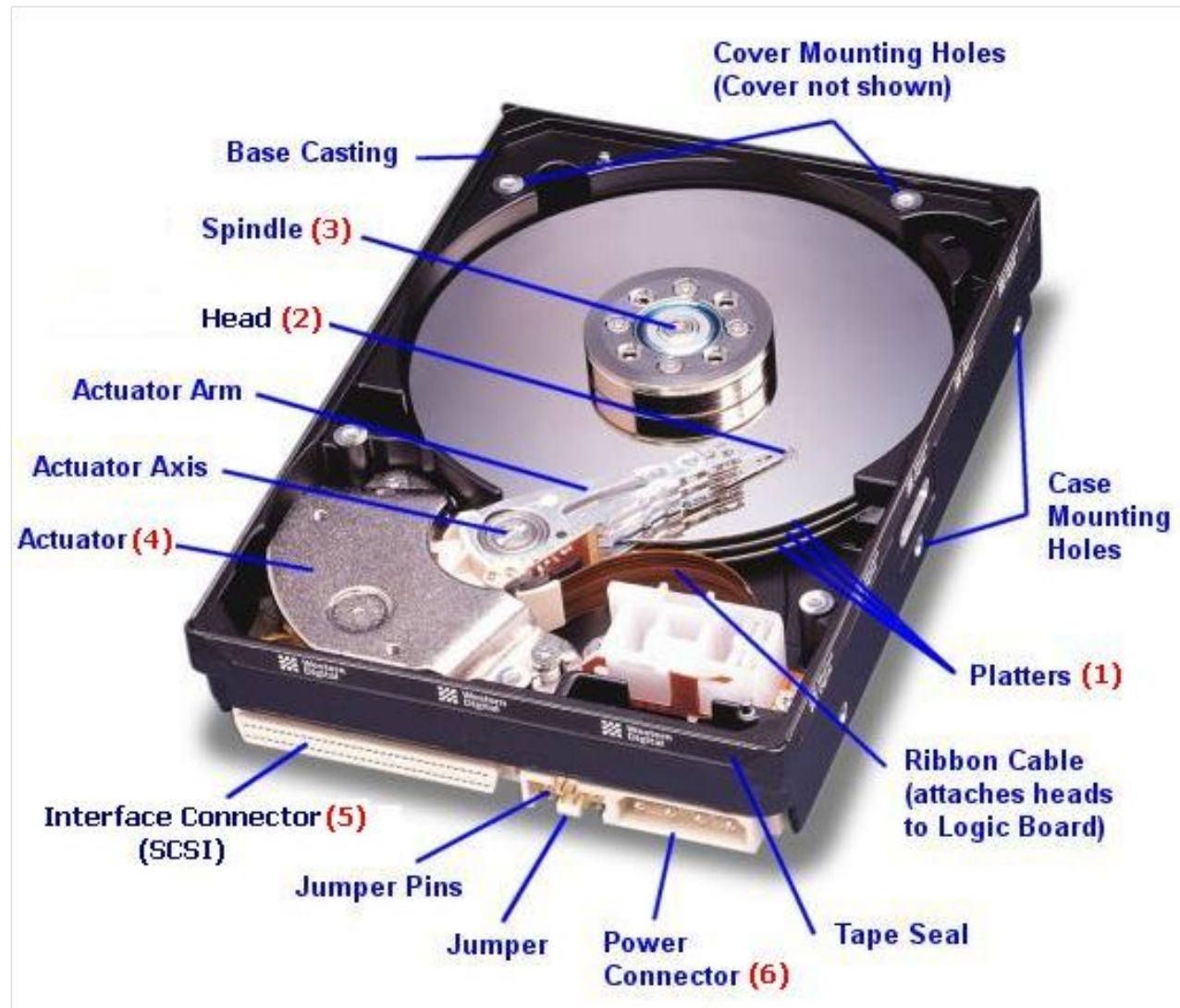
Storage Devices

- It is non - volatile
- Can be easily removed and moved & attached to some other device
- Memory capacity can be extended to a greater extent
- Cheaper than primary memory
- Storage Involves two processes
 - a) Writing data
 - b) Reading data

Hard Disks

- Invented by Reynold Johnson in 1956
- Used in the IBM 305 RAMAC accounting computer
- Actuator saves data to the platters magnetically
- Most HDDs are connected to the motherboard using a 1 meter SATA-device cable
- Hard disk, also called hard disk drive or hard drive, magnetic storage medium for a computer.
- Hard disks are flat circular plates made of aluminum or glass and coated with a magnetic material.
- Hard disks for Personal Computers can store terabytes (trillions of bytes) of information.

Hard Disk Drive (HDD)



Optical storage

Optical Storage Devices Data is stored on a reflective surface so it can be read by a beam of laser light. Two Kinds of Optical Storage Devices

- Compact Disk Read-Only Memory (CD-ROM)
- CD-Recordable (CD-R)/CD-Rewritable (CD-RW)
- Digital Video Disk Read-Only Memory (DVD-ROM)
- DVD Recordable (DVD-R/DVD Rewritable (DVD-RW)
- Photo CD

What's USB flash used for?

- Personal Data Transport
- Secure storage of data, application and software files
- System administration
- Application carriers
- Booting operating systems
- Brand and product promotion
- Backup
- Flash drives also store data densely compared to many removable media

Various USB Designs

