CHAPTER-3
(COMPUTER MEMORY)

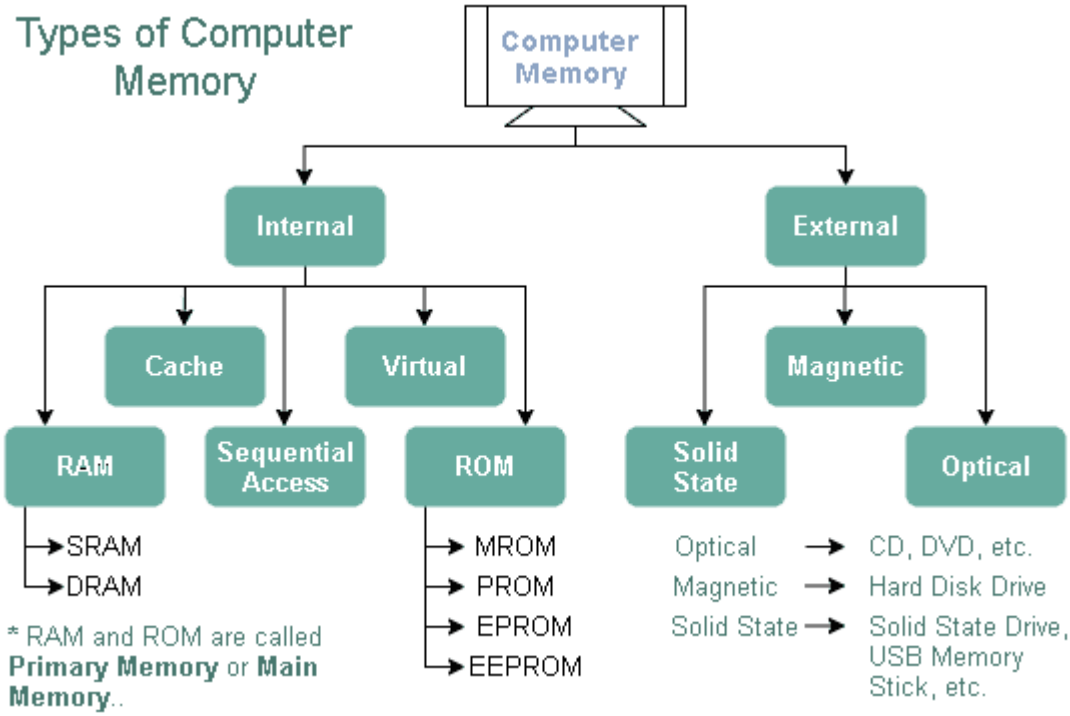
Memory

It stores or saves instructions and results, the results can be saved permanently as well as temporarily. The data or instruction once saved can be retrieved or recall or review whenever the user demands. They can store a huge amount of data and information as per requirements. The user can use the data whenever needs.

The Computer Hard Disk used as memory has the capabilities for storing volumes of data such as songs, movies, pictures, software's one can easily get access to this data whenever or wherever the user demands. Users can rest sure of their data, as the data is stored almost permanently.

The term memory refers to the component within your computer that allows for short-term data access. ... The speed and performance of your system depends on the amount of memory that is installed on your computer. If you have a desk and a filing cabinet, the desk represents the memory of your computer.

Memory is the most essential element of a computing system because without it computer can't perform simple tasks. Computer memory is of two basic types – Primary memory(RAM and ROM) and Secondary memory (hard drive, CD, etc). Random Access Memory (RAM) is primary-volatile memory and Read Only Memory (ROM) is primary-non-volatile memory.



Types of Memory

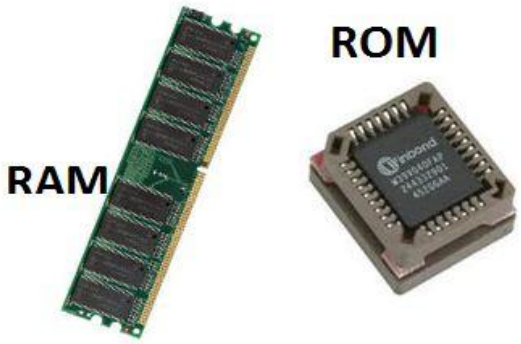
1. Primary Memory
2. Secondary Memory

Primary Memory (Main Memory)

Primary memory holds only those data and instructions on which the computer is currently working. It has a limited capacity and data is lost when power is switched off. It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed resides in the main memory. It is divided into two subcategories RAM and ROM.

Types of Primary Memory

1. RAM (Random Access Memory)
2. ROM (Read Only Memory)



1- Random Access Memory

Random Access Memory (RAM) is one of the faster types of main memory accessed directly by the CPU. It is the hardware in a computer device to temporarily store data, programs or program results. It is used to read/write data in memory until the machine is working. It is volatile, which means if a power failure occurs or the computer is turned off, the information stored in RAM will be lost. All data stored in computer memory can be read or accessed randomly at any time.

(a) Dynamic RAM

(b) Synchronous RAM

(c) Static RAM

(a) Dynamic RAM

DRAM stands for Dynamic RAM, and it is the most common type of RAM used in computers. The oldest type is known as single data rate (SDR) DRAM, but newer computers use faster dual data rate (DDR) DRAM. DDR comes in several versions including DDR2 , DDR3, and DDR4, which offer better performance and are more energy efficient than DDR. However different versions are incompatible, so it is not possible to mix DDR2 with DDR3 DRAM in a computer system. DRAM consists of a transistor and a capacitor in each cell.

(b) Synchronous RAM

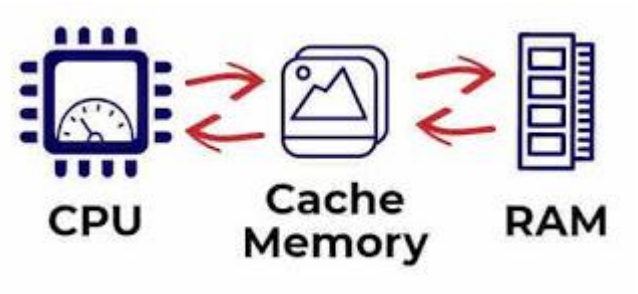
SDRAM stands for Synchronous Dynamic Random Access Memory. SDRAM operates more efficiently as it works according to the synchronization of the clock. This makes it easy to manage faster, and the speed of the SDRAM measured in MHz instead of nanoseconds. SDRAM introduced in 1969-70. It most widely used in computers. Nowadays it is also used in other systems.

(c) Static RAM

SRAM stands for Static RAM, and it is a particular type of RAM which is faster than DRAM, but more expensive and bulker, having six transistors in each cell. For those reasons SRAM is generally only used as a data cache within a CPU itself or as RAM in very high-end server systems. A small SRAM cache of the most imminently-needed data can result in significant speed improvements in a system

Cache Memory

Cache memory, also called cache, **supplementary memory system** that temporarily stores frequently used instructions and data for quicker processing by the central processing unit (CPU) of a computer. ... Cache holds a copy of only the most frequently used information or program codes stored in the main memory.



2. ROM (Read only memory)

Read-Only Memory (ROM), is **a type of electronic storage that comes built in to a device during manufacturing**. ... ROM chips come built into an external unit – like flash drives and other auxiliary memory devices – or installed into the device's hardware on a removable chip.

(a) PROM (Programmable Read Only Memory)
(b) EPROM (Erasable Programmable Read Only Memory)
(c)EEPROM (Electrical Programmable Read Only Memory)

(a) PROM

PROM (Programmable read-only memory) – It can be programmed by the user. Once programmed, the data and instructions in it cannot be changed.

(b) EPROM

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.

(c) EEPROM

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.

Secondary Memory

Secondary memory is also termed as **external memory** and refers to the various storage media on which a computer can store data and programs. The Secondary storage media can be fixed or removable.

Secondary memory is **where programs and data are kept on a long-term basis**. Common secondary storage devices are the hard disk and optical disks. The hard disk has enormous storage capacity compared to main memory. ... Secondary memory is a type of non-volatile memory.

Hard Disk Drive

Hard disk drive is made up of a series of circular disks called **platters** arranged one over the other almost ½ inches apart around a **spindle**. Disks are made of non-magnetic material like aluminum alloy and coated with 10-20 nm of magnetic material.

Standard diameter of these disks is 14 inches and they rotate with speeds varying from 4200 rpm (rotations per minute) for personal computers to 15000 rpm for servers. Data is stored by magnetizing or demagnetizing the magnetic coating. A magnetic reader arm is used to read data from and write data to the disks. A typical modern HDD has capacity in terabytes (TB) and more.

Floppy Disk

A floppy disk is a type of storage media that reads data storage information, also known as a floppy diskette, floppy, or floppy disk that is used to store electronic data, like a computer file. It was extremely expensive as it was one of the first types of hardware storage created in 1967 by IBM, which could read/write a portable device.

5 ¼ -Inch Drive

During the 1980s, a 5 ¼-inch floppy disk drive was produced that was widely in use on PCs. In the early 1990s, 5 ¼-inch floppy disk drives were also included on computers that could have the ability to store data between 360 kilobytes and 1.2 megabytes. Some 5 ½-floppy disks were able to write data to both sides of the disk and also allowed to modify data. After that, manufacturers of floppy disks began to develop double-sided drives.

3 ½ -Inch Drive

Another type of floppy disk, 3 ½-inch floppy drive that is encased in plastic, which can hold 1.44 megabytes on a high-density disk and 730 kilobytes on a double- density disk. In older times of the computer, multiple disks had to use to install the program, such as Windows 3.0.

Magnetic Tape

A magnetic tape drive is a **storage device that makes use of magnetic tape as a medium for storage**. ... It is essentially a device which records or perhaps plays back video and audio using magnetic tape, examples of which are tape recorders and video tape recorders.

Optical Disk

An optical disk is any **computer disk that uses optical storage techniques and technology to read and write data**. It is a storage device in which optical (light) energy is used. It is a computer storage disk that stores data digitally and uses laser beams to read and write data.

There are two Types:

1. CD
2. DVD

CD (Compact Disc)

CD-ROM stands for compact disk read-only memory. The data stored on CD-ROM can only be read. It cannot be deleted or changed. CD-ROM is a portable storage device. The data can be transferred easily by using CD-ROM. It can store about 650MB of data.

Digital Video Disk (DVD)

DVD stands for digital video disk. It is similar to CD-ROM. It uses a laser beam with a short wavelength. The short wavelength reads smaller holes on the disk.
The data storage capacity of the disk is increased it the hole size is small. So the storage capacity of DVD ROM is much greater than CD-ROM. It can store up to 17 GB of data.

Flash Drive

A flash drive is **a small and portable storage device that connects to computers and other devices using a USB Type**-A plug that is built onto the drive. ... Flash drives differ from hard disk drives and optical drives because they do not have any moving parts.

Computer Memory Units

- A memory unit is **the amount of data that the memory can hold**. Besides, we measure this storage capacity in terms of bytes. Moreover, there are different units of memory as per the requirement. Before studying the units of memory let us know about the memory.

- Bit = 0 or 1
- 4 Bit = 1 Nibble
- 2 Nibble और 8 Bit = 1 Byte
- 1024 Byte = 1 KB (Kilo Byte)
- 1024 KB = 1 MB (Mega Byte)
- 1024 MB = 1 GB (Giga Byte)
- 1024 GB = 1 TB (Tera Byte)
- 1024 TB = 1 PB (Penta Byte)
- 1024 PB = 1 EB (Exa Byte)
- 1024 EB = 1 ZB (Zetta Byte)
- 1024 ZB = 1 YB (Yotta Byte)
- 1024 YB = 1 BB (Bronto Byte)
- 1024 BB = 1 GB (Geop Byte)