Al-Mustaqbal University

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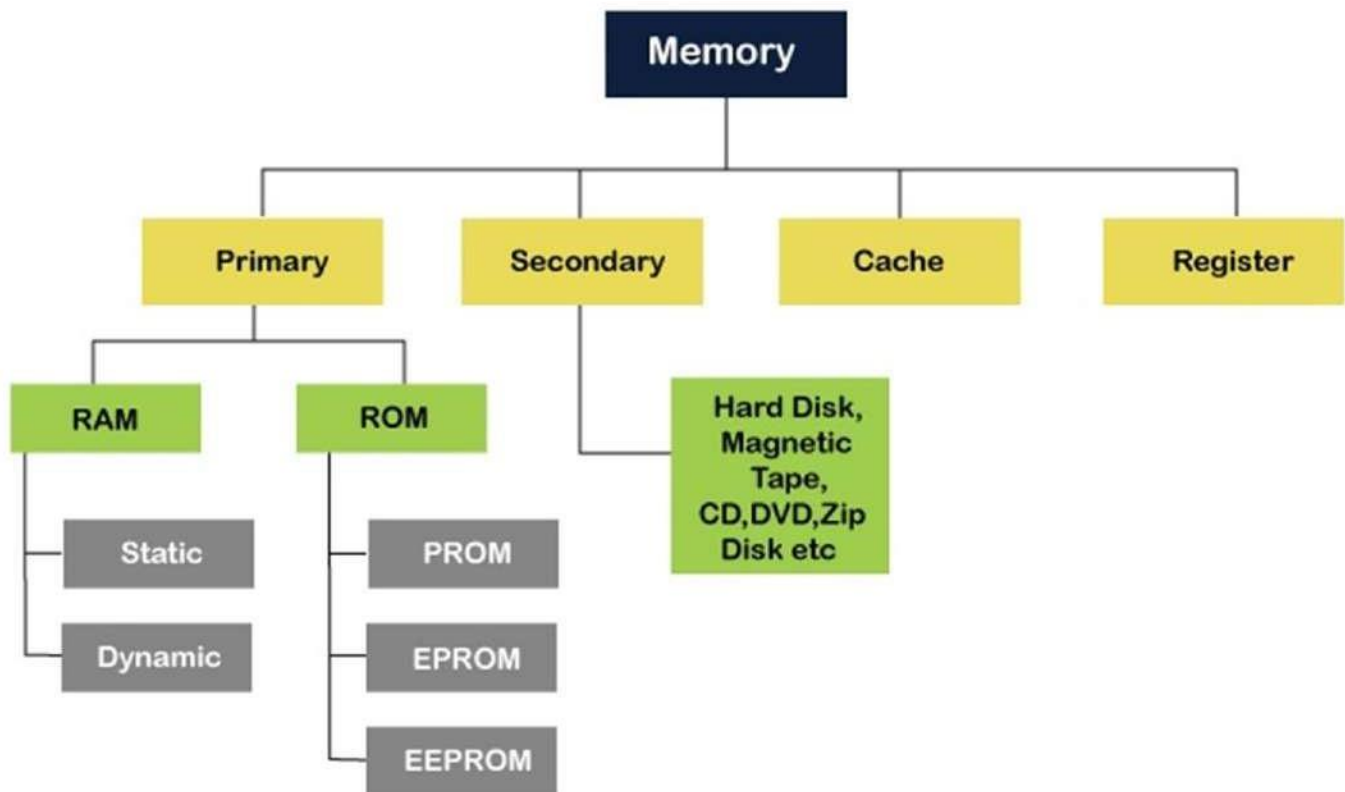
Lecture 2

Computer Organization and Logic Design

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4- Memory units:

The memory is the part of the computer that holds information (data and Instruction) for processing, fig3 represents the classification of computer memory.

Fig (3): Classification of Computer Memory.

1.1 Primary or Main Memory

Primary memory is also known as the computer system's main memory that communicates directly within the CPU, Main memory is used to kept programs or data when the processor is active to use them. The primary memory is further divided into two parts:

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

Random access memory (RAM)

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. The RAM can be either dynamic or static.

a- **Static RAM (SRAM):** is a type of RAM used to store static data in the memory. it mean the stored data will remain permanent stored as long as the power is supplied without the need for periodically rewriting the data in to memory.

b- **Dynamic RAM (DRAM):** is a type of RAM that is used for the dynamic storage of data in RAM. The stored data will not remain permanently stored even with power is applied unless the data are periodically rewritten in to memory; the later operation is called a refresh operation.

Read only memory (ROM)

Is read only memory which can be read from but not written on so that it is called anon-volatile memory, when the user turn the computer off the content of ROM are not changed, table1 show the difference between RAM and ROM , the type of ROM is:

a- Programmable Read Only Memory (PROM):

It is prepared by the maker and can be electrical programmed by the user; it cannot be erased and programmed again this means its content can never be changed.

b- Erasable Programmable Read Only Memory (EPROM):

The maker prepares it and can be electrical programmed by the user, it can be erasing (deleted) by exposure to ultraviolet light and programmed many times.

c- EEPROM (Electrically Erasable Programmable Read Only Memory): The EEROM is an electrically erasable and programmable read only memory used to erase stored data. It is also a non-volatile memory whose data cannot be erased or lost; even the power is turned off. In EEPROM, the stored data can be erased and reprogrammed up to 10 thousand times.

Table1: Difference between RAM and ROM:

| Difference	Random Access Memory (RAM)	Read Only Memory (ROM)
Read/Write	Read and write memory	Only read memory
Use	Used to store data that has to be currently processed by CPU temporarily.	It is typically used to store firmware or microcode, which is used to initialize and control hardware components of the computer.
Speed	It is a high-speed memory.	It is much slower than the RAM.
Cost	RAM is expensive.	ROM is cheap .
Function	Used for temporary storage of data and instruction.	Used for permanent storage of data and instruction.
Data-Retention	Volatile memory: program and data erased when power off is.	Permanent memory (non-volatile): program and data remains intact even is power off.
Type	SRAM,DRAM	PROM, EPROM, EEPROM

1.2 Secondary storage (External storage)

Secondary storage refers to the storage methods and technologies used for the long-term storage of non-critical data that doesn't need to be accessed as frequently as primary storage. The goal of secondary storage is to retain data until you overwrite or delete it.

The key features of secondary memory storage devices are:

1. Very high storage capacity.

2. Permanent storage (non-volatile), unless erased by user.

3. Relatively slower access.

4. Stores data and instructions that are not currently being used by CPU but may be required later for processing.

5. Cheapest among all memory.

Fig 4 shows the classification of commonly used secondary storage devices.
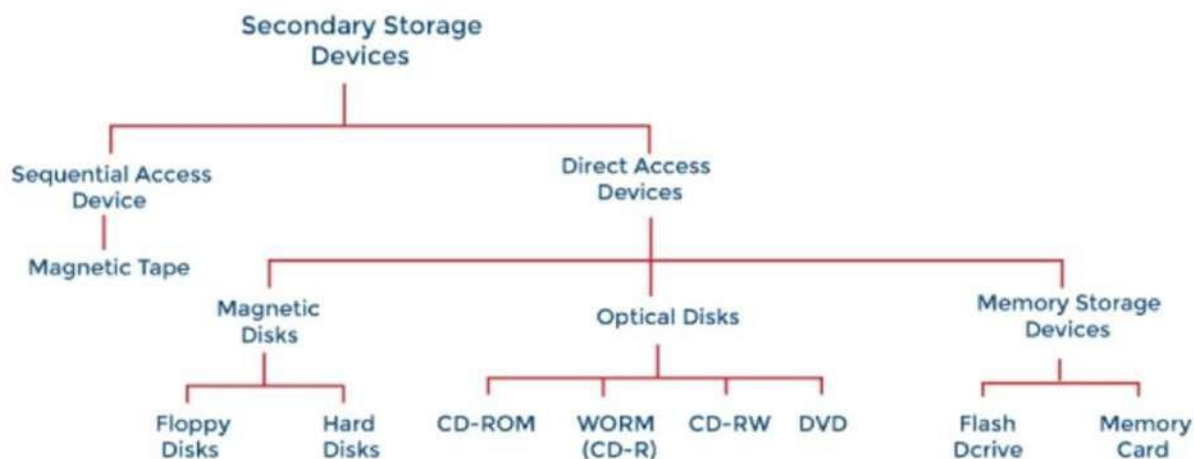
Fig(4):Classification of Secondary Storage Devices.

The classification of commonly used secondary storage devices:

1- Sequential storage Device It is a class of data storage devices that read stored data in a sequence as the magnetic tape in old computer system.

2- A direct-access storage device (DASD) is another name for secondary storage devices that store data in discrete locations with a unique address, such as hard disk drives, optical drives and most magnetic storage devices.

a. Magnetic Disk: A magnetic disk is a storage device that uses a magnetization process to write, rewrite and access data.

- **Magnetic Hard Disk: a** magnetic disk is a storage device that uses a magnetization process to write, rewrite and access data. Bits are stored in the magnetized in sports along concentric circles called **tracks.** The minimum quantity of information which can be transferred is a **sector.**
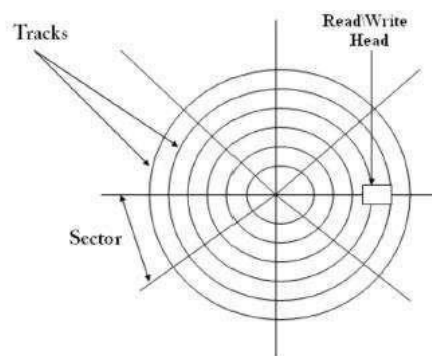
Fig (3) Hard Disk

- **Magnetic Floppy disk:** floppy disk is compose of a thin and flexible disk of a magnetic storage medium in a square or nearly square plastic enclosure lined with a fabric that removes dust particles from the spinning disk. The early floppy disks were 5.25 inch in diameter and were packaged in semi flexible jacket. . Floppy disks store digital data which can be read and written when the disk is inserted into a floppy disk drive (FDD) connected to or inside a computer or other device.

b. Optical Disk: an optical disk is any computer disk that uses optical storage techniques and technology to read and write data. It is a computer storage disk that stores data digitally and uses laser beams to read and write data. Such as (CD ,DVD and other)

c. Memory Storage Devices: A memory device includes USB drives, flash memory devices, SD and memory cards,

- **Flash Memories:** Flash memories are high-density read\write memories (high-density translates into large bit storage capacity) that are nonvolatile, which means that data can be stored indefinitely without power they are sometimes used in place of floppy or small.
- **A memory card** is an electronic data storage device used for storing digital information, typically using flash memory. These are commonly used in portable electronic devices, such as digital cameras, mobile phones, laptop computers, tablets, PDAs, portable media players, video game consoles, synthesizers, electronic keyboards and other devices

1.3 Cache Memory

It is a very high speed memory placed between RAM and CPU. It is storage buffer that stores the data that is used more and make them available to CPU when needed at fast rate. Cache memory stores copies of the data that used frequently by CPU from main memory (Ram) locations, so that they are immediately available to the CPU when needed.