Computer

- Computer is an electronic machine used to solve different problems according to a set of instructions given to it. A computer can accept data, process data into useful information and store it for later use.
- The word computer is derived from compute that means to calculate. Computer can be used as a calculating machine to produce results at very high speed. However, the calculation is not the only use of computer. It can be used for different purposes. People use computers to solve different problems quickly and easily. It has changed the way of life.
- Computers are available in different shapes and sizes.

Characteristics of Computer

- **Speed:-**

Computer processes data at a very high speed. It is much faster than human beings. A computer can perform billions of calculations in a second. Computer processor speed usually determined by clock speed is measured in Megahertz (MHz) or Gigahertz (GHz) For example, the process of multiplying 250 and 738 can take one or two minutes if it is performed by human beings. However, a computer can perform millions of such calculations within a second.

Processor

- **Reliability:-**

Computer is very reliable. The electronic components in modern computer rarely break or fail.

- **Accuracy:-**

Accuracy means that the computer provides results without any errors. Computer can process large amounts of data and produce results accurately. The result can be wrong only if the data given to the computer is not correct. Suppose the average marks of a class are required. There can be chance mistake in the result if it is performed by human beings. However , a computer can produce this result accurately and quickly.

- **Storage:-**

Computer can store a large amount of data permanently. People can use this data at any time. The user can store any type of data in the computer. The storage capacity of computer is increasing rapidly. A computer can store thousands of books easily.

Communication:-

Most computers today have capacity of communication with other computers. We can connect two or more computers by communication device such as modem. These computers can share data, instructions, and information. The connected computers are called network. We can communicate with other people in the world using like internet.

- **Recalling:-**

A computer can recall the store data and information as and when required. The data store in the computer can use at a later time. The can recall the required data in a few seconds.

- **Cost reduction:-**

We can perform a difficult task in less time and less cost. For example, we may have to hire many people to handle an office. The work can be perform by a single person with the help of commuter. It reduces the cost.

Data:-

- A collection of raw facts and figures is called data. The word raw means that facts have nor been processed to get their exact meaning. Data is given to the computer for processing. Data is collected from different sources. It is collected for different purposes. Data mat consist of numbers, symbols or pictures etc.

Examples of data:-

- Students fill an admission form when they get admission in collage. The form consist of raw facts about the students. These raw facts are student's name, fathers name ,a dress etc. the purpose of collecting this data is to maintain the records of the students during their study period in collage.
- Governments collect the data of all citizen of their country during the census. This data is store permanently and is used for different purposes at different times.

Information

- The processed data is called information. Information is an organization and processed form of data. It is more meaningful than data and is used for making decisions. Data is used as input for the processing and information is the output of this processing. This information can be used again in some other processing and will be considered as data in that processing.

Examples of Information:-

- The marks of a student in different subjects is data. This data is used to calculate the total marks which is the information. The total marks can be processed again to average marks of the student. In this processing, total marks is used as data and average marks is the information.
- In colleges and universities, the raw facts about students are stored on admission forms. If we want to find out a list of all students who live in Faisalabad, we will apply some processing on this data. This processing will given us the desired list. This list is a form of processed data and will be called information.

Components of Computer

Input Devices:-

- The data or instruction given to the computer is called input. A hardware component used to enter data and instruction into computer is called input Device. Most commonly used input devices are keyboard, mouse, microphone, scanner, digital camera and PC camera.

Keyboard:-

- Keyboard is used to enter text. It contains alphabetic, numeric and other keys for entering different type of data.

Mouse:-

- Mouse is pointing device. It controls the pointer on the screen. The user givens instructions to computer using mouse. It contains different buttons to perform different tasks like selecting an object or opening a program.

Microphone:-

- Microphone is used to enter voice into the computer.

Scanner:-

- It reads printed text and graphics and translates results in digital form.

Digital Camera:-

- Digital camera is used to take and store picture in digital form.

Webcam:-

- Webcam is PC video camera. It is used to capture video and photos on the computer. It is also used to make video phone calls on the internet.

Output Devices:-

- The data processed into useful information is called output. A hardware component used to display information to the user is called output device.
- Most commonly used output devices are monitor, printer and speaker.

Monitor:-

- Monitor is used to display text, graphics and video output.

Printer:-

- Printer is used to display printed output on paper.

Speaker:-

speaker is used to hear sound, music and voice inputs.

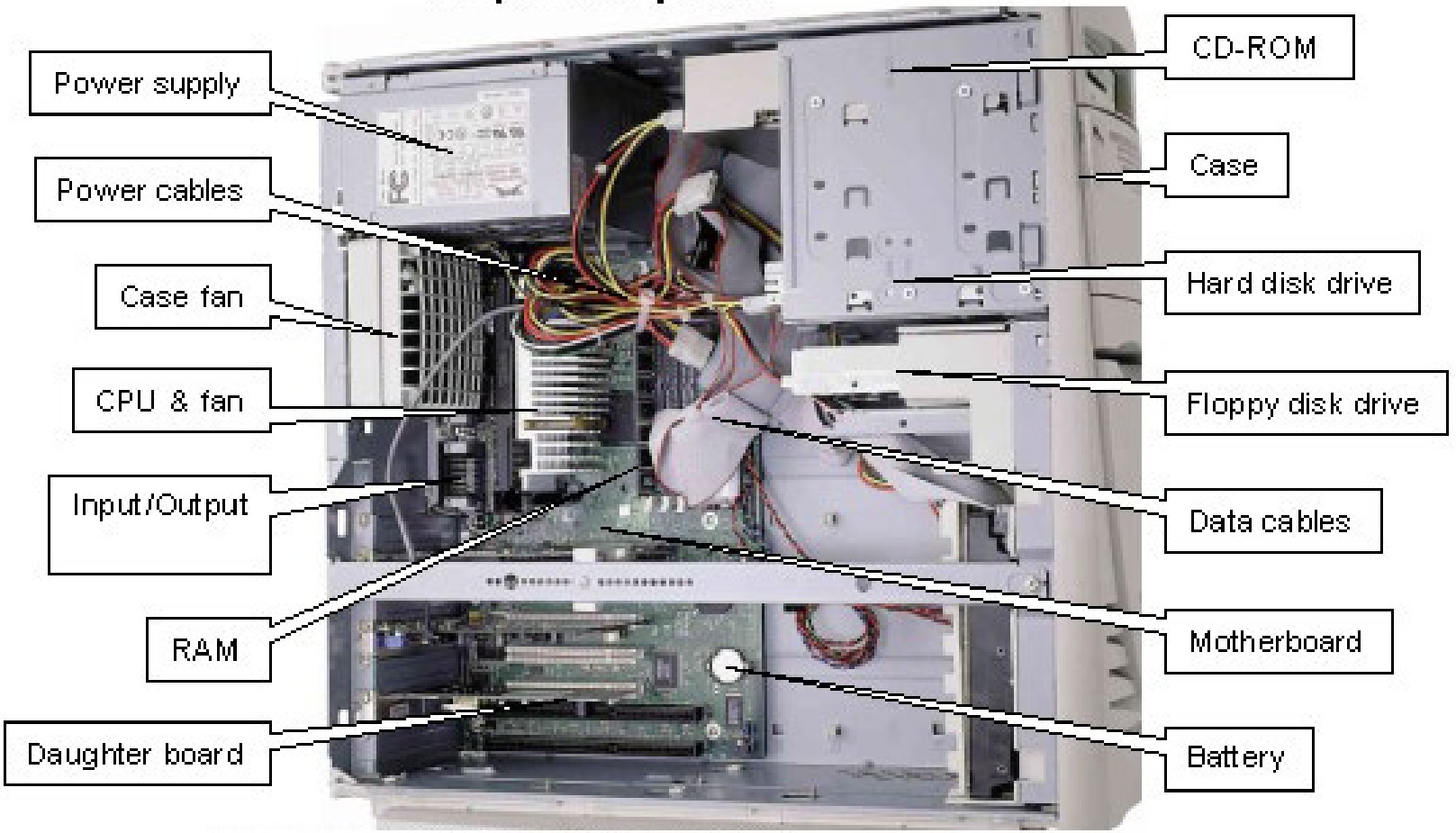
System Unit

- System unit is a case that contains different electronic components of the computer used to process data. All computer systems have a system unit. The electronic components in the system unit are connected to motherboard. Motherboard is also known as system board or main board. System board is he communication medium for the entire computer system.

CPU:-

- CPU stands for central processing unit. It is also called processor. It is brain of computer. It is most important component of computer. It interprets and execute the instructions in the computer. A computer cannot work without CPU. All computers must have a central processing unit.

Computer Components



Software and Hardware

- A set of instructions given to the computer to solve a problem is called software. Software is also called program. Different softwares are used to solve different problems. A computer works according to the instructions written in software.
- The physical parts of the computer are called hardware. The user can see and touch the hardware. Keyboard and mouse are two examples of hardware.

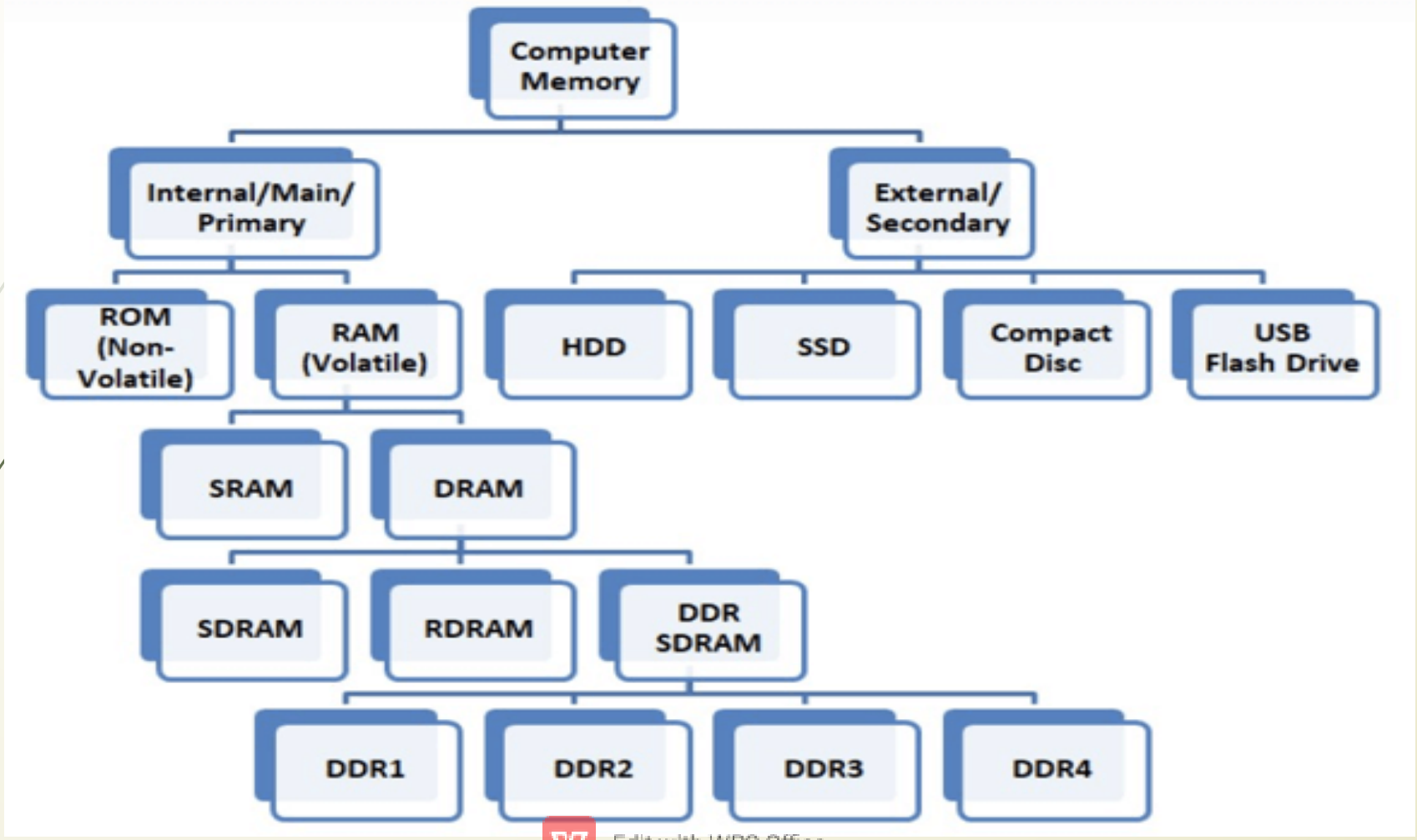
Relationship of Software and Hardware

- Software is a set of instructions that tells the computer hardware what to do. The hardware cannot perform any task without software. The software cannot be executed without hardware. A computer becomes useful when hardware and software are combined.

Difference Between Software & Hardware

Software	Hardware
Software is a set of instructions that tell a computer exactly what to do	Hardware is the physical parts of the computer that cause processing of data
Software cannot be executed without hardware	Hardware cannot perform any task without software
Software cannot be touched	Hardware can be seen and touched
Software is debugged in case of problem	Hardware is repaired in case of problem
Softwares ire is reinstalled if the problem is not solved	Hardware is replaced if the problem is not solved

Basic Types of Computer Memory



RAM (Random Access Memory)

- RAM (Random Access Memory) is the hardware in a computing device where the operating system (OS), application programs and data in current use are kept so they can be quickly reached by the device's processor. RAM is the main memory in a computer, and it is much faster to read from and write to than other kinds of storage, such as a hard disk drive (HDD), solid-state drive (SSD) or optical drive.

- Random Access Memory is volatile. That means data is retained in RAM as long as the computer is on, but it is lost when the computer is turned off. When the computer is rebooted, the OS and other files are reloaded into RAM, usually from an HDD or SSD.

- RAM comes in a variety of shapes (i.e. the way it physically connects to or interfaces with computing systems), capacities (measured in MB or GB), speeds (measured in MHz or GHz), and architectures. These and other aspects are important to consider when upgrading systems with RAM, as computer systems (e.g. hardware, motherboards) have to adhere to strict compatibility guidelines. For example:
- Older-generation computers are unlikely to accommodate the more recent types of RAM technology
- Laptop memory won’t fit in desktops (and vice versa)
- RAM is not always backward compatible
- A system generally can't mix and match different types/generations of RAM together

Types of RAM

- Static RAM (SRAM)
- Dynamic RAM (DRAM)
- Synchronous Dynamic RAM (SDRAM)
- Single Data Rate Synchronous Dynamic RAM (SDR SDRAM)
- Double Data Rate Synchronous Dynamic RAM (DDR SDRAM, DDR2, DDR3, DDR4)
- Graphics Double Data Rate Synchronous Dynamic RAM (GDDR SDRAM, GDDR2, GDDR3, GDDR4, GDDR5)

Static RAM (SRAM)

- Time in market: 1990s to present
- Popular products using SRAM: Digital cameras, routers, printers, LCD screens

Dynamic Ram (DRAM)

- Time in market: 1970s to mid-1990s
- Popular products using DRAM: Video game consoles, networking hardware

Synchronous DRAM

- Time in market: 1993 to present
- Popular products using SDRAM: Computer memory, video game consoles

Single Data Rate Synchronous Dynamic RAM (SDR SDRAM)

- Time in market: 1993 to present
- Popular products using SDR SDRAM: Computer memory, video game consoles

Double Data Rate Synchronous Dynamic RAM (DDR SDRAM)

- Time in market: 2000 to present
- Popular products using DDR SDRAM: Computer memory

DDR2 SDRAM

DDR2 stands for Double Data Rate2 Synchronous Dynamic Random Access Memory. It is similar to DDR SDRAM, but it reads or writes four words of data per clock cycle. DDR2 SDRAM introduced in 2003.

DDR3 SDRAM

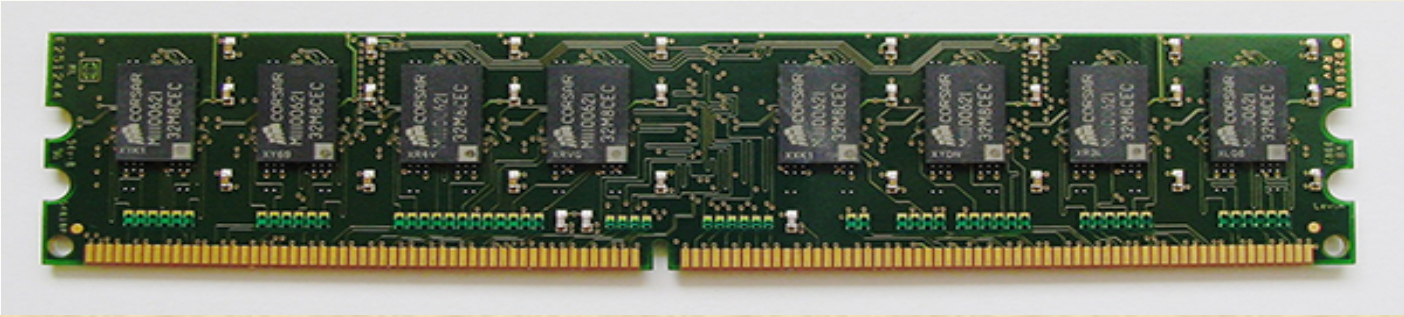
- DDR3 SDRAM stands for Double Data Rate3 Synchronous Dynamic Random Access Memory. It again doubles the speed of reading and writes, i.e., you can say that DDR3 SDRAM can read or write eight words per clock cycle. Also, the performance and speed of the RAM are improved.

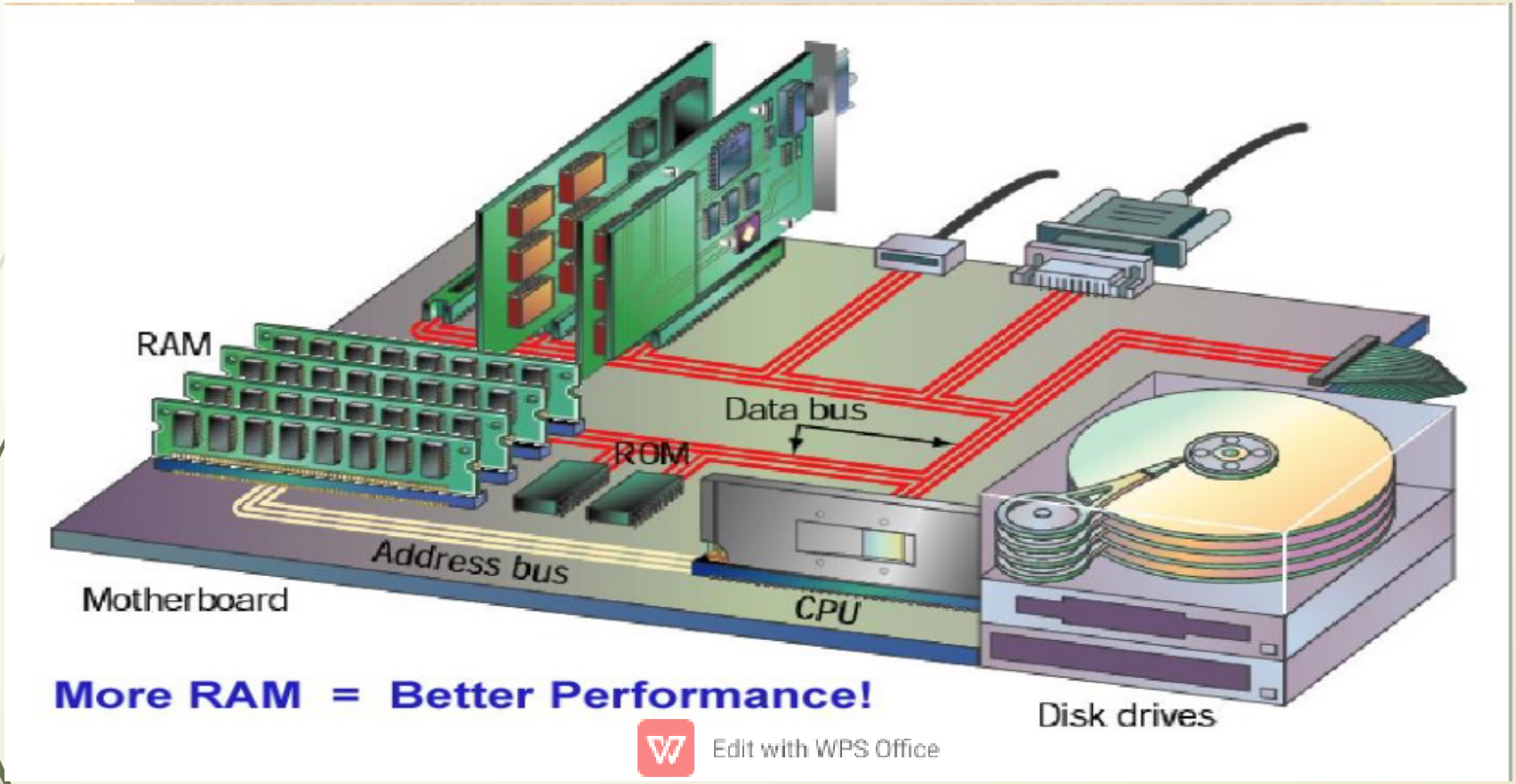
DDR4 SDRAM

- DDR4 SDRAM stands for Double Data Rate4 Synchronous Dynamic Random Access Memory. It introduced in the other half of 2014. DDR4 SDRAM provides improve performance and speed as compared to the different version of SDRAM.

DDR5 SDRAM

- DDR5 SDRAM stands for Double Data Rate5 Synchronous Dynamic Random Access Memory. It is currently under development. DDR5 SDRAM will reduce the consumption of power, and it will double the bandwidth and the capacity. The specification of DDR5c SDRAM labeled in 2016, but its production is still pending and will take time.





Secondary Storage and Output Devices

Storage Devices:-

- The hardware components used to store data, instructions and information permanently are called storage devices. It is called nonvolatile because its contents remain safe when the computer is turned off. Some examples of storage devices are USB flash drive.

Storage Capacity

Name	Abbreviation	Number of Bytes
Byte	B	1
Kilobyte	KB	1,024 Bytes
Megabytes	MB	1,024 Kilobyte
Gigabyte	GB	1,024 Megabytes
Terabyte	TB	1,024 Gigabytes
Petabyte	PB	1,024 Terabytes

Types of ROM

Read-only memory (ROM)

Non-volatile

- Permanent data and instructions from manufacturer

Types

- PROM: Programmable ROM
- EPROM: Erasable programmable ROM
- EEPROM: Electrically erasable programmable read-only memory

PROM: Programmable Read-only Memory

- Short for programmable read-only memory, a memory chip on which data can be written only once.
- Once a program has been written onto a PROM, it remains there forever.

EPROM: Erasable Programmable Read-only Memory

- An EPROM (erasable programmable read-only memory) is a special type of PROM that can be erased by exposing it to ultraviolet light. Once it is erased, it can be reprogrammed.

EEPROM: Electrically erasable programmable read-only memory

- An EEPROM is similar to a PROM, but requires only electricity to be erased.
- EEPROM (electrically erasable programmable read-only memory) is user-modifiable read-only memory (ROM) that can be erased and reprogrammed (written to) repeatedly through the application of higher than normal electrical voltage. Unlike EPROM chips, EEPROMs do not need to be removed from the computer to be modified. However, an EEPROM chip has to be erased and reprogrammed in its entirety, not selectively. It also has a limited life - that is, the number of times it can be reprogrammed is limited to tens or hundreds of thousands of times.

Secondary Storage Access Methods

Sequential Access Storage Devices (SASD)

- Access in the same order it was written
- Need to access memory location 5. Then, you need to go through 1, 2, 3, and 4 first.
- Magnetic tapes: Similar to audio tapes, SASD

Direct Access Storage Devices (DASD)

- Directly access the location
- Faster than sequential access
- Magnetic discs: Hard disk, DASD
- Optical discs, DASD
- CD-ROM 700 MB
- Magneto-optical discs
- Digital versatile discs (DVD): 4.7 GB Up to Appro.17 GB storage
- Blu Ray Disc: 50 GB UP to 200 GB storage
- Memory cards
- Pin Derives

Communication Devices:-

- The hardware components used to communicate and exchange data, instructions and information with other computers are called communication devices. Modem is an example of communication device. It enables the computer to communicate with other computers through telephone line or network cable.

Ethernet Card and Network Card