

Computer hardware

Computer based information system (CBIS) are composed of hardware, software, databases, people, telecommunications, and procedures. The components are organized to input, processing, output data and information. Physical equipment used for the input, processing, output and storage activities of computer system.

It consists of the following parts:

- Central processing unit (CPU)
- Memory (primary and secondary storage)
- Input technology
- Output technology
- Communication technology

1- The Central Processing Unit

The central processing unit (CPU) perform the actual computation inside any computer, the CPU is a microprocessor for example, Pentium III) made up of millions of microscopic transistors embedded in a circuit on a silicon wafer or chip. Examples of specific microprocessor.

The microprocessor has different portions which perform different functions:

1-**Control Unit:** this controls the flow of information. 2-

Arithmetic Logic Unit (ALU) performs arithmetic calculations.

3-Registers: which store very small amount of data and instructions for short period of time.

Control unit

-Direct and coordinates all units of the computer to execute program steps. -Direct and coordinate all operation of the computer systems. These operations include;

1- Control to the input and output devices.

2- Entry and retrieval of information from memory.

3- Routing of information between the memory, arithmetic and logic unit.

Control unit automatically coordinates the operation of the entire computer system, although the control unit does not performed any actual processing on the data, it acts as a central nervous system uses to send control signal to other units.

Arithmetic and Logic Unit (ALU)

Perform the processing of data including arithmetic operation such as addition, subtraction, multiplication, division and logic operation including comparison (ex. $A < B$) and sorting.

Register

Register are devices capable of storing information, receiving data from other areas within the computer and transferring information as directed by the control unit, it is used for temporary storage of data or instruction and the most important register are :

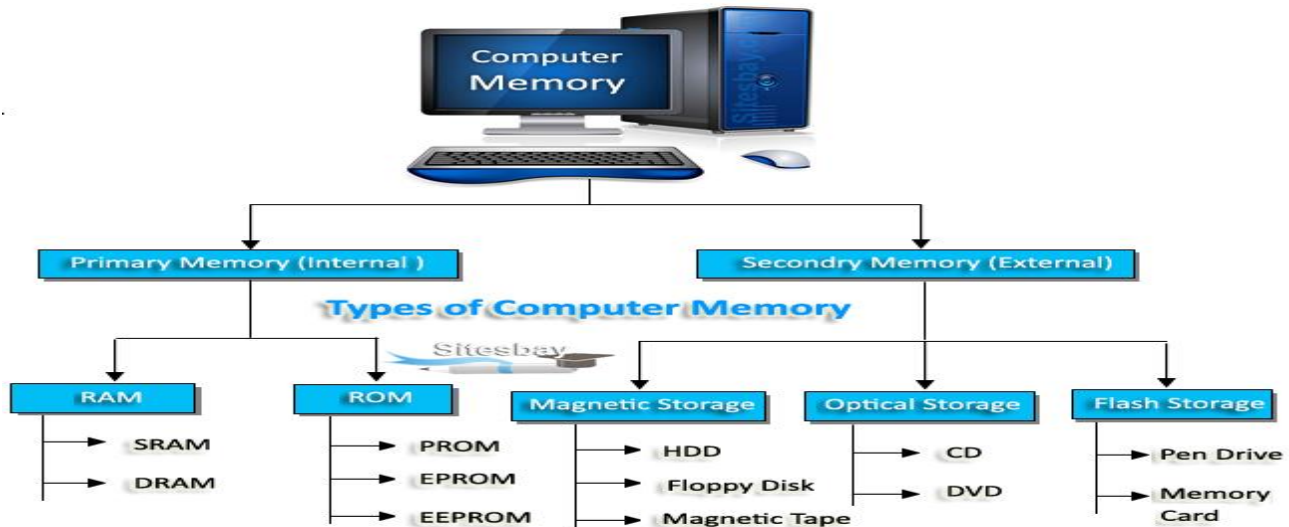
1- Program counter (PC): it contains the address of the next instruction to be executed.

2- Instruction register (IR): it contains the instruction being executed.

3- Address register (AR) : holds the address of memory location.

2- Computer Memory

There are two basic categories of memory:



A-Primary storage (main memory): The memory is the part of the computer that holds information (data and instruction) for processing so name because small amounts of data and information that will be immediately used by the CPU are stored there.

The specific functions of main memory are to hold (store): 1- All data to be processed.

2-Intermediate result of processing.

3-Final result of processing

B-Secondary Storage: where much larger amount of data and information (an entire software program, for example) are stored for extended period of time.

Memory Capacity

Bit: All computers work on a binary numbering system, i.e. they process data in ones or zeros. This 1 or 0 level of storage is called a bit. Often hardware is specified as a 32-bit computer, which means that the hardware can process 32 bits at a time.

Software is also described as 16 bit, 32 bit or 64 bit software.

CPU process only 0s and 1s, all data are translated through computer languages into series of these binary digits, or bits.

Eight bits are needed to represent a character. This 8-bit string is known as a byte.

The storage capacity of a computer is measured in bytes. The hierarchy of byte memory capacity is as follows:

1- Byte: A byte consists of eight bits.

2- Kilobyte: A kilobyte (KB) consists of 1024 bytes.

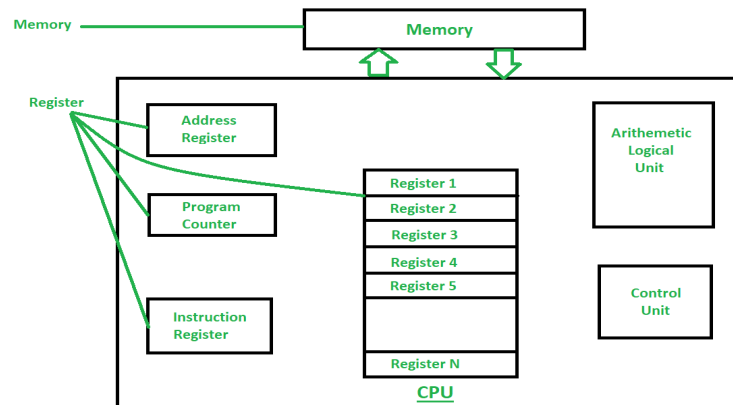
3- Megabyte: A megabyte (MB) consists of 1024 kilobytes, (1024*1024) byte or 1,048,576 byte) approximately 1,000,000 bytes.

4- Gigabyte: A gigabyte (GB) consists of 1024 megabytes, (1024*1024*10240byte) or (1,073,741,824 byte), approximately 1,000,000,000 bytes.

5- Terabyte: A terabyte (TB) consists of approximately 1,000,000,000,000 bytes.

A: There are four main types primary (main) memory:

- 1- **Registers:** are part of CPU, they have the least capacity, storing limited amounts of instructions and data only immediately before and after processing.

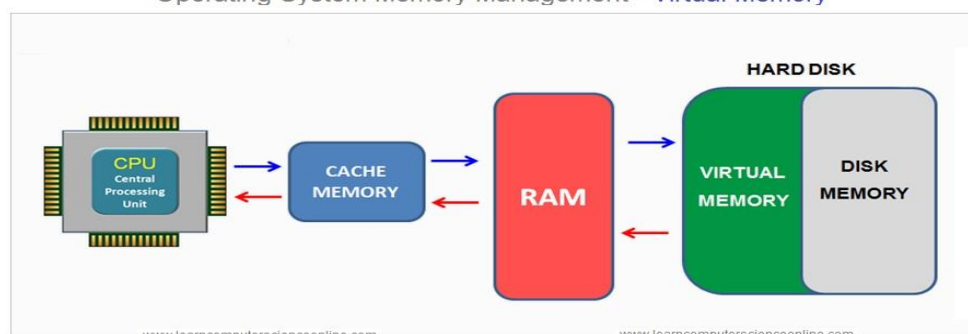


2- Random Access Memory (RAM): it stores more information than registers and is farther away from the CPU, but it stores less than secondary storage and is much closer to the CPU than is the secondary storage. When you start most software programs on your computer, the entire program is brought from secondary storage into RAM. As you use the program, small parts of the programs instructions and data are sent into the instructions as close to the CPU.

Again, getting the data and instructions as close to the CPU as possible is key to the computer's speed, as is the fact that the RAM is a type of microprocessor chip. As we shall discuss later, the chip is much faster (and more costly) than are secondary storage devices.

- 2- **Cashe Memory:** many modern computer applications (Microsoft office 98, for example) are very complex and have huge numbers of instructions .it takes considerable RAM capacity (usually a minimum 16MB) to store the entire instruction set. Or you may be using an application that exceeds your RAM. in that case, your computer has to go into secondary storage to retrieve the instruction. to alleviate this problem, software is often written in smaller blocks of instruction. As need, these blocks can be brought from secondary storage into RAM; this is still slow however, cashe memory is the place closer to the CPU where the computer can temporarily store those blocks used most often. Those used less often remain in RAM until they are transferred to cache; those used infrequently stay stored in secondary storage. Cashe memory is faster than RAM. Because, the instructions travel a shorter distance to the CPU.

Operating System Memory Management - Virtual Memory



4- Read Only Memory (ROM)

Most people who use computers have lost precious data at one time due to a "computer crash" or power failure. What is usually lost is whatever is in RAM, cache, or the registers, this loss occurs because these types of memory is volatile.

Read-only-memory (ROM) is the place (a type of chip) where certain critical instructions are safeguarded. ROM is nonvolatile and retains these instructions when the power to the computer is turned off. The (read only) means that these instructions can be read only by the computer and cannot be changed by the user.

