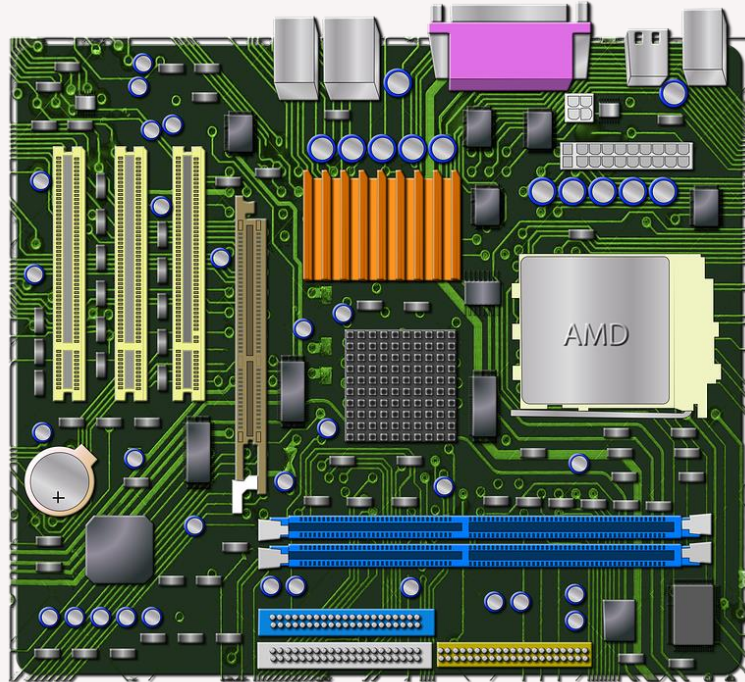


MOTHERBOARD

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INTRODUCTION

- The motherboard is the main printed circuit board (PCB) in a computer that connects and integrates all essential components.
- It houses the CPU, memory modules, expansion slots, storage connectors, and other vital hardware components.
- Acting as the central hub, the motherboard facilitates communication between the CPU, memory, graphics card, and peripherals.
- It provides power distribution, data transfer pathways, and control interfaces necessary for the computer to function.

MANUFACTURERS OF MOTHERBOARD

Motherboards are available in various sizes and configurations. Some motherboard supports 32 and 64 bit processor as well.

It is manufactured by many companies such as :

- Asus
- Intel
- MSI
- Gigabyte



COMPONENTS OF MOTHERBOARD

Processor

- The processor, also known as the central processing unit (CPU), is the brain of the computer.
- It carries out the operation on a computer program like performing basic arithmetic, logical, control, and input/output (I/O) operations.
- The processor is responsible for executing the instructions stored in the computer's memory.





Key aspects of a processor include:

- **Arithmetic Logic Unit (ALU):** The ALU is responsible for performing mathematical calculations and logical operations, such as addition, subtraction, multiplication, and comparison.
- **Control Unit:** The control unit manages the execution of instructions, ensuring that the operations are carried out in the correct sequence. It also controls the flow of data between the CPU and other components of the computer.
- **Registers:** These are small, high-speed storage locations within the CPU used to store data temporarily during processing. Registers play a crucial role in the speed and efficiency of the processor.
- **Cache Memory:** The CPU typically includes various levels of cache memory, which provides faster access to frequently used instructions and data. Cache memory helps reduce the time the processor spends waiting for data from the slower main memory (RAM).

CPU SOCKET

- A CPU socket, also known as a processor socket or CPU slot, is a physical component on a computer's motherboard that houses and connects the CPU (central processing unit) to the motherboard.
- The CPU socket is designed to match the specific requirements of a particular CPU type, such as its size, pin configuration, and electrical characteristics.



Memory

- Memory refers to the electronic components used to store and retrieve digital information for processing by a computer's central processing unit (CPU).
- It is used to store both temporary and permanent data. There are different types of memory, including cache, RAM, and ROM.



Classification of Memory

- Primary Memory
- Secondary memory
- Cache Memory
- Virtual Memory
- Volatile Memory
- Random Access Memory
- Read Only memory

Needs of Primary Memory

In order to enhance the efficiency of the system, memory is organized in such a way that access time for the process is minimized. The following approach is followed to minimize access time for the ready process.

- All programs, files, and data are stored in secondary storage that is larger and hence has greater access time.
- Secondary memory can not be accessed directly by a CPU or processor.
- In order, to execute any process operating system loads the process in primary memory which is smaller and can be accessed directly by the CPU.
- Since only those processes are loaded in primary memory which is ready to be executed, the CPU can access those processes efficiently and this optimizes the performance of the system.

Classification of Memory

Primary Memory:

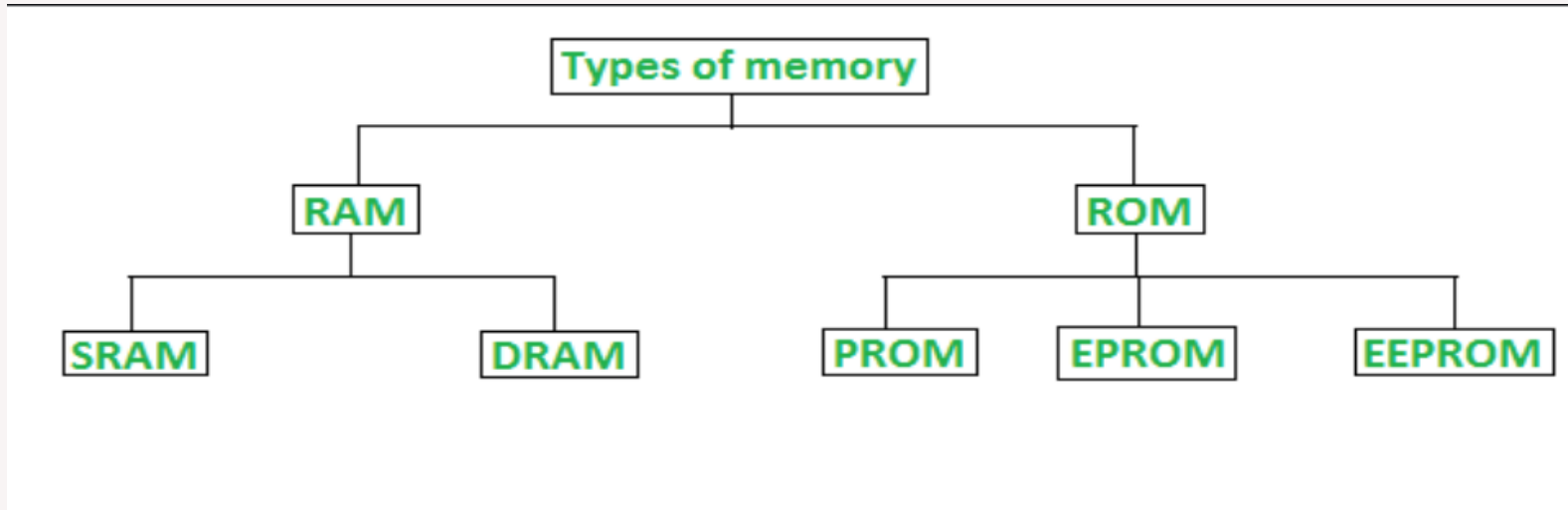
- **Volatility:** Primary memory is volatile, meaning it loses its contents when the power is turned off. This is in contrast to secondary memory (like hard drives or SSDs), which retains data even when the power is off.
- **Speed:** Primary memory is faster than secondary memory. This is because data can be accessed randomly and quickly in primary memory, allowing for rapid read and write operations.
- **Temporary Storage:** It is used for temporary storage of data and program code that is actively being used or processed by the CPU. This includes the operating system, application programs, and currently open files.

Primary Memory

- **Random Access:** Primary memory is "random access," meaning that any storage location can be accessed directly, without going through the entire memory sequentially.
- **Types of Primary Memory :-**
 - RAM (Random Access Memory)
 - Cache Memory
 - Registers
- **Direct Interaction with CPU:** Primary memory directly interacts with the Central Processing Unit (CPU). The CPU fetches instructions and data from the primary memory for processing.
- **Determines System Performance:** The speed and efficiency of primary memory play a crucial role in determining the overall performance of a computer system.



Classification of primary memory



Types of RAM

DRAM :

- It stands for Dynamic Random Access Memory .
- DRAM is the most common type of RAM used in computers.
- It requires constant refreshing of its memory cells to maintain data, as it is volatile and loses its content when power is turned off.

SRAM :

- It stands for Static Random Access Memory .
- SRAM is another type of volatile RAM, but unlike DRAM, it doesn't require constant refreshing.
- SRAM is faster and more expensive than DRAM and is often used in cache memory.

Types of ROM

PROM :

- It stands for Programmable Read-Only Memory.
- PROM allows users to write or program data onto the chip once. Once programmed, the data is fixed and cannot be modified.
- PROM chips are commonly used for firmware and software storage.

EPROM:

- It stands for Erasable Programmable Read-Only Memory.
- EPROM is a type of ROM that can be erased and reprogrammed multiple times.
- EPROMs were widely used before the development of Electrically Erasable Programmable Read-Only Memory (EEPROM) and Flash memory.

EEPROM

- It stands for Electrically Erasable Programmable Read-Only Memory.
- EEPROM, also known as E2PROM, allows for data to be erased and reprogrammed electrically.
- EEPROM is commonly used when occasional updates are required.

Secondary Memory

- **Non-Volatile Storage:** Secondary memory devices are non-volatile, meaning they retain data even when the power is turned off.
- **Examples of Secondary Memory :-**
 - Hard Disk (HDD)
 - Solid-State Drives (SSDs)
 - Optical Discs (CDs, DVDs, Blu-rays),
- **Portability:** Some secondary memory devices, like USB flash drives and external hard drives, are portable. This makes it easy to transfer data between different computers or to carry important files on the go.

MEMORY SLOTS

Memory slots, also known as DIMM (Dual In-Line Memory Module) slots, are connectors on the motherboard used to install memory modules (RAM). They provide temporary storage for data and instructions used by the CPU during system operation.



EXPANSION SLOTS



Expansion slots are connectors on the motherboard used to install expansion cards, which add additional functionality to the computer system. Common types of expansion slots include PCIe (Peripheral Component Interconnect Express), PCI (Peripheral Component Interconnect), and AGP (Accelerated Graphics Port) slots.

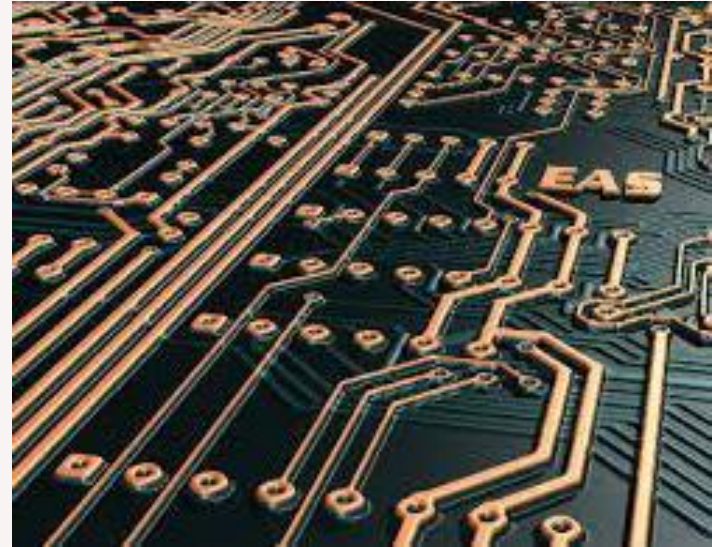
Complementary Metal-Oxide-Semiconductor(CMOS)

- CMOS is an integrated circuit built on a printed circuit board. It is a battery-powered memory chip that effortlessly holds the initialisation data. The BIOS uses this data to turn on the device, i.e., during the bootup process.



BUSES

- **Buses are circuits on the motherboard that connect the CPU to other components. There are many buses on the motherboard. A bus moves instructions and data around the system. The speed of a bus is measured in megahertz (MHz). The faster the bus, the faster data is communicated.**



BIOS/UEFI CHIP



Unified Extensible Firmware Interface (UEFI) is a specification for a software program that connects a computer's firmware to its operating system (OS). UEFI is expected to eventually replace basic input/output system (BIOS) but is compatible with it.C

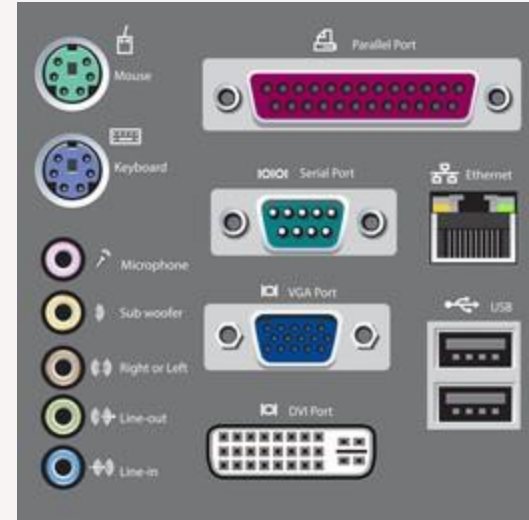
PORTS

USB Ports: Universal Serial Bus ports for connecting various peripherals like keyboards, mice and external storage devices.

Ethernet Port: Used for connecting to wired networks for internet access or local area networking.

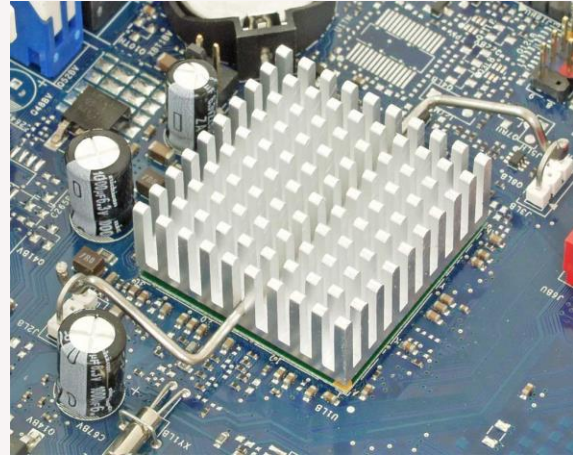
Audio Ports: Includes headphone and microphone jacks for audio input and output.

Video Ports: Includes HDMI, DisplayPort, and VGA ports for connecting monitors or other display devices.



NORTH BRIDGE

The northbridge is an integrated circuit responsible for communications between the CPU (central processing unit) interface, AGP (accelerated graphics port), and the memory. Unlike the southbridge, the northbridge is directly connected to these components.



SOUTH BRIDGE

The southbridge is an IC (integrated circuit) on the motherboard responsible for the hard drive controller, I/O controller and integrated hardware

