Computer Hardware

Lecture 05 – Week 03

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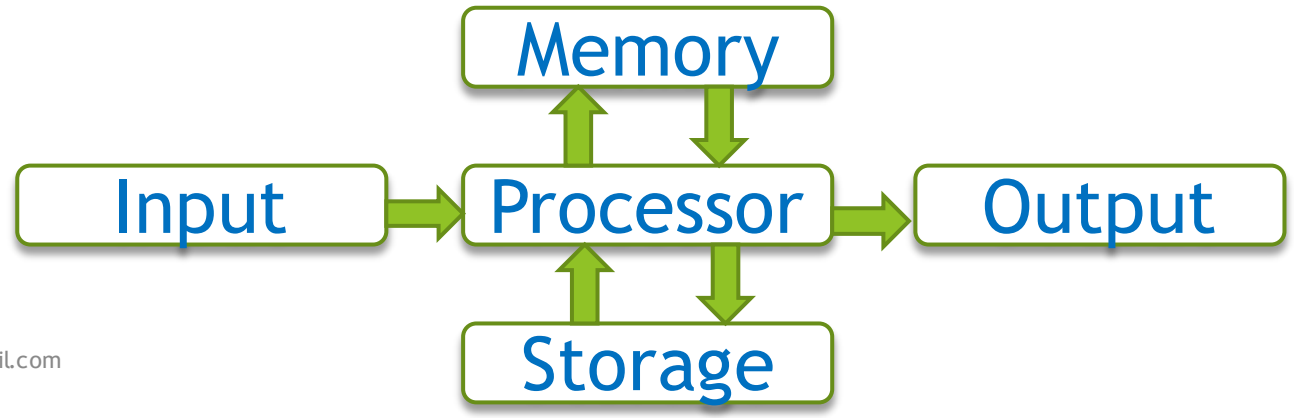
Topics to be covered

- Computer Hardware
- Basic Architecture of Computer System
- Computer Memory
- Secondary Storage
- Input/Output Devices

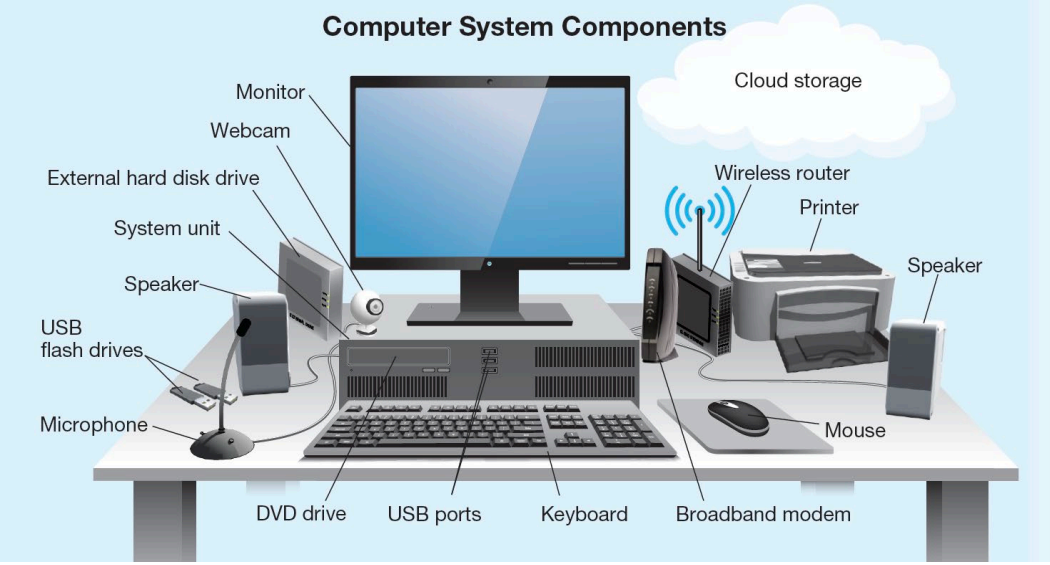
What is Hardware?

- When you think about computer, you probably picture its hardware, the computer's physical parts.
- You use hardware devices, such as a keyboard or mouse to input data.
- The processor is a hardware device that turns the raw data into usable information.
- Hardware devices such as a monitor or a disk drive show output and store data for later access



Hardware Overview

- **Hardware** — all system unit components plus connected devices.
- **Peripheral device** — connected device outside of the computer.

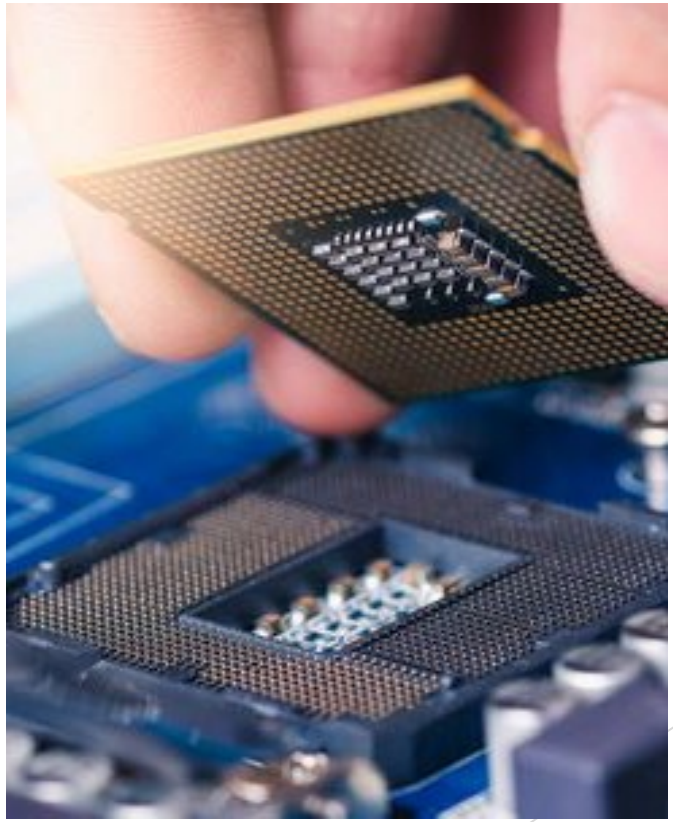


Inside the case

- Processing Devices (CPU)
- Primary Storage (RAM)
- Secondary Storage Devices

Central Processing Unit

- Perhaps the most important piece of hardware in a computer is the central processing unit, or CPU.
- This is the device that process data.
- The CPU is a small, thin piece of silicon attached to the circuit board.
- The CPU is covered with tiny electrical circuits, or paths along which an electrical current is carried.
- By moving data along these circuits in specific ways, the CPU can do arithmetic and compare data very quickly.



Central Processing Unit (cont.)

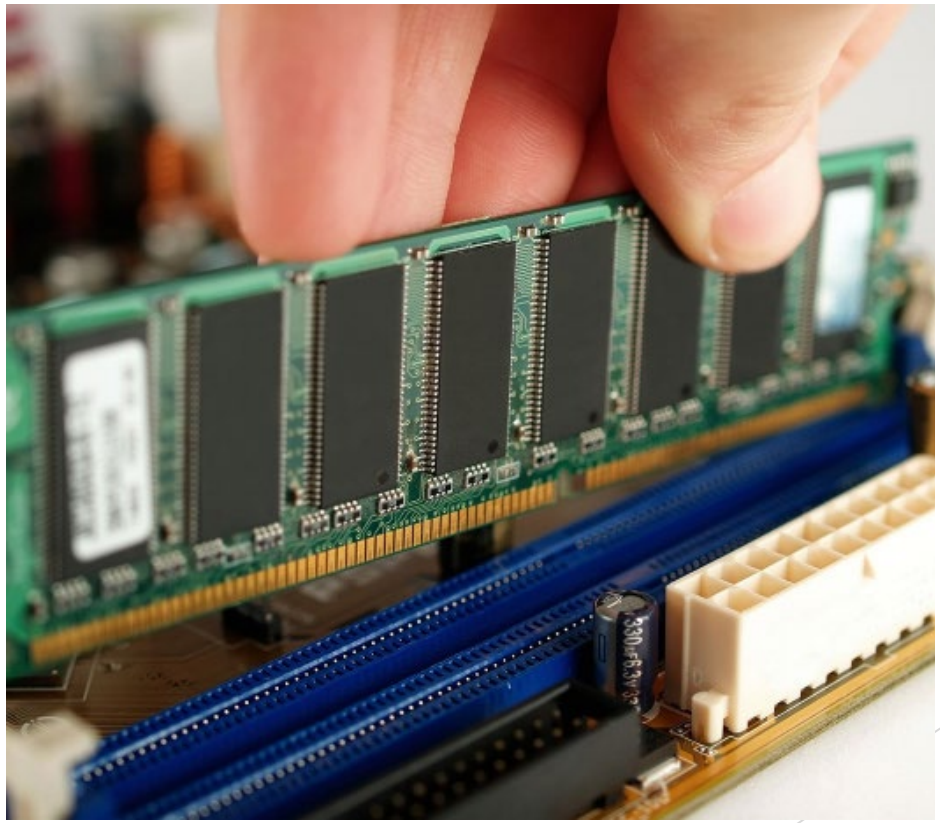
The CPU is comprised of three main parts:

- **Arithmetic Logic Unit (ALU):** Executes all arithmetic and logical operations.
  - Arithmetic calculations like as addition, subtraction, multiplication, and division.
  - Logical operation like compare numbers, letters, or special characters.
- **Control Unit (CU):** controls and co-ordinates computer components.
  - Read the code for the next instruction to be executed.
  - Increment the program counter so it points to the next instruction.
  - Read whatever data the instruction requires from cells in memory.
  - Provide necessary data to an ALU or register.
  - If the instruction requires an ALU or specialized hardware to complete, instruct the hardware to perform the requested operation.
- **Registers:** Stores the data that is to be executed next, “very fast storage area”.

Primary Storage (RAM)

- Some hardware used to store data is inside the computer case near the CPU.
- The computer uses random access memory, or RAM, to store data and instructions while the computer is working. In this way, the CPU can quickly find the data is works with.
- This type of storage is called primary storage.
- RAM is volatile memory, which means data in RAM is lost when the computer is turned off.

https://www.techtarget.com/searchstorage/definition/RAM-random-access-memory

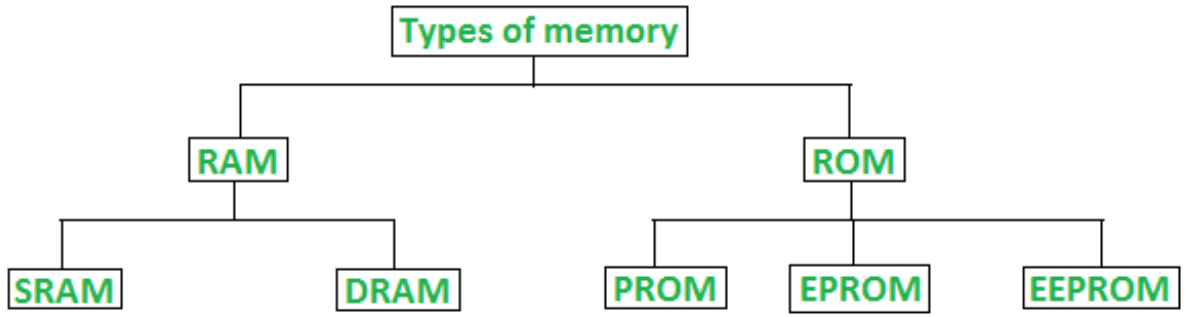


Primary Storage (ROM)

- Read Only Memory (ROM) is a permanent form of storage.
- ROM stays active regardless of whether power supply to it is turned on or off.
- ROM devices do not allow data stored on them to be modified.

Types of memory

https://www.geeksforgeeks.org/random-access-memory-ram-and-read-only-memory-rom/



Classification of computer memory

Types of Random Access Memory (RAM)

- Dynamic Random Access Memory (DRAM):
  - Capacitor is used in DRAM.
  - It can't hold charge for long time if power is not provided continuously.
  - It required an electric current to maintain its electrical state.
  - The electrical charge of DRAM decreases with time that may result in loss of data.
- Static Random Access Memory (SRAM):
  - Made up of transistor.
  - CPU doesn't need to wait to access data from SRAM during processing.
  - It's faster than DRAM.
  - It's more expensive.

Types of Read-Only Memory (ROM)

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

Other pieces of storage hardware are secondary storage. The following devices let you store data permanently-even when the computer is turned off.

- Hard drives use a stack of disk platters to store large amounts of information permanently on the computer.
- External hard drives, which are plugged into the computer, are used to store backups of your data.
- They can be desktop or portable devices.
- They usually connect to the computer via a universal serial bus, or USB, port.
- A port is a connection between a computer and a device.

Secondary Storage Devices (Contd..)

- Flash, jump, thumb, or pen drives – all names for the same kind of storage devices—connected to the computer through a USB port.
- Compact discs (CDs), digital video discs (DVDs), and Blu-ray Disc (BDs) are optical storage devices.
- Cloud storage is online storage offered on various websites.
- Memory cards store data for mobile devices like smartphones and digital cameras.

Secondary Storage Devices (Contd..)

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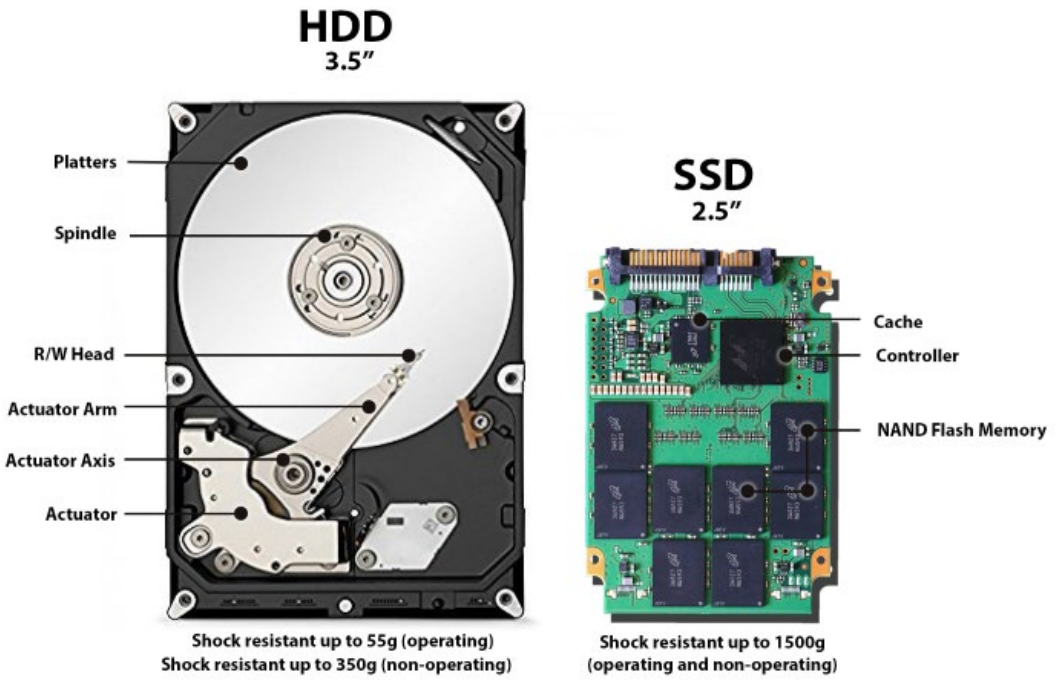

SSD vs HDD: What's the difference?

- HDDs are traditional storage devices with spinning platters that read and write data.
- SSDs are newer technology that stores data on instantly accessible memory chips.
- SSDs are faster, quieter, smaller, consume less energy, and more durable.
- HDDs are cheaper, have more capacity, and offer easier data recovery if damaged.

Secondary Storage Capacity

- Hard disk drives hold the most data.
- Many computers now have hard drives that can store more than 4 terabytes.
- Some external hard drives can store more than 30 terabytes.
- Thumb or flash drives hold the next largest amount of data, sometimes over a terabyte.
- CDs and DVDs hold least amount of data- from around 700 megabytes to almost 10 gigabytes.