

INTRODUCTION to COMPUTER AND ICT

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For BS Computer Science, BS (IT),
BS Geology, BS Mathematics,
BS Commerce, BS Statistics



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MANAGEMENT Information System
1st Edition
Dr. Rahman Ali



MANAGEMENT Information System

1st Edition

In accordance with approved curriculum
for BS Commerce, Master of Commerce,
BBA and MBA program of the HEC
and University of Peshawar.



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Chapter 3:

Computer Hardware

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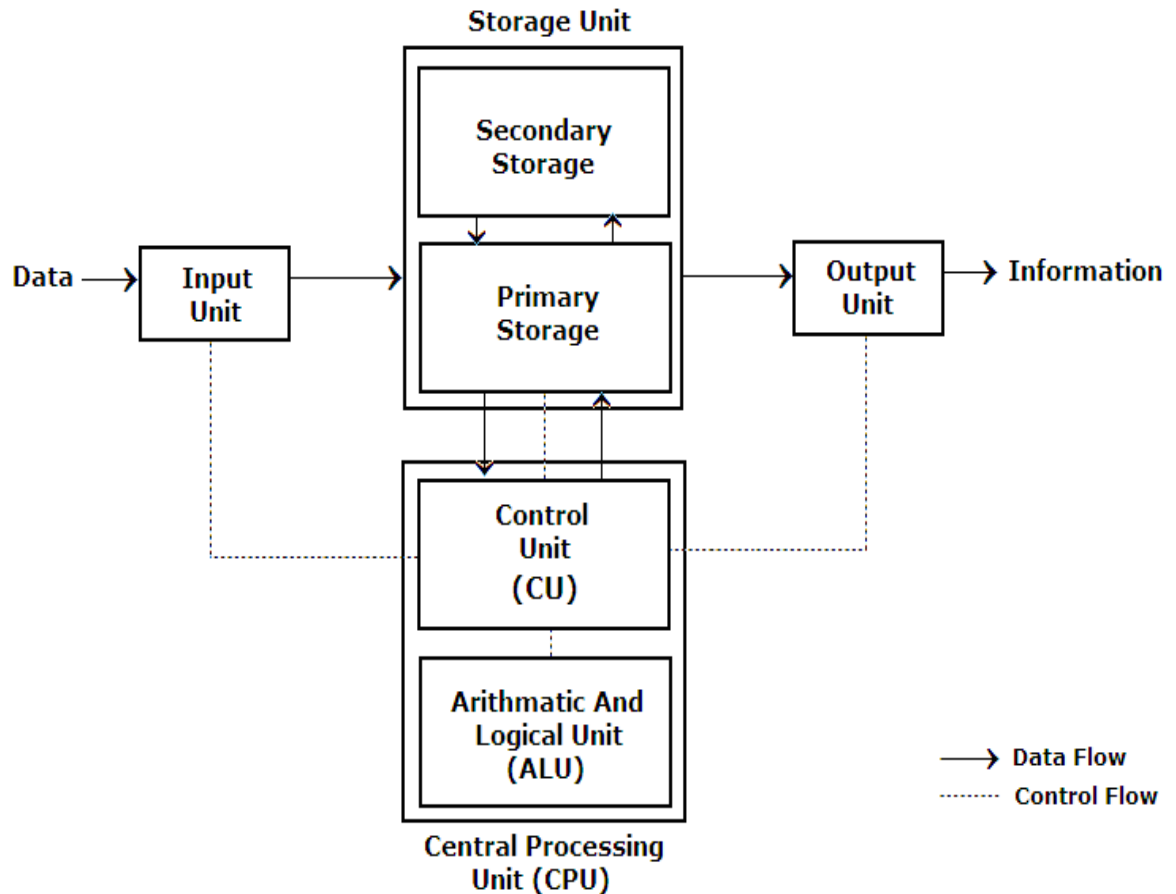
Outlines

- ✓ Basic Architecture
- ✓ Input Devices
- ✓ Storage Devices
 - Primary Memory
 - Secondary Memory
 - Cloud Storage
 - Physical and Logical Storage
- ✓ Processing Unit
- ✓ Output Devices.
- ✓ Communication Devices

Basic Architecture of Computer

The basic architecture of computer is based on the components that work together to perform the computer's operations.

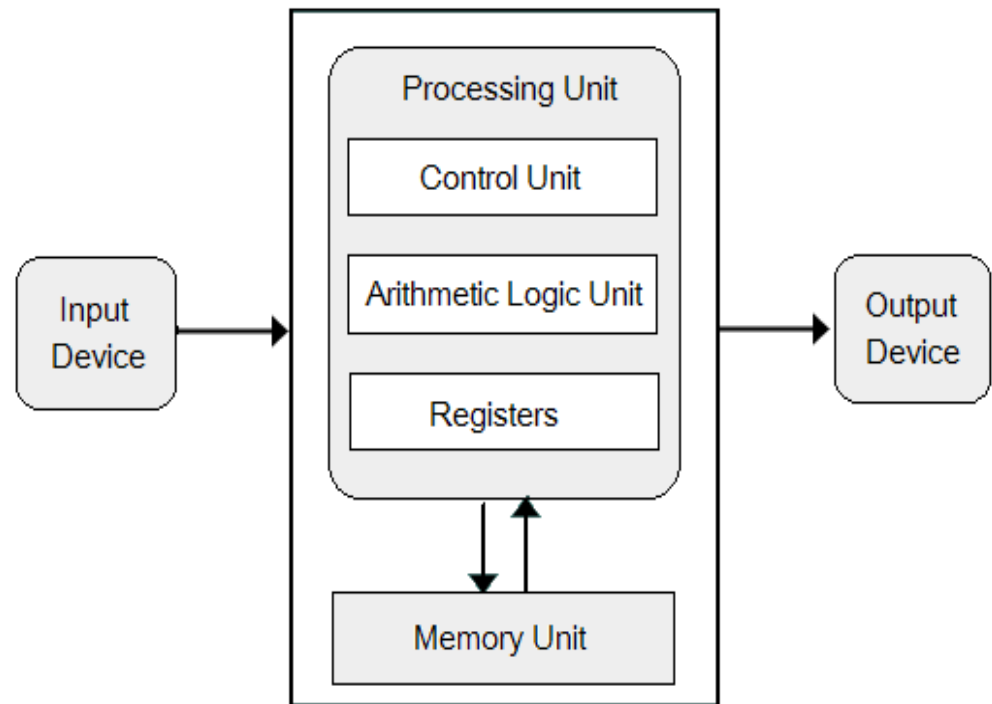
- Input unit
- Storage unit
- Processing unit
- Output unit.



Basic Architecture of Computer

➤ Von Neumann Architecture

- Described by Von Neumann in 1945.
- Stored-program computer rather than fixed-program computer.
- The model describe computer with the following components.
 - A CPU, comprised of ALU and registers.
 - A CU with instruction register and program counter.
 - Main memory
 - Secondary memory
 - I/O mechanisms.



Input Devices

- Any device used to input data into computer.
- Allow us to interact with computer.
- A wide range of devices including:
 - Mouse
 - Keyboard
 - Scanner
 - Audio conversion device
 - Biometric e.g. fingerprint sensor
 - Barcode reader
 - Business card reader
 - QR code reader
 - Digital camera
 - Joystick
 - Light pen
 - Touch screen
 - Medical imaging devices
 - Microphone and more.



Storage Devices

- A device capable of holding data and information.
- Basically two types:
 - Primary memory, used to hold programs and programs data.
 - Secondary memory, a mass storage device that permanently stores data.

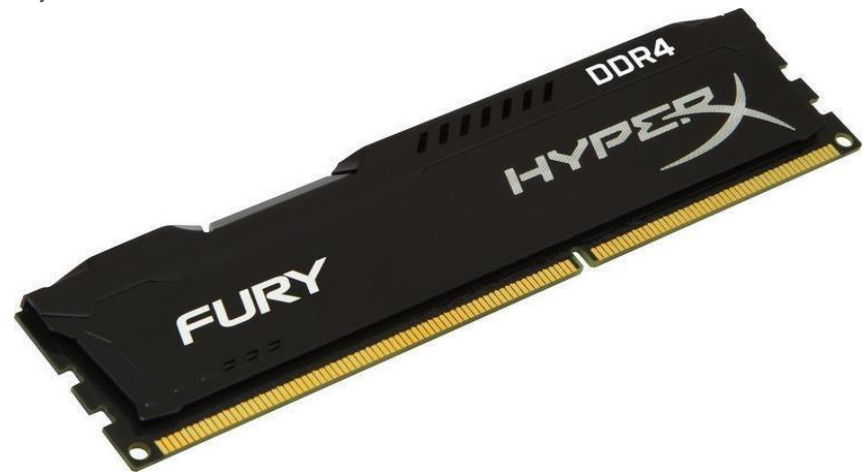
➤ Primary Memory

- Provides quick access to data and programs.
- Lies between processor and mass storage devices.
- Based on type and purpose, classified to several sub-types:
 - RAM
 - ROM
 - BIOS memory
 - Cache memory
 - CPU Registers.

Primary Memory

1. RAM

- Random Access Memory, allows random access of data rather than sequential.
- Holds part of the OS and programs being run by the computer.
- Faster than secondary memory to enable fast data processing.
- Volatile memory.
- Different types including:
 - SRAM (Static random access memory)
 - SDRAM (Synchronized dynamic random access memory)
 - DDR SDRAM (Double data rate SDRAM)
 - DDR2 SDRAM
 - DDR3 SDRAM
 - DDR4 SDRAM



Primary Memory

2. ROM

- Read Only Memory, a memory on which data is pre-recorded.
- Data written on ROM can't be modified or with difficulty.
- Non volatile.
- Stores firmware and other programs like those needed to boot computer.
- Used to store the entire OS of some devices like calculators, laser printers etc.



- **MROM**
 - Mask read-only memory.
 - Programmed by the manufacturer
 - Used to store boot loader and other firmware.

Primary Memory

2. ROM (continued...)

- PROM

- Programmable read-only memory
- Blank chips on which data could be written only one.

- EPROM

- Erasable programmable read-only memory.
- Data can be erased and re-written.
- Ultraviolet light is used to erase data.

- EEPROM

- Electrically erasable programmable read-only memory.
- Data is erased by exposing the chip to an electric charge.
- Similar to flash memory.
- Allows to write data one byte at a time rather than in blocks.

Primary Memory

3. BIOS Memory

- Built into the motherboard.
- Non volatile.
- Stores BIOS settings.
- Traditionally called CMOS RAM as it uses a volatile **C**omplementary **M**etal-**O**xide **S**emiconductor SRAM powered by the "CMOS" battery.



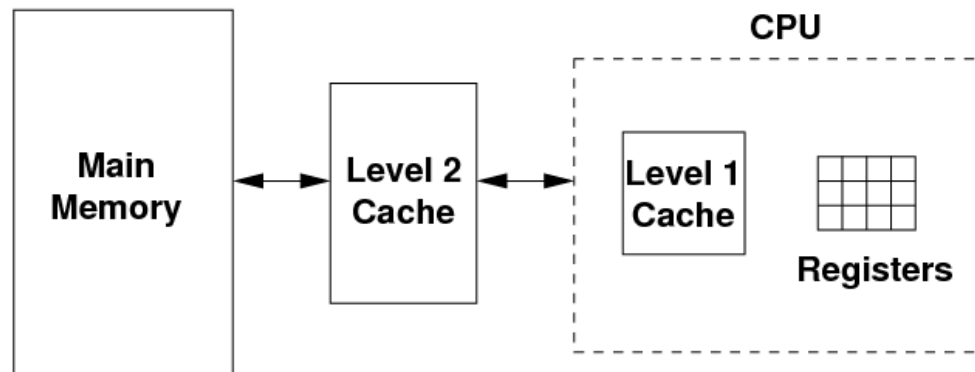
Primary Memory

4. Cache Memory

- Integrated directly with CPU.
- Faster than RAM.
- Smaller size.
- Stores frequently accessed instructions.

5. CPU Registers

- Inside CPU.
- Provides very fast access to data e.g. an instruction, address or character.



Secondary Memory

- Non-volatile memory.
- Permanently stores data until deleted.
- Large capacity.
- Slower.
- Examples: Hard drive, SSD drive, Flash memory.

1. Hard Disk Drive

- Magnetic storage device.
- One or more platters in air sealed casing.
- Magnetic head reads and writes the data.
- Connected to the motherboard via ATA, SCSI or SATA cables.



Secondary Memory

1. HDD (continued...)

- Reading

- To transfer data from secondary memory to main memory.

- Writing

- To transfer data from main memory to secondary memory.

- Read/Write Head

- Reads and writes data into the platter.
- One or more, depending upon the number of platters.
- Three types:
 1. Positioned at a fixed distance from the platter.
 2. Some come in physical contact with the platter during read/write.
 3. Some rest lightly on the platter surface.

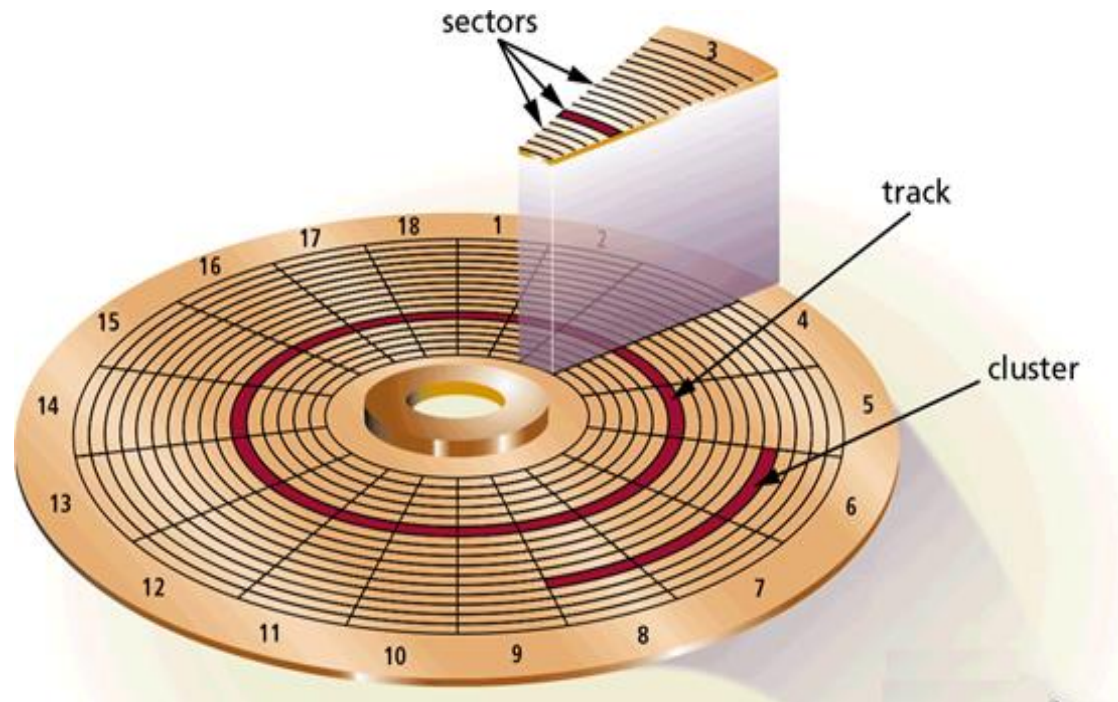


Secondary Memory

1. HDD (continued...)

- Disk Formatting

- Tracks and sectors to store data.
- 1 track = 30 sectors.
- 1 sector = 600 bytes (storing 512 kb data)



Secondary Memory

2. Solid State Drive

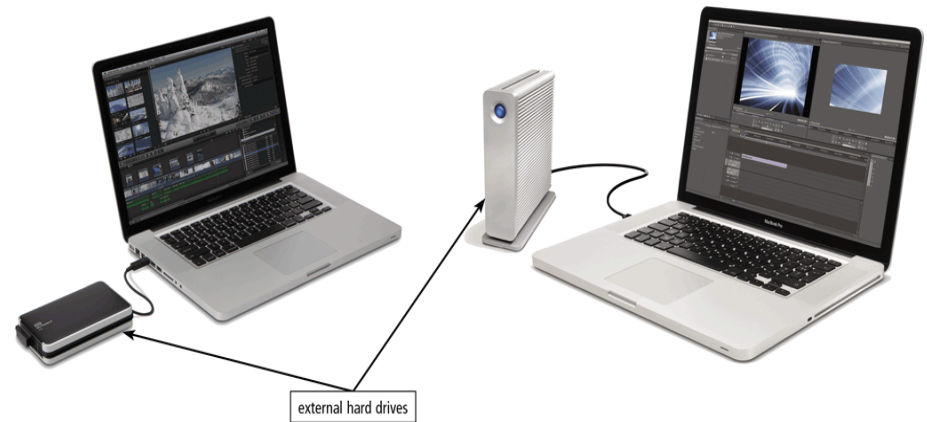
- Latest technology used in secondary storage devices.
- Much like RAM memory, but non-volatile.
- Advantages
 - No moving parts.
 - Much faster than HDD.
 - Low power consumption.
 - No noise and vibration.
 - Generates lesser heat.
 - Light in weight.
 - More reliable than HDD



Secondary Memory

3. External Hard Disk

- External storage device.
- Connects via USB or other port.



4. RAID

- Redundant Array of Independent Disks.
- Two or more HDDs or SSDs integrated together.
- Redundancy in data.
- Increased speed.
- Concurrent access to data.
- Disk mirroring.
- Disk stripping.



Secondary Memory

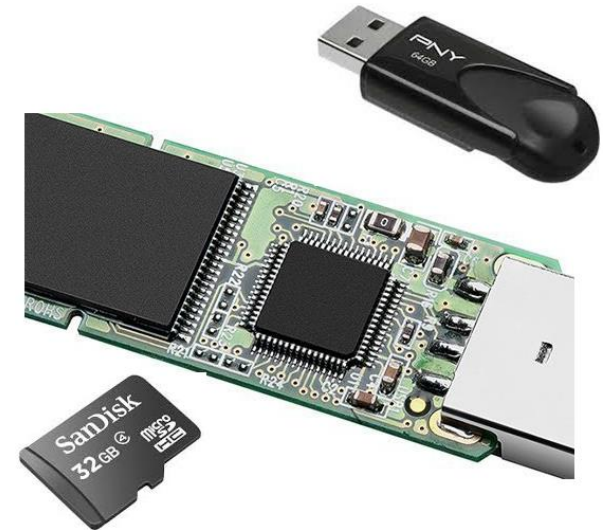
5. Optical Storage

- Optically readable media.
- Light is used to read/write data.
- Examples: CD and DVD disks.



6. Flash Memory

- Electrically erasable memory.
- Developed using the concept of EEPROM.
- Data is erased block by block rather than byte by byte.
- Faster than EEPROM.
- Examples: USB stick, memory card, SSD.



Secondary Memory

7. Cloud Storage

- Online data storage and maintenance.
- The hosting company is responsible for keeping the data available and accessible.
- Data made available over the internet.

- Personal Cloud

- Provides memory space to individuals to store and share data.
- Google Drive, Dropbox.

- Public Cloud

- Third party provides and maintains computing resources to individuals and organizations.
- Accessed online using a web browser.
- Amazon Web Service, Microsoft Azure.



Secondary Memory

7. Cloud Storage (continued...)

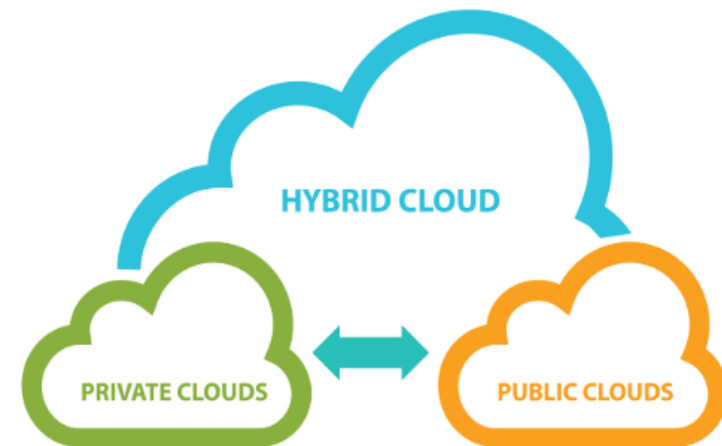
- Private Cloud

- Enterprise cloud.
- Created for the dedicated use of a single organization.
- The organization runs its own cloud servers and has a direct control over the infrastructure.



- Hybrid Cloud

- Private cloud as well as third party public cloud.
- Intended to distribute workload across two platforms.
- Requires high level of compatibility between the platforms.



Physical and Logical Storage

- Physical Storage

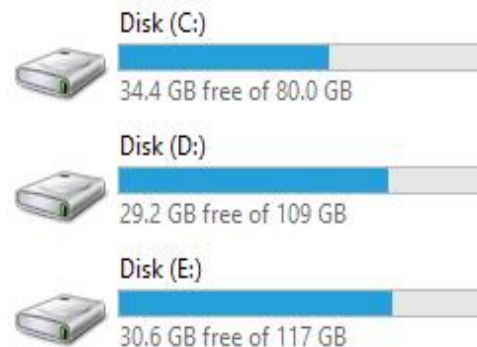
- Refers to the storage device that physically exists.
- Contains a specific amount of unallocated memory space.
- Examples: Hard drive, USB drive, SSD etc.

- Logical Storage

- Virtual space allocated within a physical drive.
- One or more partitions in the physical storage device.
- One physical drive can have multiple logical drives and vice versa.



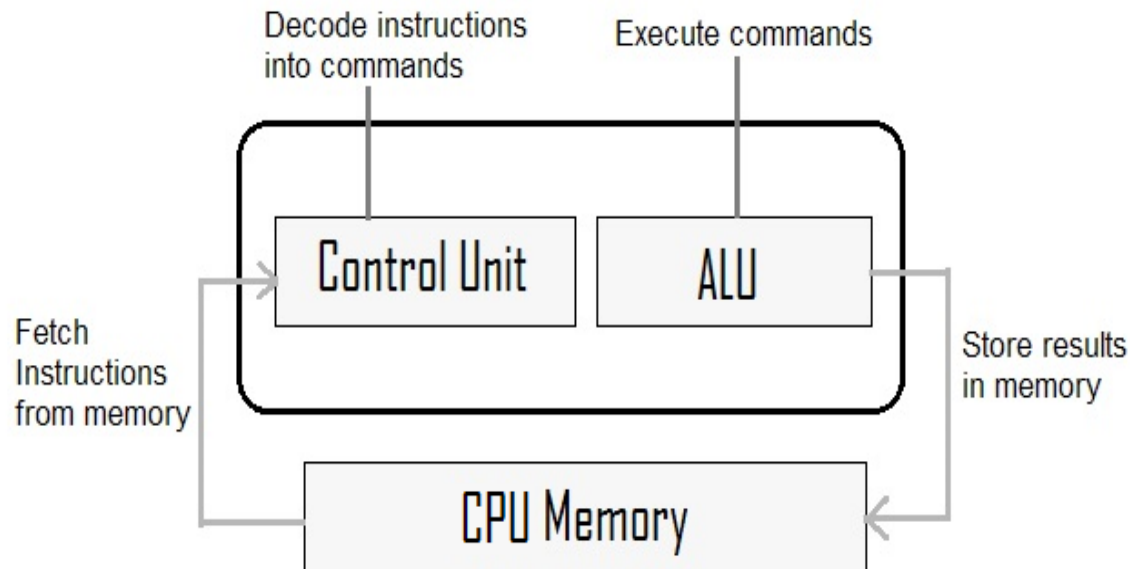
(a) Physical Storage



(b) Logical Storage

Processing Unit

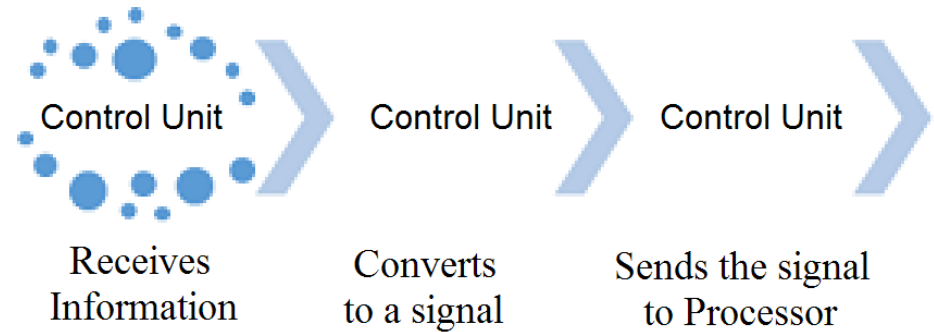
- Central processing unit (CPU).
- Handles the instructions received from hardware and software.
- Four basic components:
 - CU
 - ALU
 - Processor buses
 - Processor memory.



Processing Unit

➤ Control Unit

- Controls and directs operations.
- Extracts, decodes and executes instructions.
- Controls flow of data.



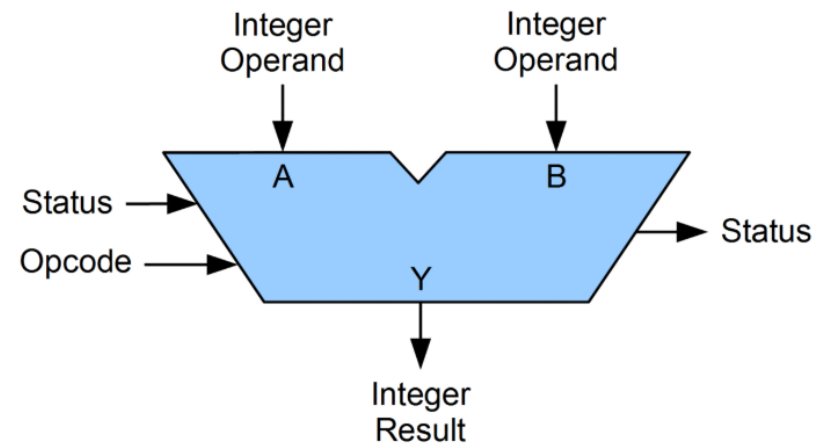
➤ Arithmetic Logic Unit

• Arithmetic Unit

- Performs arithmetic operations, e.g. addition, subtraction.

• Logic Unit

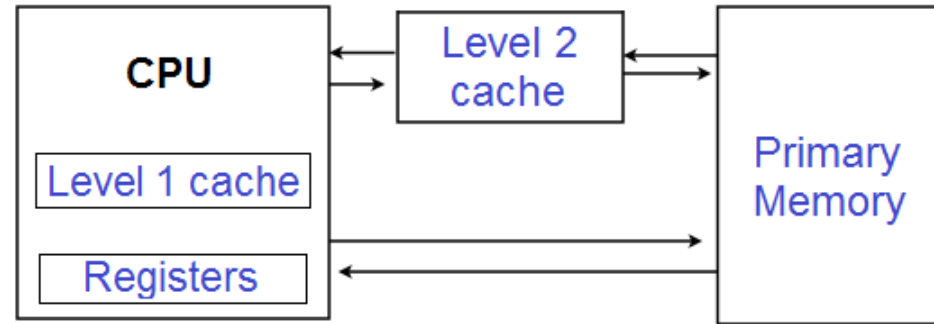
- Logical Operations, e.g. less than, greater than.
- Decision operations.



Processing Unit

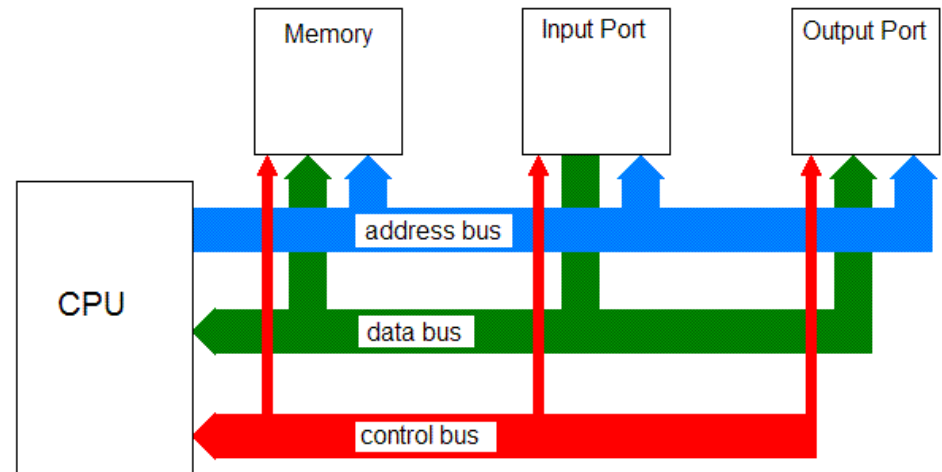
➤ CPU Memory

- Random access memory.
- Faster than regular RAM.
- Integrated with CPU or as a separate chip.
- Cache memory.
- CPU registers.



➤ CPU Buses

- Communication media.
- Interconnect chips within CPU.
- Communicate CPU components with motherboard.



Output Devices

- Peripherals that output data in some form.
- Display, e.g. on a monitor.
- Physical production, e.g. printing a document.
- Examples:
 - Printer
 - Monitor
 - Headphones
 - Speaker
 - Plotter
 - Projector
 - GPS
 - Sound card
 - Video card.



Communication Devices

These are the devices that assist a computer to connect to, and send or receive data over a network.



➤ Wi-Fi Adapter

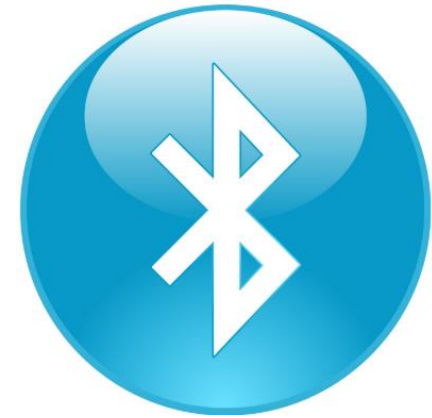
- Radio waves based communication.
- On sender device, it transforms the data into radio signals.
- On receiver side, decodes the signal it receives from the router.



Communication Devices

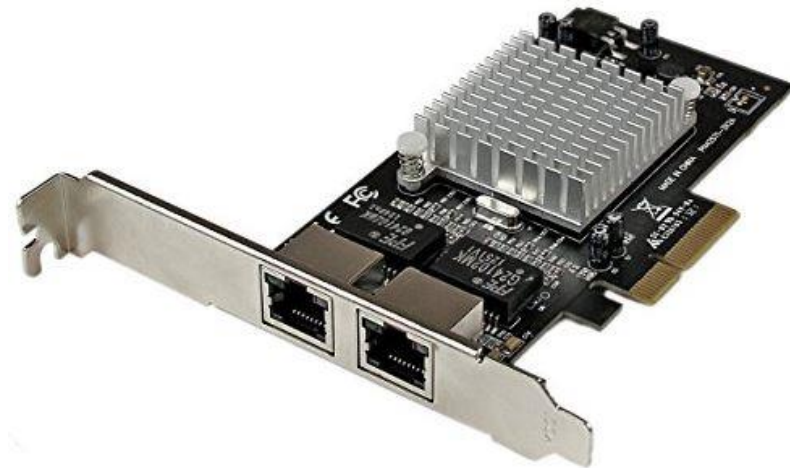
➤ Bluetooth

- Radio waves based wireless technology.
- Communication over short distances.
- Personal area network.
- High level of security.



➤ Network Interface Card

- NIC.
- Connects a device to the rest of the network.
- Interface between a computer and a network e.g. a LAN or the internet.
- Add-in card, either fitted in an expansion slot or connected via USB port.



References

- Ali, R. & Ali, A. (2018). Chapter 3: Computer Hardware. *Management Information System – 1st Edition* (pp. 35-56). Mahla Jangi, Qissa Khawani, Peshawar, Pakistan: Al-ilum Publications.

Thanks!
Any Questions
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