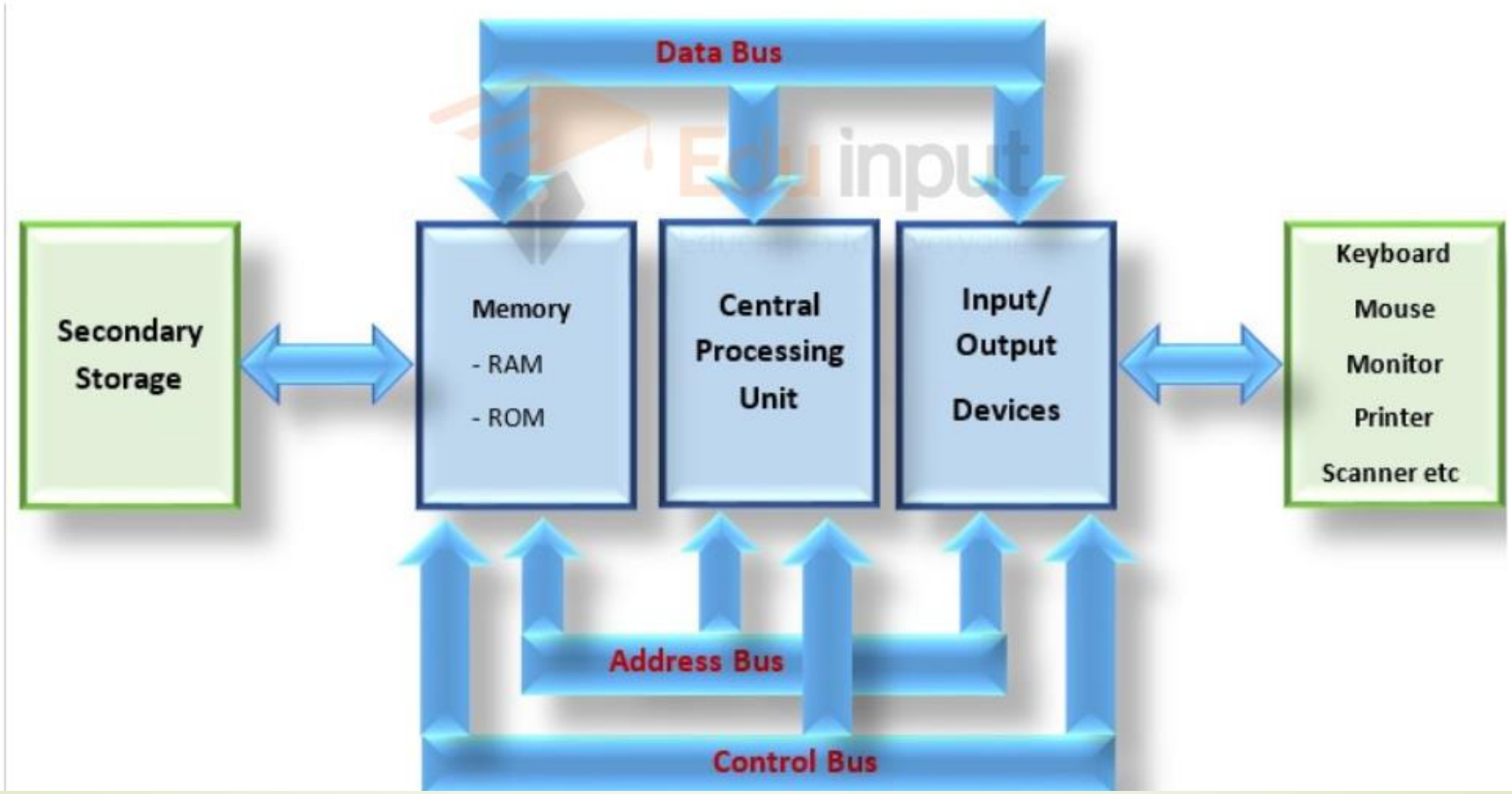
# DFITT05209:Computer Architecture

## Lecture Two

# Architecture of Computer System



# Architecture of a computer system…..

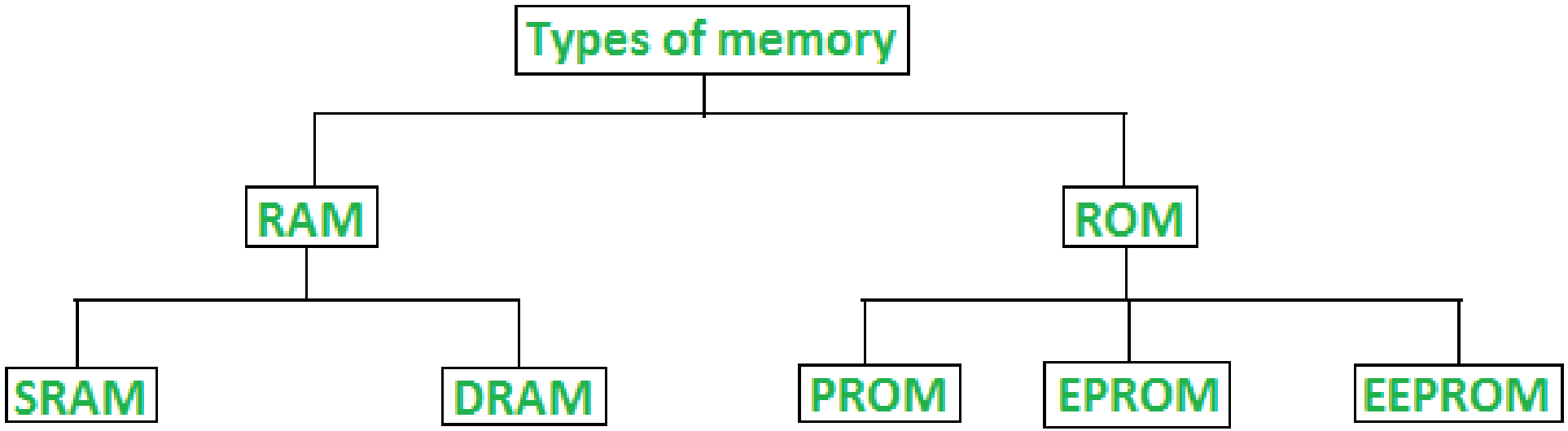
- Secondary storage, also known as auxiliary storage or external memory, is a type of data storage that provides non-volatile, long-term storage for computer systems.

- RAM is volatile memory that temporarily stores the files you are working on. Volatile memory, means that the information temporarily stored in the module is erased when you restart or shut down your computer. Information is stored electrically on transistors, when there is no electric current, the data disappears. Each time you request a file or information, it is retrieved either from the computer's storage disk or the internet

# Architecture of a computer system…..

- ROM: stands for non-volatile memory in computers., which means the information is permanently stored on the chip.
- The memory does not depend on an electric current to save data, instead, data is written to individual cells using binary code. Non-volatile memory is used for parts of the computer that do not change, such as the initial boot-up portion of the software, or the firmware instructions that make your printer run. Turning off the computer does not have any effect on ROM. Non-volatile memory cannot be changed by users.

# **Architecture of a computer system..(**RAM and ROM)



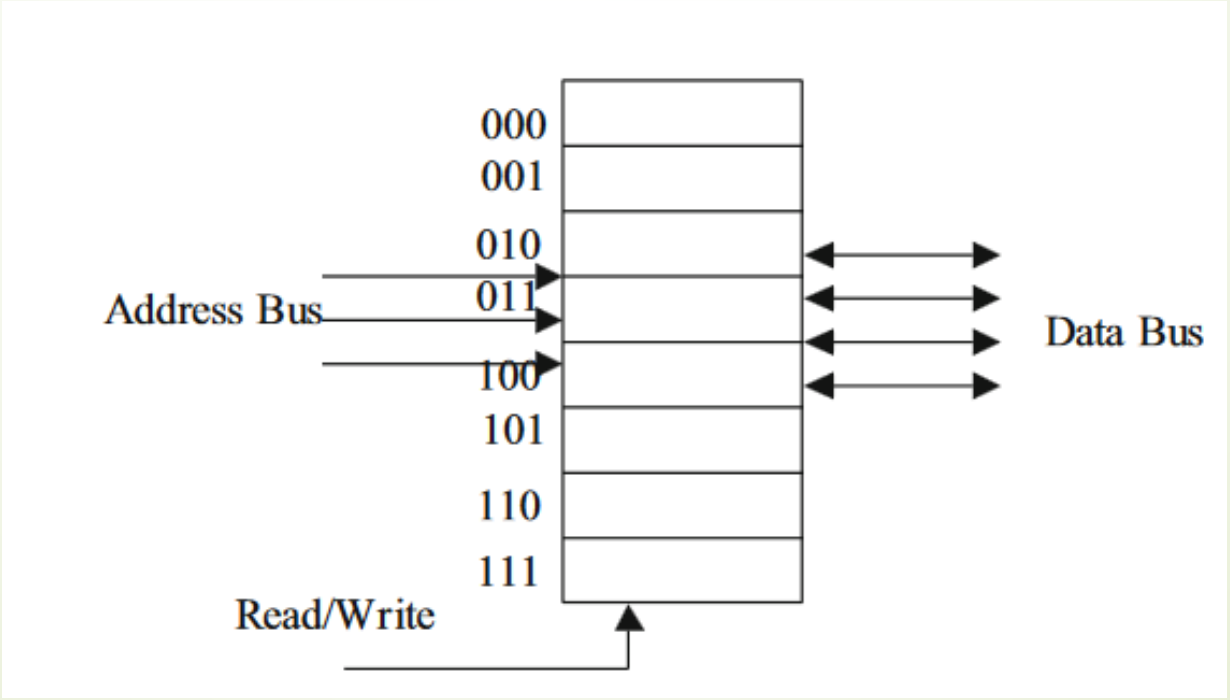

**Classification of computer memory**

# Architecture of a computer system…..

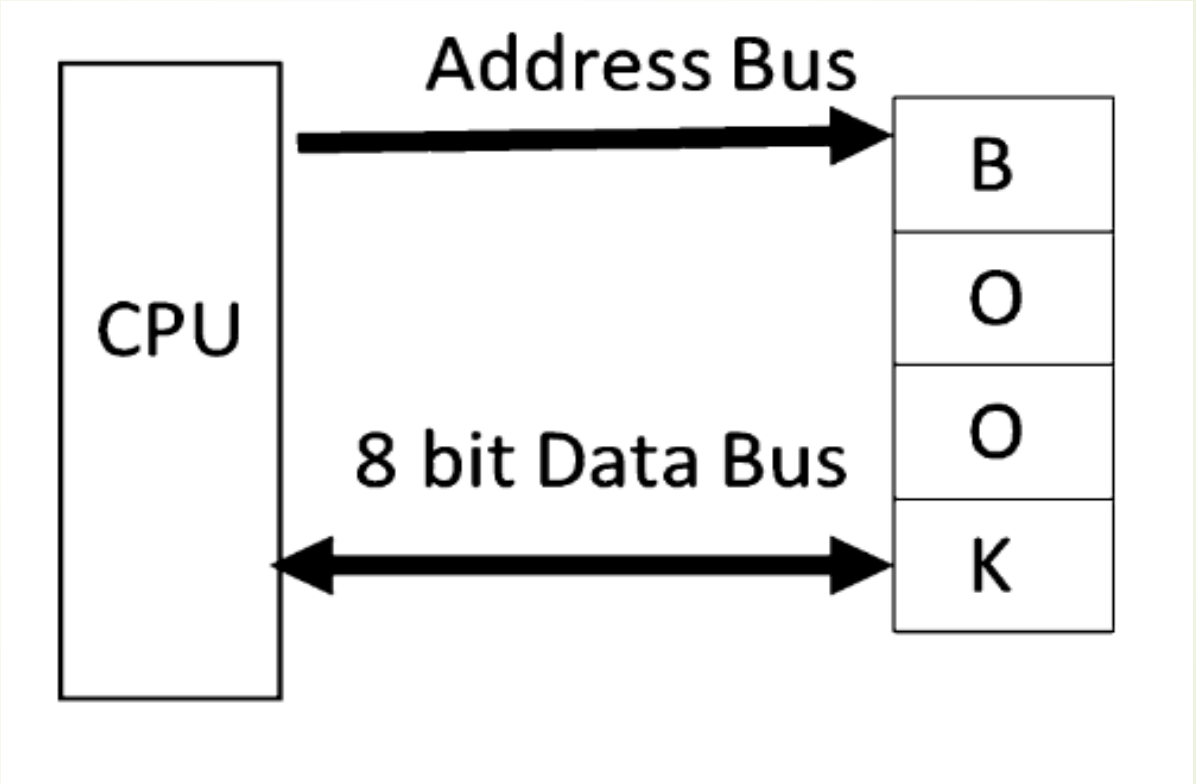
- The Central processing unit (CPU) is the "brain" of the computer and is responsible for accepting data from input devices, processing the data into information, and transferring the information to memory and output devices.

# Architecture of a computer system…..

- **CPU Buses:** When more than one wire carries the same type of information, it is called a bus. The most common buses inside a microcomputer are the address bus, the data bus, and the control bus.



# Architecture of a computer system…..



# Architecture of a computer system…..



- Address Bus: Is a communication pathway used to send memory addresses from the CPU to other components, such as RAM or I/O devices
- Data Bus : The data bus is used to carry data to and from the memory.

# Relation Between Address Bus and Data Bus

- Cooperation: Both buses work together to facilitate communication within a computer system.

The address bus specifies where data is to be sent or retrieved, while the data bus carries the actual data.

- Synchronous Operation: When the CPU wants to read or write data, it first uses the address bus to send the address of the memory location, then uses the data bus to transfer the data to or from that address

# Differences Between Address Bus and Data Bus.....

| Feature | Address Bus | Data Bus |
|---|---|---|
| **Direction** | Unidirectional | Bidirectional |
| **Function** | Carries memory addresses | Carries actual data |
| **Width** | Determines addressable memory size | Determines data transfer capacity |
| **Data Type** | No data, only addresses | Transfers data (e.g., bytes, words) |
| **Usage** | Used for locating data in memory | Used for transferring data |

# Control Bus

- Control Bus plays a crucial role in managing the operations of both the Data Bus and the Address Bus

Management Role of the Control Bus

i. Coordinating Operations
ii. Timing Signals
iii. Control Signals

# i. Coordinating Operations

- ✓The control bus sends control signals that dictate when data should be read from or written to memory or I/O devices
- ✓This coordination ensures that the Data Bus and Address Bus operate in harmony

# Timing Signals

- It provides timing signals that synchronize the operations across the system.
- This is essential for ensuring that data is transferred at the correct time, preventing conflicts or data corruption

# Control Signals

The control bus conveys specific commands, such as:

i. **Read/Write Commands:** Indicating whether data should be read from or written to a specific address.
ii. **Interrupt Signals:** Indicating that a device needs the CPU's attention.
iii. **Acknowledgment Signals:** Confirming that a command has been received or executed.

# Performance in a computer system



- In computer organization, performance refers to the speed and efficiency at which a computer system can execute tasks and process data

- A high-performing computer system is one that can perform tasks quickly and efficiently while minimizing the amount of time and resources required to complete these tasks
- Definition : Computer performance is the amount of work accomplished by a computer system.

# Performance in a computer system

Factors that can impact the performance of a computer system, including

- Processor speed: The speed of the processor, measured in GHz (gigahertz), determines how quickly the computer can execute instructions and process data.
- Memory: The amount and speed of the memory, including RAM (random access memory) and cache memory, can impact how quickly data can be accessed and processed by the computer.

# Performance in a computer system

Factors that can impact the performance of a computer system, including…

- Storage: The speed and capacity of the storage devices, including hard drives and solid-state drives (SSDs), can impact the speed at which data can be stored and retrieved.
- I/O devices: The speed and efficiency of input/output devices, such as keyboards, mice, and displays, can impact the overall performance of the system.
- Software optimization: The efficiency of the software running on the system, including operating systems and applications, can impact how quickly tasks can be completed

# Performance in a computer system

- Performance depends on the response time, throughput, and execution time of a computer system ,while a Response time is the time from the start to completion of a task.

# Performance in a computer system

- **Throughput** is the total amount of work done in a given time. CPU execution time is the total time a CPU spends computing on a given task

# End of today, Lecture

# Quiz

- Define  input, output devices with examples.
- Explain what ROM is and why it is called "Read-Only Memory." what are the primary purpose of ROM in a computer system