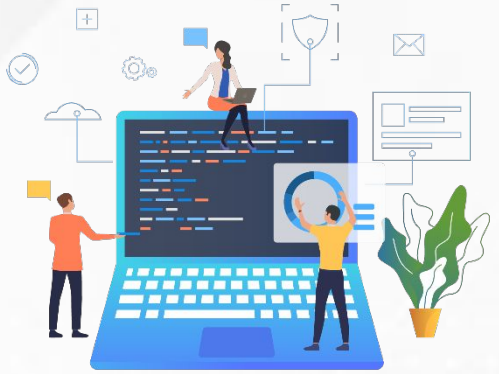
Microprocessor and Interfacing
(MPI)
GTU # 3160712

Dedicated Faculty, Committed Education
Darshan
Institute of Engineering & Technology

Unit-1: Introduction to Microprocessor



Positive Vibes MPI is the interesting, easiest and scoring subject

Prof.Swati R Sharma
Computer Engineering Department
Darshan Institute of Engineering & Technology, Rajkot

swati.sharma@darshan.ac.in
(O) 9727747317

Topics to be covered

- What is a Microprocessor?
- Basic concepts of Microprocessor
- Comparison Microprocessor vs. Microcontroller
- System Bus
- Microprocessor systems with bus organization

Introduction to Microprocessor

What is a Microprocessor?

What is a Microprocessor?

Definition:

"The Microprocessor is a

Can perform multiple tasks

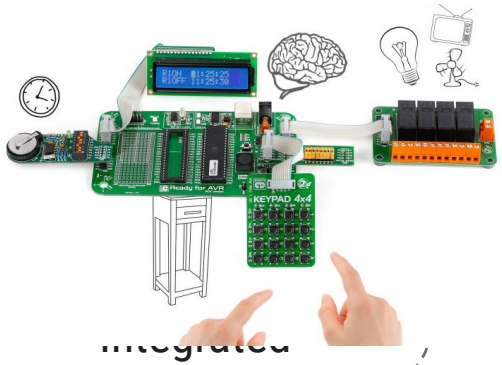
Multipurpose,

Programmable,

Clock Driven,

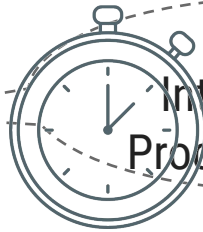
Register Based,

Digital-Integrated Circuit



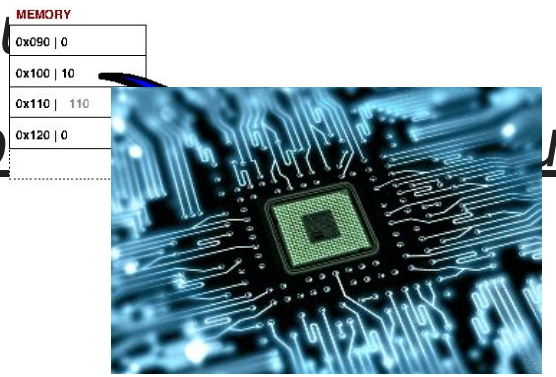
circuit (IC)

task



Store Intermediate Processing data

which accepts binary data as inp



processes it according to instructions stored in its memo ults as output."

Basic concepts of Microprocessor

Basic concepts of Microprocessors

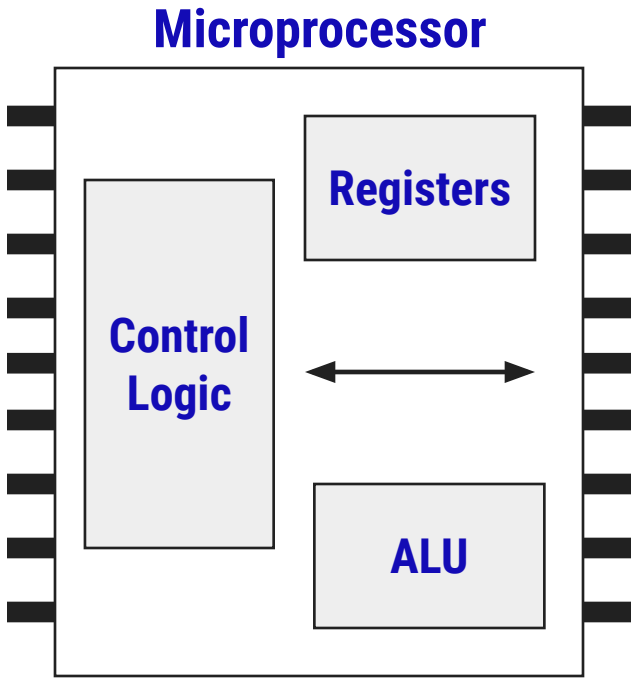
- Microprocessor is a computer **Central Processing Unit (CPU)** on a single chip that contains millions of **transistors** connected by wires.

Processor	No. of transistors
Intel 8085	6500
Pentium IV	42 million
Core i3	1.4 Billion
Core i7	1.7 Billion

Basic concepts of Microprocessor

Microprocessor

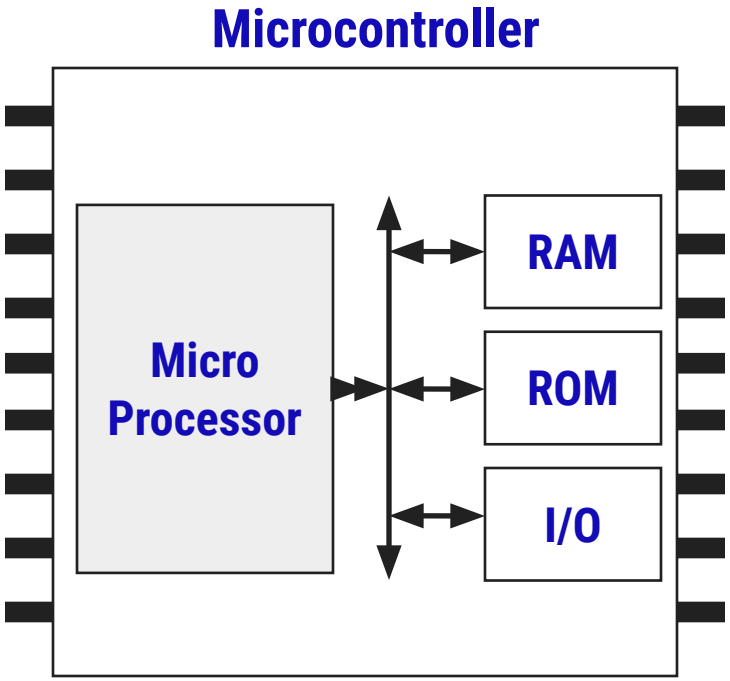
Silicon chip which includes ALU, Register circuits & Control circuits

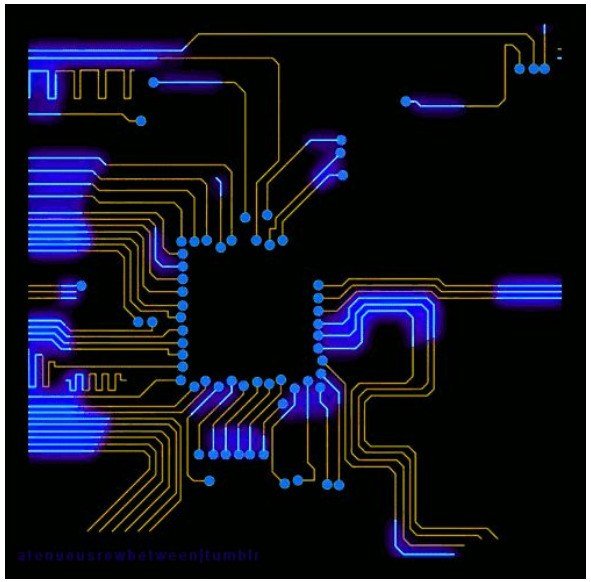


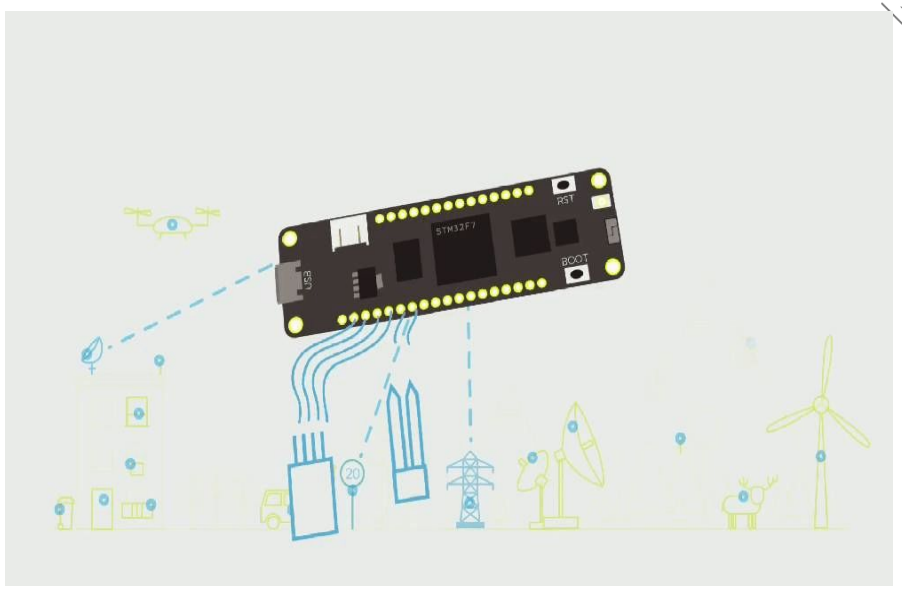
Basic concepts of Microprocessors

Microcontroller

Silicon chip which includes microprocessor, memory & I/O in a single package.







Microprocessor vs. Microcontroller

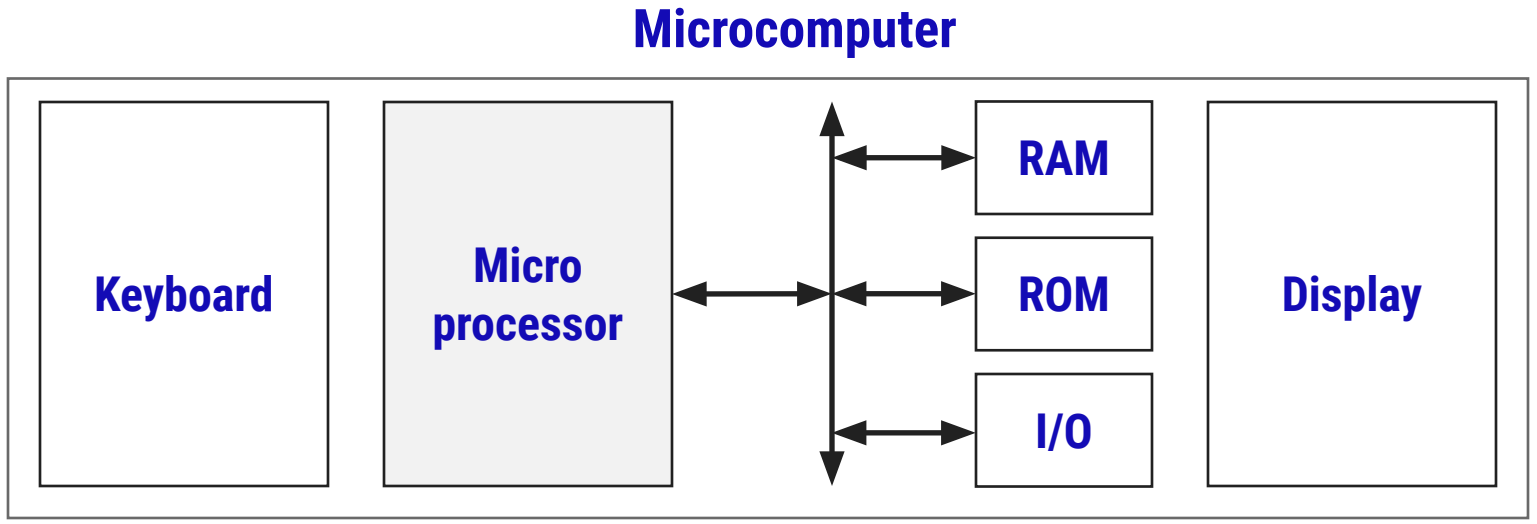
Microprocessor vs Microcontroller

Microprocessor	Microcontroller
It is vital part of **computer system**.	It is vital part of **embedded system**.
It contain CPU inside it but does not contain on chip RAM, ROM and other peripherals.	It has CPU, fixed size of RAM, ROM and peripherals mounted on a single chip.
It is multipurpose device which performs several tasks. **E.g.** Software development, word processing, playing games, surfing etc.	It is designed for specific task with fixed input, processing and output. **E.g.** Operating a washing machine, handling mouse click event etc.
It operates at high speed compared to microcontroller. E.g. Clock speed of latest microprocessor is measured in GHz.	It operates at comparatively lower speed than microprocessor. E.g. Clock speed is measured in MHz.
Application: Desktop PC's, Laptops, notepads etc.	**Application**: Microwave oven, washing machine, remote control, Mouse etc.

Basic concepts of Microprocessors

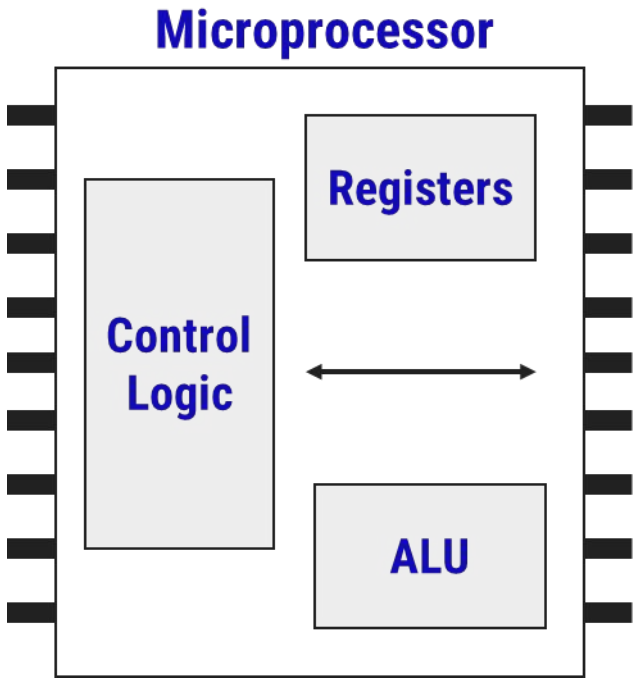
Microcomputer

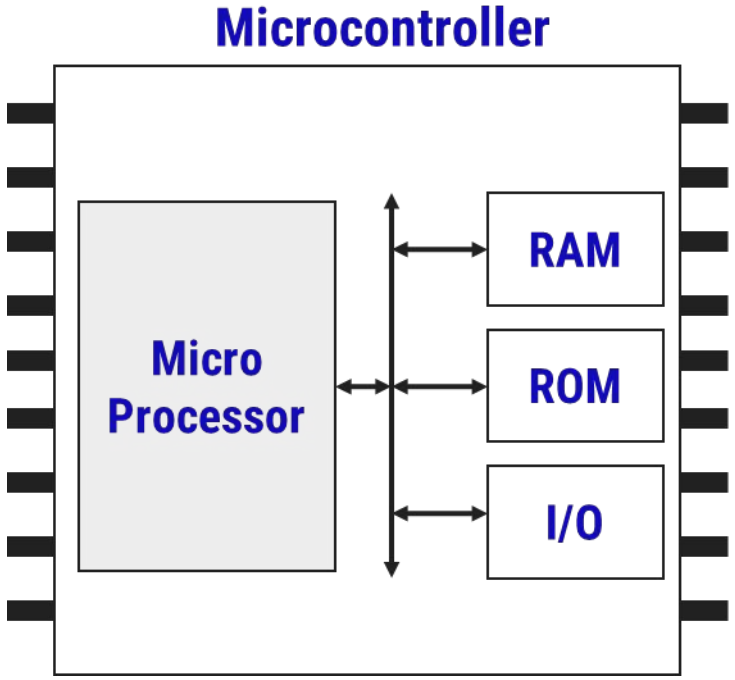
A small computer with a microprocessor as its CPU. Includes memory, I/O etc.

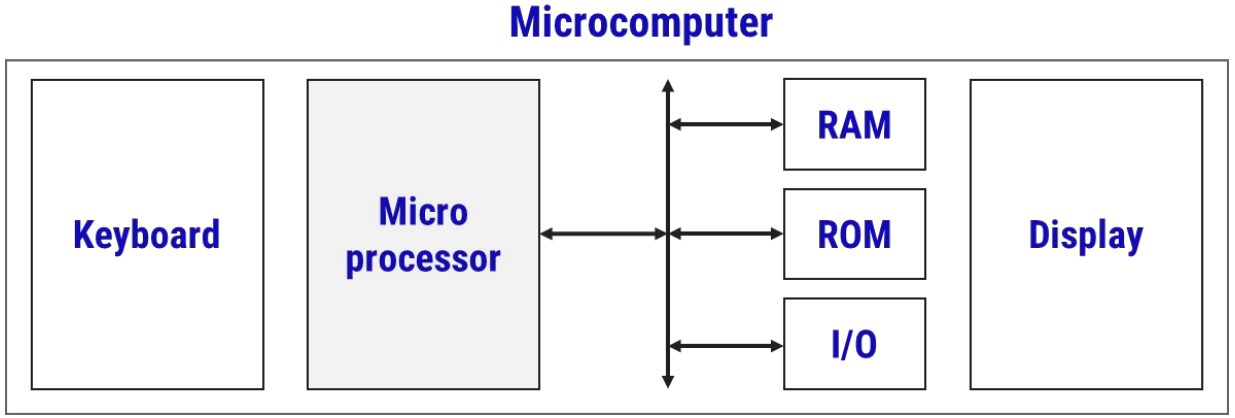


*Que:Explain the difference between a microprocessor and a microcomputer.[**3-marks, GTU Exam Winter 2018]***

Microprocessor, Microcontroller and Microcomputer



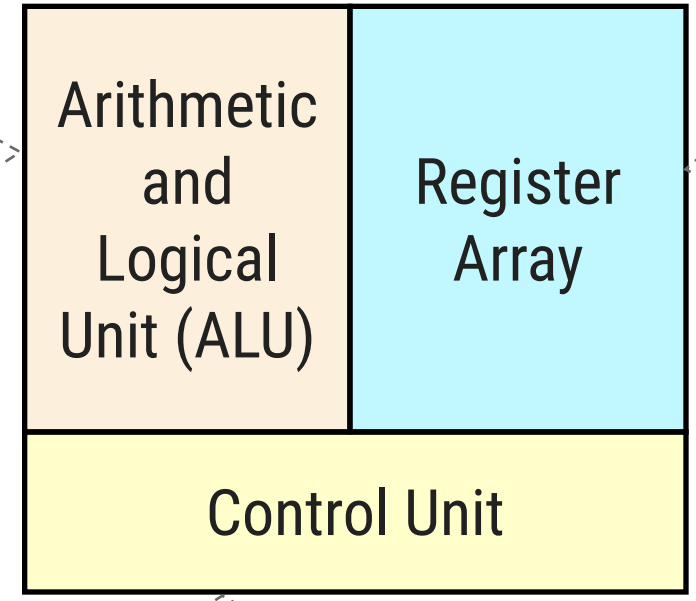




Components of Microprocessor

Components of Microprocessor

- **Brain** of the computer.
- Performs Arithmetic and Logical operations



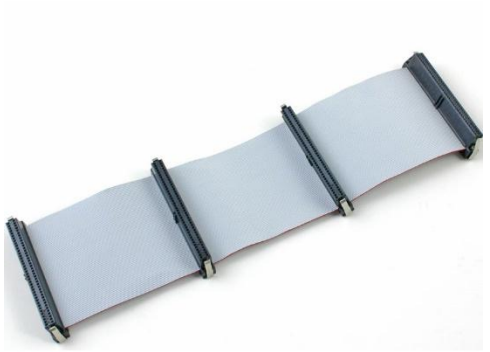
Small additional memory location, which are used to **store** and **transfer** data.

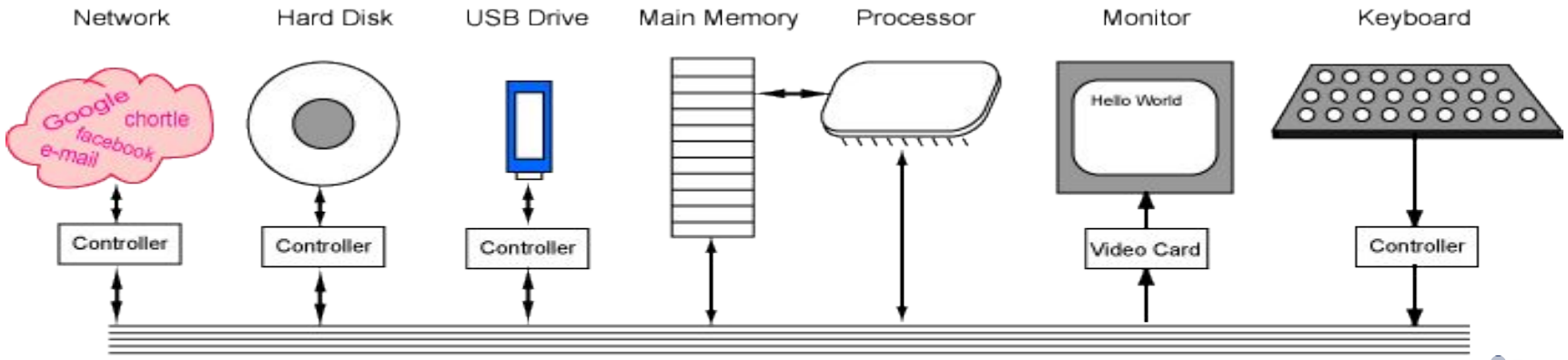
- It controls and executes the flow of **data** between the microprocessor, memory and peripherals.
- Signal **permits** the CPU to receive or transmit data.

System Bus

System bus

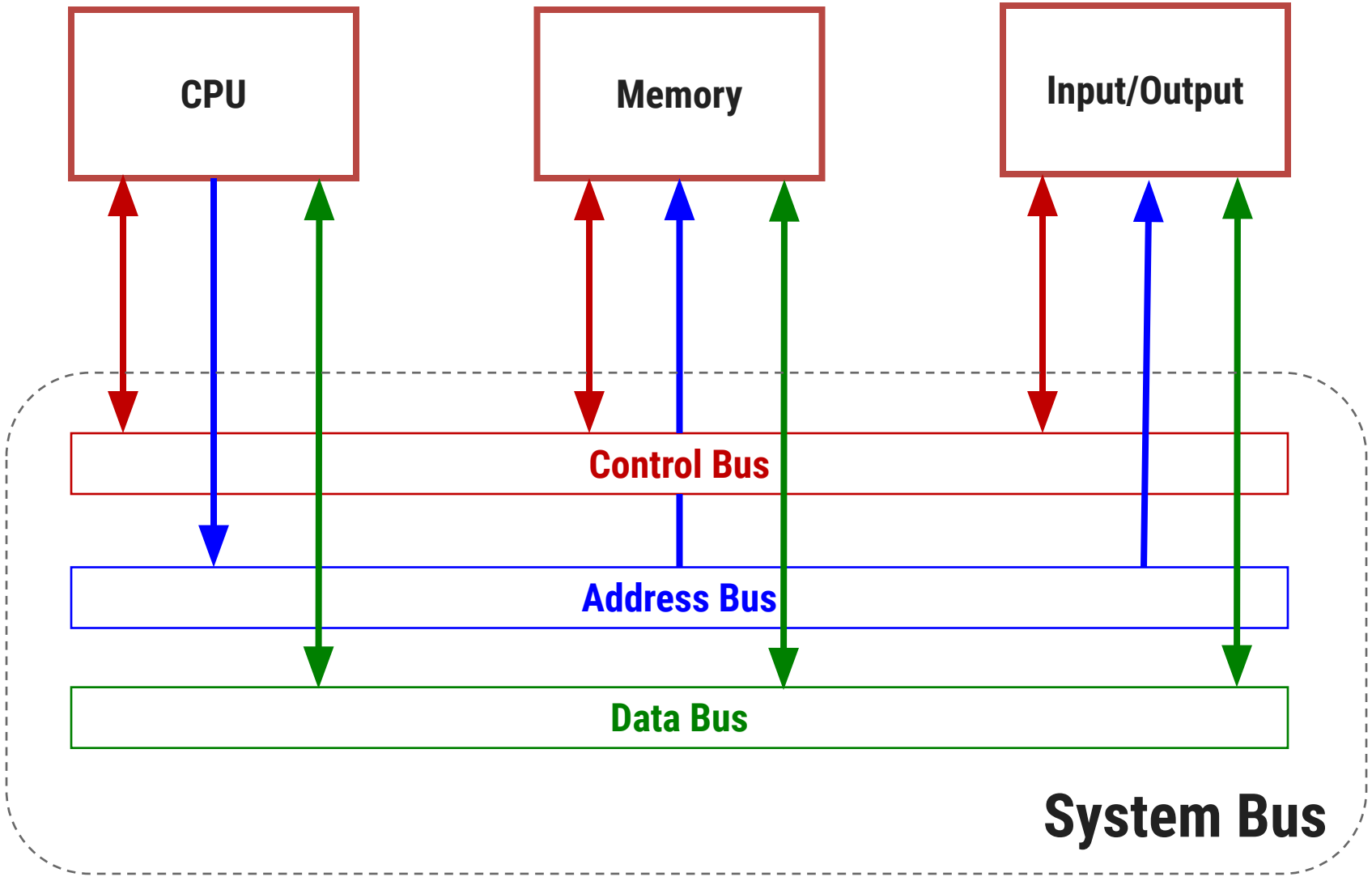
- The network of wires or electronic pathways is known as **'Bus'**.
- The technique was developed to reduce costs and improve modularity.
- Classification
  1. **Address Bus** - Transfer Address
  2. **Data Bus** - Transfer Data
  3. **Control Bus** - Transfer Control Signal



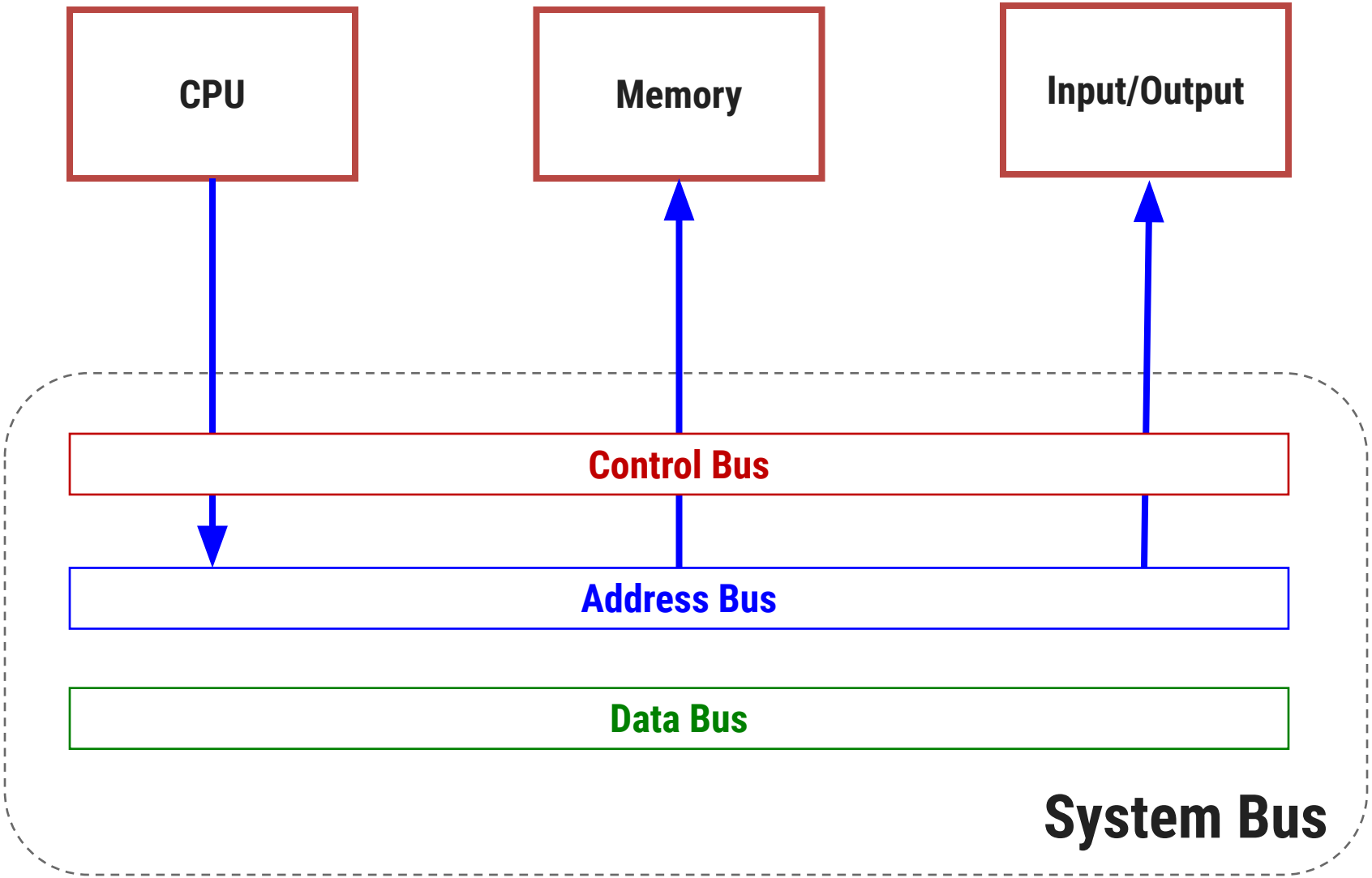


Main Components of a Computer System

System bus


CPU
Memory
Input/Output
Control Bus
Address Bus
Data Bus
System Bus

Address Bus


CPU
Memory
Input/Output
Control Bus
Address Bus
Data Bus
System Bus

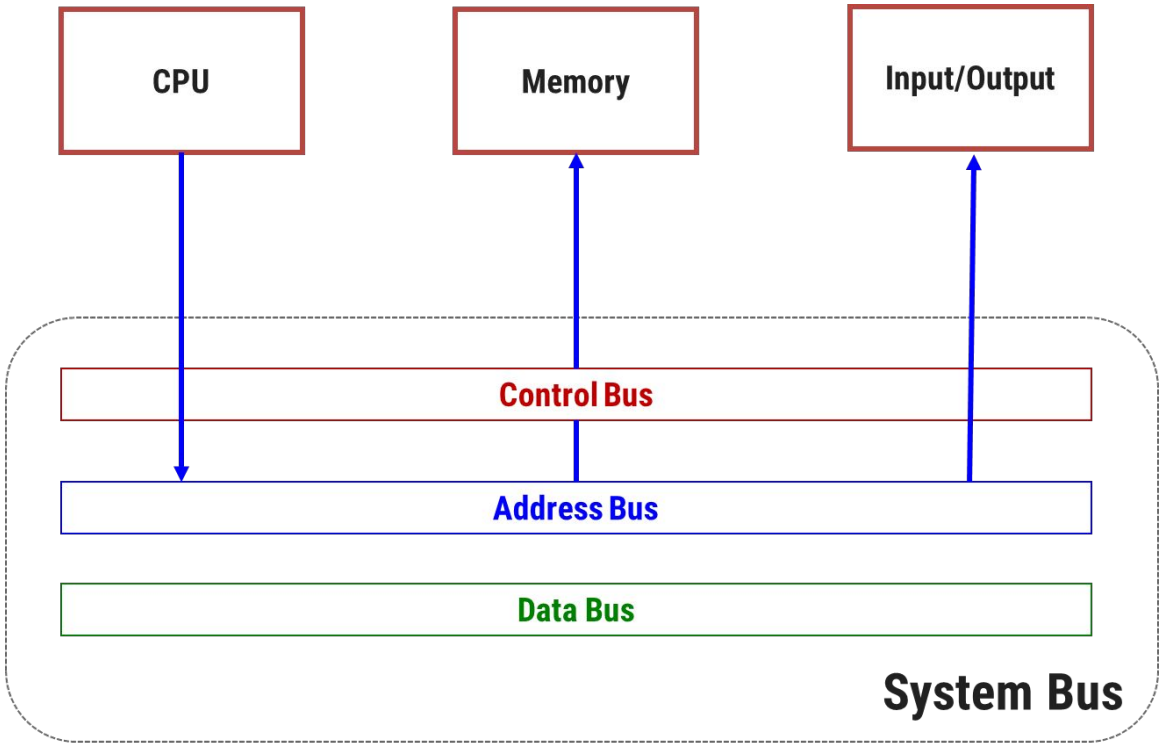
Address Bus

- Transfers the addresses of Memory or I/O devices.
- Address bus is unidirectional.
- The maximum address capacity is equal to two to the power of the number of lines present (2^{lines}).

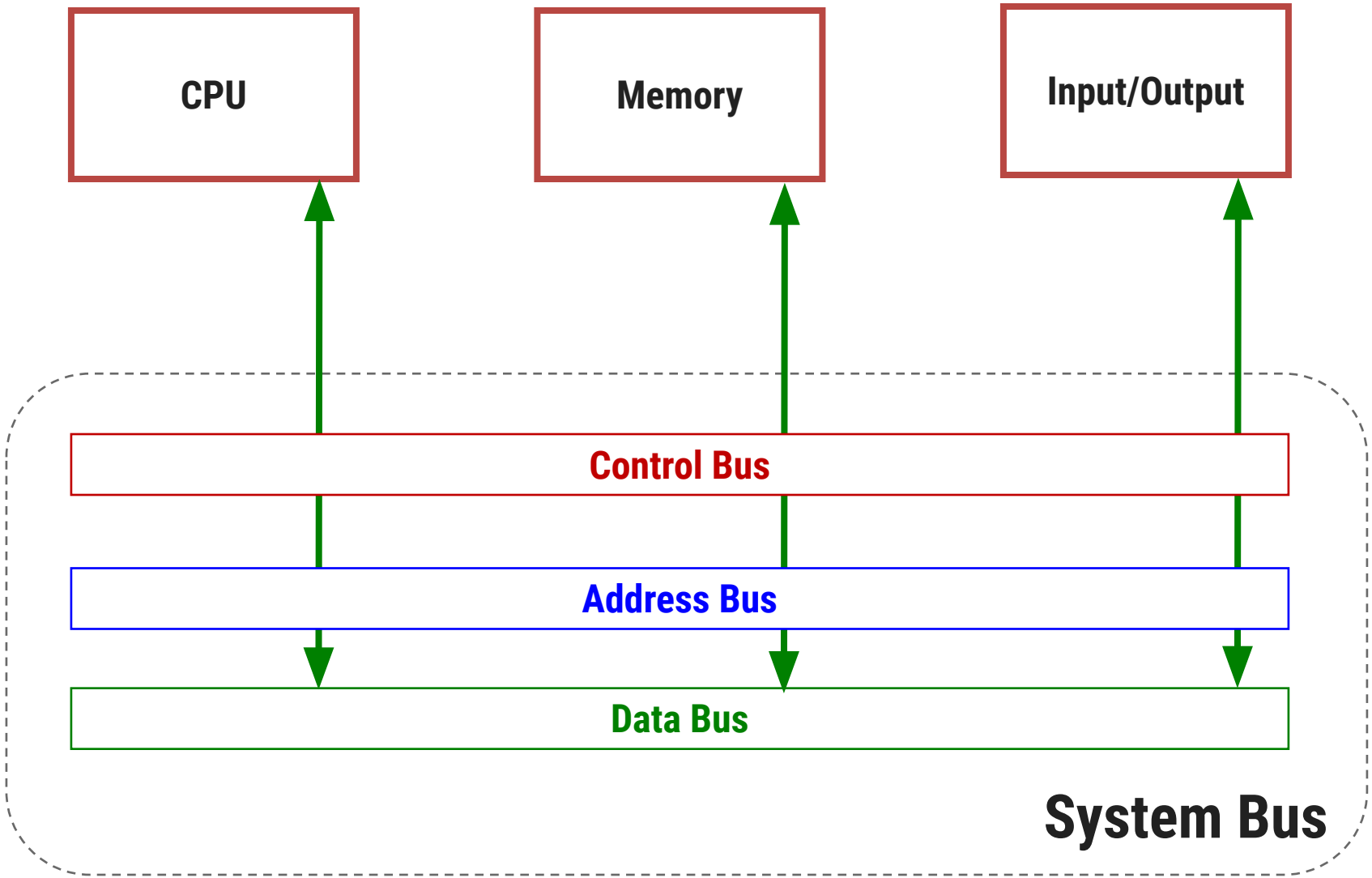
  E.g. 8085 has 16-address lines

  ∴ Maximum address capacity

  2^{16} = 65536 bytes



Data bus

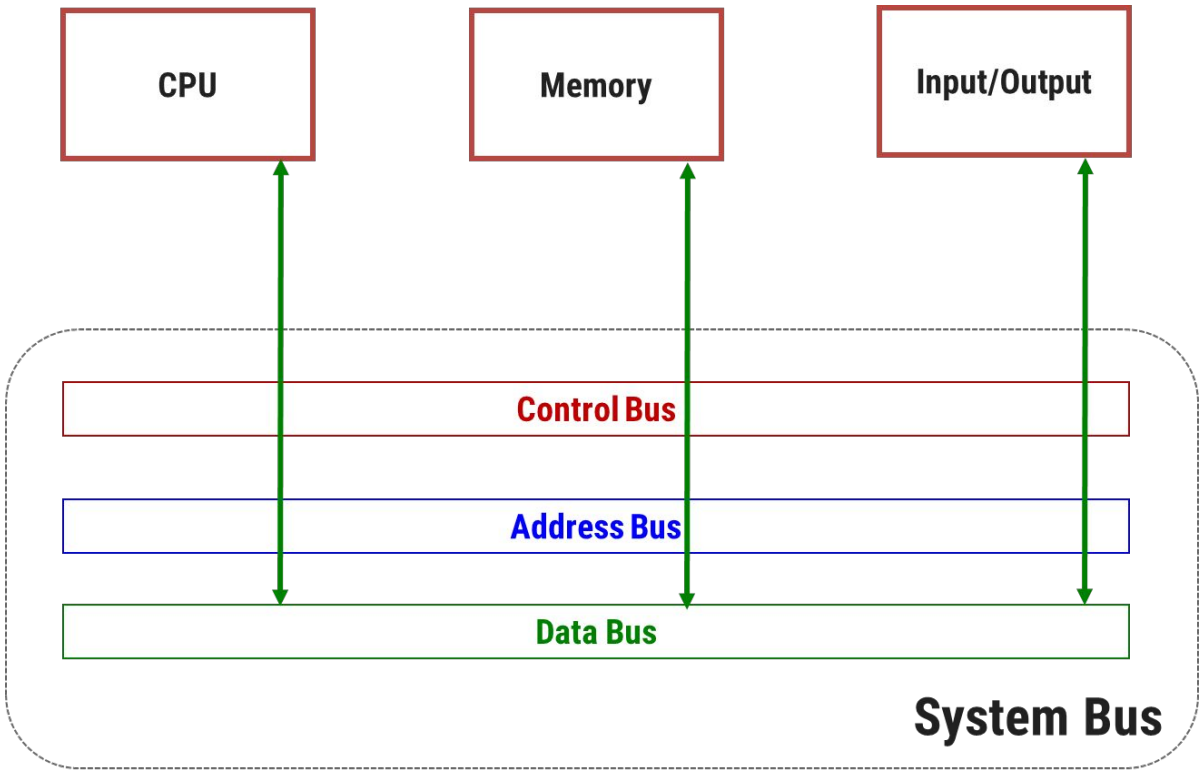


Data Bus

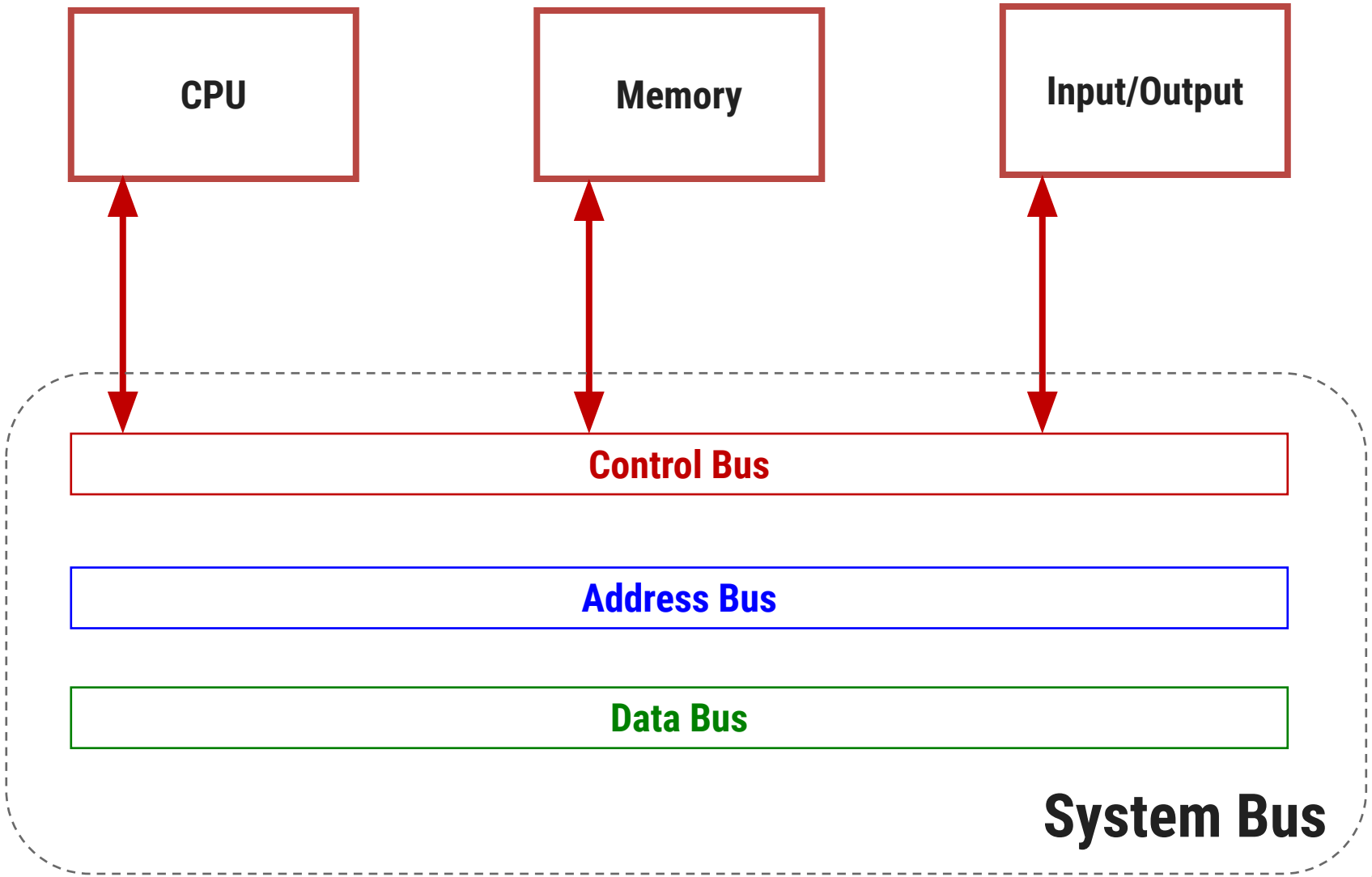
- It is used to transfer data within Microprocessor and Memory/IO devices.
- Data Bus is **bidirectional** as Microprocessor requires to send and receive data.
- Each wire of data bus is used to transfer the data corresponding to a single bit of binary data.

  E.g. 8085 has 8 - data lines

  ∴ 8085 is known as 8-bit processor



System bus

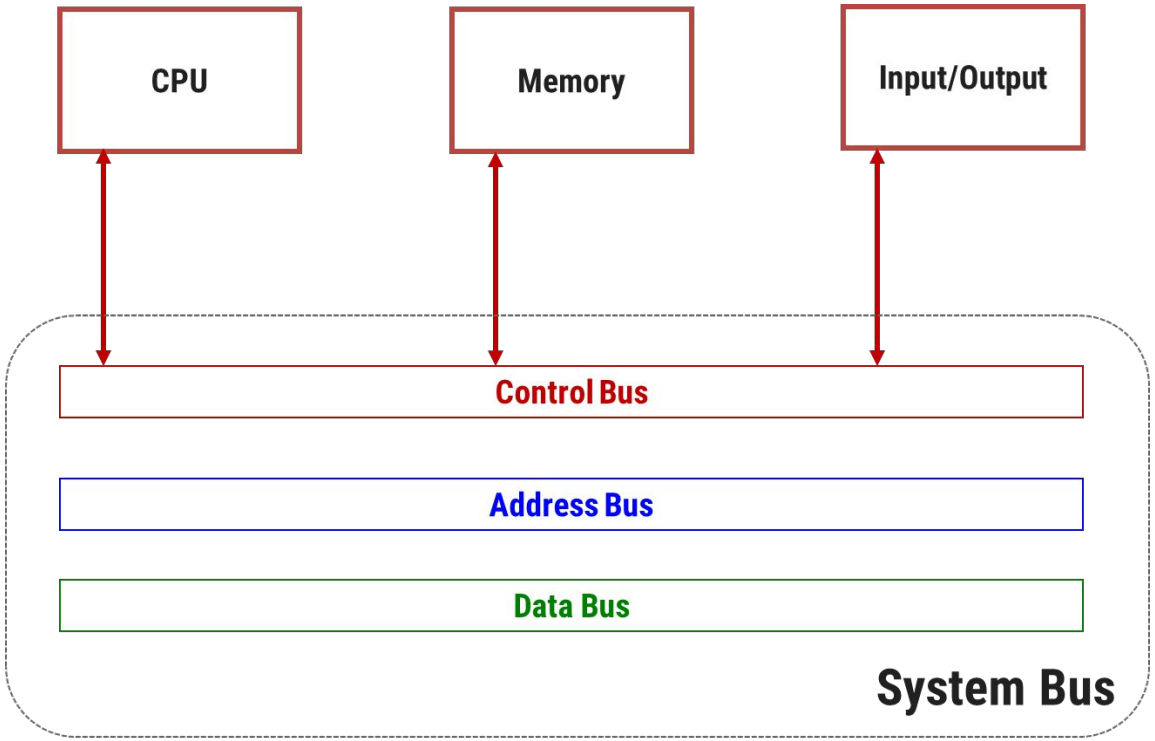


Control Bus

- Microprocessor uses control bus to process data.

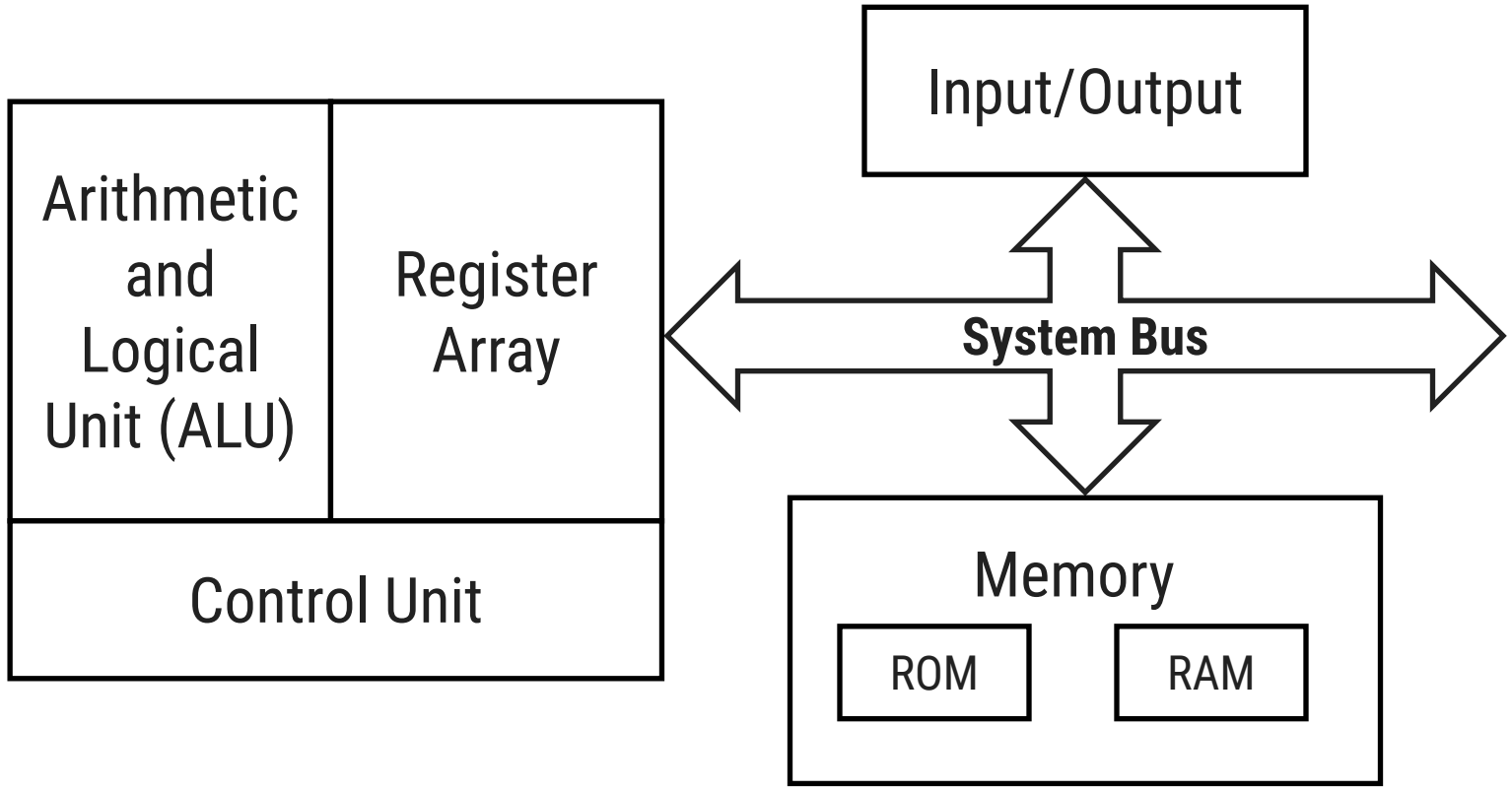
  i.e. *what to do with the selected memory location.*

- Some control signals are **Read**, **Write** and **Opcode fetch** etc.
- Control Bus is **bidirectional**.
- This is a dedicated bus, because all timing signals are generated according to control signal.



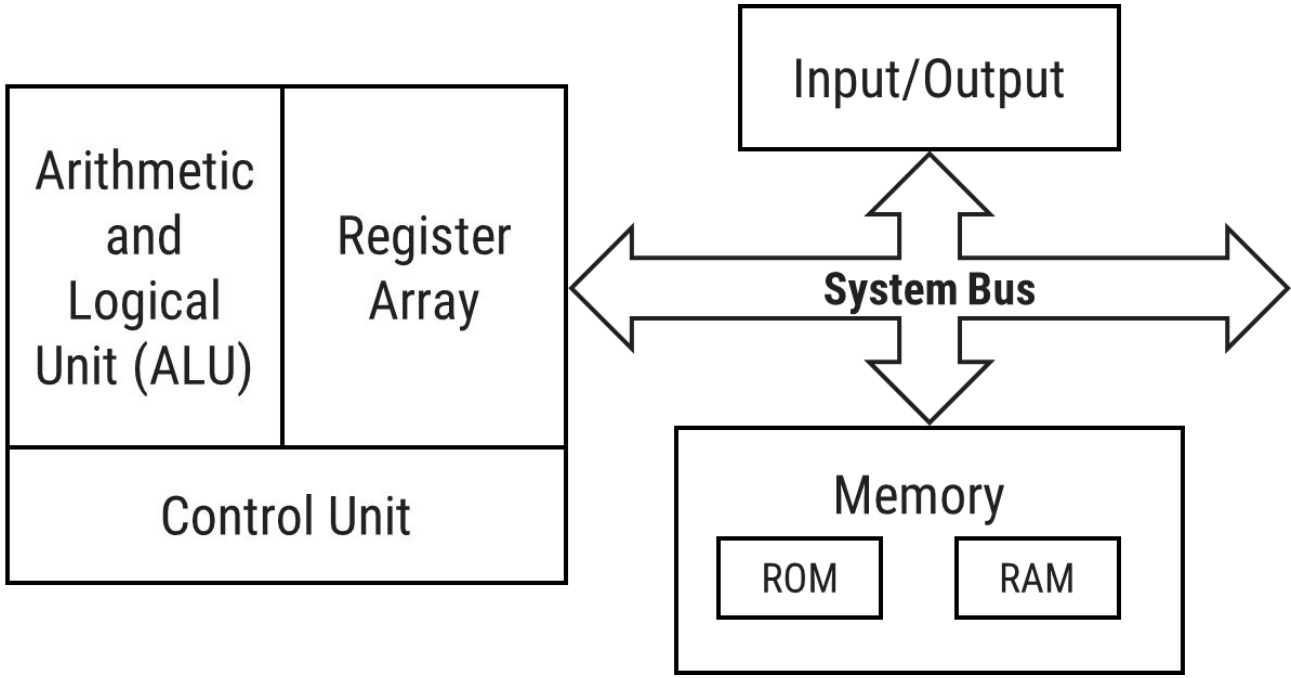
Microprocessor systems with bus organization

Microprocessor systems with bus organization



Microprocessor systems with bus organization

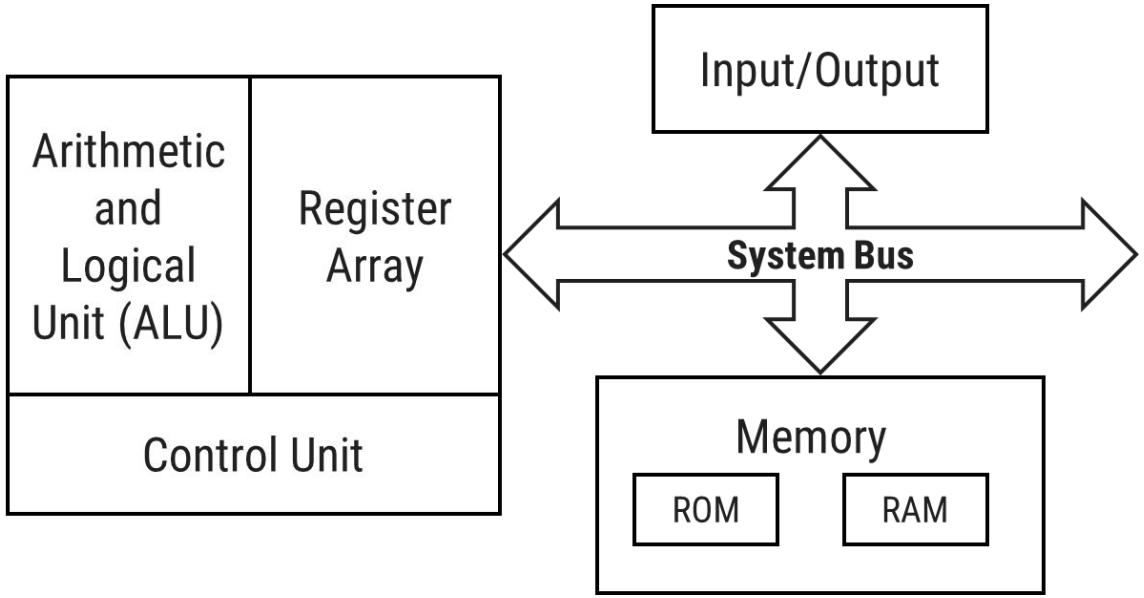
- In most simplified form a microprocessor based system consist of a **Microprocessor**, **I/O** (Input/Output) device and **Memory**.
- These components are interfaced (connected) with microprocessor over a common communication path called **system bus**.
- Microprocessor is master of the system and responsible for executing the program.



Microprocessor systems with bus organization

- **Memory** is responsible for **storing program** as well as **data**.
- System generally consists of two types of memories:
  - ROM (Read only and non-volatile) and
  - RAM (Read/write and volatile).
- I/O devices are used to communicate with the outer environment.
- Example of input device: keyboard, mouse.

  Example of output device: monitor, printer.



GTU Exam Questions

Sr	Questions	Marks	Year
1.	Explain the difference between a microprocessor and a microcomputer.	3	W'18
2.	How can you determines that Microprocessor is an 8, 16 or 32 bit.	3	W'19
3.	List and specify the various features of microprocessor, memory and I/O devices including concepts of system bus.	7	W'19

References

Book: Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh S. Gaonkar Pub: Penram International

Thank You