# SNS COLLEGE OF TECHNOLOGY

**Coimbatore-35.**

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**Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai**

## COURSE NAME : 23ITT202 – COMPUTER ORGANIZATION AND ARCHITECTURE

## II YEAR/ III SEMESTER

## UNIT – I OVERVIEW AND INSTRUCTION

**Topic: Power wall & Uniprocessors to multiprocessors**

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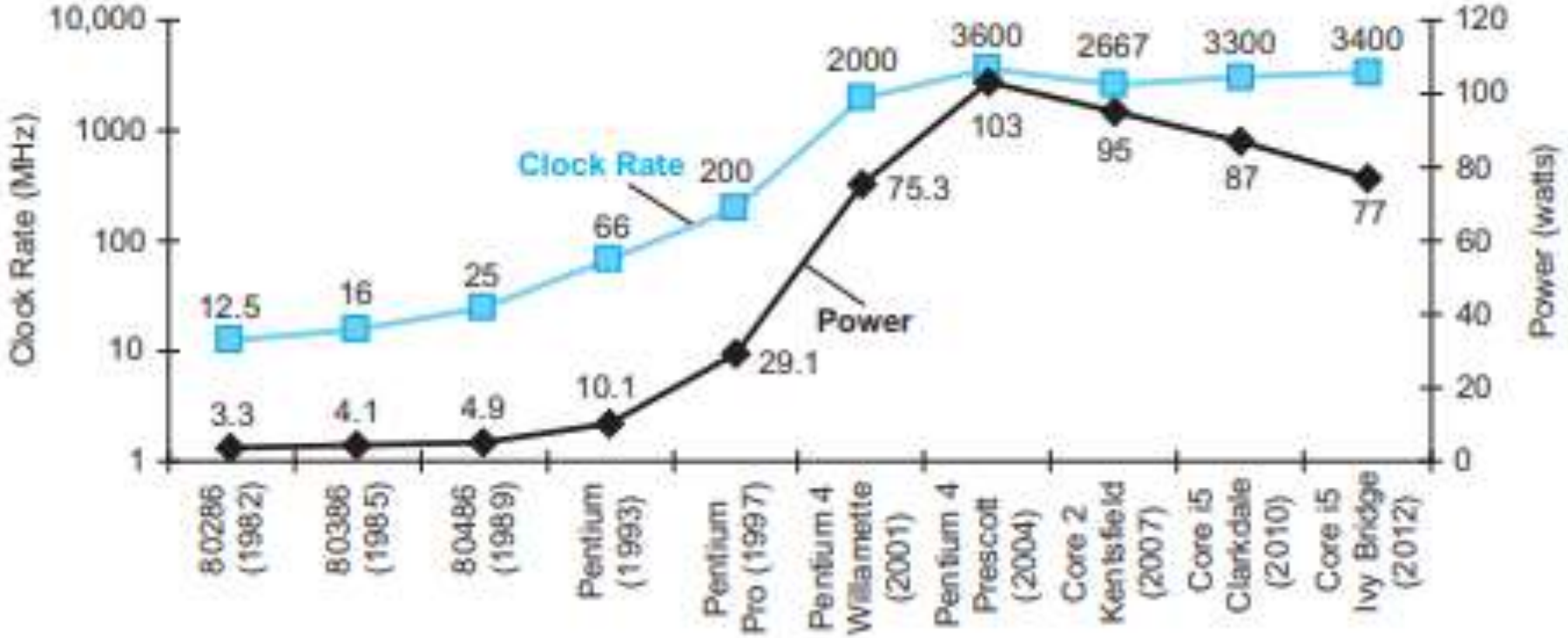
# Power Wall

- Power wall refers to the metaphorical wall signifying the peak power constraint of a system.
- The term power wall typically means that the maximum clock speed has been reached and that chips would be too hot if they were clocked at higher frequencies.
- The “Power Wall” refers to the difficulty of scaling the performance of computing chips and systems at historical levels, because of fundamental constraints imposed by affordable power delivery and dissipation.

# Clock rate and Power for Intel x86 microprocessors over eight generations and 25 years



- The dynamic energy depends on the capacitive loading of each transistor and the voltage applied:

$$Energy \propto Capacitive\ load \times Voltage^2$$

This equation is the energy of a pulse during the logic transition of $0 \rightarrow 1 \rightarrow 0$ or $1 \rightarrow 0 \rightarrow 1$. The energy of a single transition is then

$$Energy \propto 1/2 \times Capacitive\ load \times Voltage^2$$

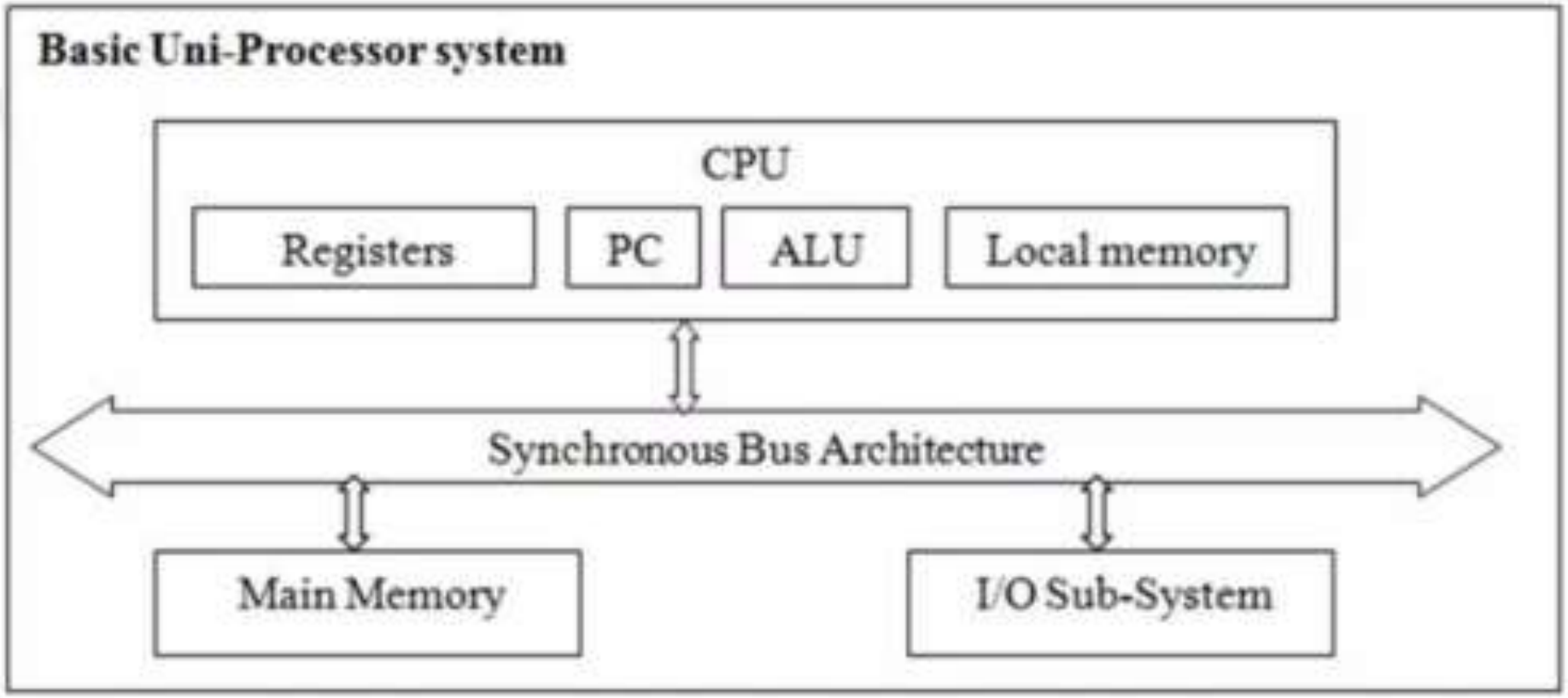
The power required per transistor is just the product of energy of a transition and the frequency of transitions:

$$Power \propto 1/2 \times Capacitive\ load \times Voltage^2 \times Frequency\ switched$$

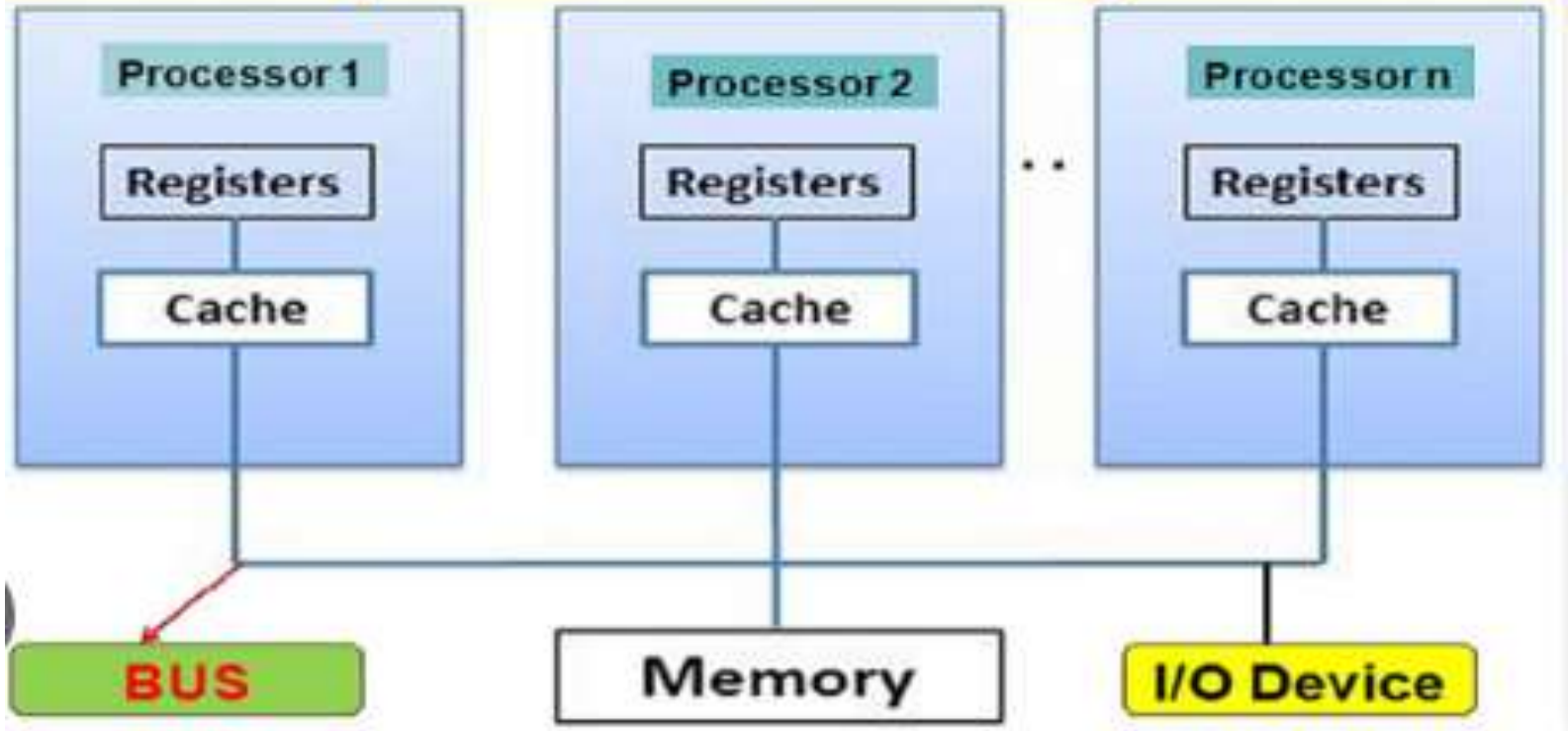
- Frequency switched is a function of the clock rate.

# Uniprocessors to multiprocessors

- The transition from uniprocessors to multiprocessors significantly impacts computer architecture.
- In uniprocessors, the focus is on optimizing the performance of a single CPU, while in multiprocessors, the architecture needs to support efficient communication and coordination among multiple CPUs.


Basic Uni-Processor system
CPU
Registers
PC
ALU
Local memory
Synchronous Bus Architecture
Main Memory
I/O Sub-System

# Multiprocessors Systems



## Uniprocessor :

A type of architecture that is based on a single computing unit. All operations (additions, multiplications, etc ) are done sequentially on the unit.

## Multiprocessor :

A type of architecture that is based on multiple computing units. Some of the operations are done in parallel and the results are joined afterwards.

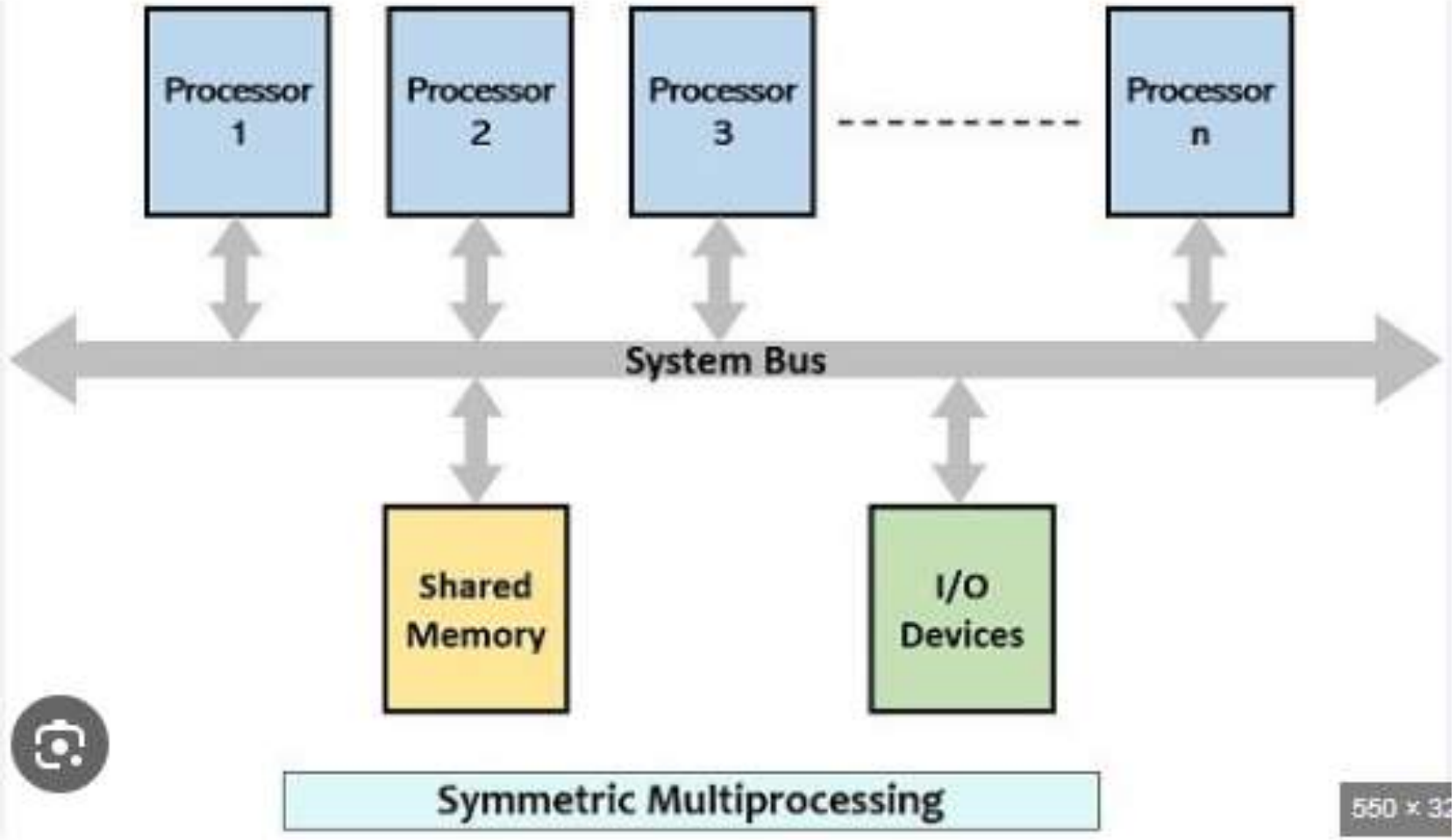
1. Symmetric multiprocessing
2. Asymmetric multiprocessing

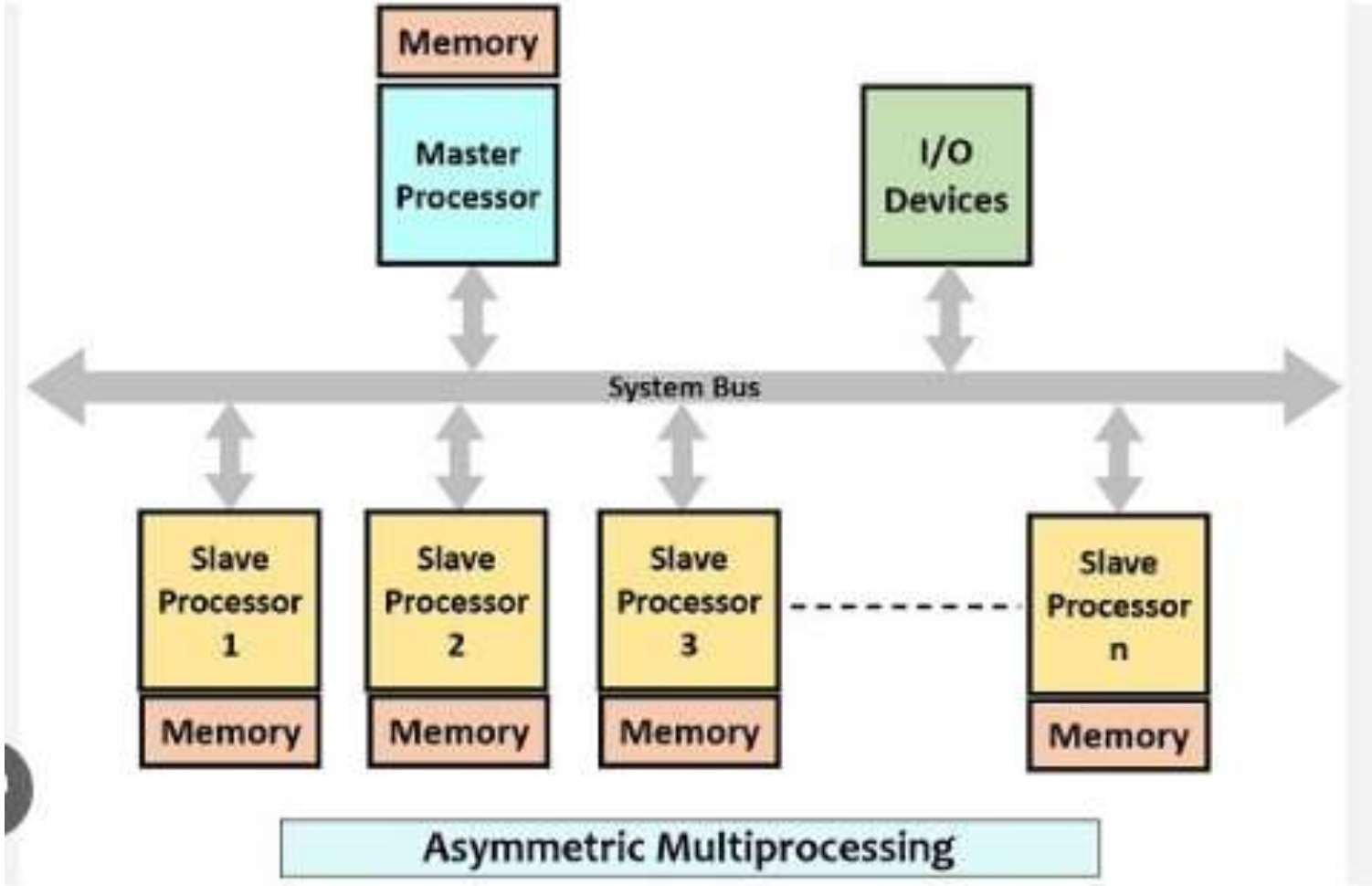
## Symmetric multiprocessing

- All the processors are treated equally.
- Two or more identical processors are connected to a single, shared main memory, have full access to all input and output devices, and are controlled by a single operating system.

## Asymmetric multiprocessing

- All the processors are not treated equally.
- The processors are in a master-slave relationship. While the other processors are viewed as slave processors, one serves as the master or supervisor process.
- In this system, the master processor is responsible for assigning tasks to the slave processor.


Processor 1
Processor 2
Processor 3
Processor n
System Bus
Shared Memory
I/O Devices
Symmetric Multiprocessing


Memory
Master Processor
I/O Devices
System Bus
Slave Processor 1
Slave Processor 2
Slave Processor 3
Slave Processor n
Memory
Memory
Memory
Memory
Asymmetric Multiprocessing


THANK
YOU!