# MULTIPROCESSORS AND MULTICOMPUTERS

UniT 1

Multiprocessor/ parallel systems

- A Multiprocessor is a computer system with two or more central processing units (CPUs) sharing full access to a common RAM.
- These systems have multiple processors working in parallel that share the computer clock, memory, bus, peripheral devices etc.
- An image demonstrating the multiprocessor architecture is:
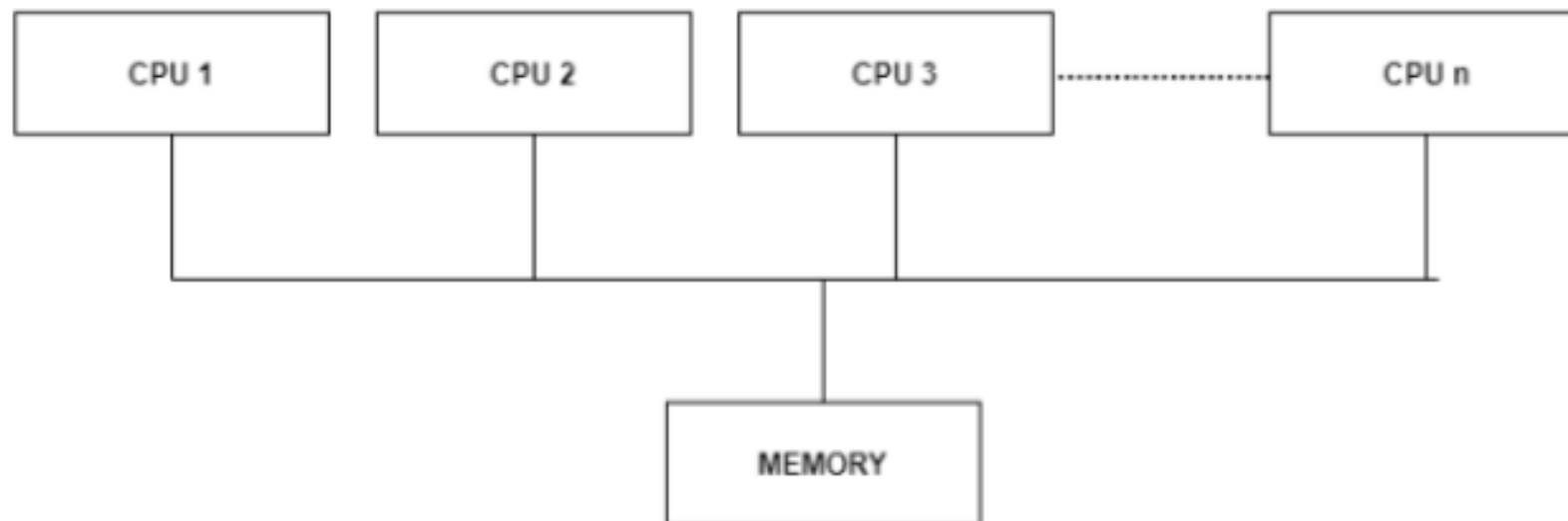
Multiprocessing Architecture

- **Types of Multiprocessor Systems**
- **Symmetric Multiprocessing (SMP):**
  - All processors are treated equally.
  - Each CPU runs tasks independently but shares the same memory. Example: Modern desktops, servers.
  - All the processors are in a peer to peer relationship i.e. no master - slave relationship exists between them.
- **Asymmetric Multiprocessing (AMP):**
  - One CPU is the master, others are slaves.
  - Master assigns tasks, slaves execute. Asymmetric multiprocessor system contains a master slave relationship.
  - each processor is given a predefined task.
  - There is a master processor that gives instruction to all the other processors. Example: Early supercomputers, embedded systems.

Advantages of Multiprocessor Systems

- More reliable Systems - In a multiprocessor system, even if one processor fails, the system will not halt.

- Enhanced Throughput- If multiple processors are working together, then the throughput of the system increases i.e. number of processes getting executed per unit of time increases.

▫ More Economic Systems- are cheaper than single processor systems in the long run because they share the data storage, peripheral devices, power supplies etc. If there are multiple processes that share data, it is better to schedule them on multiprocessor systems with shared data than have different computer systems with multiple copies of the data.

Disadvantages of Multiprocessor Systems

- Increased Expense - Even though multiprocessor systems are cheaper in the long run than using multiple computer systems, still they are quite expensive. It is much cheaper to buy a simple single processor system than a multiprocessor system.

- Complicated Operating System Required - There are multiple processors in a multiprocessor system that share peripherals, memory etc. So, it is much more complicated to schedule processes and impart resources to processes than in single processor systems. Hence, a more complex and complicated operating system is required in multiprocessor systems.

Characteristics of multiprocessor

- 1. A multiprocessor system is an interconnection of two or more CPUs with shared memory and input-output equipment.
- 2. The term "processor" in multiprocessor can mean either a central processing unit (CPU) or an input-output processor (IOP).

- 3. The similarity and distinction between multiprocessor and multicomputer are
- Similarity
  - Both support concurrent operations
- Distinction
  - The network (multicomputer system) consists of several autonomous computers that may or may not communicate with each other.
  - A multiprocessor system is controlled by one operating system that provides interaction between processors.

- 4. Multiprocessing improves the reliability of the system.
- 5. Multiprocessing can improve performance by decomposing a program into parallel executable tasks.
- 6. The benefit is an improved system performance.
  - Multiple independent jobs can be made to operate in parallel.
  - A single job can be partitioned into multiple parallel tasks.

MULTICOMPTER
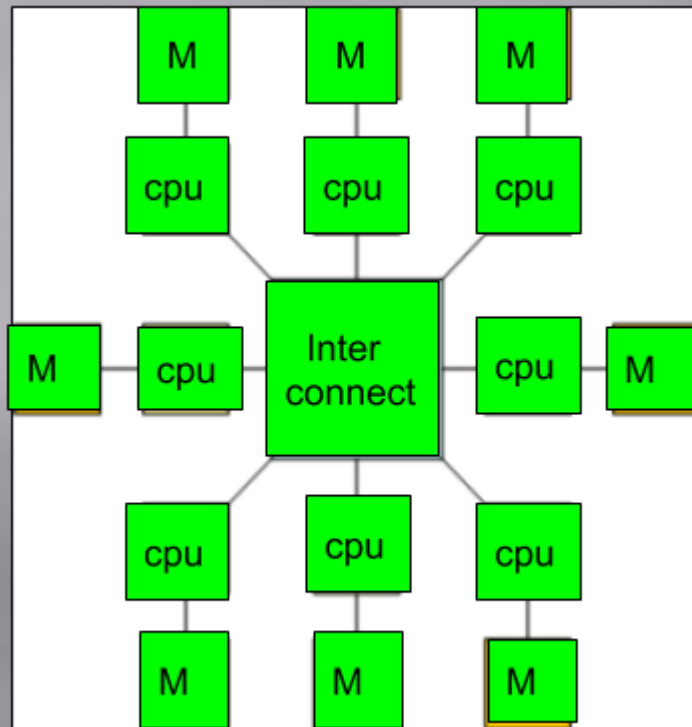
MULTIPROCESSOR
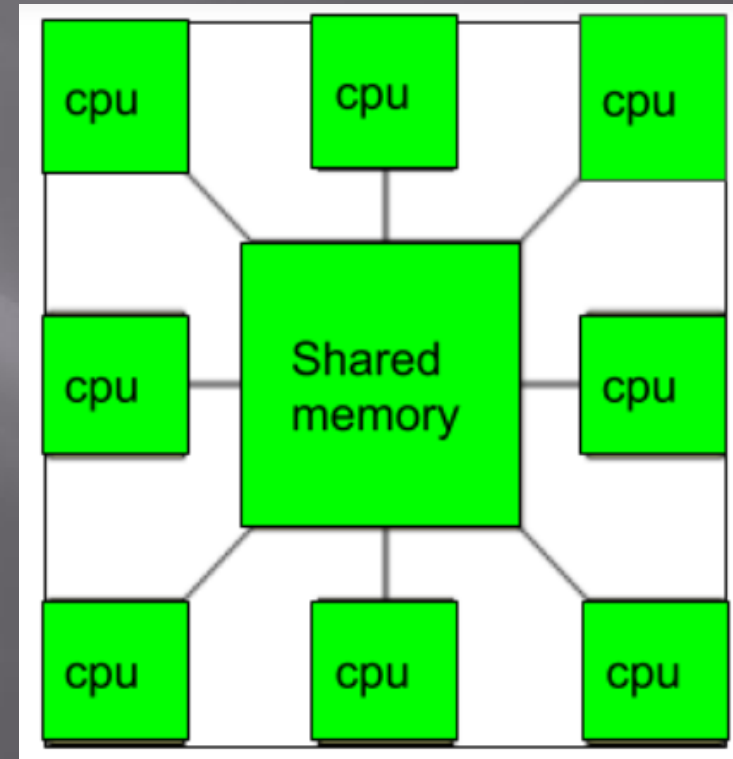
Multicomputer system

- A multicomputer system is a computer system with multiple processors that are connected together to solve a problem.

- Each processor has its own memory and it is accessible by that particular processor and those processors can communicate with each other via an interconnection network.

- As the multicomputer is capable of messages passing between the processors, it is possible to divide the task between the processors to complete the task. Hence, a multicomputer can be used for distributed computing.

- **Types of Multicomputers**
- **Cluster Computing**
  - Group of computers connected via LAN.
- **Grid Computing**
  - Computers connected over a wide area (like the internet).
- **Cloud Computing**
  - Internet-based distributed computing.

BASIS FOR COMPARISON	MULTIPROCESSOR	MULTICOMPUTER
Basic	Multiple processors in a single computer.	Interlinked multiple autonomous computers.
Memory attached to the processing elements	Single shared	Multiple distributed
Communication between processing elements	Mandatory	Not necessary
Type of network	Dynamic network	Static Nw

END