DEPARTMENT OF INFORMATION TECHNOLOGY

Distributed Computing

BS (Information Technology) P – III

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Computing

Computing refers to leveraging computer technology for solving a problem / achieving a particular task.

- Hardware
- Software
- Data → Big data
- Memory/Storage

Distributed Computing

Distributed computing is the method of making multiple computers work together to solve a common problem.

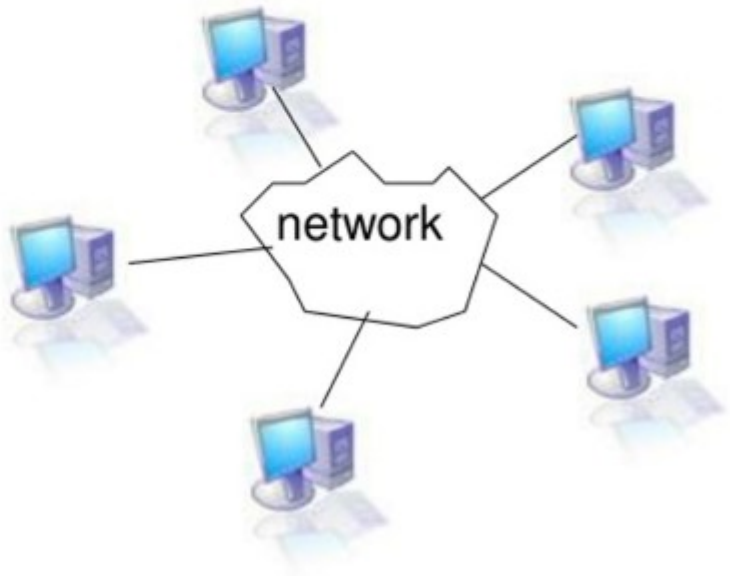
It makes a computer network appear as a powerful single computer that provides large-scale resources to deal with complex challenges.

Distributed Computing

Construction of Distributed Systems

Units of A Distributed System:

- Units/Nodes (Computers, sensors, …)
- Network
- Software

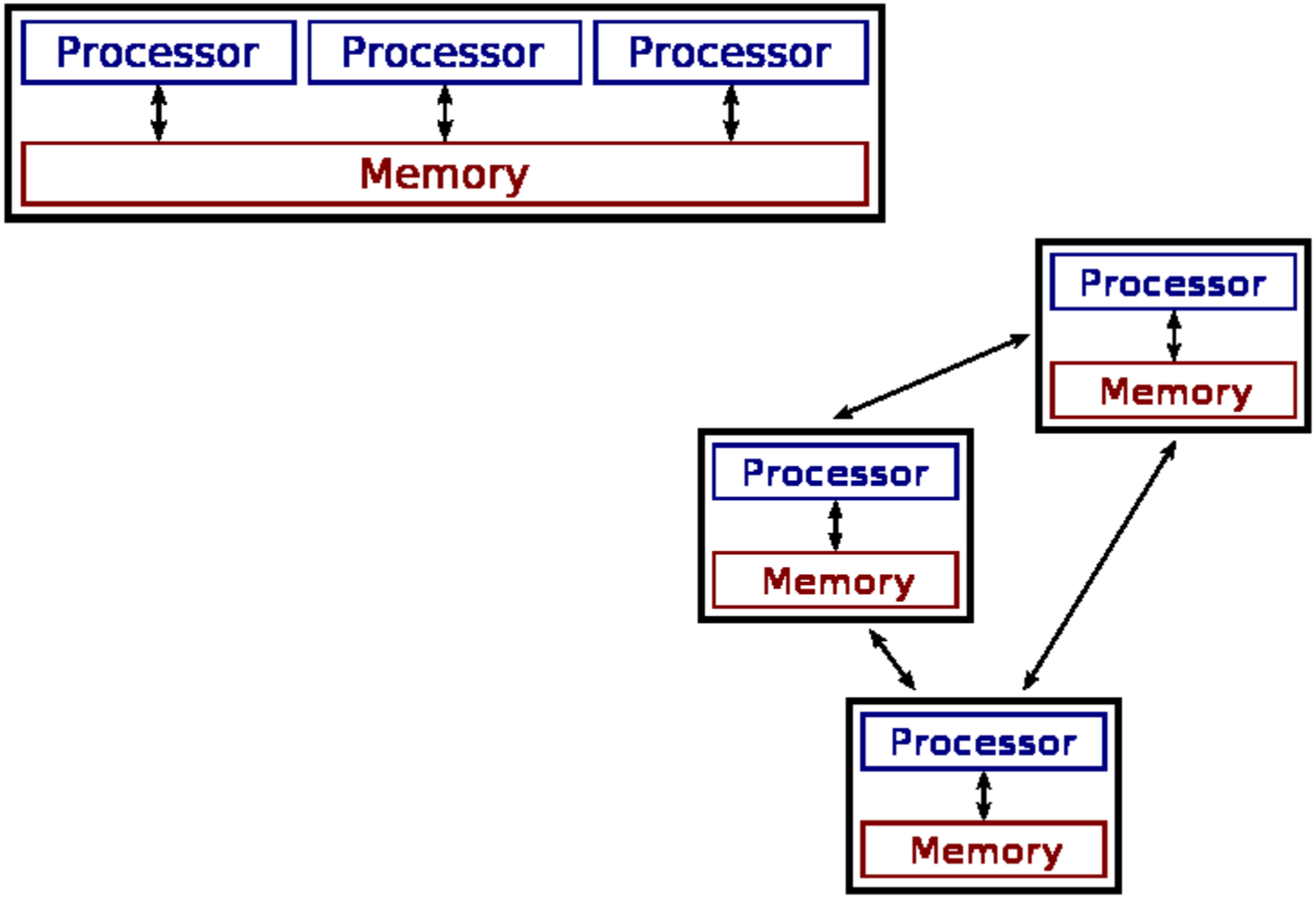


Parallel Computing vs Distributed Computing

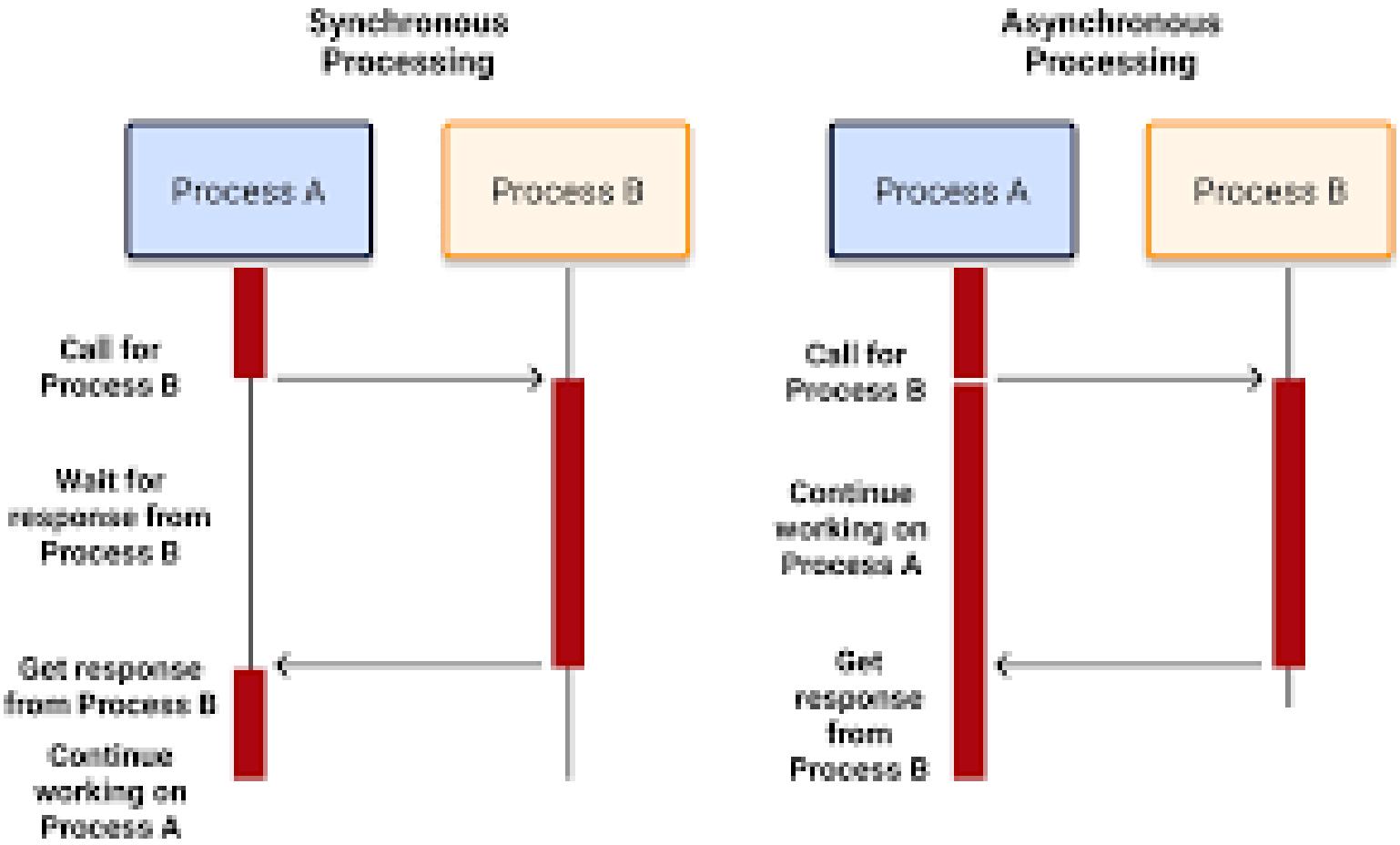
Parallel computing is a particularly **tightly coupled form of distributed computing**. In parallel processing, all processors have access to shared memory for exchanging information between them.

On the other hand, in distributed processing, each processor has private memory (distributed memory). Processors use message passing to exchange information.

Parallel Computing vs Distributed Computing



Asynchronous vs Synchronous Computing



Distributed Systems

There is no unique definition for distributed systems.
Similar terms are

- Networked system
- parallel systems
- Concurrent systems
- Decentralized systems

Enslow's Definition

Distributed System = Distributed hardware + Distributed control + Distributed data

Distributed Hardware

Physically shared/distributed memory and logically shared/distributed memory

	Logically shared	Logically distributed
Physically shared	Common memory	Simulated message passing
Physically distributed	Distributed shared memory	message passing

Distributed Software

- Cooperating the actions of units (computers, sensors, …)
- Supporting system resources (hard ware and software) sharing.
- Supporting data sharing.

Distributed Data

- Copies: Processors hold data copies.
- Divided data: Data are divided and distributed to processors.

Distributed Control

- Master/Slave (fixed/dynamic)
- Multi control points (homogenous/heterogeneous)

Features of Distributed Systems

- Resource sharing: hardware, software, data
- Openness: openness of main interface of the system, scalability of the current system
- Concurrency: concurrent execution of the processes, high performance, nice rate of price and performance (PC cluster = poor man's supercomputer)
- Fault tolerance: ability to tolerate the fault of system units, availability(using potential redundancy to overcome the system fault).
- Transparency: a distributed system can be looked as one computer (access transparency, position transparency, parallel transparency,….)