CS-251: Parallel and Distributed Computing

Lecture 05 – MULTIPROCESSOR SYSTEMS

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MULTIPROCESSOR SYSTEMS

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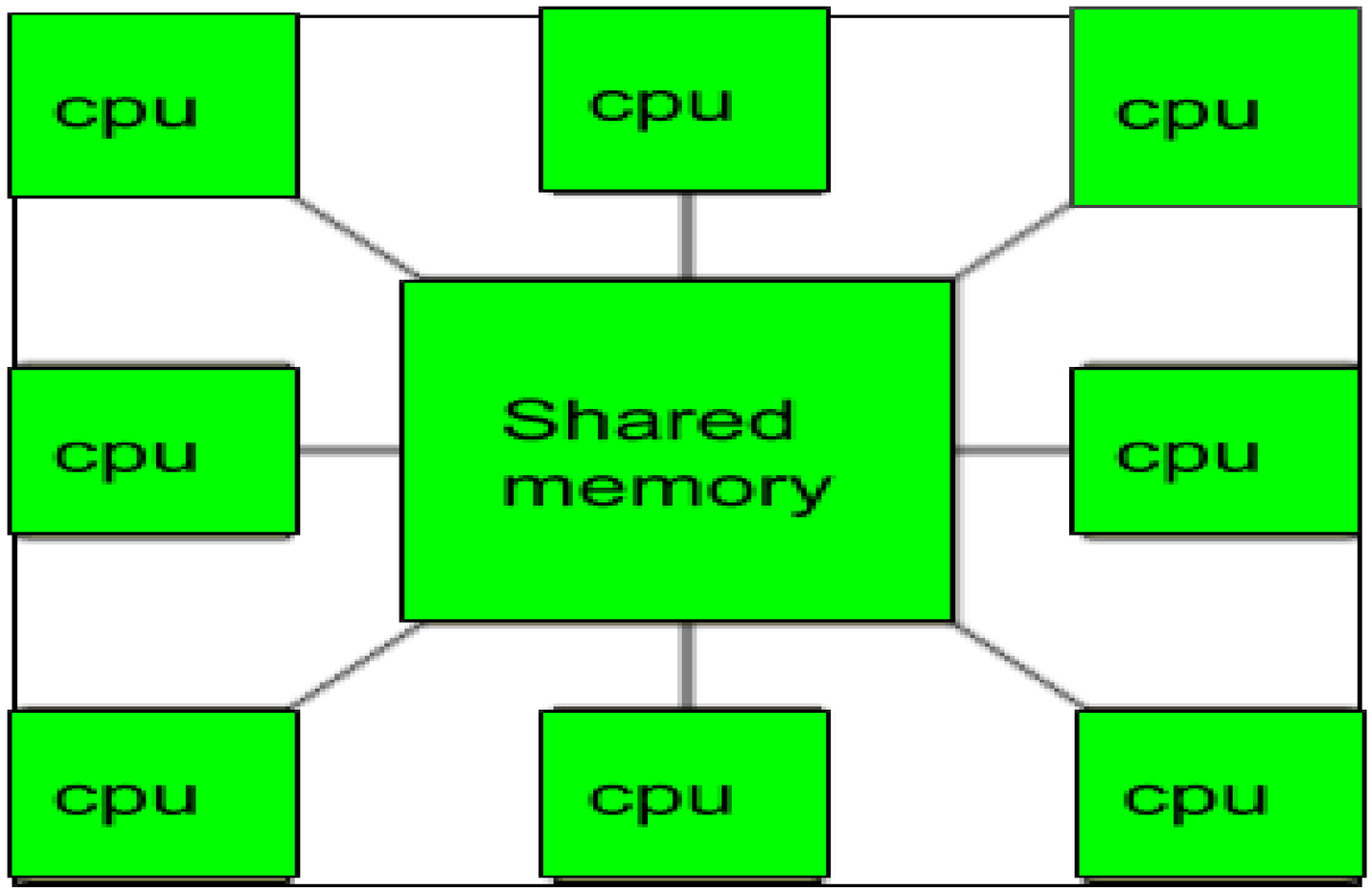
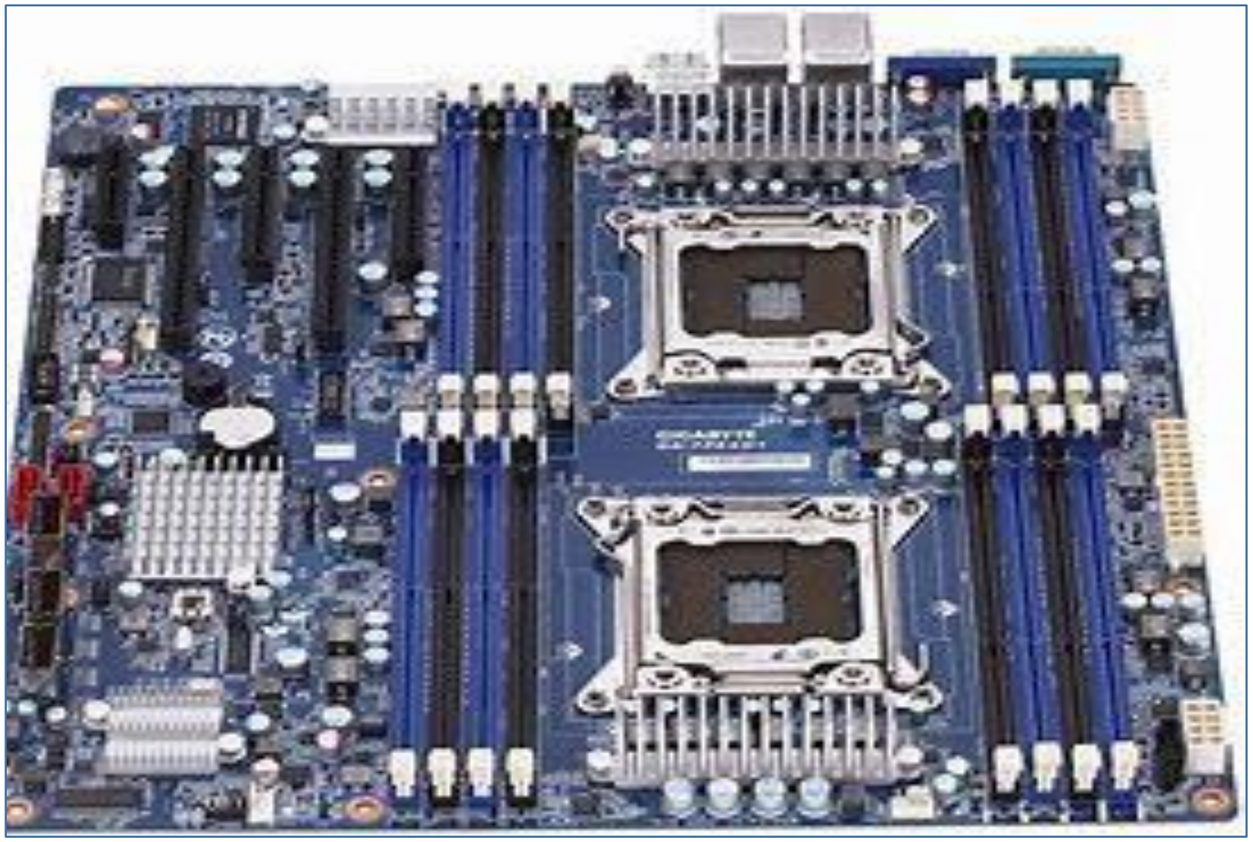
MULTIPROCESSOR SYSTEM

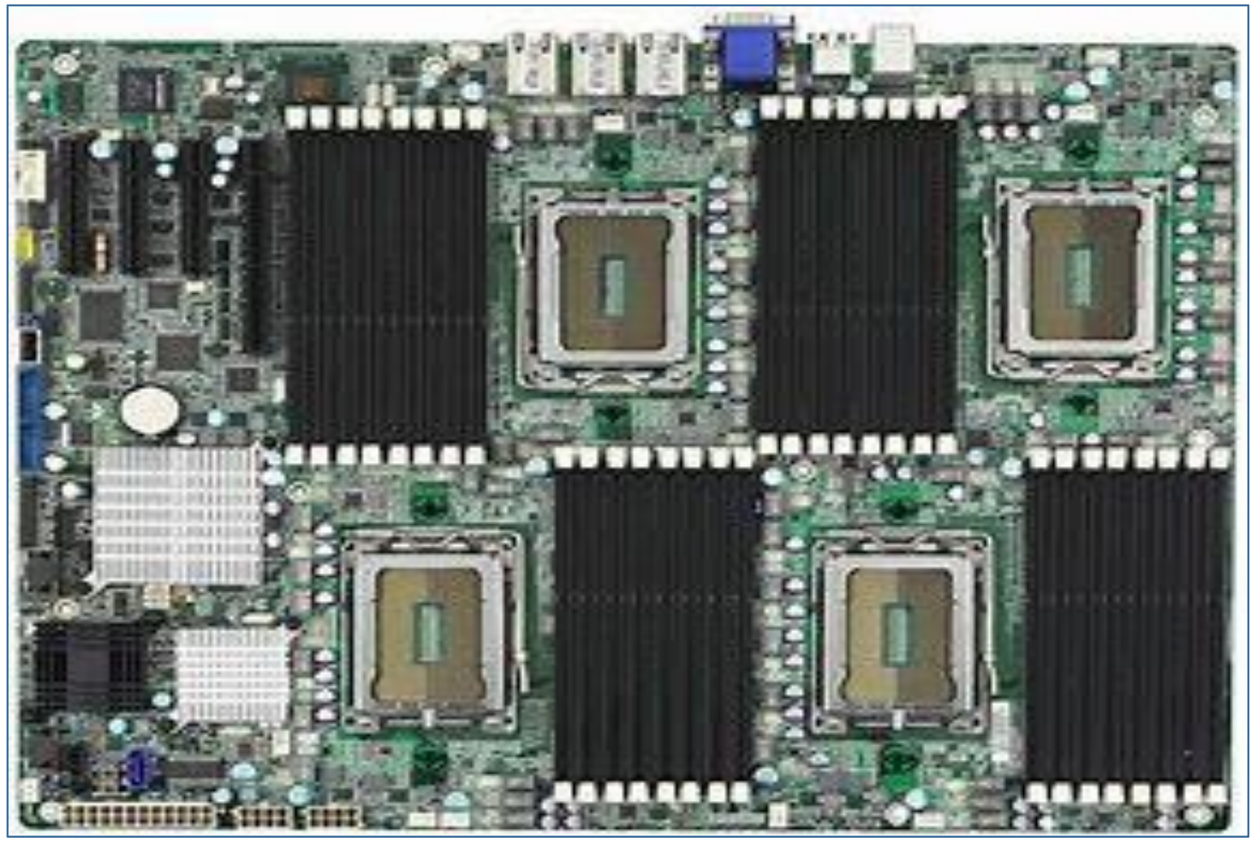
- A multiprocessor is a computer system with two or more central processing units (CPUs), with each one sharing the common main memory as well as the peripherals.
- In multiprocessing, all CPUs may have equal functions or some may be reserved for specific functions.

ARCHITECTURE OF MULTIPROCESSOR



EXAMPLES OF MULTIPROCESSORS

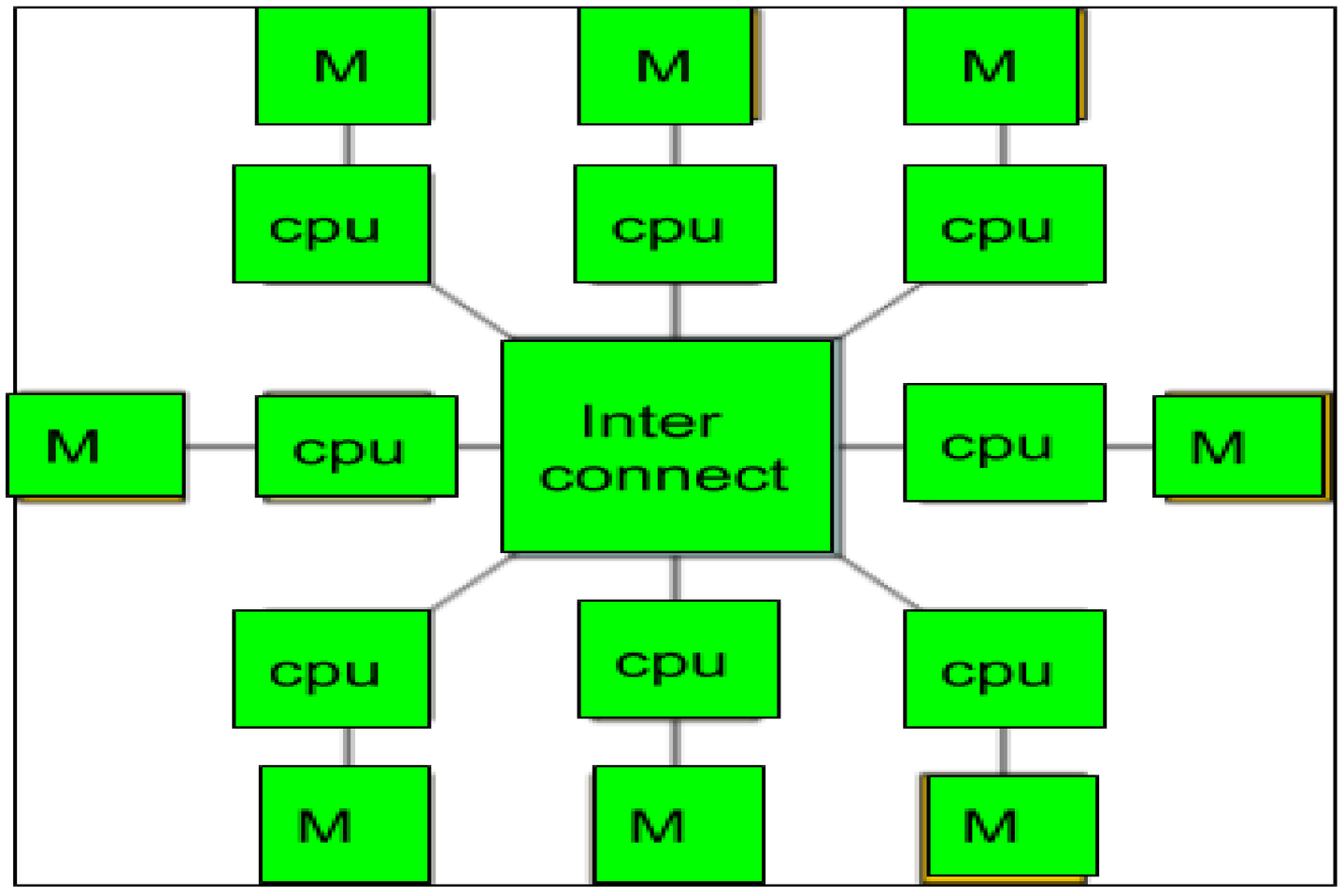




MULTICOMPUTER SYSTEMS

- 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.
- It is a cluster of computers that operate as a singular computer IT can be used for distributed computing

ARCHITECTURE OF MULTICOMPUTER



VIRTUALIZATION

- Virtualization is the creation of a virtual rather than actual version of something, such as an operating system , a server, a storage device or network resources.
- In computing, virtualization means to create a virtual version of a device or resource, such as a server, storage device, network or even an operating system where the framework divides the resource into one or more execution environments

TYPES OF VIRTUALIZATION

- OS Virtualization(Virtual Machines): Involves putting a second instance or multiple instances of an operating system
- Application-Server Virtualization:It spreads applications across servers, and servers across applications(load balancing)
- Application Virtualization:It mkes applications operate on computers as if they reside naturally on the hard drive, but instead are running on a server

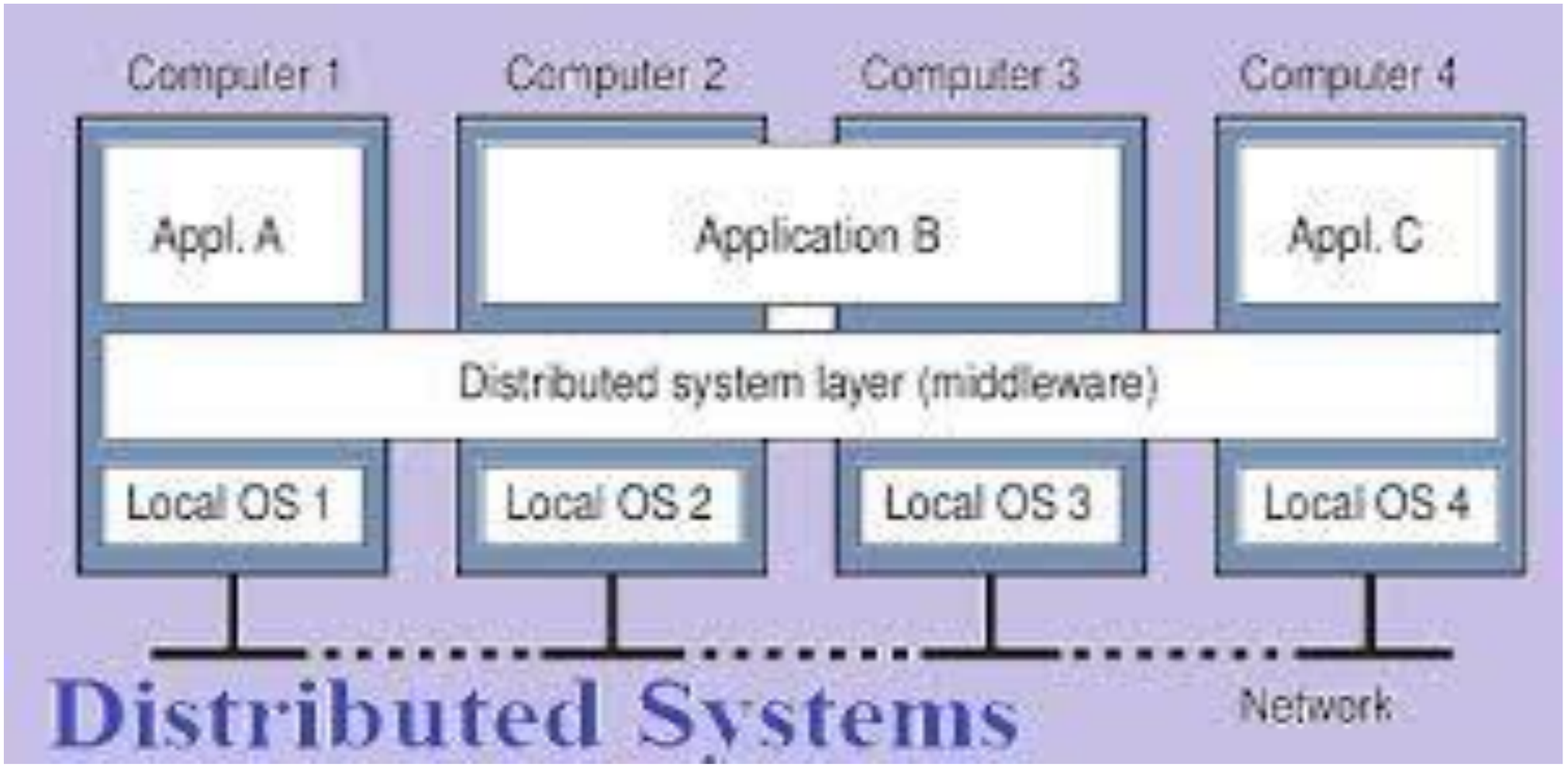
TYPES OF VIRTUALIZATION

- Administrative Virtualization:It means segmented admin roles through group and user policies.
- Network Virtualization: Involves virtually managing IPs, and is accomplished through tools like routing tables, NICs, switches, and VLAN tags.
- Hardware Virtualization:It involves partioning,mainly hard drives.
- Storage Virtualization:It is an array of servers that are managed by a virtual storage system.

DISTRIBUTED SYSTEMS

- A distributed system is any network structure that consists of autonomous computers that are connected using a distribution middleware.
- Computers in this system need; first, it a local memory, and secondly, it has to connect to the network.
- Examples include; client/server and peer-to-peer systems

ARCHITECTURE OF DISTRIBUTED SYSTEMS



PARALLEL COMPUTING

- Parallel computing also known as parallel processing is a type of computing architecture in which several processors execute or process an application or computation simultaneously

MULTITHREADING

- Multithreading is a type of execution model that allows multiple threads to exist within the context of a process such that they execute independently but share their process resources.
- A thread maintains a list of information relevant to its execution including the priority schedule, exception handlers, a set of CPU registers, and stack state in the address space of its hosting process.

MULTIPROCESSOR VS MULTICOMPUTER

MULTIPROCESSOR SYSTEM	MULTICOMPUTING SYSTEM
Has two or more CPUs that allow simultaneous processing of programs	A set of processors connected by the communication network that works jointly to solve a computation problem
Easier to process	Less easy to program
More difficult and costly to build	Easier and effective to build
Supports parallel computing	Supports distributed computng

VIRTUALIZATION VS CLOUD COMPUTING

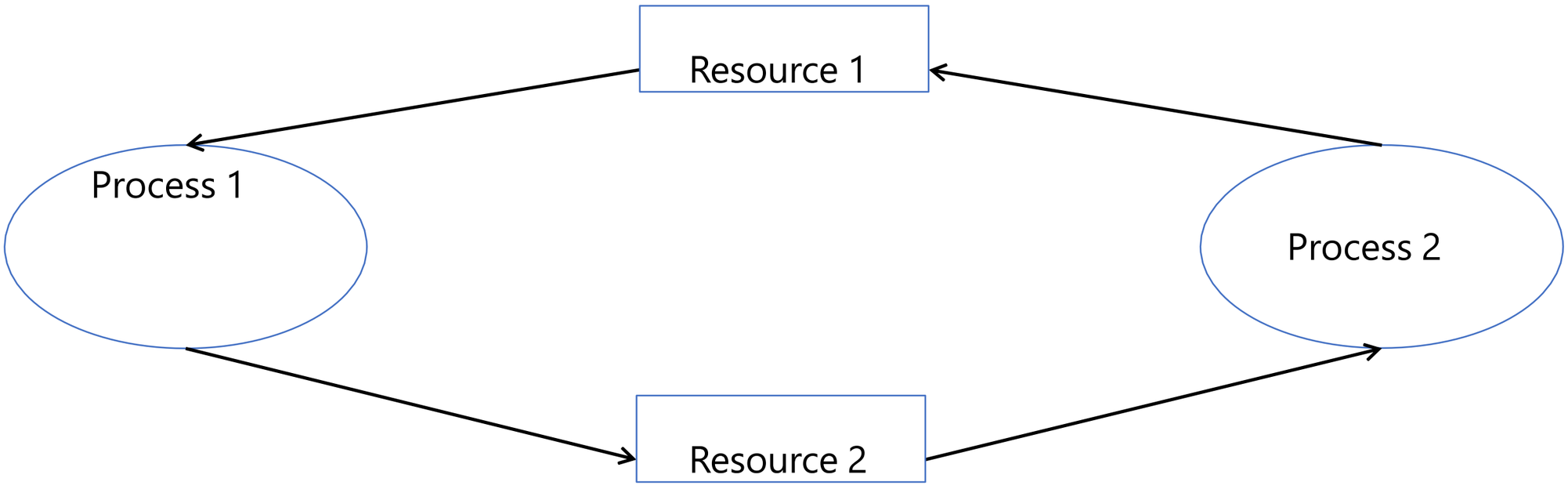
CLOUD COMPUTING	VIRTUALIZATION
A methodology of delivering services over the internet	A technique of creating virtual version of a computer hardware platform,storage device ora network resource
Cloud configuration is template based	Virtualization configuration is image based
Helps to provide resources to a group of users for various task	Helps to deliver packaged resources to a set of users for a particular task

PARALLEL COMPUTING VS DISTRIBUTED SYSTEMS

PARALLEL COMPUTING	DTRIBUTED SYSTEMS
Occurs in a simple computer	Involves multiple computer
Computer can have shared or distributed memory	Each computer has its own memory
Processors communicate with each other uing a bus	Computers communicate wit each other via the bus
Increase the performance of the system	Perform computation tasks efficiently

DEFINITION OF DEADLOCK

- Ths is a situation where a set of processes are blocked because each process is holding a resource and waiting for another resource acquired by some other process

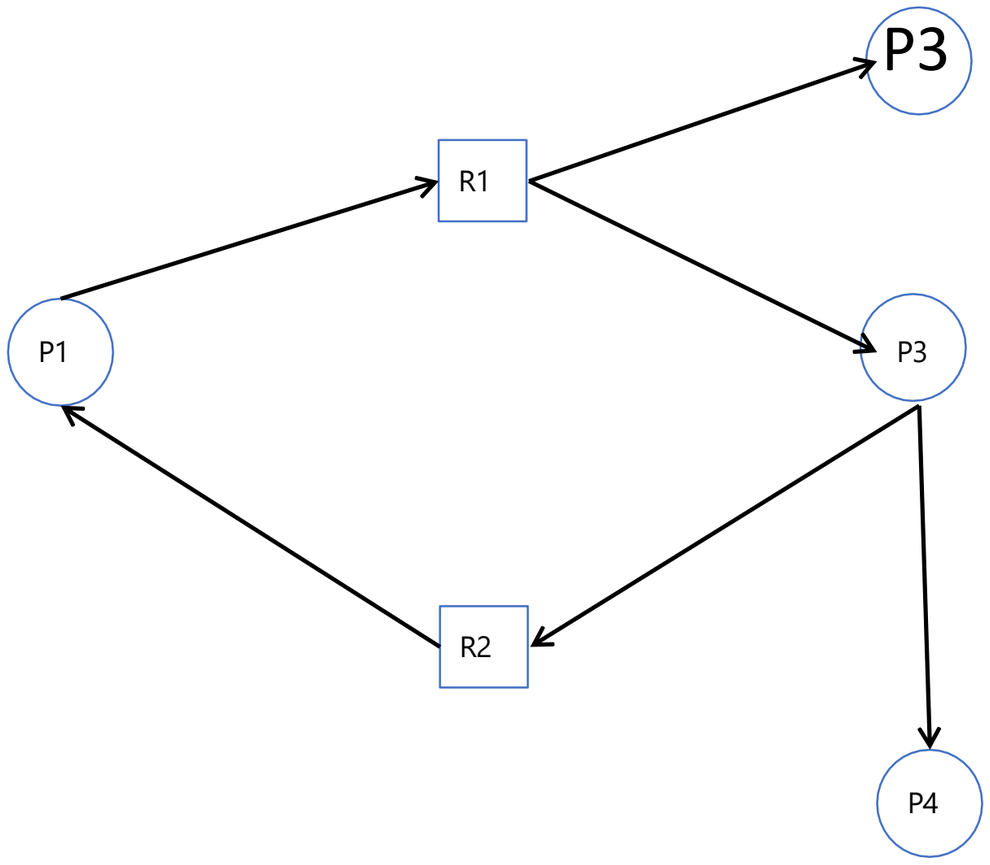


CONDITIONS FOR DEADLOCK

- Mutual exclusion : One or more resource are non-shareable
- Hold and wait : A process is holding at least one resource and waiting forresources
- No preemption : A resource cannot be taken from a process unless the process releases the resource
- Circular wait: A set of processes are waiting for each other in circular form

DETECTION OF DEADLOCK

- Resource allocation graph. If this graph contains a cycle, then there is deadlock . Else, there is none.



DEADLOCK HANDLING

- Deadlock prevention or avoidance
- Deadlock detection and recovery
- Ignore the problem all together