Bharathidasan University

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Course Code : Operating Systems

Course Title : 20UCA5CC5

Unit : Unit IV

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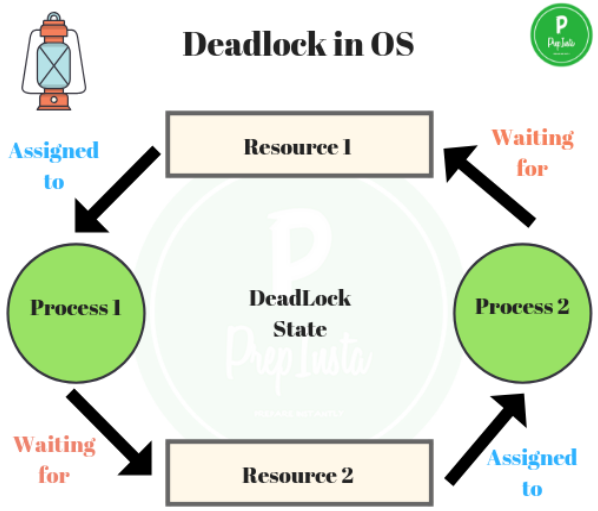
OPERATING SYSTEM
UNIT-4

DEADLOCK

1. INTRODUCTION TO DEADLOCK

- Deadlock is a set of processes are blocked
- Each process is holding a resource and waiting for another resource
- It is used by some other process.



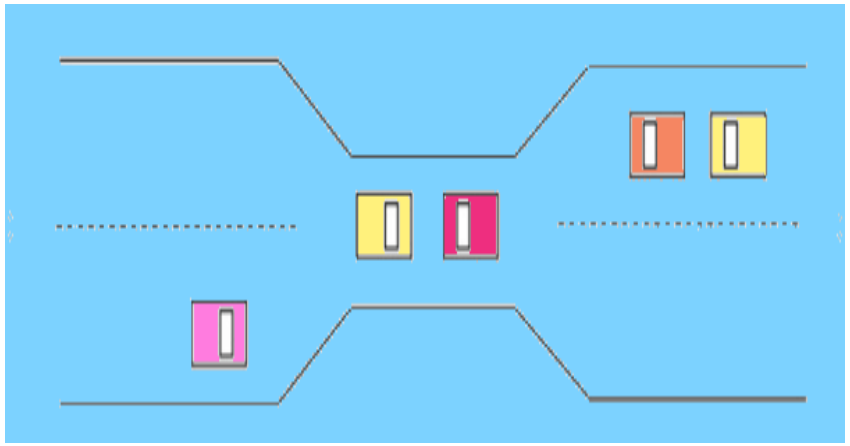
Resources

- A process in operating systems uses different resources

    1) Requests a resource

    2) Use the resource

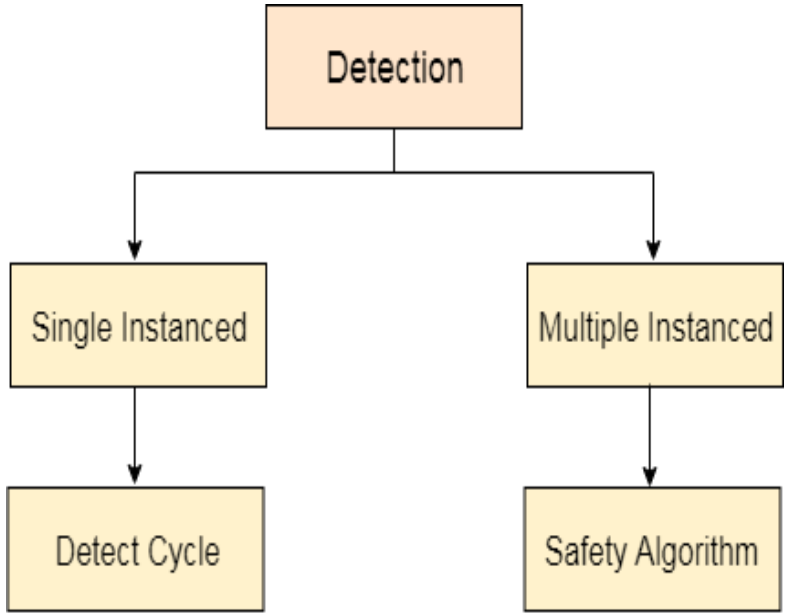
    3) Releases the resource



2. DEADLOCK DETECTION AND RECOVERY

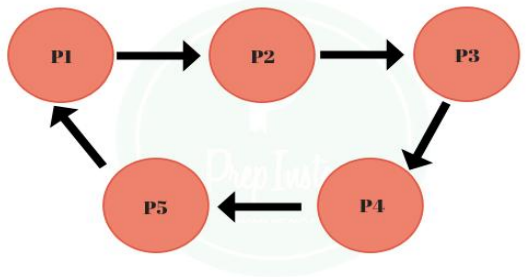
(i) Deadlock Detection

- Deadlock Detection is a task of OS
- There are 2 types of detection



1. **If resources have single instance:**

- A wait-for graph is made.
- wait-for graph P1 is waiting for resource
- currently in use by P2
- P2 is waiting for resource
- currently in use by P3
- P5 is waiting for resource
- currently in use by P1
- which creates a cycle thus deadlock is confirmed



2. Several Instances of a Resource Type

It is using 4 data structure.

i. Available

- Each element Available[i] indicates the number of resources of i type available.
- Denoted by Ri

ii. Maximum

- Maximum demand of each process.

iii. Allocation

- Number of resources of each type
- currently allocated to each process.

iv. Need

- Tells about remaining resources type
- which are required by each process.

(ii) Deadlock Recovery

Killing the process:

I. killing all the process involved in the deadlock.

II. Killing process one by one.

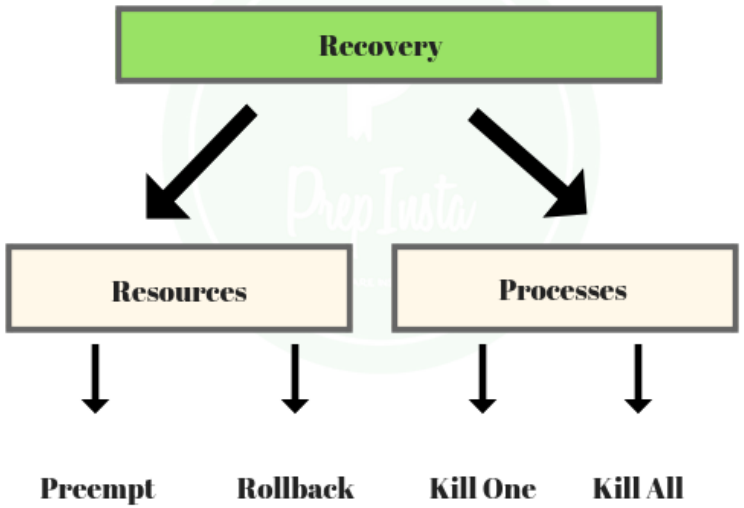
III. After killing each process check for deadlock again

Resource Preemption:

- Resources are preempted from the processes involved in the deadlock,
- preempted resources are allocated to other processes

Rollback

- A state when the system is not in deadlock is called **safe state**.
- A rollback to previous ‘n’ number of safe states.
- Iterations can help in the recover.

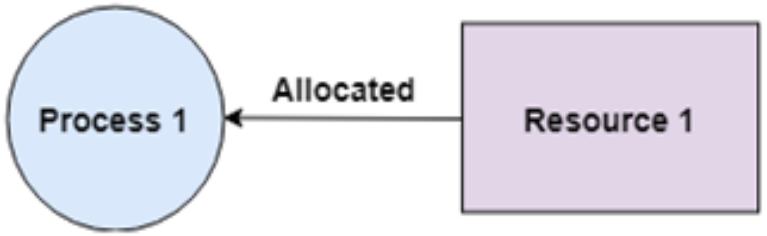


3. DEADLOCK PREVENTION

- **Deadlock condition**

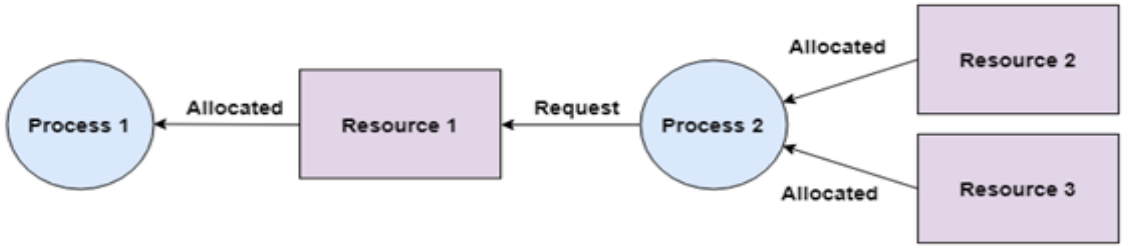
1. **Mutual Exclusion:**

- One or more than one **resource is non-sharable** (Only one process can use at a time)



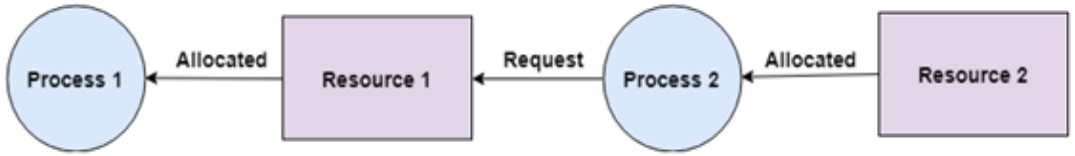
2. Hold and Wait:

- A process is holding **at least one resource** and waiting for resources



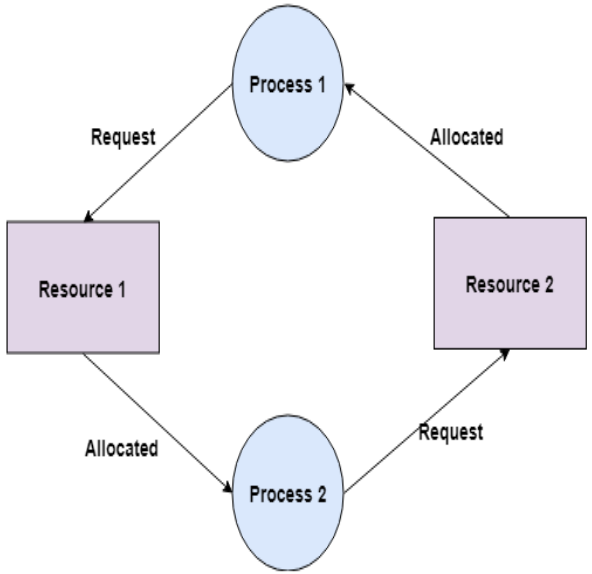
3. No Preemption:

- A resource **cannot be taken from a process** unless the process releases the resource.



4. Circular Wait:

- A set of processes are **waiting for each other in circular form.**



4. DEADLOCK AVOIDANCE

1. Safe State

- A sequence of requests **exists can be satisfied** without deadlock

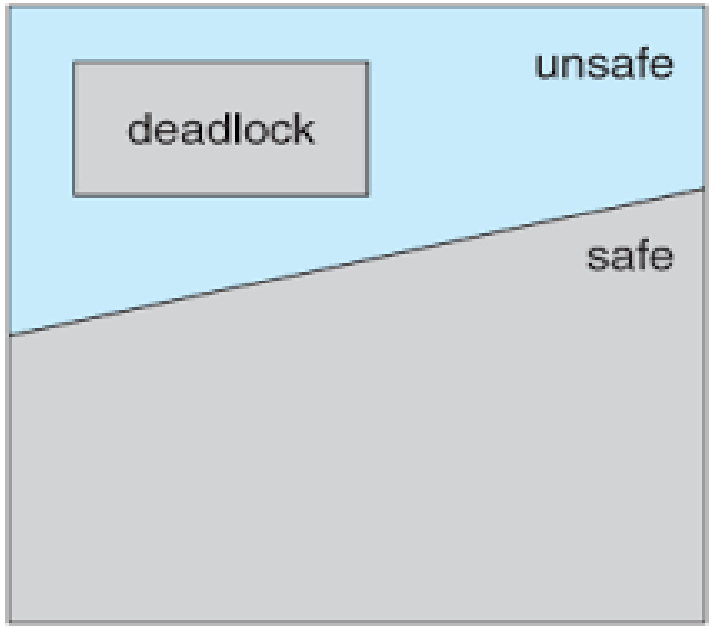
  Safe State → no deadlock

2. Unsafe State

- A sequence of requests **cannot be satisfied**

  Unsafe state → possibility of deadlock

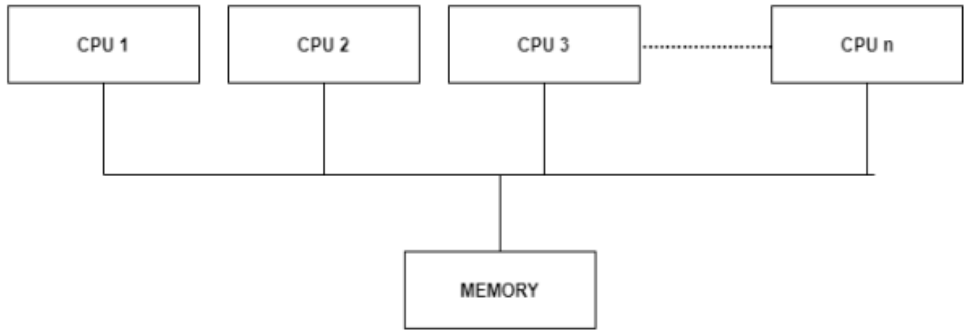
Avoidance → That system will never enter a unsafe state



MULTIPLE PROCESSOR SYSTEM

1.MULTIPROCESSORS

- It is Use of two or more central processing units (CPU) within a single computer system.
  - These multiple CPUs shares the computer bus, memory and other devices



Multiprocessing Architecture

COMPONENTS OF MULTIPROCESSOR

1.CPU– CPU is capable to access memories and control the entire I/O tasks.

2. IOP– I/P processor can access direct memories

- I/O processor has response for controlling all input and output tasks.

Input/Output Devices –It is used for inserting the input commands, and producing output after processing.

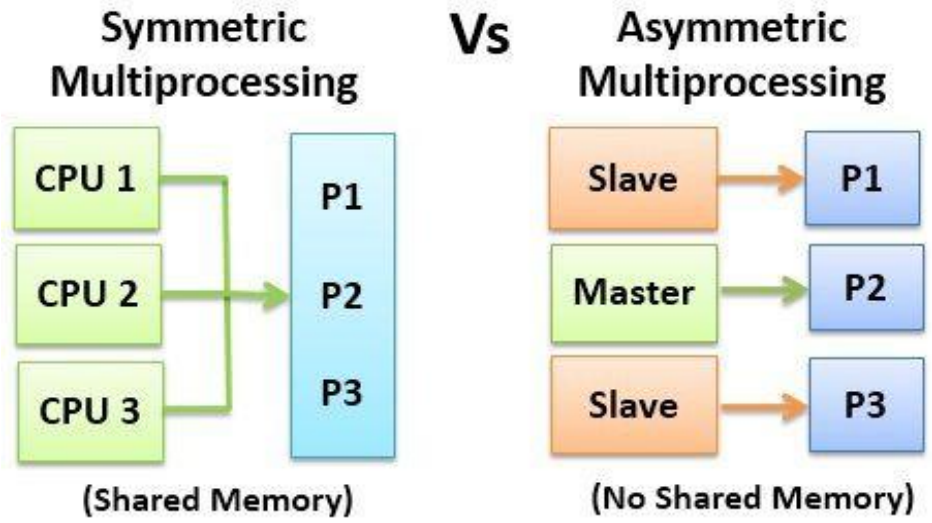
2. TYPES OF MULTIPROCESSOR

1.Symmetric Multiprocessors

- Each processor contains a copy of the operating system
- They communicate with each other
- All the processors are in a peer-to-peer relationship
- No master-slave relationship

2. Asymmetric Multiprocessors

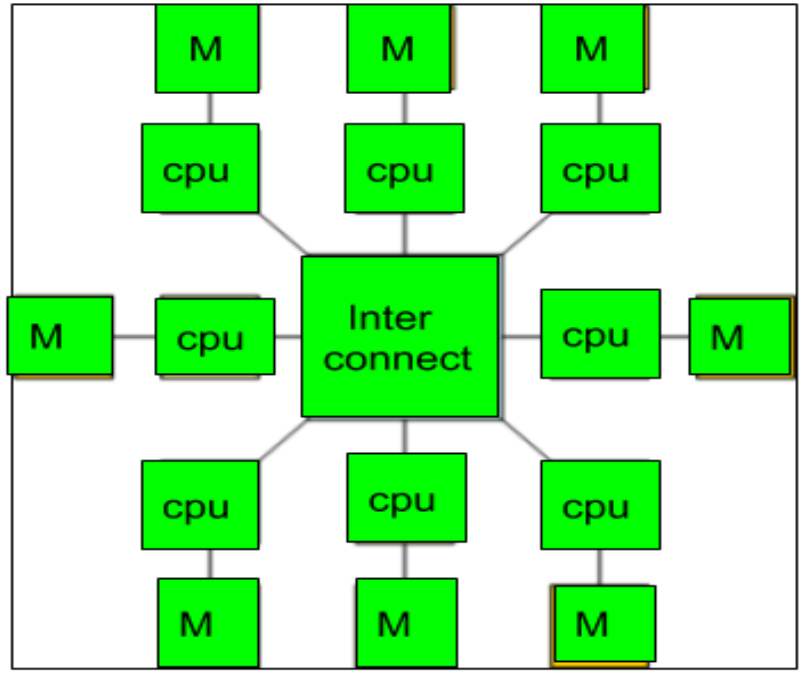
- Each processor is given a predefined task.
- There is a master processor
- That gives instruction to all the other processors.
- Master-Slave relationship exists



3. MULTICOMPUTER

- A multicomputer system is a **computer system** with **multiple processors**
- Each processor has its **own memory**
- These processors can communicate with each other through an **interconnection network.**
- It is used to **passing messages** between the processors

- It **divides the task** between the processors to complete the task.
- **Multicomputer** can be used for **distributed computing.**
- It is **easy to build** a multicomputer than a multiprocessor.



THANK YOU