Ch - 4 - Deadlock

* Explain Deadlock with its types.

=> Deadlock is accures when two processes is interelated with each other and use same resources.

If Processes A is hold some resources and Processes B is also hold some resources. If Processes A require Processes B resources and Processes B require Processes A resources this situation is called Deadlock.

There are four Condition of Deadlock.

1 Mutual Exclusion : Two Processes cannot use the same resources (~~Processes~~) at a time.

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2 Hold and Wait : Process waits for some resources while holding another resources at a time.

3 No Preemption : The Process which once scheduled will be executed till the completion.

4 Circular Wait : All the Process must be waiting for the resources in a cyclic manner.

* Explain Deadlock Handling Method.

=> There are four Deadlock Handling Method

1) Deadlock Ignorance
2) Deadlock Prevention
3) Deadlock Avoidance
4) Deadlock Detection and Recovery.

1 Deadlock Ignorance :

Deadlock Ignorance is the

mostly widely used approach among all the method.

Deadlock Ignorance method is mainly use for end ~~use~~ user.

In this approach, the operating system assumes that the system deadlock never occurs.

This method is best suitable for a single end user system where User use the system only for browsing.

Solution:

If Deadlock occures in this system, than in this method we have to simply restart the computer.

2 Deadlock Prevention:

In this method, System have to follow this four condition.

1) Mutual Exclusion

2) Hold and Wait
3) No Preemption
4) Circular Wait.

1 Mutual Exclusion:

In this condition, two process can not use same resources at a time means same time.

2 Hold and Wait:

In this condition, Process waits for some resources while holding another resources at a time.

3 No Preemption:

In this condition, Process which once scheduled will be executed till the completion.

4 Circular Wait:

In this condition, Process must be waiting for the resources in a cyclic manner.

3 Deadlock Avoidance :

In Avoid Deadlock, the process must tell OS, the maximum number of resources a process can request to complete its execution.

There are two way to Perform Deadlock Avoidance method.

(i) Banker's Algorithm
(ii) Resources Allocation Graph.

(i) Banker's Algorithm :

Banker's algorithm is named so because it used in the banking system.

This algorithm is used to Find whether system accuress deadlock or not.

This algorithm is also called Deadlock avoidance algorithm.

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Ex. Here, Resource type A has 10 instances, type B has 5 instances, and type C has 7 instances.

Process	Allocation			Max		
	A	B	C	A	B	C
P_0	0	1	0	7	5	3
P_1	2	0	0	3	2	2
P_2	3	0	2	9	0	2
P_3	2	1	1	2	2	2
P_4	0	0	2	4	3	3

=> Given, A = 10, B = 5, C = 7

From table,
Resource A is total allocated = 7
Resource B is total allocated = 2
Resource C is total allocated = 5

Remaining Resource
A = 3, B = 3, C = 2

Required Resource For Process,

Process	Required Resource		
	A	B	C
P_0	7	4	3
P_1	1	2	2
P_2	6	0	0
P_3	0	1	1
P_4	4	3	1

From the, Required Resources Table,

We can allocate Resources A, B, and C to Process P_1.

P_1 Process, ~~term~~ terminat and Free the all resources.

So, Available Resources,
A = 6 , B = 3 , C = 2

After that, we can allocate resources A B and C to Process P_3.

P_3 Process terminate and Free the all resources.

So, Available Resources,
A = 8 , B = 4 , C = 3

According to Process P_1,

We can allocate Resources P_3, P_4, P_0 and P_2 Respectuly

So, Safe Sequence,
$P_1 \rightarrow P_3 \rightarrow P_4 \rightarrow P_0 \rightarrow P_2$

(iii) Resources Allocation Graph

Resources Allocation Graph is explained to us what is the state of the system in term of Processes and Resources.

Resources Allocation Graph is show how many resources are available, how many are allocated.

For Resources Allocation Graph, we have to use two type of vertices.

1 Process Vertex :

Every Process will be represented as a Process Vertex.

Which is denoted by a circle (O).

2 Resource Vertex:

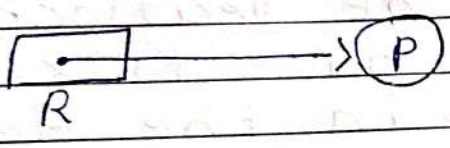
Every Resource will be represented as a Resource Vertex.

Which is ~~dem~~ denoted by a ~~Reca~~ Rectangle [□]

There are Two type of Edges in RAG.

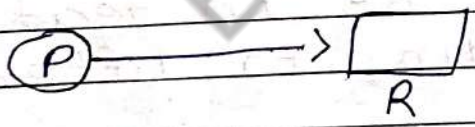
1 Assign Edges:

If you already assign a resource to a process then it is called Assign Edges.

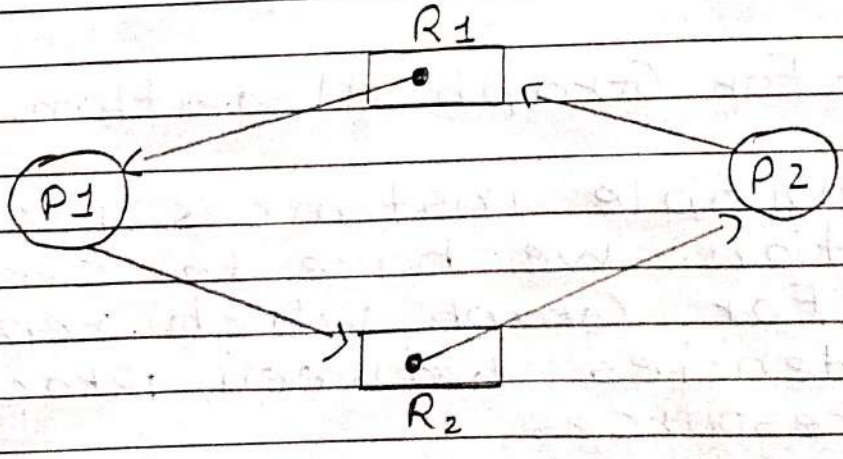


2 Request Edges:

If some Process have future resource request, that is assign by Request Edges.



Ex.



4 Deadlock Detection :

This are main point of Deadlock Detection.

(i) If resources have a single intance -

In this case of Deadlock detection, we have to check for the cycle in the Resource Allocation Graph.

(ii) If there are multiple instances of resources.

In this case, System may or may not be in deadlock varies according to different situations.

(iii) Wait - For Graph Algorithm.

For multiple instances resources allocation, we have to create Wait - For Graph which represent dependencies between processes and resources.

=> Deadlock Recovery :

Real-time Operating System use Deadlock Recovery.

Deadlock Recovery Method :

(i) Killing the Process :

Killing all the Processes involved in the Deadlock.

We have to kill Process one by one. After killing each process check for deadlock again.

(ii) Resource Preemption :

Resources are preempted from the processes involved in the deadlock.

In Resource Preemption, the system goes into starvation.

(iii) Concurrency Control :

Concurrency Control mechanisms are used to prevent data

inconsistencies in system with multiple concurrent processes.

These mechanisms ensure that concurrent process do not access the same data at the same time.