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CS-501

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METHODS FOR HANDLING DEADLOCKS (Part-6)

Methods for Handling Deadlocks

- *Deadlock Prevention*
- *Deadlock Avoidance*
- ***Deadlock Detection***
- *Ignore the problem*

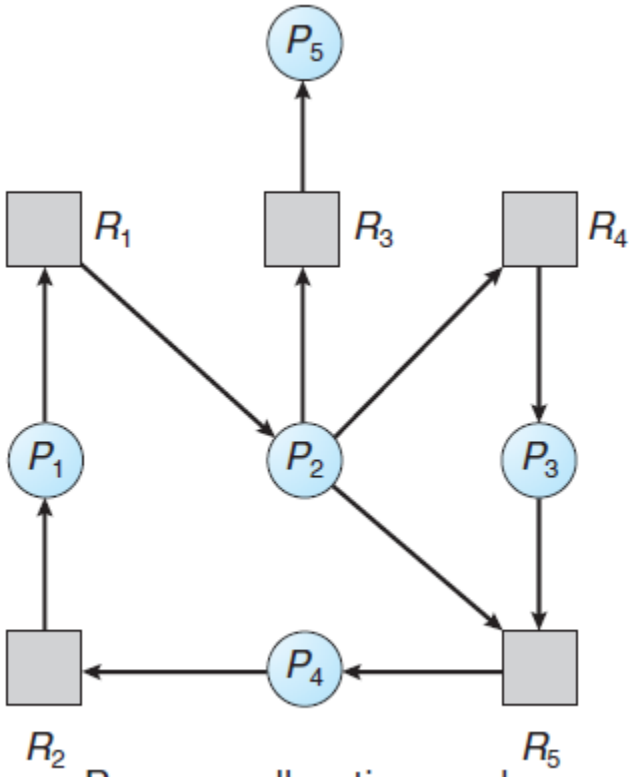
DEADLOCK DETECTION

Deadlock Detection

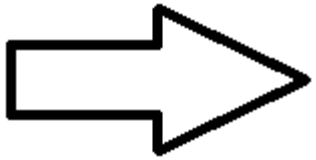
- *Allow* system to enter deadlock state.
- *Detection algorithm*.
- *Recovery scheme*.

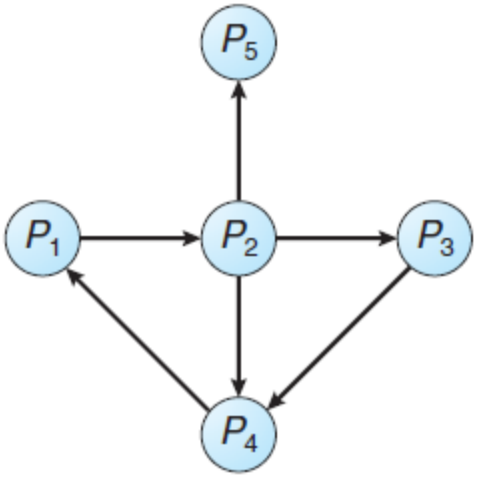
Single Instance of Each Resource Type

- Maintain *wait-for* graph
  - Nodes are processes
  - Pi -> Pj if Pi is waiting for Pj
- *Periodically* invoke an algorithm that searches for a cycle in the graph. If there is a cycle, there exists deadlock



Resource-allocation graph.





Corresponding wait-for graph.

Homework

- Several Instances of a Resource Type.
- Detection Algorithm Usage.

RECOVERY FROM DEADLOCK

Recovery from Deadlock 1/3

- *Abort* all deadlocked processes.

- Abort one process at a time until the *deadlock cycle* is eliminated.

Recovery from Deadlock 2/3

- In which order should we choose to abort?
  - What the *priority* of the process is?
  - How *long* the process has computed and how much longer the process will compute before completing its designated task?
  - How many and what types of *resources* the process has used (for example, whether the resources are simple to preempt)?
  - How many more resources the process needs in order to *complete*?
  - How many processes will need to be *terminated*?
  - Whether the *process* is interactive or batch?

Recovery from Deadlock 3/3

- *Resource Preemption.*
- *Selecting a victim* – minimize cost.
- *Rollback* – return to some safe state, restart process for that state.
- *Starvation* – same process may always be picked as victim, include number of rollback in cost factor.

References

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley.

2. William Stallings, “Operating Systems: Internals and Design Principles”, 6th Edition, Pearson Education.

3. D M Dhamdhere, “Operating Systems: A Concept based Approach”, 2nd Edition, TMH.

Thank You.