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**FACULTY OF ENGINEERING AND TECHNOLOGY
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CS-501

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METHODS FOR HANDLING DEADLOCKS

(Part-3)

Resource-Allocation Graph Scheme

Methods for Handling Deadlocks

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

DEADLOCK AVOIDANCE
Continue...

AVOIDANCE ALGORITHMS

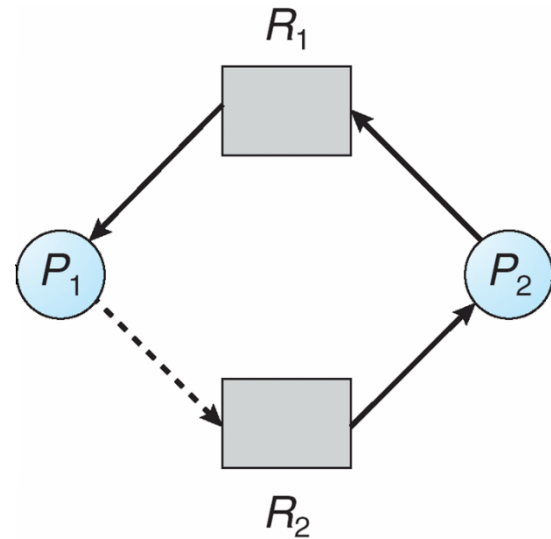
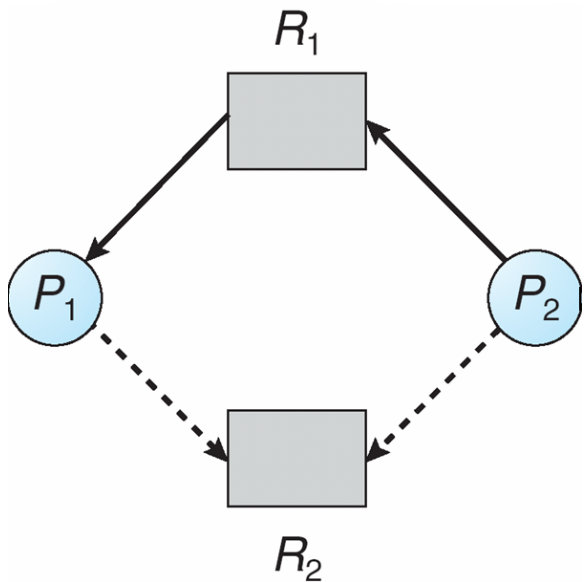
Avoidance algorithms

- Single instance of a resource type:
 - *Use a resource-allocation graph*
- Multiple instances of a resource type:
 - *Use the banker's algorithm*

RESOURCE-ALLOCATION GRAPH SCHEME

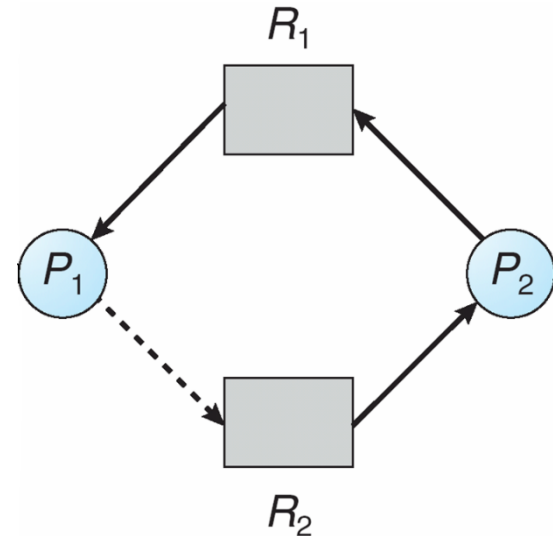
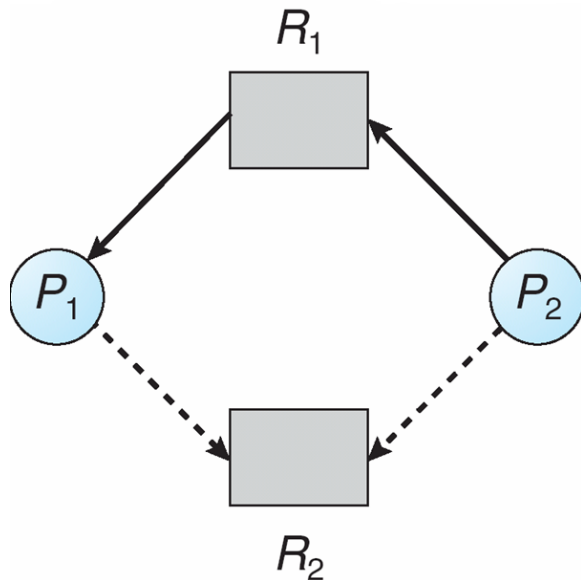
Resource-Allocation Graph Scheme^{1/2}

- *Claim edge* $P_i \rightarrow R_j$ indicated that process P_j may request resource R_j in the future; represented by a dashed line.
- Claim edge converts to *request edge* when a process requests a resource.
- Request edge converted to an *assignment edge* when the resource is allocated to the process.



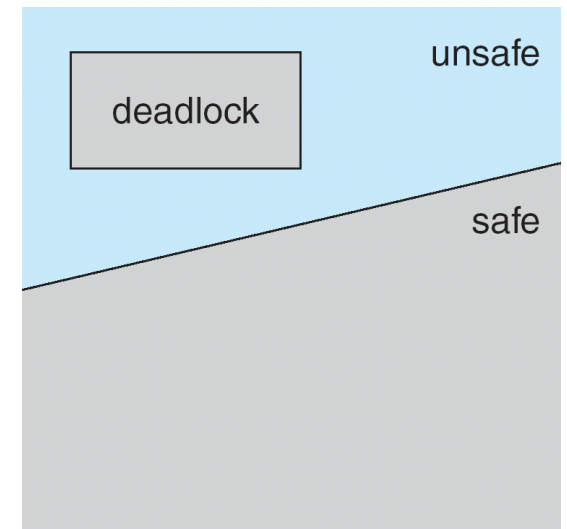
Resource-Allocation Graph Scheme^{2/2}

- When a resource is *released* by a process, assignment edge reconverts to a claim edge.
- Resources must be claimed *a priori* in the system



Analysis

- We check for safety by using a *cycle-detection algorithm*.
- If no cycle exists, then the allocation of the resource will leave the system in a *safe state*. If a cycle is found, then the allocation will put the system in an *unsafe state*.
- **Algorithm:** *Request can be granted only if converting request into assignment does not lead to an unsafe state.*



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.

