

Operating System: Deadlock

By: Vishvadeep Gothi



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**AIR- 19, 119, 440, 682
in GATE**



**ME from IISc Bangalore
Mtech BITS Pilani in Data
Science**



**14+ Years of Teaching Experience,
10+ Years in GATE/IES**



Subjects Taken:
Computer Organization & Architecture,
data structure, operating system,
C-Programming, Data science,
Machine Learning, Python,
coding interview problems,





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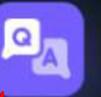
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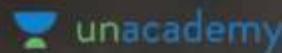
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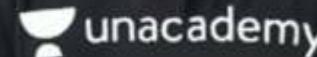
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Operations on Resources

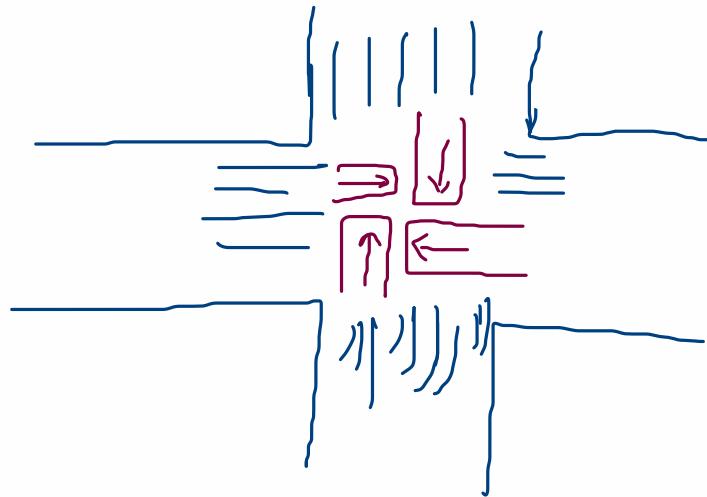
→ H/w, s/w

3 operations on resources:

1. Request :- process required for a resource to OS.
2. Use :- when OS allocates the resource to process, then the process can use it.
3. Release :- when use is completed then process releases the resource.

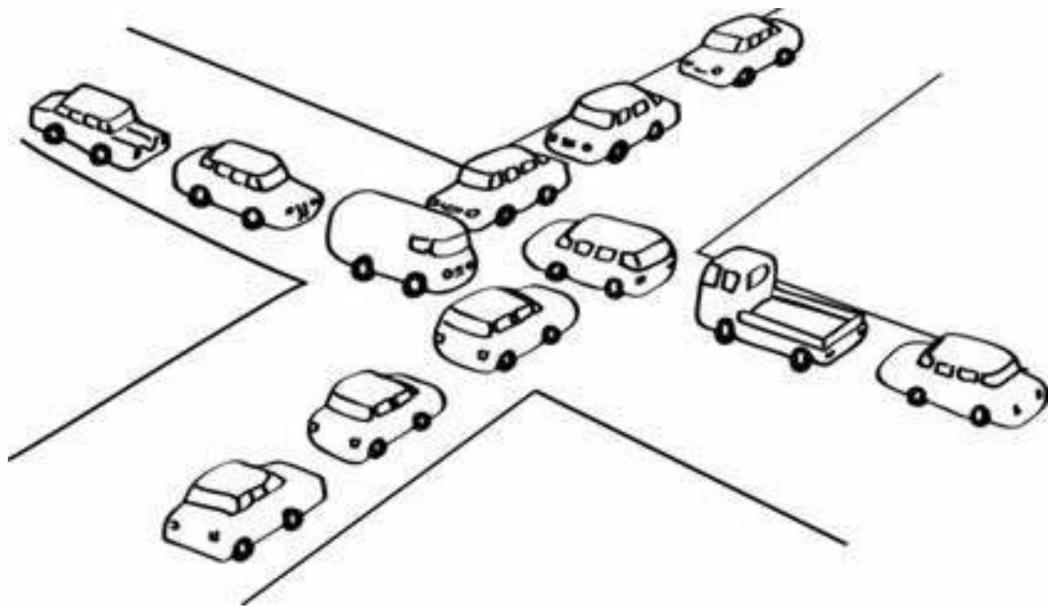
Deadlock

If two or more processes are waiting for such an event which is never going to occur.



Deadlock

2 friends f_1 , f_2 → manager



Necessary Conditions for Deadlock

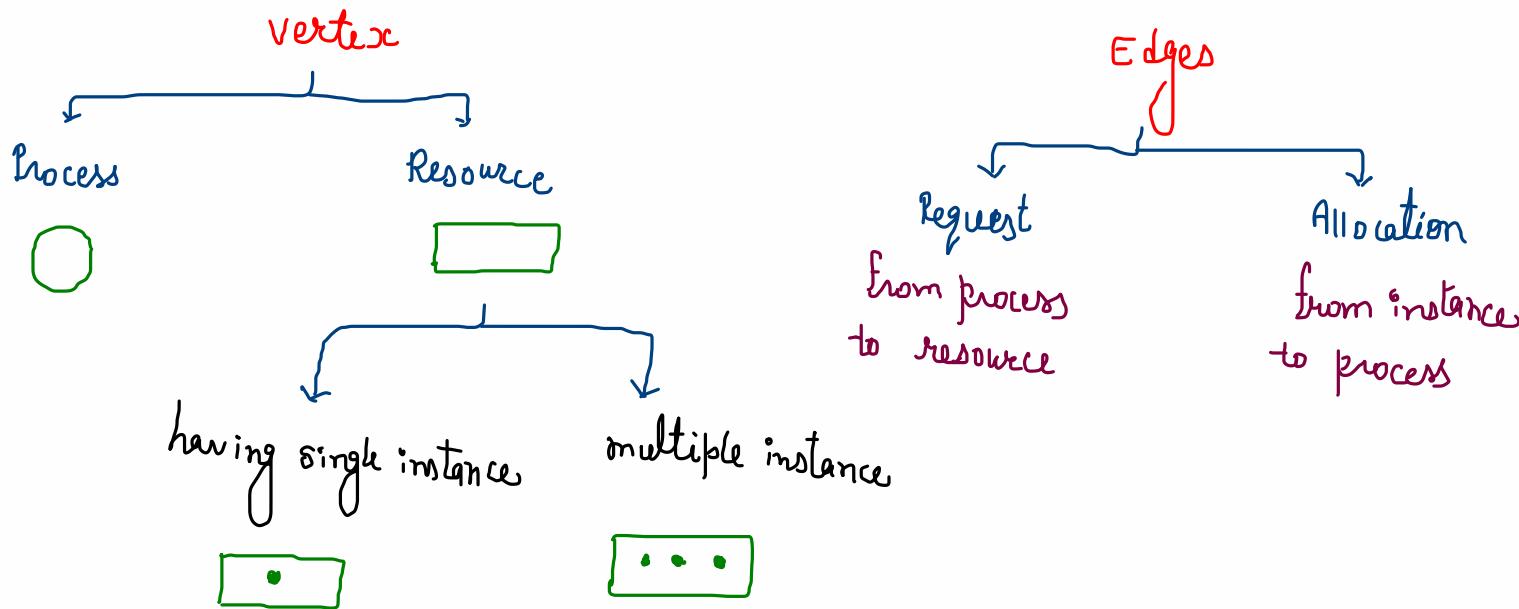
Deadlock can occur only when all following conditions are satisfied:

1. Mutual Exclusion :- if one process using a resource, then other process can not use it.
2. Hold & Wait :- each deadlocked process should hold atleast one resource & should wait for at least one resource.
3. No-preemption :- no any forceful preemption of resources.
4. Circular Wait

processes	Holds	waits
p ₁	keyboard	Harddisk
p ₂	Harddisk	printer
p ₃	Printer	Keyboard

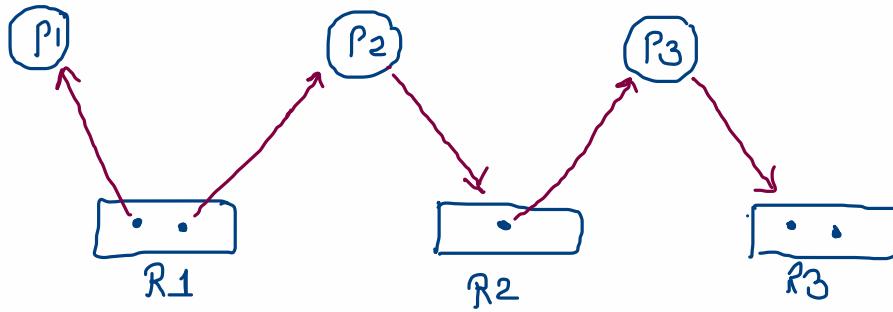
Resource Allocation Graph

(directed)



Resource Allocation Graph

Ex:-



Recovery From Deadlock

1. Make Sure that deadlock never occur
 - Prevent the system from deadlock or avoid deadlock
2. Allow deadlock, detect and recover
3. Pretend that there is no any deadlock



Next Class

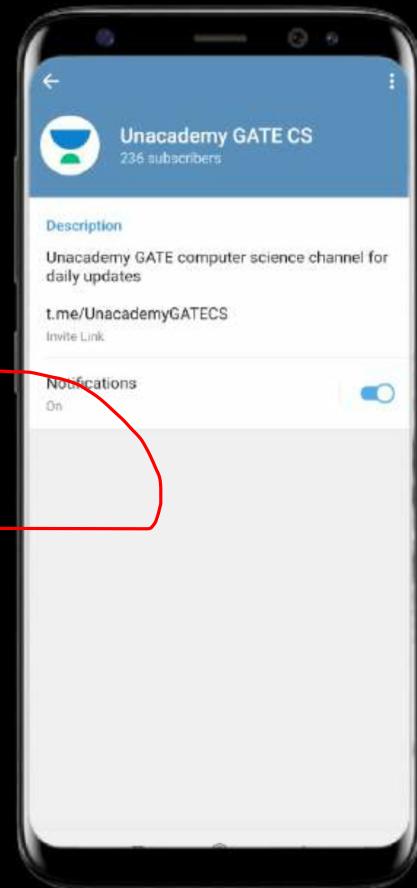
Deadlock prevention
~~Dining Philosopher Problem~~



~~Classical Problems on Synchronization~~
deadlock
avoidance
↓
banker's



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