

Operating System: Banker's Algorithm Resource Request Algorithm

By: Vishvadeep Gothi



VISHVADEEP GOTHI SIR

**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,





Vishvadeep Gothi

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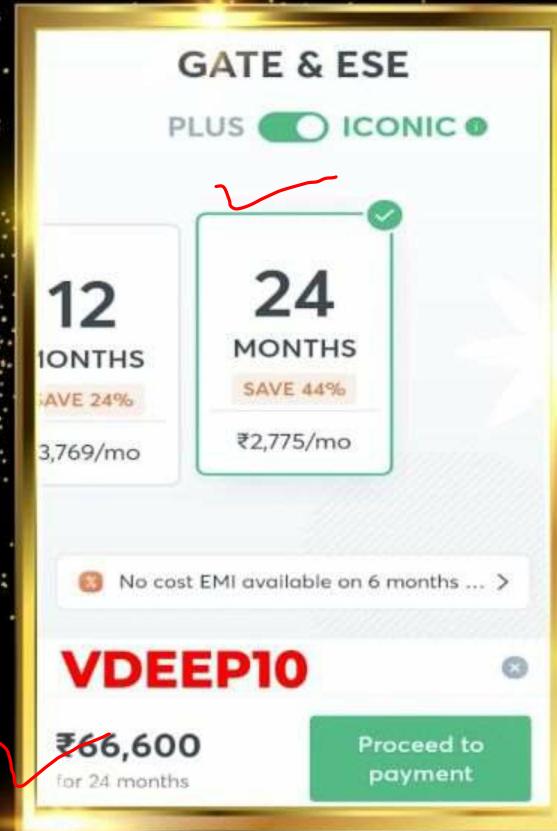
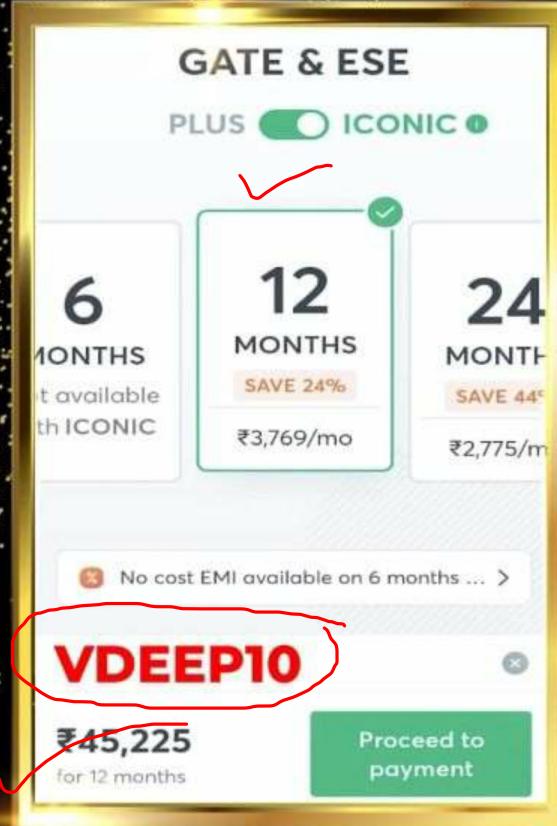
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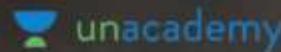
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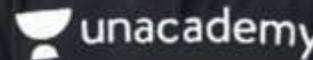


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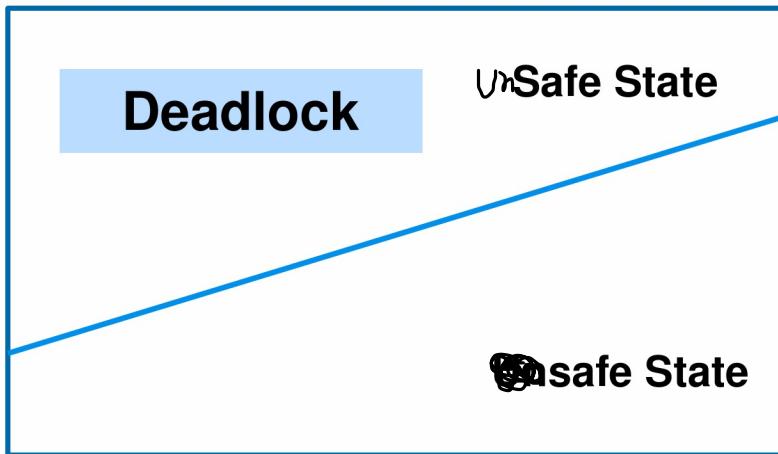
Deadlock Avoidance

In deadlock avoidance, the OS tries to keep system in safe state



Deadlock Avoidance

In deadlock avoidance, the OS tries to keep system in safe state



Banker's Algorithm

The banker's algorithm is a resource allocation and deadlock avoidance algorithm that tests for safety



Banker's Algorithm

Process	Allocation	Max	Available	Need
	A B C	A B C	A B C	A B C
P ₀	0 1 0	7 5 3	3 3 2	7 4 3
P ₁	3 0 2	3 2 2	2 3 0	1 2 2
P ₂	3 0 2	9 0 2	6 0 0	0 1 1
P ₃	2 1 1	2 2 2		
P ₄	0 0 2	4 3 3	4 3 1	

$\langle P_1, P_3, P_0, P_2, P_4 \rangle$

Banker's Algorithm

1. Let Work and Finish be vectors of length 'm' and 'n' respectively.
Initialize: Work = Available
 $\text{Finish}[i] = \text{false}$; for $i=1, 2, 3, 4....n$
2. Find an i such that both
 - (a) $\text{Finish}[i] = \text{false}$
 - (b) $\text{Need}_i \leq \text{Work}$
if no such i exists goto step (4)
3. $\text{Work} = \text{Work} + \text{Allocation}[i]$
 $\text{Finish}[i] = \text{true}$
goto step (2)
4. if $\text{Finish}[i] = \text{true}$ for all i
then the system is in a safe state

Resource Request Algorithm



Question

Yes request can be granted.

What will happen if process P1 requests one additional instance of resource type A and two instances of resource type C?

$$\text{Request}_{P_1} = \langle 1, 0, 2 \rangle$$

Valid
available enough resources

1. Request is valid or not? $\text{Request}_i \leq \text{Need}_i$
2. Enough resources available? $\text{Request}_i \leq \text{Available}$

3. Allocate & check safety.

yes safe

Banker's Algorithm

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P ₀	0	1	0	7	5	3	3	3	2
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			

Allocate $\langle 1, 0, 2 \rangle$ to process P₁.

- {
1. Allocation_i = Allocation_i + Request_{ij}
 2. Need_{ij} = Need_{ij} - Request_{ij}
 3. Available = Available - request_{ij}

Banker's Algorithm



Question

$\text{Request}_0 = \langle 1, 0, 2 \rangle$

- Valid
- enough resources
- allocate

What will happen if process P0 requests one additional instance of resource type A and two instances of resource type C?

	Need		
	A	B	C
P0	7	4	3
P1	6	4	1
P2	1	2	2
P3	6	0	0
P4	4	3	1

	allocation	available
	1	1 2
		3 3 2
	2 3 0	

System is in unsafe state

Request will not be granted.

Question

$\text{Request}_3 = \langle 0, 1, 0 \rangle$

- ↗ valid
- ↗ enough resources
- ↘ allocate

What will happen if process P3 requests one additional instance of resource type B?

	Need		
	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	0	0	1
	4	3	1

Available

3 3 2
3 2 2

Allocation

System is in safe state

Request can be granted.

P₃ | 2 1 1
 2 2 1

$\langle P_1, P_3, P_0, P_2, P_4 \rangle$

Resource Request Algorithm

1. If $\text{Request}_i \leq \text{Need}_i$,
Goto step (2) ; otherwise, raise an error condition, since the process has exceeded its maximum claim.
2. If $\text{Request}_i \leq \text{Available}$
Goto step (3); otherwise, P_i must wait, since the resources are not available.
3. Have the system pretend to have allocated the requested resources to process P_i , by modifying the state as follows:

$$\text{Available} = \text{Available} - \text{Request}_i$$

$$\text{Allocation}_i = \text{Allocation}_i + \text{Request}_i$$

$$\text{Need}_i = \text{Need}_i - \text{Request}_i$$

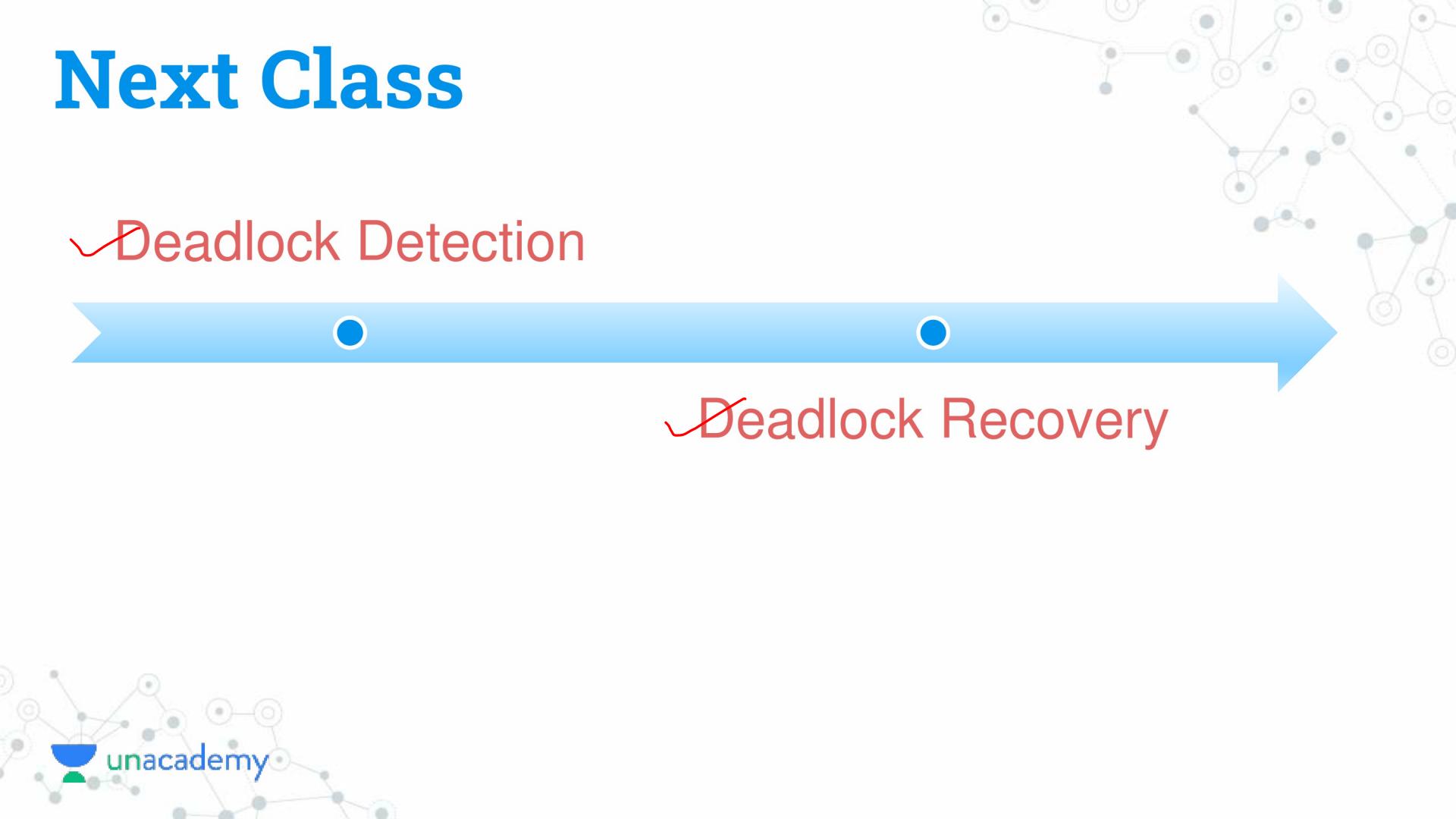
4. Run safety algo, if safe state then request granted
otherwise denied.

Next Class

✓ Deadlock Detection

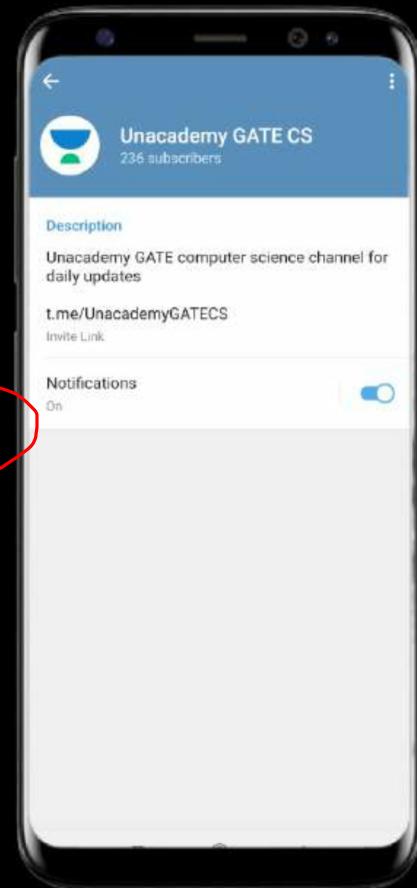


✗ Deadlock Recovery





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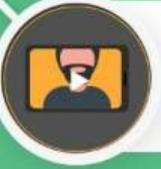
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