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BANKERS ALGORITHM

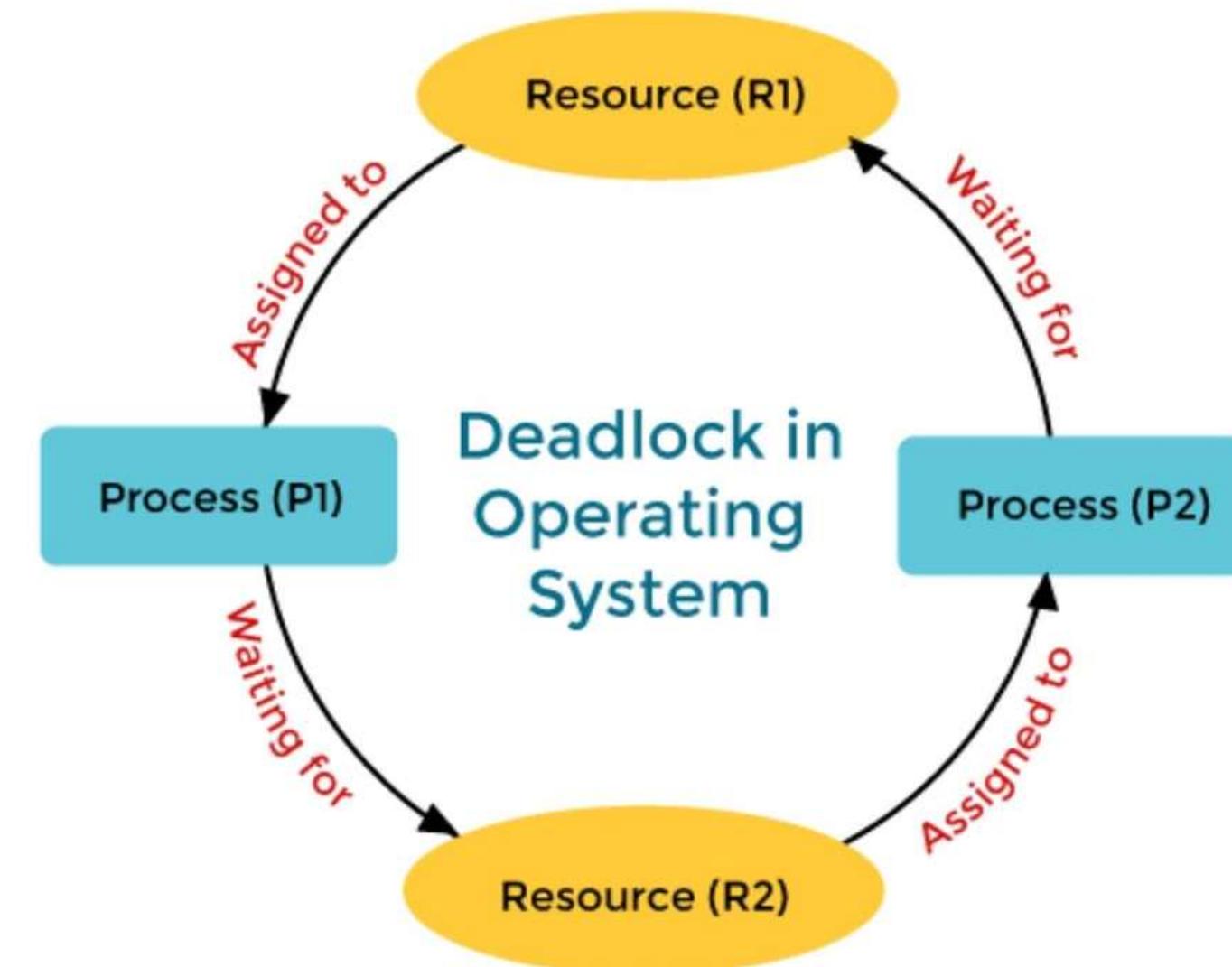
What is the Banker's Algorithm?

- A resource allocation and deadlock avoidance algorithm for operating systems.
- Ensures safe allocation of resources to processes to prevent deadlocks.



DEADLOCK?

- A situation where two or more processes are blocked forever, waiting for each other to release resources needed to proceed.



BANKER'S ALGORITHM COMPONENTS

Key Components:

- **Resource Types**
- **Processes**
- **Data Structures :**
 - Max Need Matrix
 - Allocated Matrix
 - Available Matrix

SAFETY ALGORITHM

How the Algorithm Works:

- **Simulate resource allocation:** Allocate resources to processes based on their requests and the available resources.
- **Finish processes:** Check if any process can finish execution with its remaining resources.
- **Release resources:** If a process finishes, release its allocated resources and update the Available Matrix.
- **Repeat until all processes finish:** Continue simulating resource allocation, finishing processes, and releasing resources until all processes finish or a deadlock is detected.

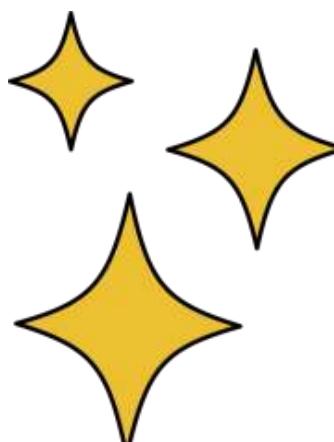
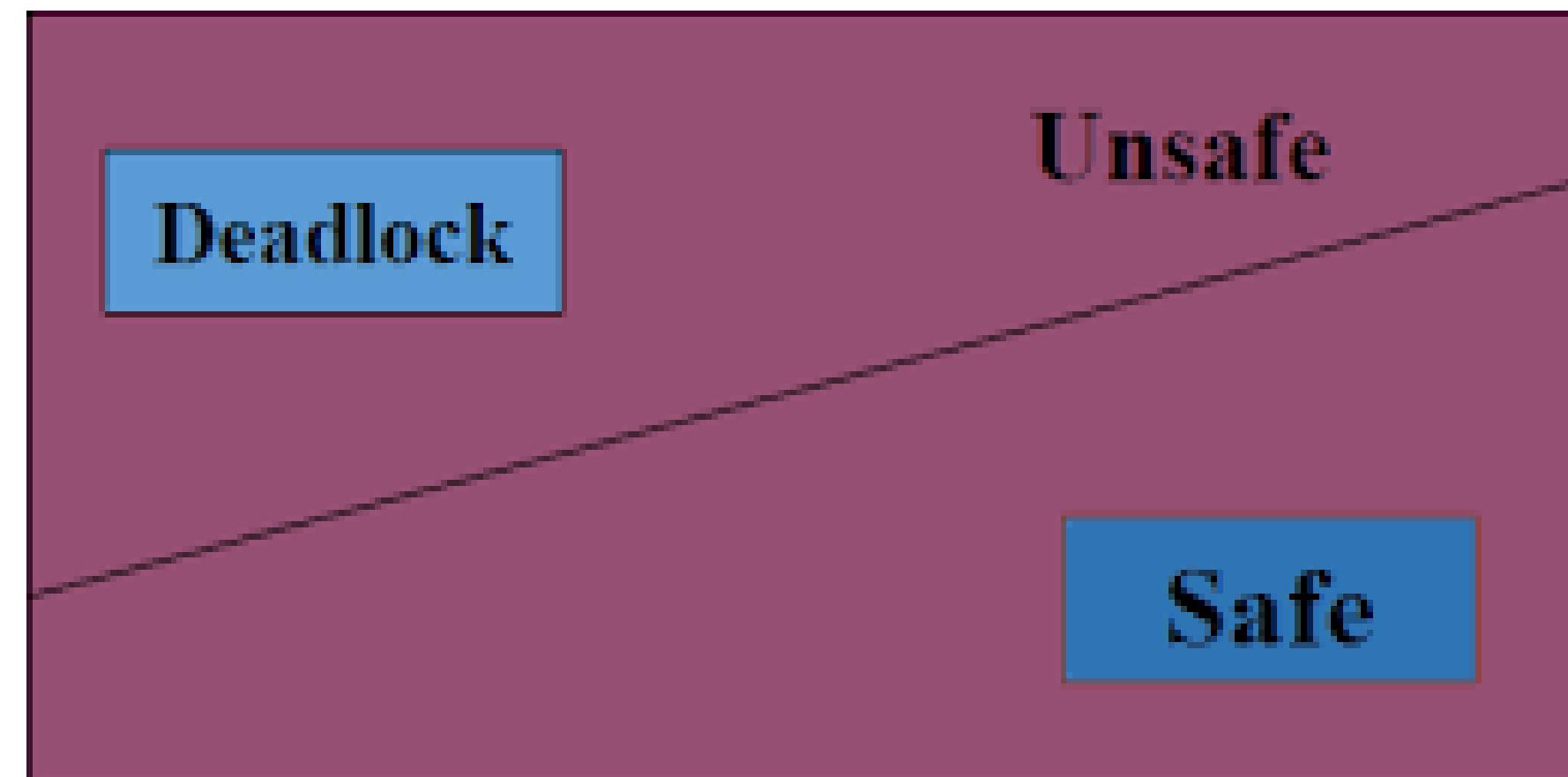
SAFE STATE AND DEADLOCK DETECTION

Safe State:

- A system state where the Safety Algorithm can finish all processes eventually.
- Indicates that granting resource requests will not lead to a deadlock.

Deadlock Detection:

- If the Safety Algorithm fails to finish any process in its simulation, it indicates a deadlock.
- The system must take corrective actions to avoid deadlock, such as resource preemption or process termination.



EXAAMPLE

Total A= 10, B=5, C=7;

Pro ces s	Allocation			Max Need			Available			Remaining Need/Requeste d (max need – allocation)		
	A	B	C	A	B	C	A	B	C	A	B	C
P1	0	1	0	7	5	3	3	3	2	7	4	3
P2	2	0	0	3	2	2	5	3	2	1	2	2
P3	3	0	2	9	0	2	7	4	3	6	0	0
P4	2	1	1	4	2	2	7	4	5	2	1	1
P5	0	0	2	5	3	3	7	5	5	5	3	1
	7	2	5				10	5	7			

Remaining need <= Work/Available

For P1 : 7 4 3 <=3 3 2 ; False

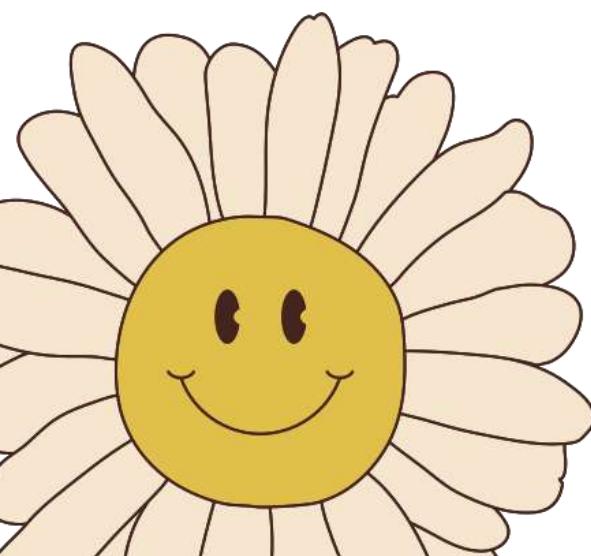
For P2: 1 2 2 <=3 3 2; True

So P2 enters the Safe state and the new Available Value will be

$$\begin{aligned}\text{Work/ Available} &= \text{Work } (3 \ 3 \ 2) + \text{Allocation } (2 \ 0 \ 0) \\ &= 5 \ 3 \ 2\end{aligned}$$

So similarly if we update the value and can fulfill the requests of all processes then the process sequence will be:

P2 P4 P5 P1 P3 Safe Sequence



ADVANTAGES AND DISADVANTAGES

Advantages:

- Effective deadlock avoidance: Can prevent deadlocks from occurring in the first place.
- Improved resource utilization: Allocates resources efficiently by considering maximum needs.
- Fairness: Ensures fair access to resources for all processes.

Disadvantages:

- Overhead: Requires maintaining and updating data structures, increasing system overhead.
- Limited applicability: Works best for systems with static resource requests and predictable execution times.
- Complexity: Implementation can be complex, especially for large systems with many resources and processes.



THANK YOU

Resources:

<https://www.codetextpro.com>

<https://www.geeksforgeeks.org>

<https://chat.openai.com>