Department of Computer Science and Engineering

FACULTY OF ENGINEERING AND TECHNOLOGY
UNIVERSITY OF LUCKNOW
LUCKNOW

CS-501

Dr. Zeeshan Ali Siddiqui
Assistant Professor
Deptt. of C.S.E.

METHODS FOR HANDLING DEADLOCKS (Part-2)

Methods for Handling Deadlocks

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

DEADLOCK AVOIDANCE
Continue…

SAFE STATE

Safe State 1/3

- When a process requests an available resource, the system must decide if immediate allocation leaves the system in a *safe state*.

- A state is safe if the system can allocate resources to each process (up to its maximum) in some order and still *avoid a deadlock*.

Safe State 2/3

- A system is in a safe state only if there *exists* a safe sequence.

- *Safe sequence*
  - A sequence of processes <P1, P2, ..., Pn> is a safe sequence for the current allocation state if, for each Pi, the resource requests that Pi can be *satisfied* by the currently available resources plus the resources held by all Pj, with j < i.

Safe State 3/3

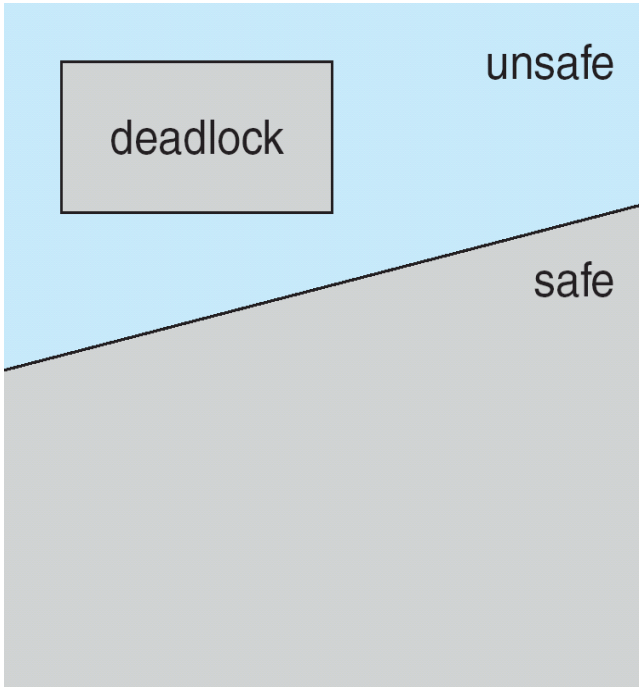
- In this situation, if the resources that Pi needs are not immediately available, then Pi can *wait* until all Pj have finished.

- When they have finished, Pi can obtain all of its needed *resources*, complete its designated task, return its allocated resources, and terminate.

- When Pi terminates, Pi+1 can obtain its needed resources, and so on. If no such sequence exists, then the system state is said to be *unsafe*.

General Facts

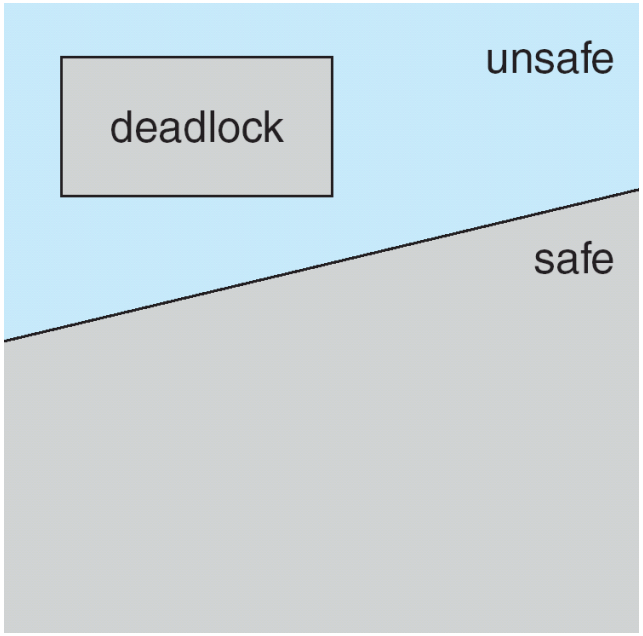
- If a system is in safe state -> **no deadlocks**
- If a system is in unsafe state -> ***possibility of deadlock***
- **Avoidance**: ensure that a system will never enter an unsafe state.



Example

- Let a system with 12 resources

	Max	Current
P0:	10	5
P1:	4	2
P2:	9	2



- Available: 12-9=3
- Need of
  - P0=5
  - P1=2
  - P2=7

- The sequence *<P1, P0, P2>* satisfies the safety condition.
- At time t0, the system is in a *safe 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.