



Module 13

Operating Systems Two



Module Thirteen

- Operating Systems - Part Two
- In this presentation, we are going to talk about :
- Resource Allocation



Overview

- Previously we talked about:
- Job Scheduling

Now: Resource Allocation



Resource Allocation

- Types of resources that the Operating System allocates to programs:
- Peripherals
 - Printer
 - Keyboard
- Memory
 - Initial allocation
 - Dynamic allocation
- File Page Lock
 - Database file



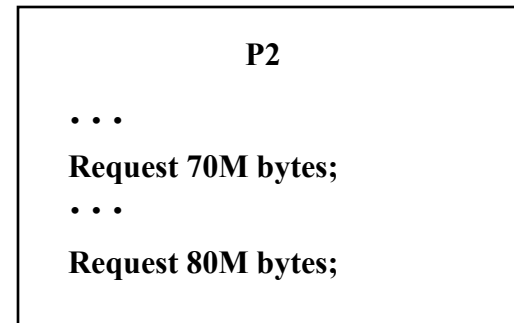
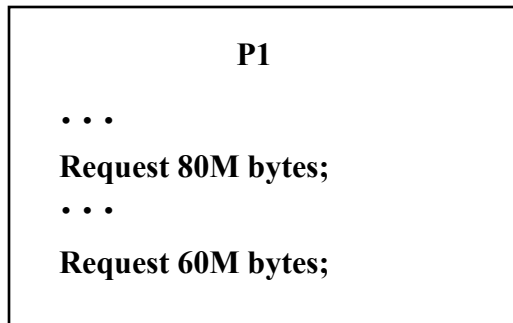
Deadlock

- Permanent blocking of a set of processes that either compete for system resources or communicate with each other.
- Involve conflicting needs for resources by two or more processes.



Example of Deadlock

- Space is available for allocation of 200M bytes, and the following sequence of events occur



- Deadlock occurs if both processes progress to their second request



Conditions for Deadlock

- Mutual exclusion

Only one process may use a resource at a time.
- Hold-and-wait

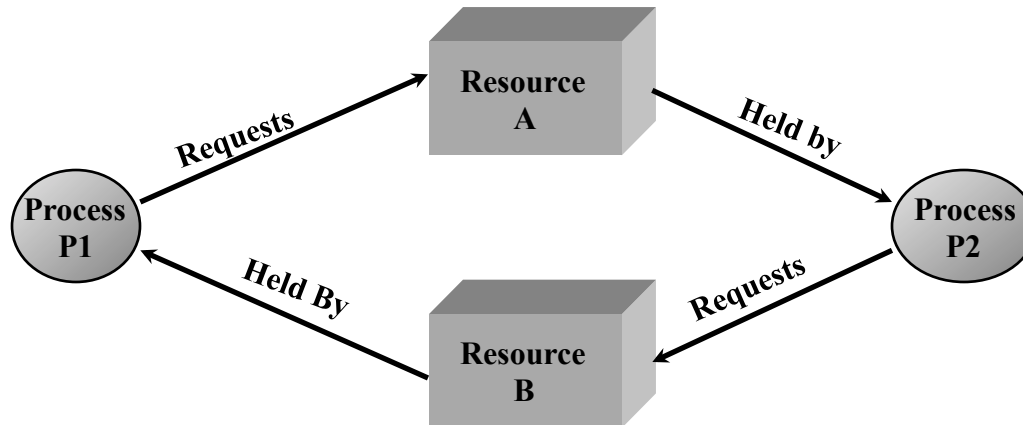
A process may hold allocated resources while awaiting assignment of others.
- No preemption

No resource can be forcibly removed from a process holding it.
- Circular wait

A closed chain of processes exists, such that each process holds at least one resource needed by the next process in the chain.

Consequence of the first three conditions.

Circular Wait





Deadlock Detection

- Operating system checks for deadlock.
- Check at resource request
 - early detection of deadlock
 - frequent checks consume processor time
- Check periodically.



Deadlock Avoidance

- Do not start a process if its demands might lead to deadlock.
- Do not grant an incremental resource request to a process if this allocation might lead to deadlock.
- Not necessary to preempt and rollback processes.
- Maximum resource requirement must be stated in advance.
- Processes under consideration must be independent; no synchronization requirements.
- There must be a fixed number of resources to allocate.
- No process may exit while holding resources.



Strategies once Deadlock Detected

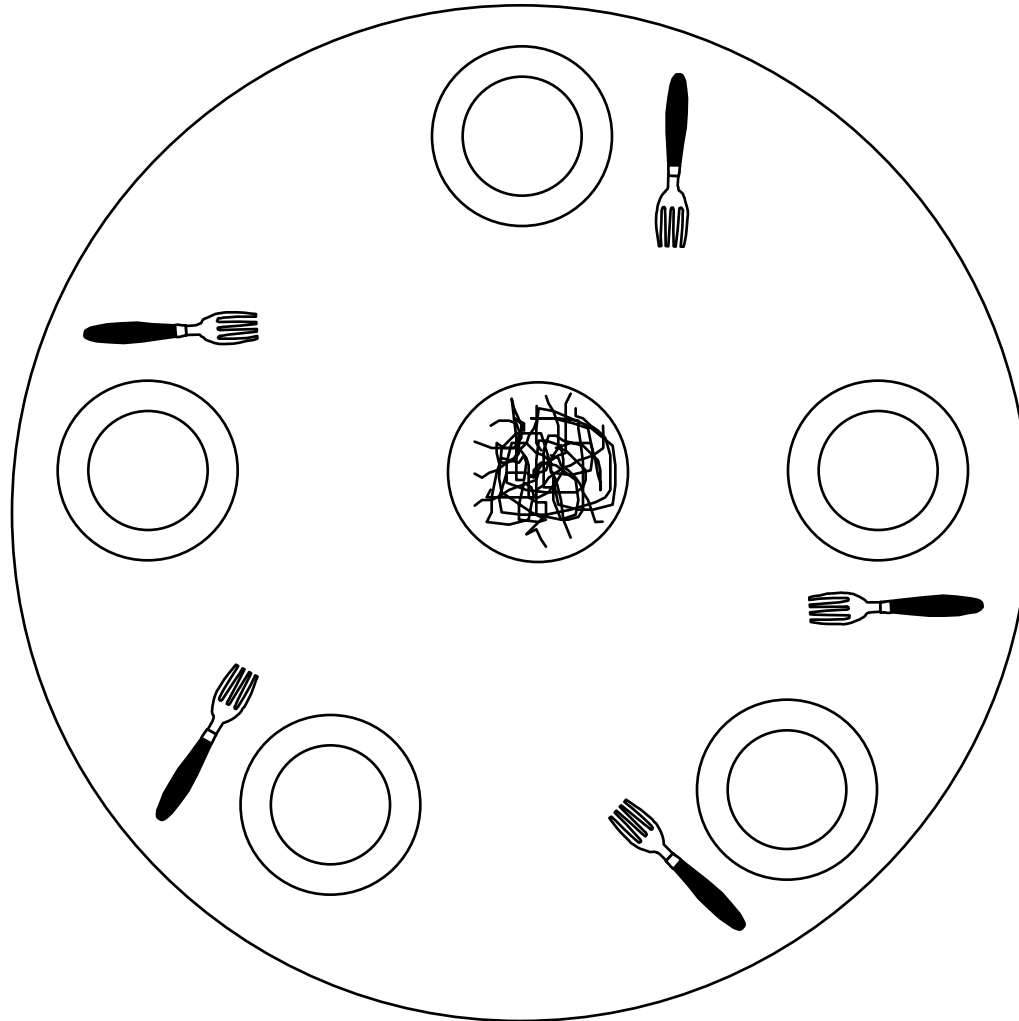
- Abort all deadlocked processes.
- Back up each deadlocked process to some previously defined checkpoint, and restart all process.
Original deadlock may occur.
- Successively abort deadlocked processes until deadlock no longer exists.
- Successively preempt resources until deadlock no longer exists.



Deadlocked Selection Criteria

- Least amount of processor time consumed so far.
- Least number of lines of output produced so far.
- Most estimated time remaining.
- Least total resources allocated so far.
- Lowest priority.

Dining Philosophers Problem





Summary

- Operating Systems Part Two
Resource Allocation

Next: Data Security