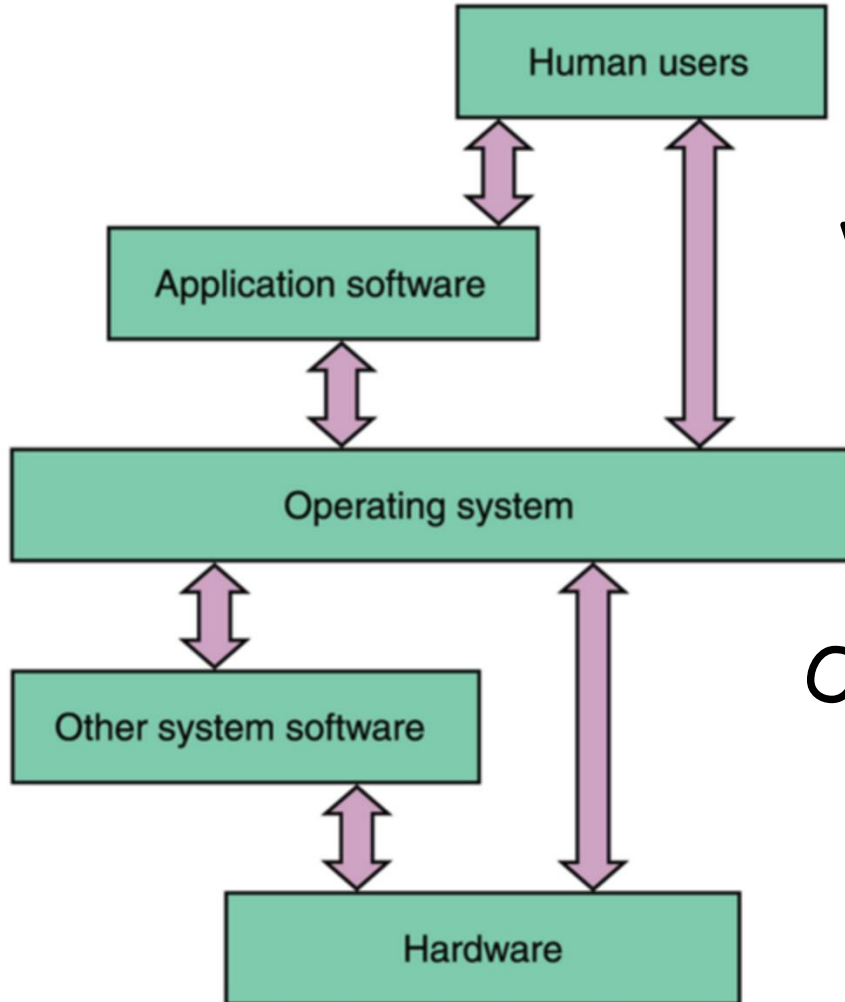


Midterm Exam Review Session

Instructor: Dr. Liting Hu

Introduction to Operating Systems

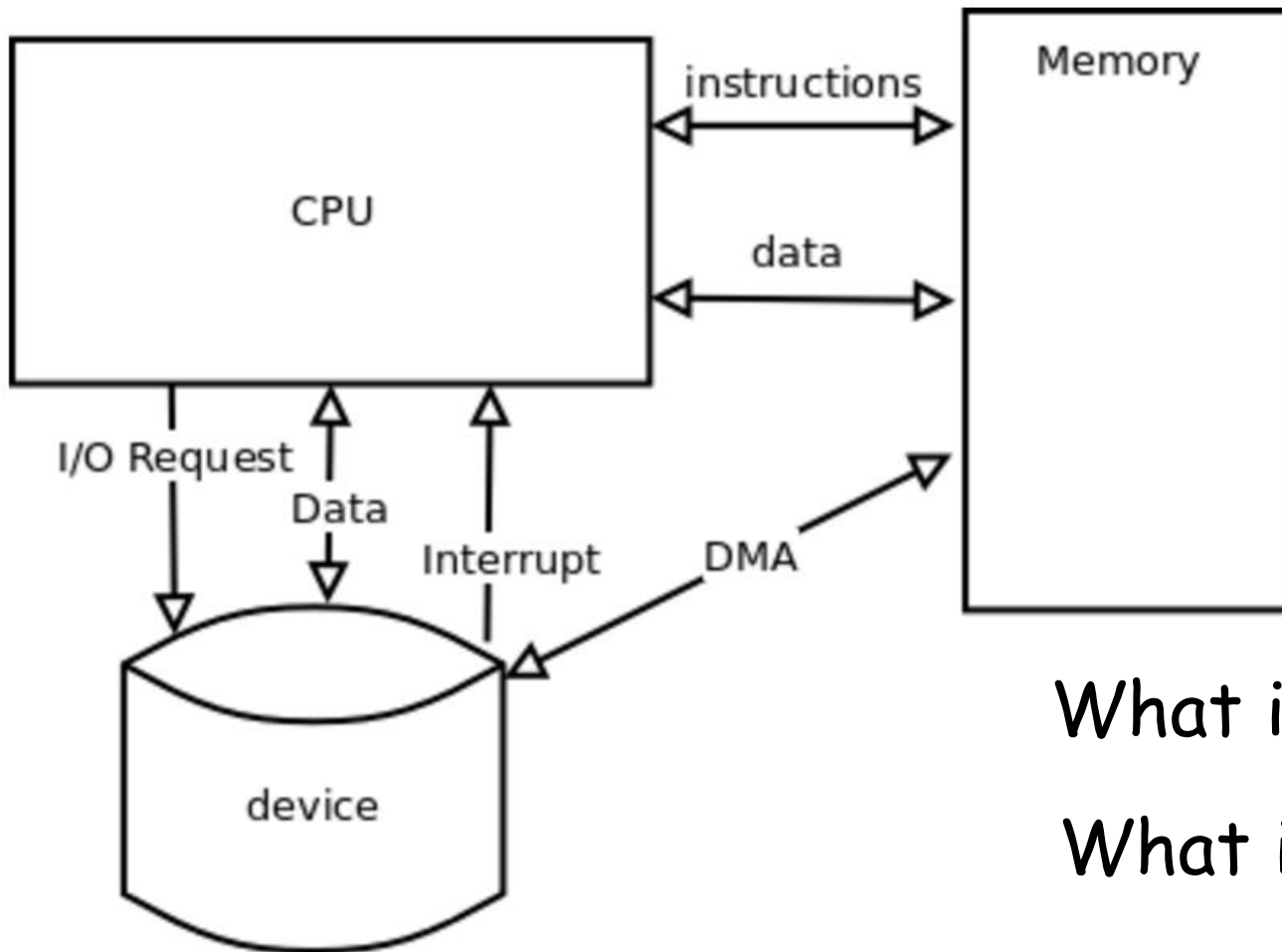
1. Introduction to Operating Systems



What is operating system?

Operating system benefits?

1.1 Computer Architecture

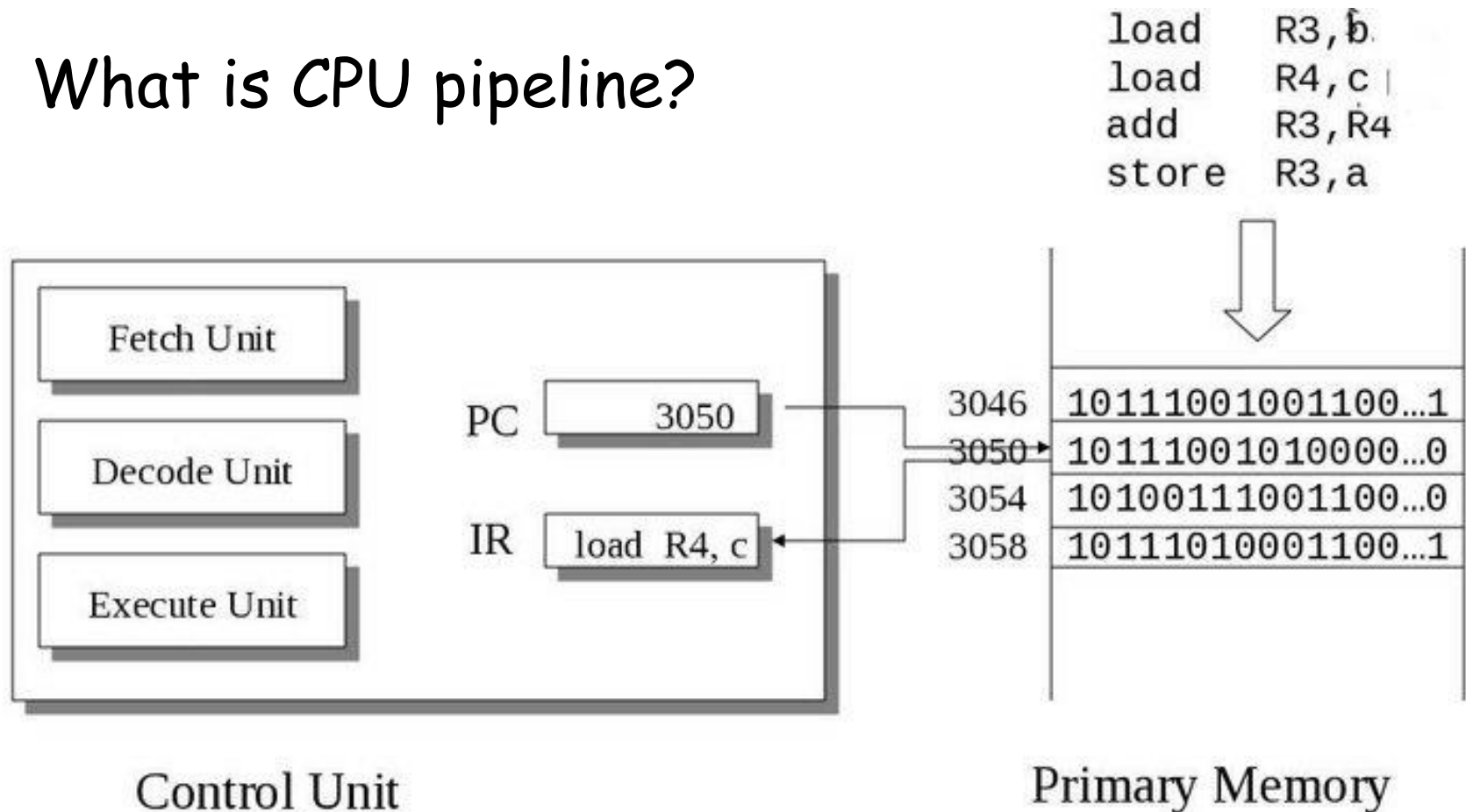


What is interrupt?

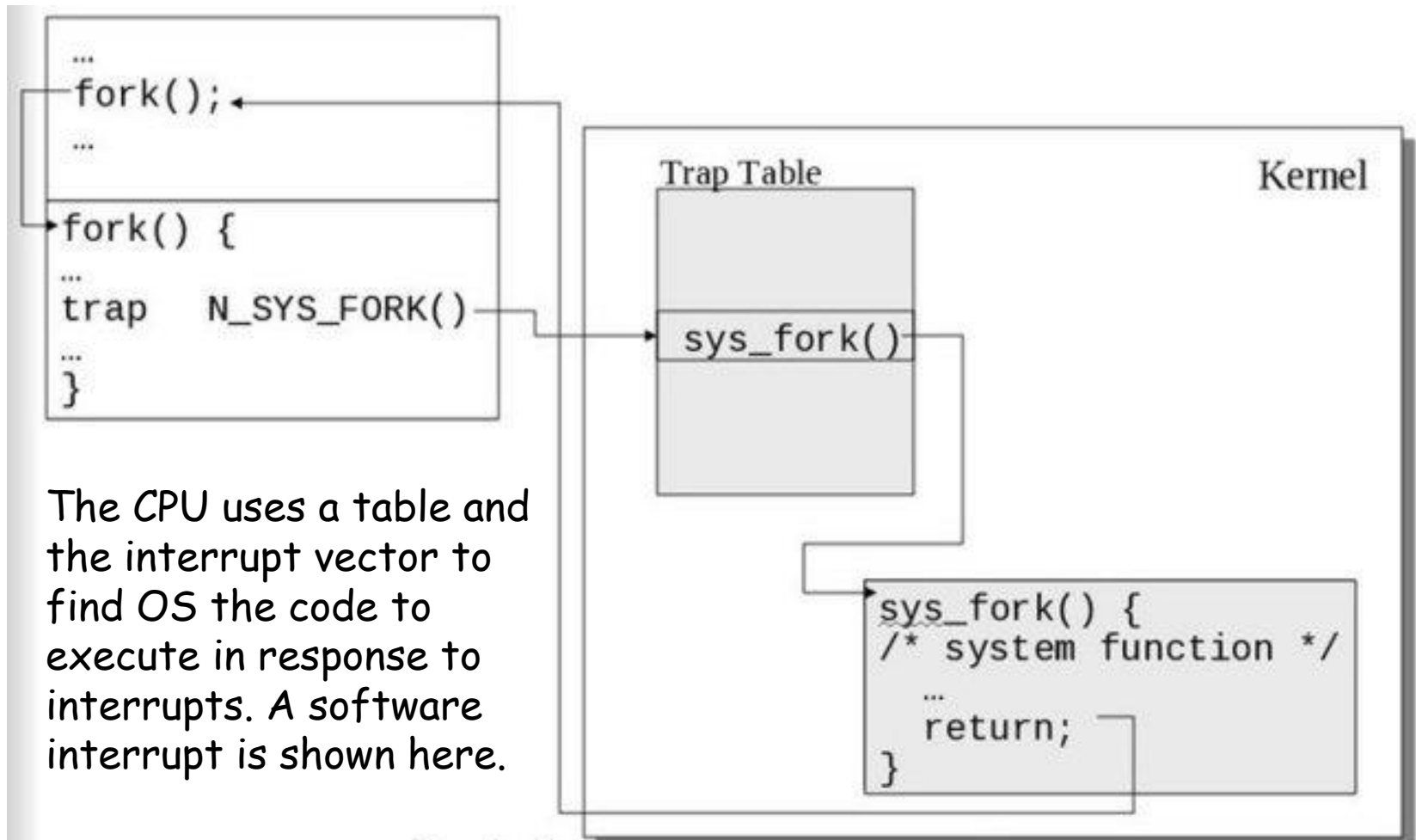
What is DMA?

1.2 The CPU Control Unit

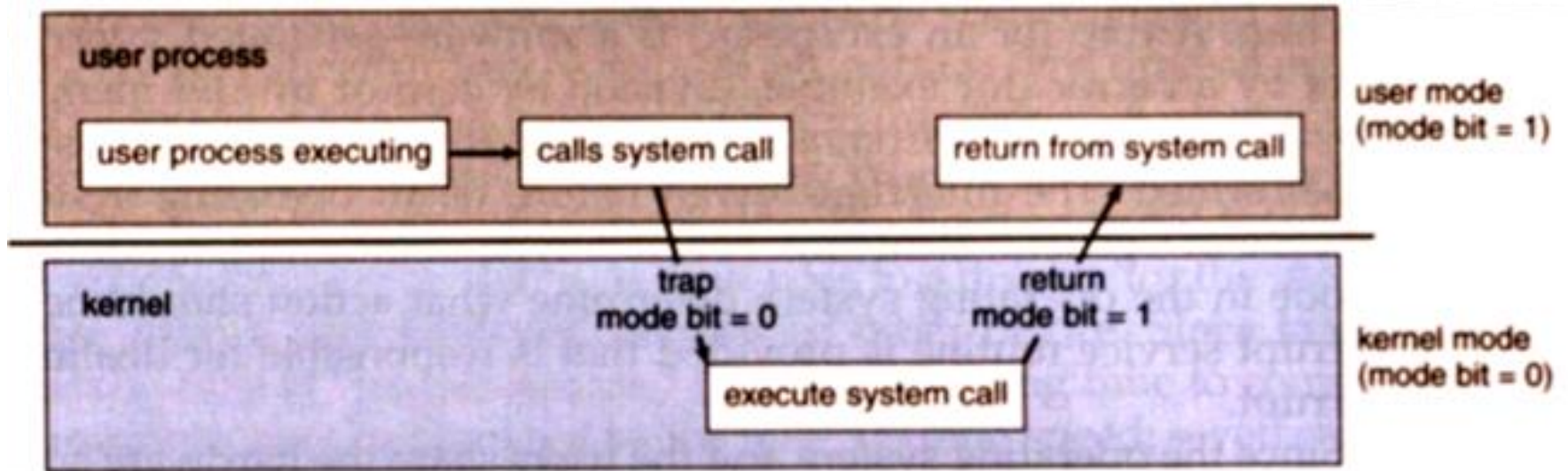
What is CPU pipeline?



1.3 CPU Response to Interrupts



1.4 System Calls

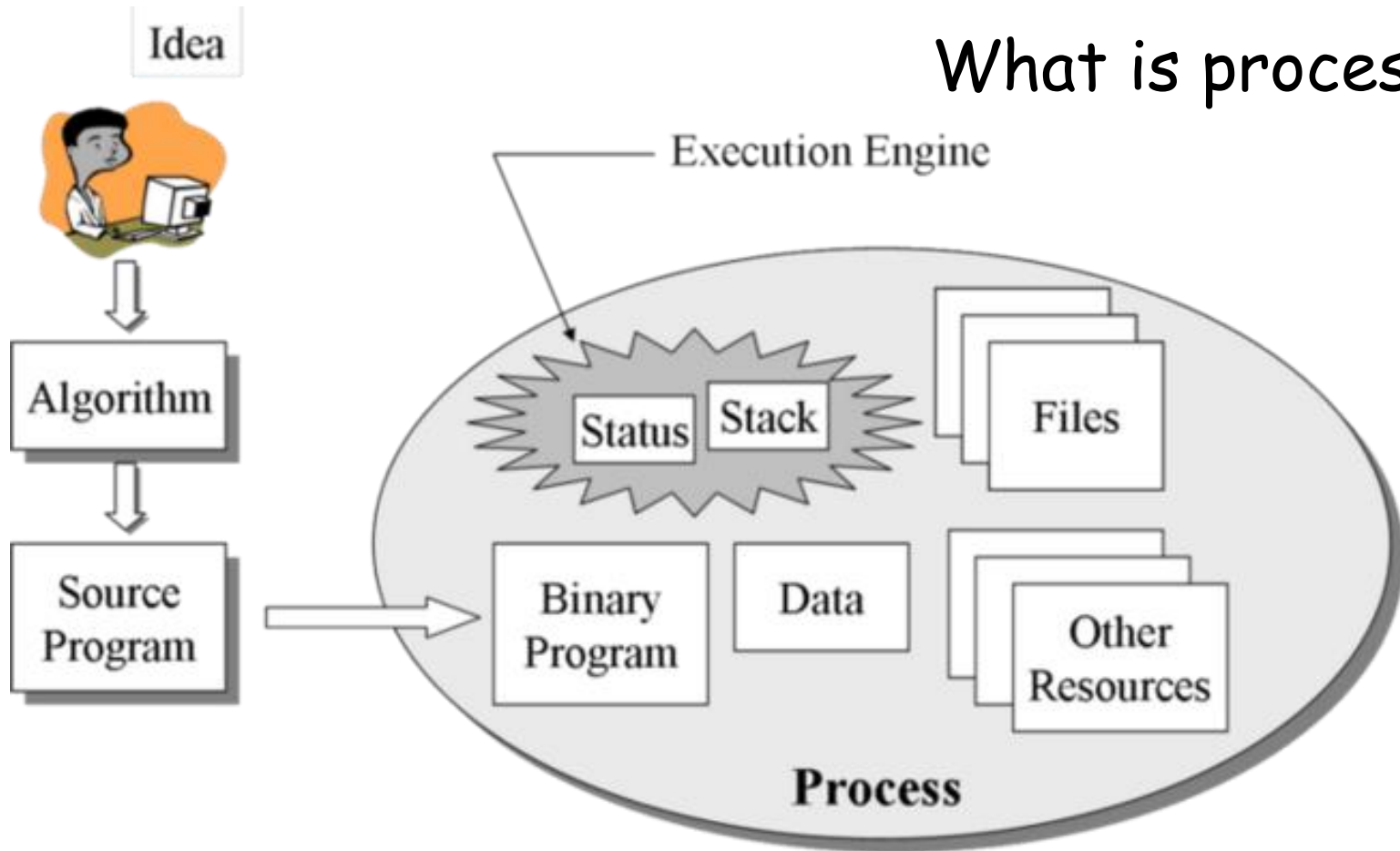


When to switch from user mode to kernel mode?

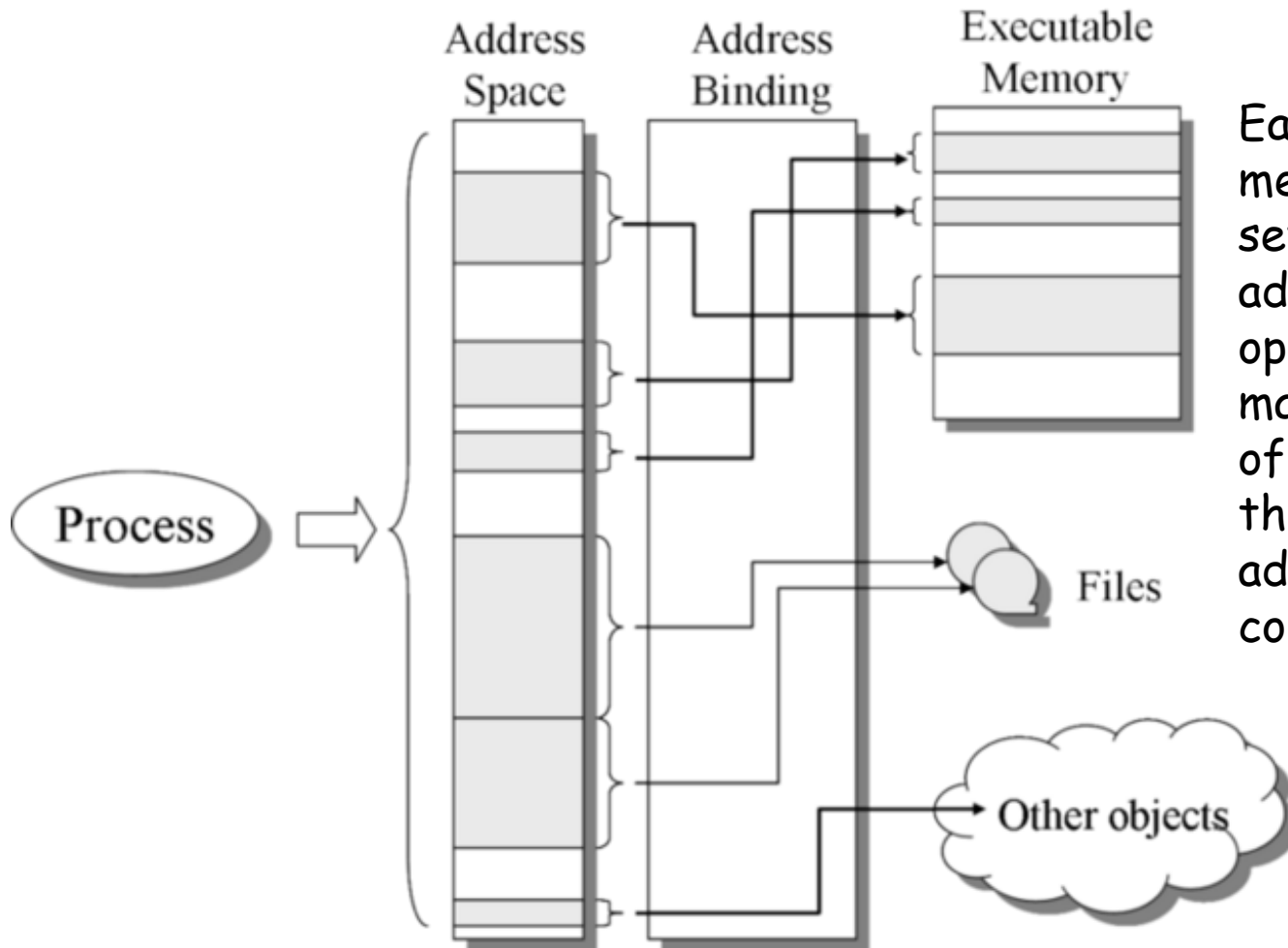
Processes management

2. Processes Management

What is process?



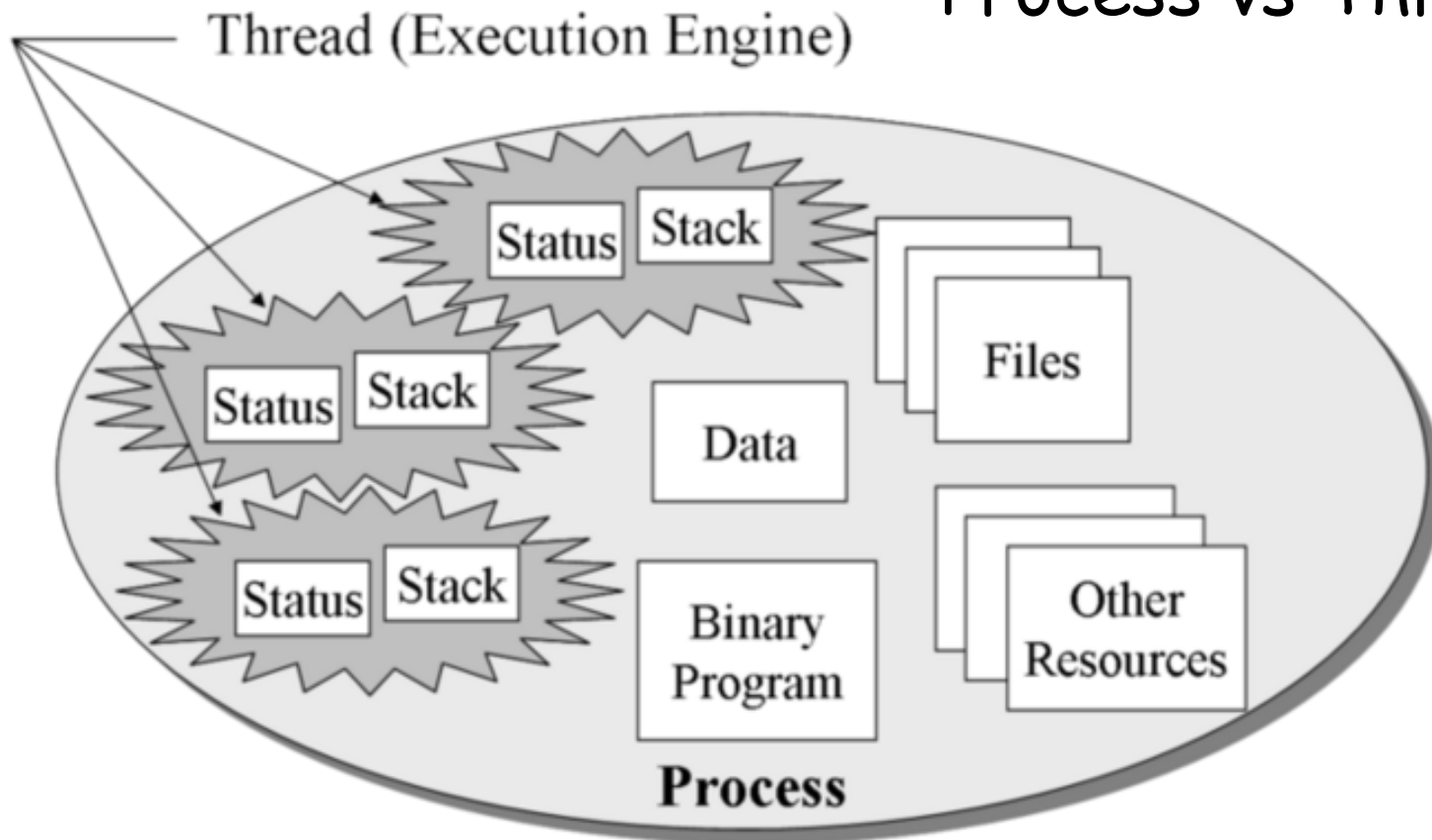
2.1 Address Space



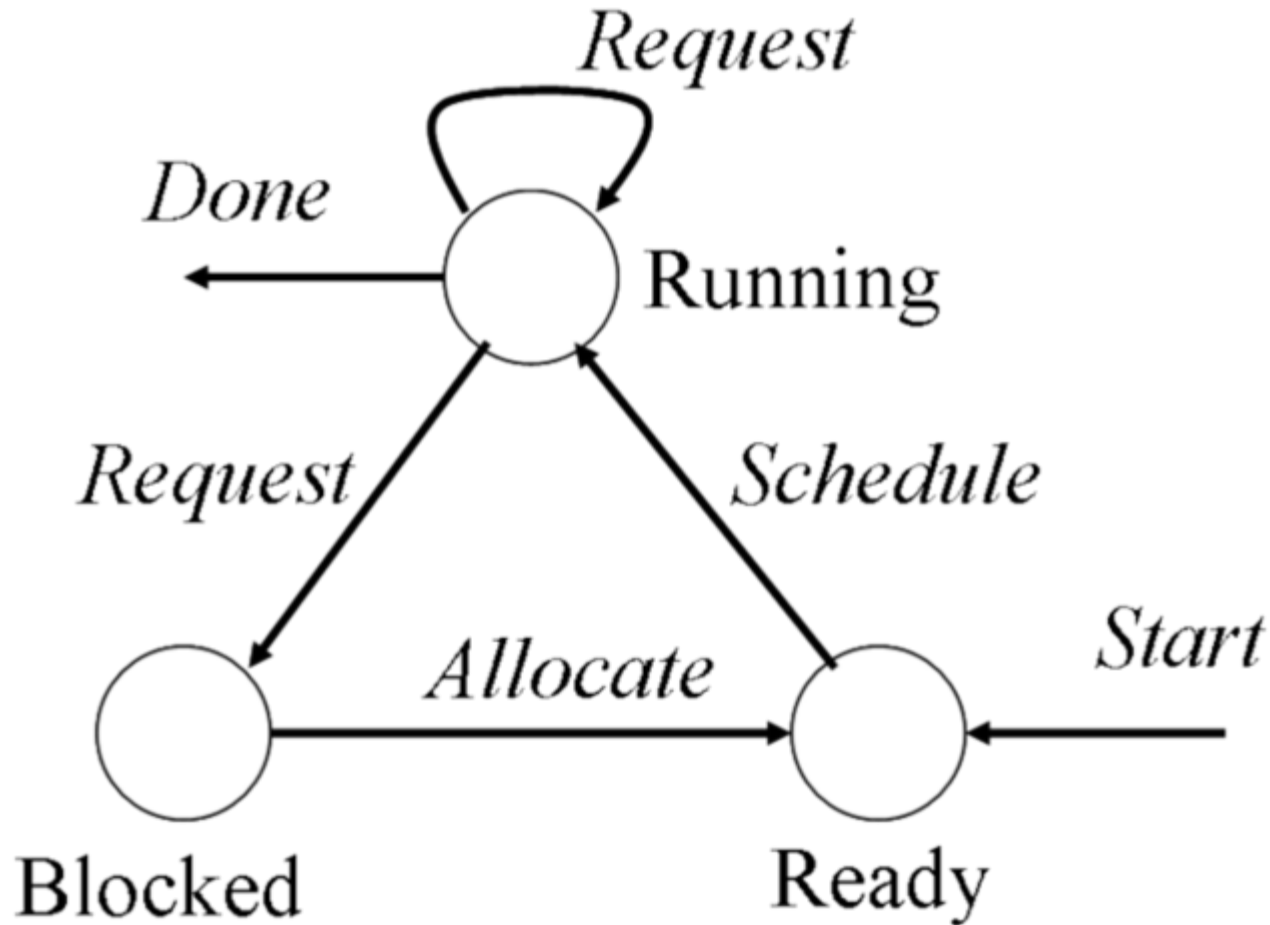
Each process views its memory as a contiguous set of logical memory addresses. The operating system manages the translation of logical addresses to the physical memory addresses of the computer.

2.2 Multi-threaded Process

Process vs Thread?

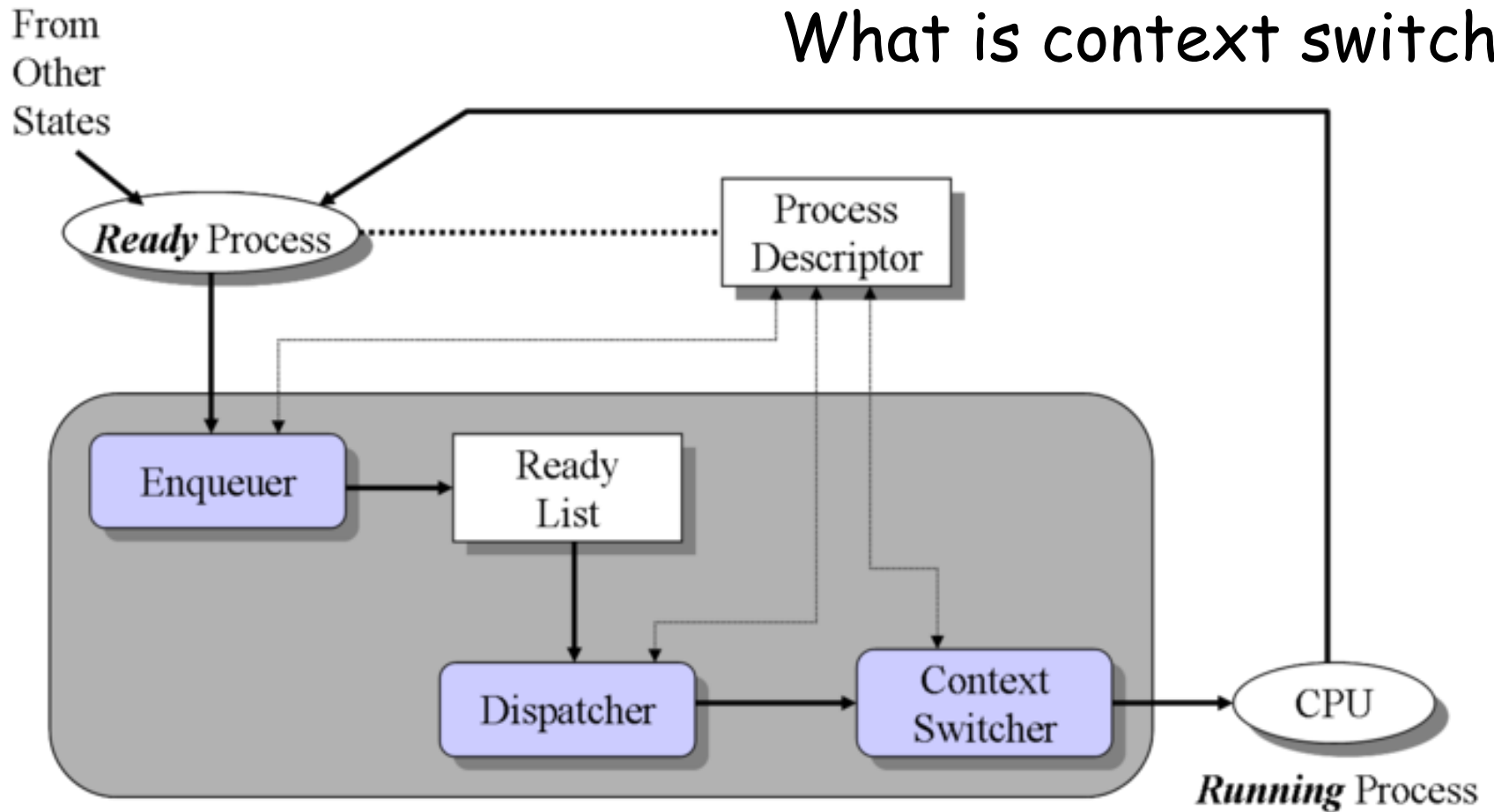


2.3 Process Finite State Diagrams



2.4 Process Scheduler

What is context switch?

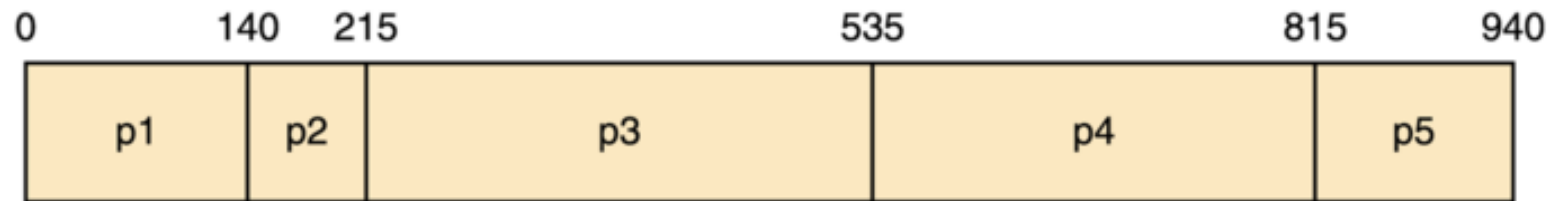


2.5 Scheduler Metrics

- CPU Utilization
- Throughput
- Waiting time
- Service time
- Turnaround time for a process
- Response time

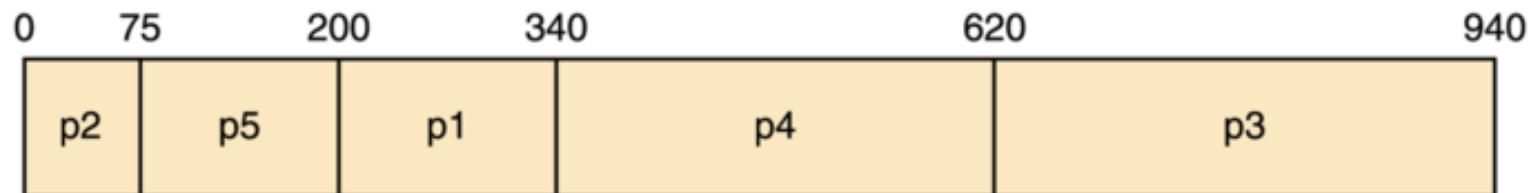
2.5.1 First Come, First Served Scheduler

Process	Service time
p1	140
p2	75
p3	320
p4	280
p5	125



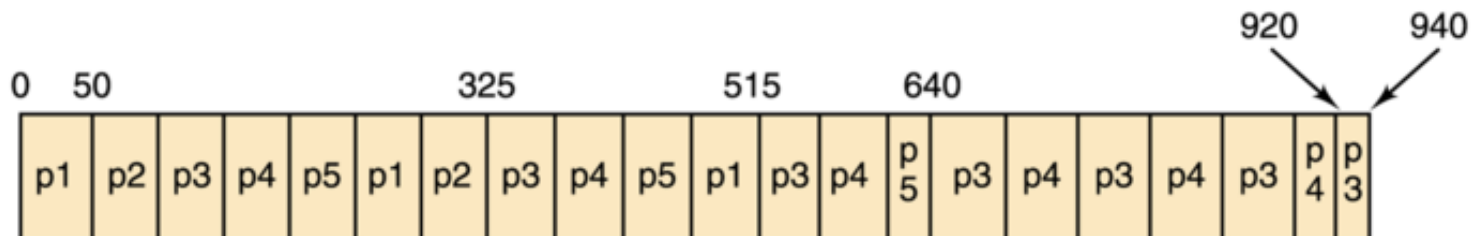
2.5.2 Shortest Job Next Scheduler

Process	Service time
p1	140
p2	75
p3	320
p4	280
p5	125



2.5.3 Round Robin Scheduler

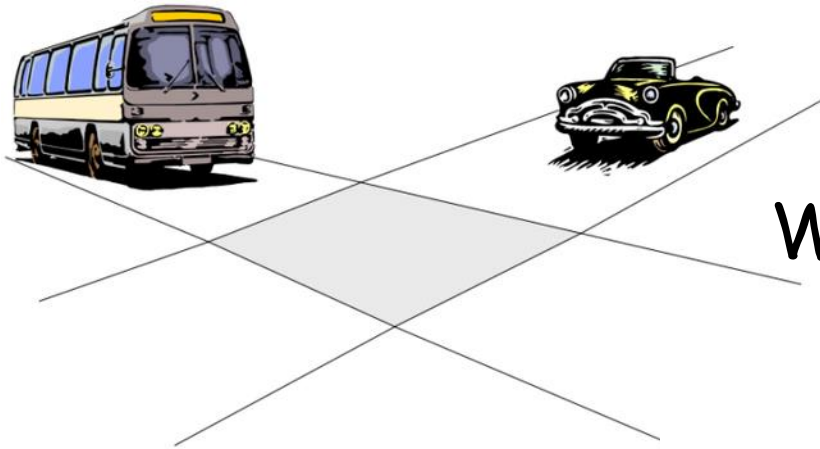
Process	Service time
p1	140
p2	75
p3	320
p4	280
p5	125



Interprocess Communication and Synchronization

3. IPC and Synchronization

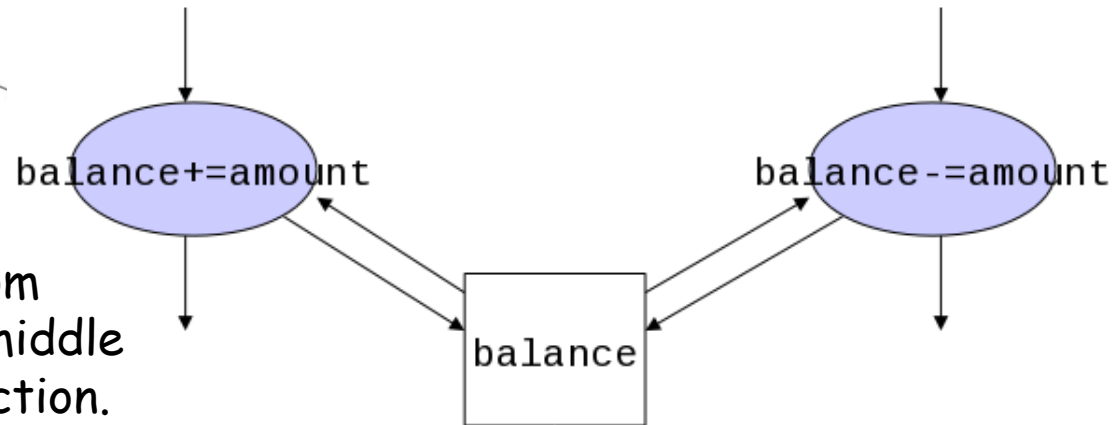
- Potential IPC problems



Race condition?

Critical region?

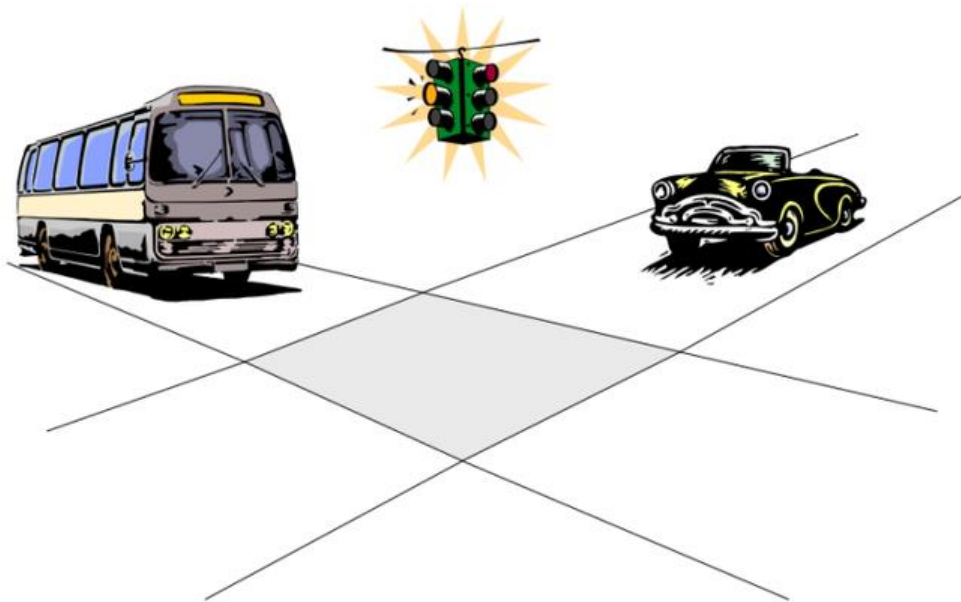
What is data inconsistency?



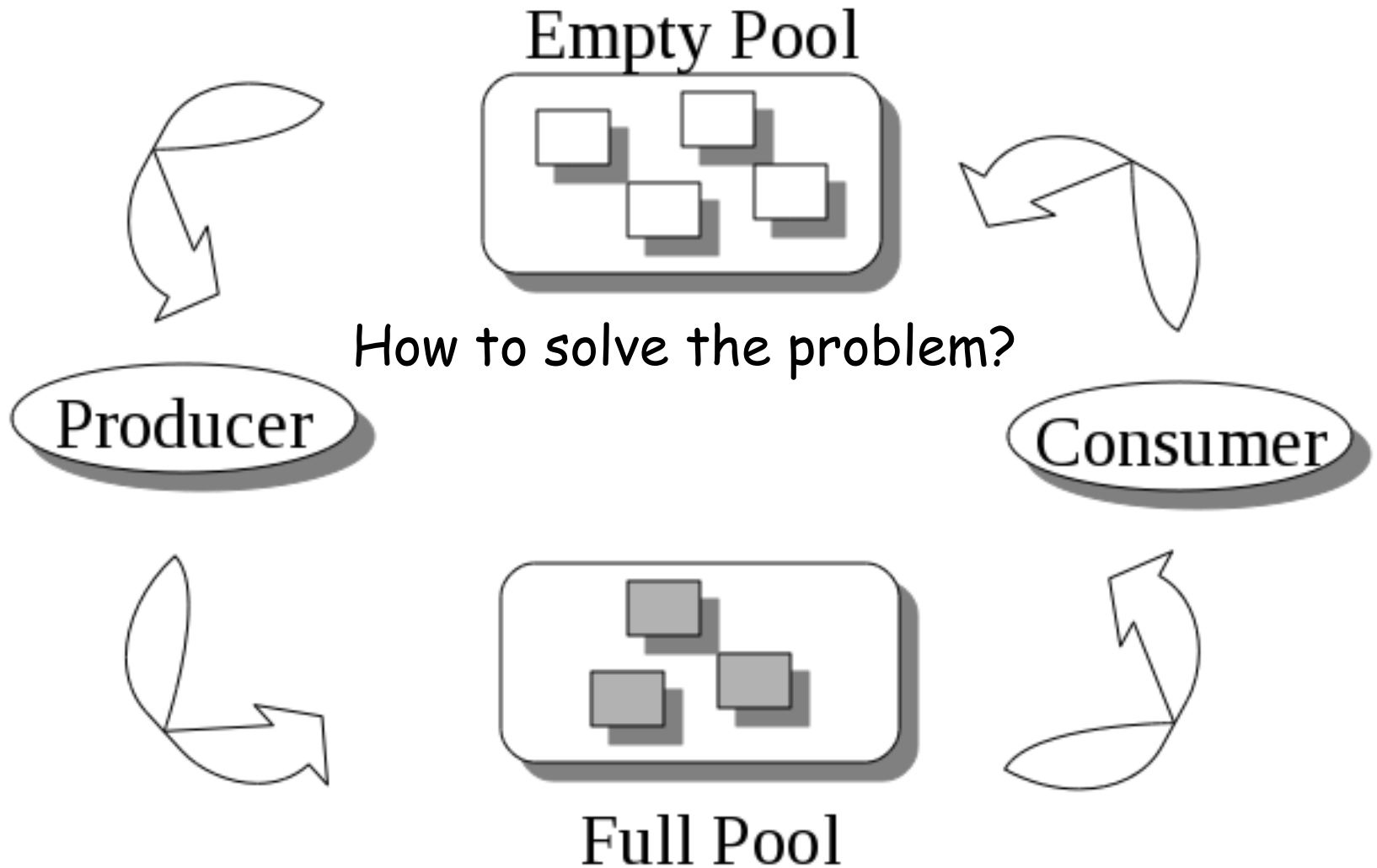
The root of the problem stems from a context switch occurring in the middle of the execution of the critical section.

3.1 Possible solutions

- Software solution
- Disable interrupts
- Mutex and Semaphore



3.2 Bounded Buffer (Producers and Consumers)



Deadlocks

Deadlocks

A deadlock condition can occur when two processes need multiple shared resources at the same time in order to continue.



How to avoid deadlocks?

Review Tips

- Slides
- Section quiz
- Exam review session
- Sample midterm
- Text book