



Operating Systems

CSN-232

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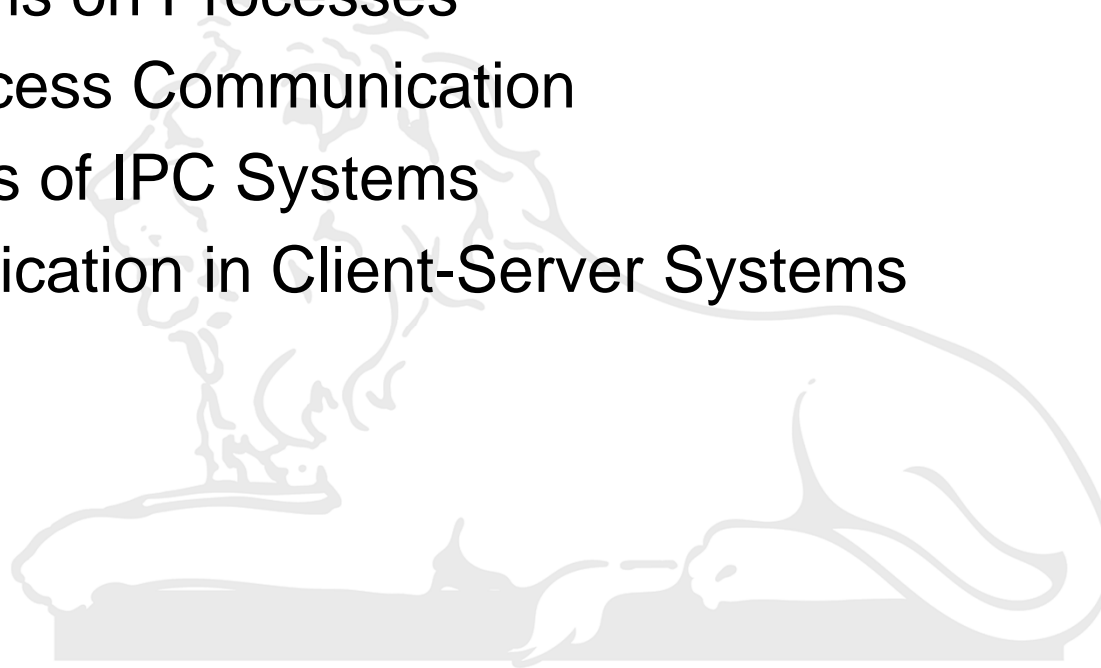
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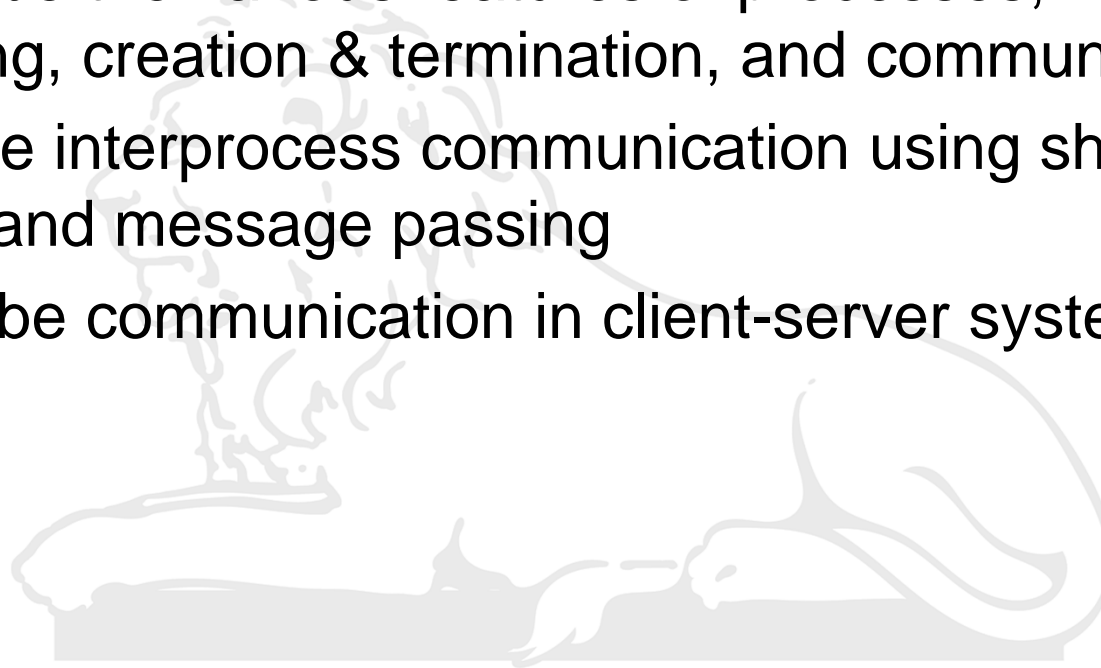
Process Management

- Process Concept
- Process Scheduling
- Operations on Processes
- Inter-process Communication
- Examples of IPC Systems
- Communication in Client-Server Systems



Objectives

- To introduce the notion of a process -- a program in execution, which forms the basis of all computation
- To describe the various features of processes, including scheduling, creation & termination, and communication
- To explore interprocess communication using shared memory and message passing
- To describe communication in client-server systems



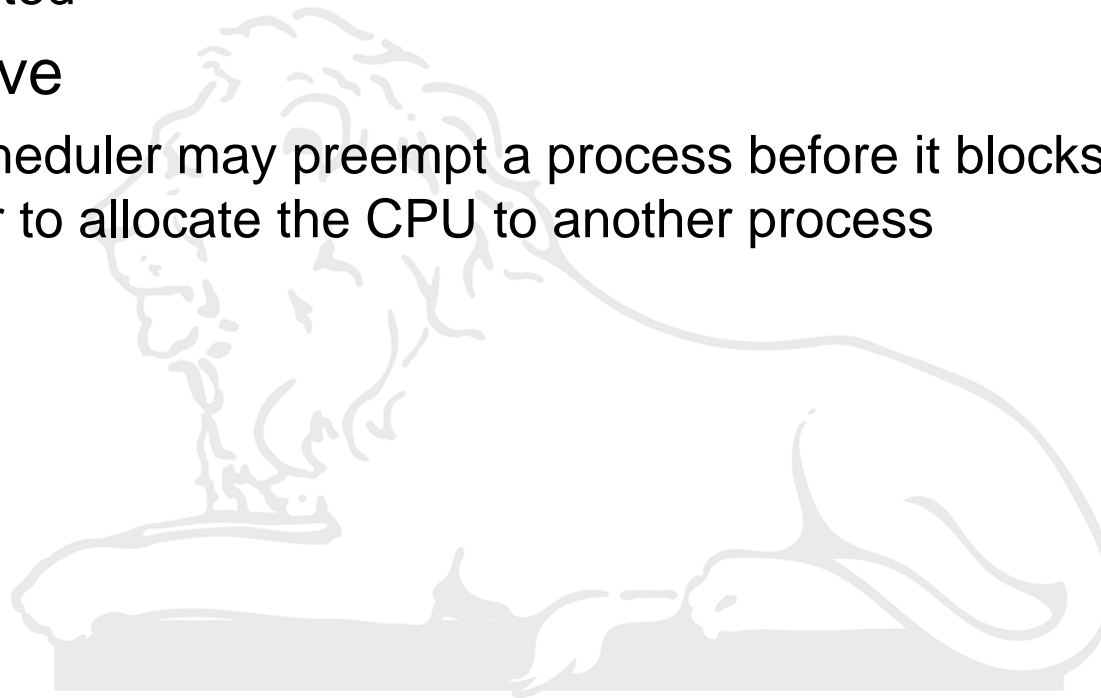
Scheduling Criteria

- CPU utilization
- Balanced Utilization
- Throughput
- Turnaround time
- Wait time
- Response time
- Predictability
- Fairness
- Priorities



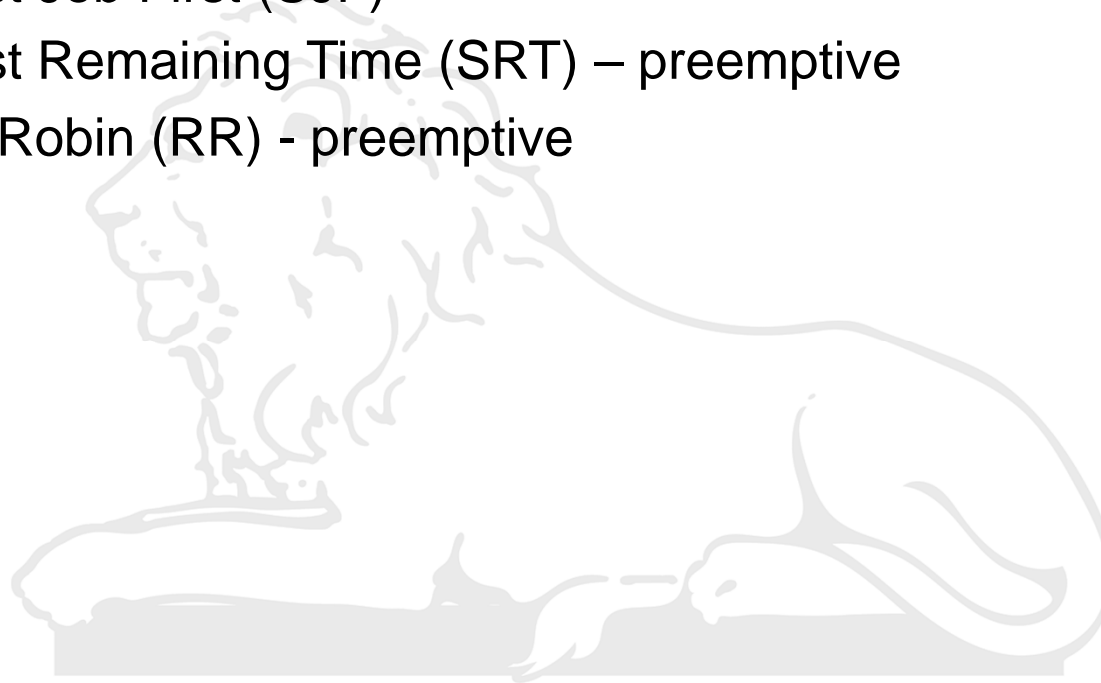
Scheduling Algorithms

- Nonpreemptive
 - A process retained control of the CPU until the process blocked or terminated
- Preemptive
 - The scheduler may preempt a process before it blocks or terminates in order to allocate the CPU to another process



Scheduling Algorithms

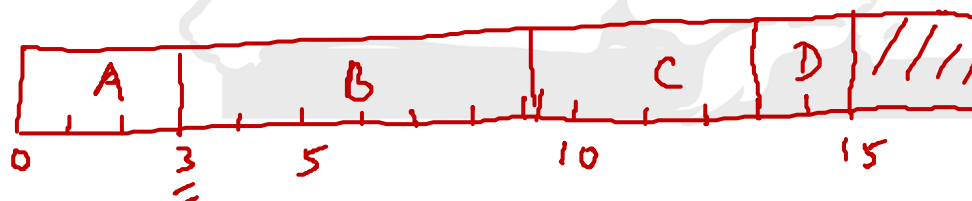
- Based on Queue
 - First Come First Serve (FCFS)
 - Shortest Job First (SJF)
 - Shortest Remaining Time (SRT) – preemptive
 - Round Robin (RR) - preemptive



Processing Schedule data

Process	Arrival time	Processing time
A	0.000	3
B	1.001 ✓	6
C	4.001 ✓	4
D	6.001 ✓	2

(1) FCFS



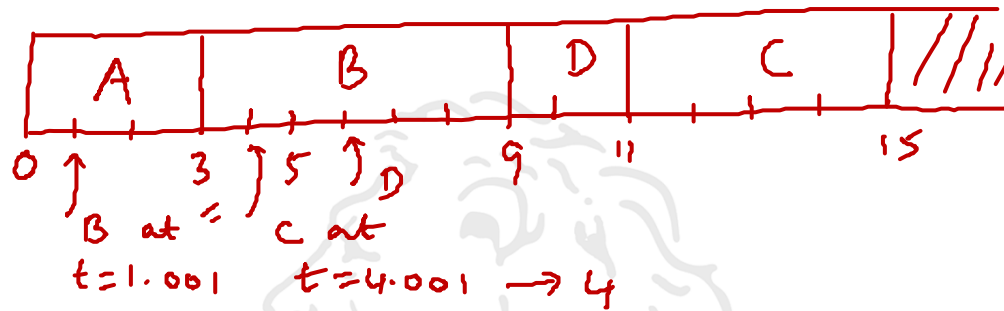
Average turn around time

$$ATAT \text{ for FCFS} = \left\{ \begin{aligned} &(3-0) \\ &+ (9-1) \\ &+ (13-4) \\ &+ (15-6) \end{aligned} \right\}$$

$$= (3 + 8 + 9 + 9) / 4 / 4$$

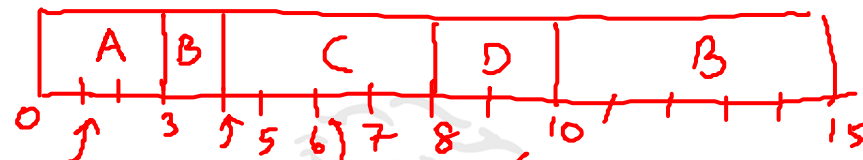
$$= 7.25$$

(2) Shortest Job First (SJF)



$$\begin{aligned}
 \text{ATTAT} &= \left[(3-0) + (9-1) + (15-4) + (11-6) \right] / 4 \\
 &= \underline{\underline{6.75}}
 \end{aligned}$$

(3) Remaining Job first



$$B = 1.001 \rightarrow 4.999$$

$$\text{A} \rightarrow 1.999$$

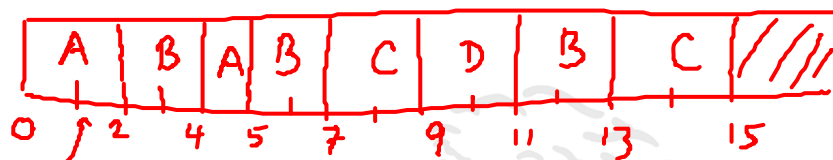
$$\text{C} \rightarrow 4.001 \rightarrow 1.999$$

$$\text{D} \rightarrow 6.001 \rightarrow 2$$

$$A_{TAT} = \left[(3-0) + (15-1) + (8-4) + (10-6) \right] / 4$$

$$= \underline{\underline{6.25}}$$

(4) Round robin (Quantum 2)



~~A - 3~~

~~B - 6~~

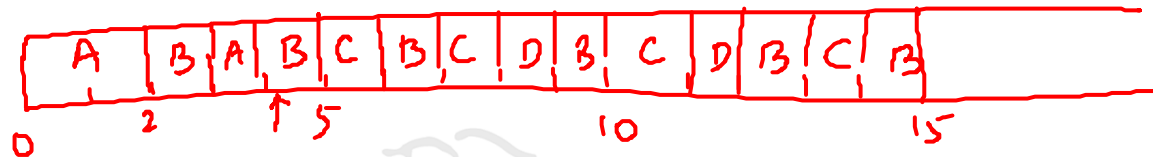
at 4.001 C - 4

at 6.001 D - 2

$$ATAT = \left[(5-0) + (13-1) + (15-4) + (11-6) \right] / 4$$

$$= 8.25$$

(5) Round robin (Quantum 1)



~~A B~~
 1.001 B - 6 5 4 3 2 1
 4.001 C - 4 3 2 1
 6.001 D → 2 1

$$ATAT = \left[(4 - 0) + (15 - 1) + (14 - 4) + (12 - 6) \right] / 4$$

$$= \underline{\underline{8.5}}$$
