Operating System

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Outlines

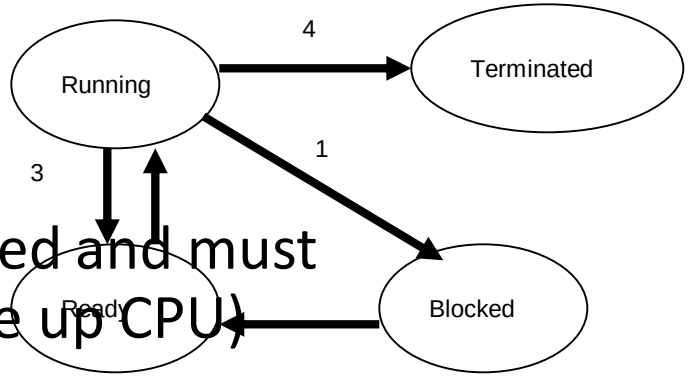
- Introduction to CPU Scheduling
- Preemptive vs Non-Preemptive scheduling
- First come First service(FCFS) scheduling
- Shortest job first(SJF) scheduling
- Shortest remaining time first(SRTF) scheduling
- Round Robin(RR) scheduling
- Priority Scheduling
- Multilevel queue scheduling
- Multilevel feedback queue scheduling
- Multi Processor scheduling
- Real-time scheduling

CPU Scheduling Algorithms

CPU scheduling algorithms decides which of the process in the ready queue is to be allocated the CPU. There are many different CPU scheduling algorithms, out of those algorithms, which algorithm maximize the CPU utilization and throughput and minimize turnaround time, waiting time and response time, those algorithms are the best of all algorithms

Preemptive vs. Non-preemptive scheduling

- **Non-preemptive scheduling:**
  - The running process keeps the CPU until it voluntarily gives up the CPU
    - process exits
    - switches to blocked state
    - Transition 3 is only voluntary
- **Preemptive scheduling**:
  - The running process can be interrupted and must release the CPU (can be forced to give up CPU)



Preemptive vs. Non-preemptive scheduling

- **Non-preemptive scheduling:**

  In non preemptive scheduling a scheduled job always completes before another scheduling decision is made. The jobs therefore finish in the order in which they are scheduled. The example of non preemptive scheduling are first come first serve (FCFS), shortest job first (SJF), priority algorithms.

  In non-preemptive once the CPU assigned to a process, the processor do not release until the completion of that process. The CPU will assigned to some other job only after the previous job has finished

- **Preemptive scheduling**:

  In preemptive scheduling the CPU can release the processes even in the middle of execution

CPU Scheduling Algorithms

- First-Come First Served scheduling(FCFC)
- Shortest job first scheduling(SJF)
- Shortest remaining time first(SRTF)
- Round Robin Scheduling(RR)
- Priority Scheduling
- Multilevel Queue Scheduling
- Multilevel Feedback Queue Scheduling

First Come First Serve (FCFS) Scheduling

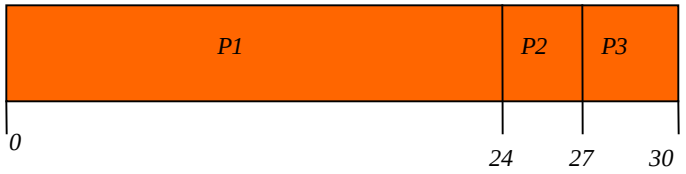
- Policy: Process that requests the CPU FIRST is allocated the CPU FIRST.
  - FCFS is a non-preemptive scheduling algorithm.
- Implementation - using FIFO queues
  - incoming process is added to the tail of the queue.
  - Process selected for execution is taken from head of queue.
- Performance metric - Average waiting time in queue.
- Gantt Charts are used to visualize schedules.

First-Come, First-Served(FCFS) Scheduling

- ***Example***

Process	Burst Time
P1	24
P2	3
P3	3

Gantt Chart for Schedule



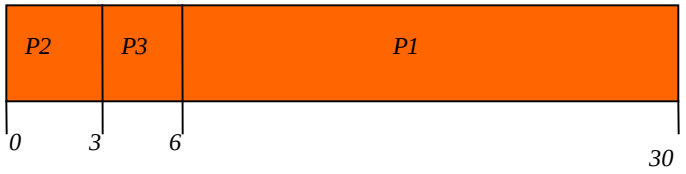
- Suppose the arrival order for the processes is
  - P1, P2, P3
- Waiting time
  - P1 = 0;
  - P2 = 24;
  - P3 = 27;
- Average waiting time
  - (0+24+27)/3 = 17

FCFS Scheduling (cont.)

- ***Example***

Process	Burst Time
P1	24
P2	3
P3	3

Gantt Chart for Schedule



- Suppose the arrival order for the processes is
  - P2, P3, P1
- Waiting time
  - P1 = 6; P2 = 0; P3 = 3;
- Average waiting time
  - (6+0+3)/3 = 3 , better..
- Convoy Effect:
  - short process behind long process, e.g. 1 CPU bound process, many I/O bound processes.

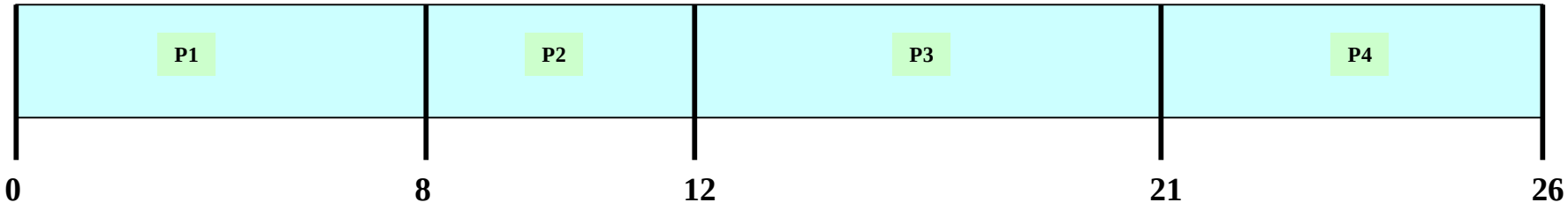
CPU SCHEDULING

Scheduling Algorithms

EXAMPLE DATA:

Process	Arrival Time	Service Time
1	0	8
2	1	4
3	2	9
4	3	5

FCFS



Average wait = ((8-0) + (12-1) + (21-2) + (26-3))/4 = 61/4 = 15.25

Residence Time at the CPU