Priority (Preemptive)

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CPU Scheduling Algorithms

- First Come First Serve (FCFS)
- Shortest Job First (SJF)
- Priority Scheduling
- Round Robin (RR)

Priority-Based Scheduling

Scenario:
If a newly arrived process has a higher priority than the currently running process.

Characteristics:

- **Preemptive Priority Scheduling Algorithm:**
  - The CPU is preempted, and the currently running process is moved to the ready queue.
  - The newly arrived process is then scheduled for execution.
- **Non-Preemptive Priority Scheduling Algorithm:**
  - The newly arrived process is placed at the tail of the ready queue.
  - The currently running process continues execution until it finishes, after which the scheduler picks the next process.

Pre-emptive Priority Scheduling

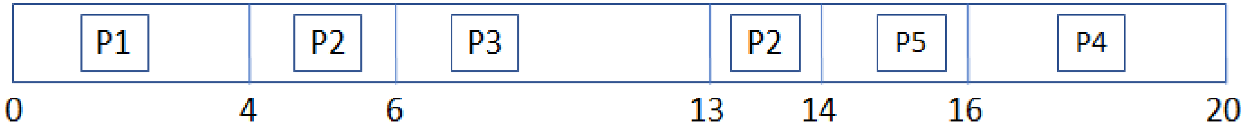
- Pre-emptive Priority Scheduling is a CPU scheduling algorithm where processes are assigned priorities, and the CPU is always allocated to the process with the highest priority that is ready to run.
- If a higher-priority process arrives while a lower-priority process is executing, the current process is pre-empted, and the CPU is given to the higher-priority process.

Example 1 Pre-emptive Priority

Turnaround Time = Completion Time – Arrival Time

Process	Priority	Burst Time	Arrival Time
P1	1	4	0
P2	2	3	0
P3	1	7	6
P4	3	4	11
P5	2	2	12

- Gantt Chart



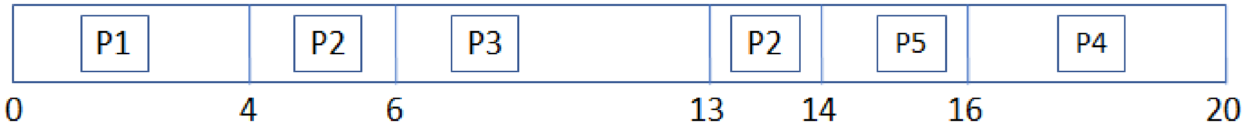
- Turnaround Time P_1 = 4; P_2 = 14; P_3 = 7; P_4 = 9; P_5 = 4
- Average turnaround time: 38/5 = 7.6ms

Example 1 Pre-emptive Priority

Waiting Time = Turnaround Time – Burst Time

Process	Priority	Burst Time	Arrival Time
P1	1	4	0
P2	2	3	0
P3	1	7	6
P4	3	4	11
P5	2	2	12

- Gantt Chart



- Turnaround Time P_1 = 4; P_2 = 14; P_3 = 7; P_4 = 9; P_5 = 4
- Waiting Time P_1 = 0; P_2 = 11; P_3 = 0; P_4 = 5; P_5 = 2
- Average waiting time: 18/5 = 3.6ms

Example 2 Pre-emptive Priority

- Consider the following set of processes, given in milliseconds.

process	Burst time	Arrival time	Priority
P1	6	0	2
P2	2	5	3
P3	8	3	2
P4	3	0	1
P5	4	8	1

- Low number represents the high priority.

Priority Scheduling

- Problem ≡ **Starvation/Indefinite blocking**

- Low priority processes may never execute
  - Leave some low priority processes waiting indefinitely for the CPU

Priority Scheduling

- Solution ≡ **Aging** – as time progresses increase the priority of the process that wait in the system for a long time.

- For e.g- If priorities range from 127 (low) to 0 (high), decrement the priority of a waiting process by 1 every 15 minutes.

Question ?