

OPERATING SYSTEM

Pre-emptive and Non-Pre-emptive Scheduling

1. Non-Preemptive Scheduling

Definition

In non-preemptive scheduling, once a process is assigned the CPU, it cannot be interrupted by the operating system until it finishes execution or goes into the waiting (I/O) state.

Explanation

- CPU is allocated to one process at a time
- The process runs continuously
- No forced context switching

Advantages

- Simple to implement
- Less overhead due to fewer context switches

Disadvantages

- Poor response time
- Long processes can delay short ones

Examples

- FCFS (First Come First Served)
- Non-preemptive SJF
- Non-preemptive Priority Scheduling

2. Preemptive Scheduling

Definition

In preemptive scheduling, the operating system can interrupt a running process and reassign the CPU to another process based on priority, time quantum, or remaining burst time.

Explanation

- CPU can be taken back by the OS
- Frequent context switching
- Better response time

Advantages

- Suitable for multitasking and time-sharing systems
- Prevents CPU monopolization

Disadvantages

- More overhead
- More complex to implement

Examples

- Round Robin (RR)
- Shortest Remaining Time First (SRTF)
- Preemptive Priority Scheduling
- Multilevel Feedback Queue

Other Scheduling Algorithms (Explained)

1. First Come First Served (FCFS)

Definition

FCFS schedules processes in the order they arrive in the ready queue.

Type

- Non-preemptive

Advantages

- Simple and fair

Disadvantages

- High waiting time
- Convoy effect

2. Shortest Job First (SJF)

Definition

SJF selects the process with the smallest CPU burst time for execution.

Type

- Non-preemptive
- Preemptive version → SRTF

Advantages

- Minimum average waiting time

Disadvantages

- Burst time prediction is difficult
- Starvation possible

3. Shortest Remaining Time First (SRTF)

Definition

SRTF is the preemptive version of SJF, where the process with the shortest remaining execution time gets the CPU.

Advantages

- Best average waiting time

Disadvantages

- Starvation
- High context switching

4. Priority Scheduling

Definition

In priority scheduling, each process is assigned a **priority**, and the CPU is allocated to the **highest-priority process**.

Type

- Preemptive or Non-preemptive

Problem

- Starvation of low-priority processes

Solution

- Aging

5. Round Robin (RR)

Definition

Round Robin scheduling assigns the CPU to each process for a **fixed time quantum** in a cyclic order.

Type

- Preemptive

Advantages

- Fair for all processes
- Good response time

Disadvantages

- Too small quantum → high overhead
- Too large quantum → behaves like FCFS

6. Multilevel Queue Scheduling

Definition

Processes are divided into **multiple queues**, each with its own scheduling algorithm.

Example Queues

- System processes
- Interactive processes
- Batch processes

7. Multilevel Feedback Queue Scheduling

Definition

Allows processes to move between queues based on their behavior and CPU usage.

Advantages

- Prevents starvation
- Highly flexible