

Asansol Engineering College



Department of Information technology

Topic: Process Scheduling

Name: Priyanka Kumari

University Roll No: 10800221133

Subject Name: Operating System

Contents

1. Introduction
2. Process Scheduling Queues
3. First Come First Serve (FCFS)
4. Shortest Job Next (SJN)
5. Priority Based Scheduling
6. Round Robin Scheduling
7. References

Introduction

Process Scheduling:

The process scheduling is the activity of the process manager that handles the removal of the running process from the CPU and the selection of another process on the basis of a particular strategy.

Process scheduling is an essential part of a Multiprogramming operating systems. Such operating systems allow more than one process to be loaded into the executable memory at a time and the loaded process shares the CPU using time multiplexing.

Categories of Scheduling:

There are two categories of scheduling:

1. Non-preemptive:

Here the resource can't be taken from a process until the process completes execution. The switching of resources occurs when the running process terminates and moves to a waiting state.

2. Preemptive:

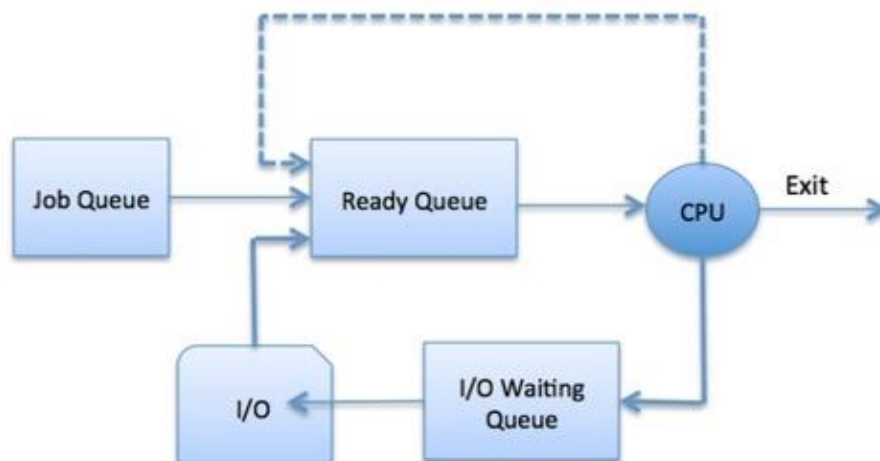
Here the OS allocates the resources to a process for a fixed amount of time. During resource allocation, the process switches from running state to ready state or from waiting state to ready state. This switching occurs as the CPU may give priority to other processes and replace the process with higher priority with the running process.

Process Scheduling Queues:

The OS maintains all Process Control Blocks (PCBs) in Process Scheduling Queues. The OS maintains a separate queue for each of the process states and PCBs of all processes in the same execution state are placed in the same queue. When the state of a process is changed, its PCB is unlinked from its current queue and moved to its new state queue.

The Operating System maintains the following important process scheduling queues –

- **Job queue** – This queue keeps all the processes in the system.
- **Ready queue** – This queue keeps a set of all processes residing in main memory, ready and waiting to execute. A new process is always put in this queue.
- **Device queues** – The processes which are blocked due to unavailability of an I/O device constitute this queue.

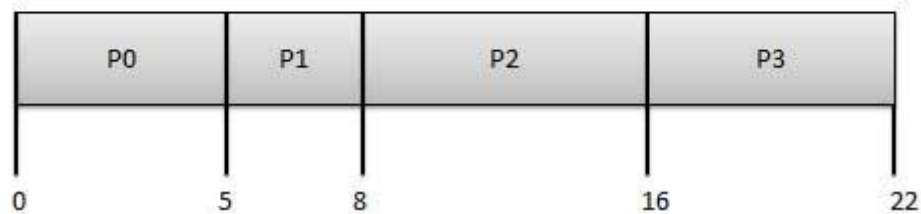


The OS can use different policies to manage each queue (FIFO, Round Robin, Priority, etc.).

First Come First Serve (FCFS)

- Jobs are executed on first come, first serve basis.
- It is a non-preemptive, pre-emptive scheduling algorithm.
- Easy to understand and implement.
- Its implementation is based on FIFO queue.
- Poor in performance as average wait time is high.

Process	Arrival Time	Execute Time	Service Time
P0	0	5	0
P1	1	3	5
P2	2	8	8
P3	3	6	16



Wait time of each process is as follows –

Process	Wait Time : Service Time - Arrival Time
P0	$0 - 0 = 0$
P1	$5 - 1 = 4$
P2	$8 - 2 = 6$
P3	$16 - 3 = 13$

Average Wait Time: $(0+4+6+13) / 4 = 5.75$

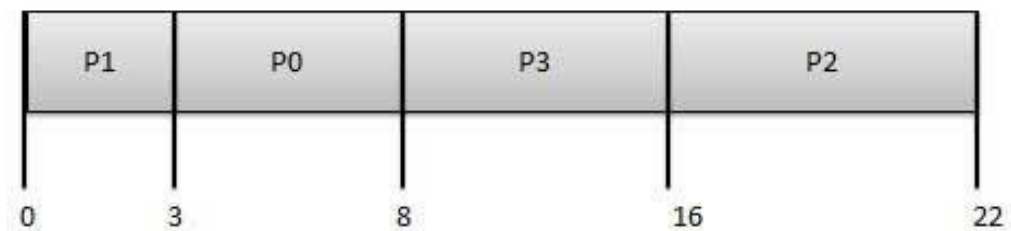
Shortest Job Next (SJN)

- This is also known as **shortest job first**, or SJF
- This is a non-preemptive, pre-emptive scheduling algorithm.
- Best approach to minimize waiting time.
- Easy to implement in Batch systems where required CPU time is known in advance.
- Impossible to implement in interactive systems where required CPU time is not known.
- The processor should know in advance how much time process will take.

Given: Table of processes, and their Arrival time, Execution time

Process	Arrival Time	Execution Time	Service Time
P0	0	5	0
P1	1	3	5
P2	2	8	14
P3	3	6	8

Process	Arrival Time	Execute Time	Service Time
P0	0	5	3
P1	1	3	0
P2	2	8	16
P3	3	6	8



Waiting time of each process is as follows –

Process	Waiting Time
P0	$0 - 0 = 0$
P1	$5 - 1 = 4$
P2	$14 - 2 = 12$
P3	$8 - 3 = 5$

Average Wait Time: $(0 + 4 + 12 + 5)/4 = 21 / 4 = 5.25$

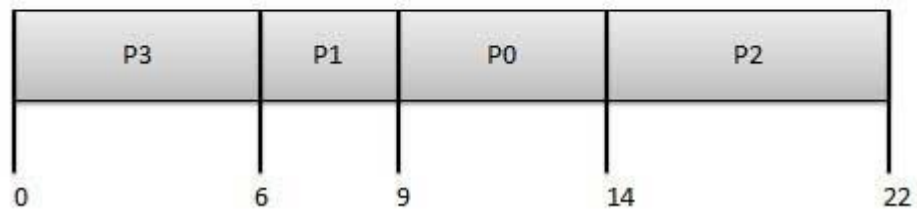
Priority Based Scheduling

- Priority scheduling is a non-preemptive algorithm and one of the most common scheduling algorithms in batch systems.
- Each process is assigned a priority. Process with highest priority is to be executed first and so on.
- Processes with same priority are executed on first come first served basis.
- Priority can be decided based on memory requirements, time requirements or any other resource requirement.

Given: Table of processes, and their Arrival time, Execution time, and priority. Here we are considering 1 is the lowest priority.

Process	Arrival Time	Execution Time	Priority	Service Time
P0	0	5	1	0
P1	1	3	2	11
P2	2	8	1	14
P3	3	6	3	5

Process	Arrival Time	Execute Time	Priority	Service Time
P0	0	5	1	9
P1	1	3	2	6
P2	2	8	1	14
P3	3	6	3	0



Waiting time of each process is as follows –

Process	Waiting Time
P0	$0 - 0 = 0$
P1	$11 - 1 = 10$
P2	$14 - 2 = 12$
P3	$5 - 3 = 2$

Average Wait Time: $(0 + 10 + 12 + 2)/4 = 24 / 4 = 6$

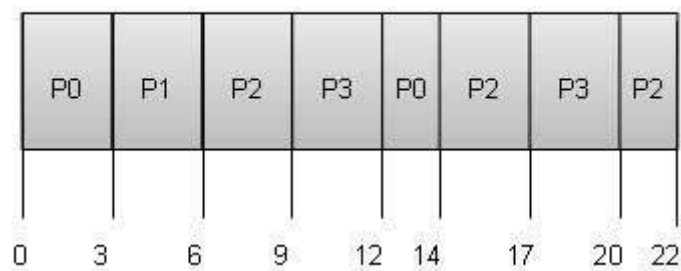
Shortest Remaining Time

- Shortest remaining time (SRT) is the preemptive version of the SJN algorithm.
- The processor is allocated to the job closest to completion but it can be preempted by a newer ready job with shorter time to completion.
- Impossible to implement in interactive systems where required CPU time is not known.
- It is often used in batch environments where short jobs need to give preference.

Round Robin Scheduling

- Round Robin is the preemptive process scheduling algorithm.
- Each process is provided a fix time to execute, it is called a **quantum**.
- Once a process is executed for a given time period, it is preempted and other process executes for a given time period.
- Context switching is used to save states of preempted processes.

Quantum = 3



Wait time of each process is as follows –

Process	Wait Time : Service Time - Arrival Time
P0	$(0 - 0) + (12 - 3) = 9$
P1	$(3 - 1) = 2$
P2	$(6 - 2) + (14 - 9) + (20 - 17) = 12$
P3	$(9 - 3) + (17 - 12) = 11$

Average Wait Time: $(9+2+12+11) / 4 = 8.5$

Reference

www.geeksgforgeeks.com

www.tutorial.com

www.wikipedia.com