

CPU scheduling algorithms

Non-preemptive

- FCFS
- STJ \rightarrow SRT

Preemptive

- Round robin
- Priority

STJ : Non-preemptive

SRT : Preemptive

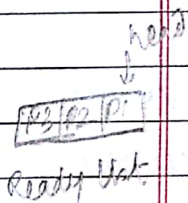
\rightarrow shortest remaining time

FCFS (First come first serve) scheduling

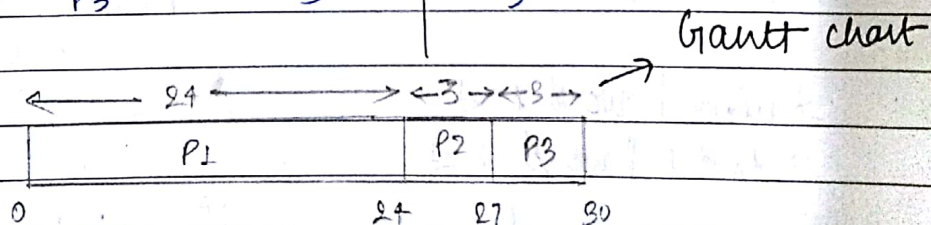
The priority of a process is assigned ~~in which~~ according to the request of the processor.

Considers those processes which are at the head of the ready list.

We use a FIFO queue to for maintaining the ready list.



Process	CPU burst	Arrival time \rightarrow for second example
P1	24	0
P2	3	2
P3	3	5



Average turnaround time

$$T_{TRND}(P1) = 24$$

$$T_W(P1) = 0$$

$$T_{TRND}(P2) = 27 \rightarrow 24 + 3$$

$\underbrace{\hspace{1cm}}_{\text{waiting}}$

$$T_W(P2) = 24$$

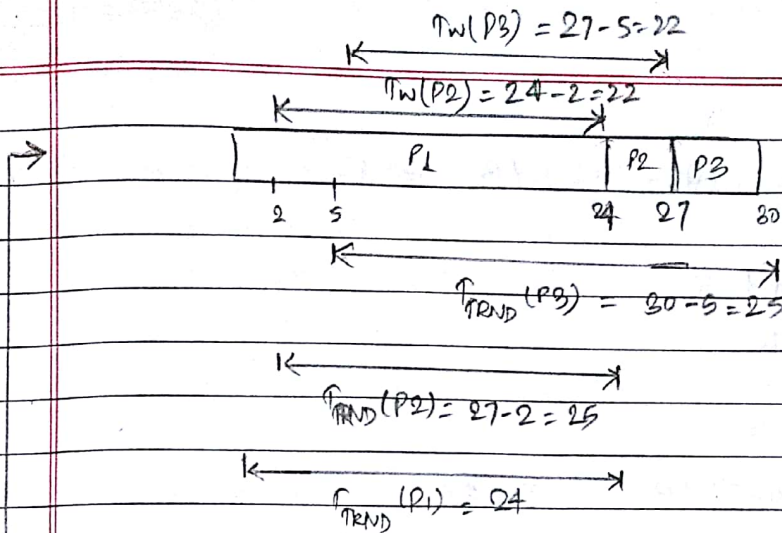
$$T_{TRND}(P3) = 30 \rightarrow 27 + 3$$

$\underbrace{\hspace{1cm}}_{\text{waiting}}$

$$T_W(P3) = 27$$

$$\text{Average turnaround time} = (24 + 27 + 30) / 3$$

$$\text{Average waiting time} = (0 + 24 + 27) / 3 = 17$$



$$T_{TURN}(P1) = 24 = 24 - 0$$

$$T_{TURN}(P2) = 25 = (27 - 2) = ((24 + 3) - 2)$$

$$T_{TURN}(P3) = 25 = 30 - 5 = ((27 + 3) - 5)$$

$$\text{Average } T_{TURN} = (24 + 25 + 25) / 3$$

$$T_W(P1) = 0$$

$$T_W(P2) = 22 = 24 - 2$$

$$T_W(P3) = 22 = 27 - 5$$

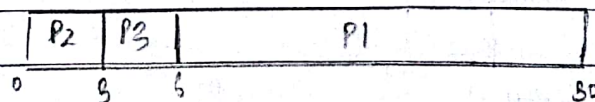
$$\text{Average } T_W = (0 + 22 + 22) / 3$$

SJF (Shortest Job First) scheduling

Process	CPU Burst	Ready List
P1	24	P3 P2 P1
P2	3	
P3	3	P1 P3 P2

Non-

- Preemptive scheduling
- We keep the process with least CPU burst at head.
- If two processes have same CPU bursts, we apply FCFS.



Average turnaround time

$$T_{TURN}(P1) = 30, \quad T_{TURN}(P2) = 3, \quad T_{TURN}(P3) = 6$$

$$\text{Avg. } T_{\text{RAND}} = (30 + 3 + 6) / 3 = 13$$

Average waiting time

$$T_w(P1) = 6$$

$$T_w(P2) = 0$$

$$T_w(P3) = 3$$

$$\text{Avg } T_w = (6 + 0 + 3) / 3 = 3$$

	FCFS	SJF
Avg T_{RAND}	27	13
Avg T_w	17	3

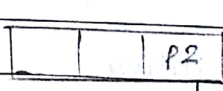
Objective of scheduling


- minimize waiting time
- minimize context switching
- to ensure no single process monopolizes the CPU.

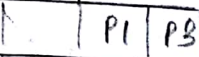
Problem with FCFS - Convoy effect \rightarrow one by one


Problem with SJF - we need to know CPU burst time of all processes beforehand


Processes	CPU burst	Arrival time
P1	24	2
P2	3	0
P3	3	2

0th time instant  \rightarrow Ready list
 \rightarrow head

1st time instant 

2nd time instant 

3rd time instant 

6th time instant 

Average turnaround time

$$T_{\text{turn}}(P1) = 30 - 2 = 28$$

$$T_{\text{turn}}(P2) = (3 - 0) = 3$$

$$T_{\text{turn}}(P3) = 6 - 2 = 4$$

$$\text{Avg } T_{\text{turn}} = (28 + 3 + 4) / 3$$

Average waiting time

$$T_w(P1) = 6 - 2 = 4$$

$$T_w(P2) = 0 - 0 = 0$$

$$T_w(P3) = 3 - 2 = 1$$

$$\text{Avg } T_w = (4 + 0 + 1) / 3$$

- FCFS is the simplest scheduling time.
- SJF is ~~the~~ mostly used in industry.

lecture 6

BDU

01/02/18

SJF - better in production environment than development environment.

- On many machines, we can't do SJF. So first time