CS & IT ENGINEERING

Operating Systems

Process Management

Lecture No. 04

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- FCFS Scheduling
- SJF
- Performance of SJF

Q.

PYQ

Consider three Processes P_1, P_2, P_3 arriving in the Ready Queue at time 0 in the order P_1, P_2, P_3. Their service time requirements are 10,20&30 units respectively. Each Process spends 20% of its Service time on I/O followed by 70% of its Service time on Computation at CPU and last 10% on I/O before completion.
Assuming Concurrent I/O and negligible Scheduling Overhead. Calculate for FCFS Scheduling

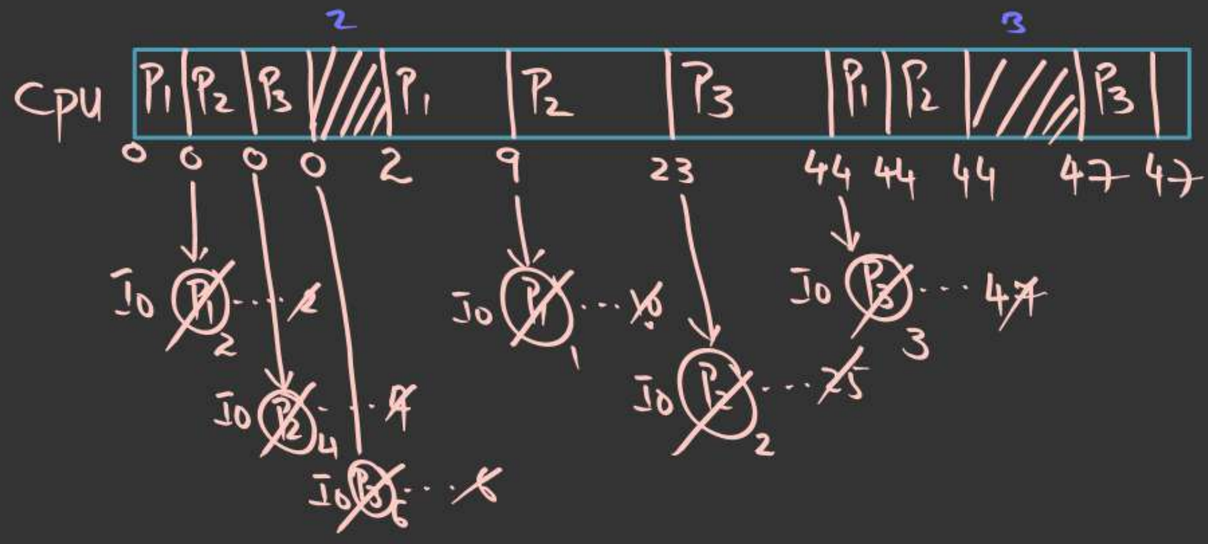
(i) Average TAT of Processes 2m

(ii) % CPU idleness 2m

Ser. Time	P.NO	A.T	20% IOBT	70% CBT	10% IOBT
10	1	0	2	7	1
20	2	0	4	14	2
30	3	0	6	21	3

$$AVTAT = \frac{44+44+47}{3}$$

$$\%\,cpu\ Idleness = \frac{5}{47}$$



Repeat the Problem if S=1

P.No	A.T	<IOBT ; BT ; IOBT>
1	0	<2 ; 7 ; 1>
2	0	<4 ; 14 ; 2>
3	0	<6 ; 21 ; 3>

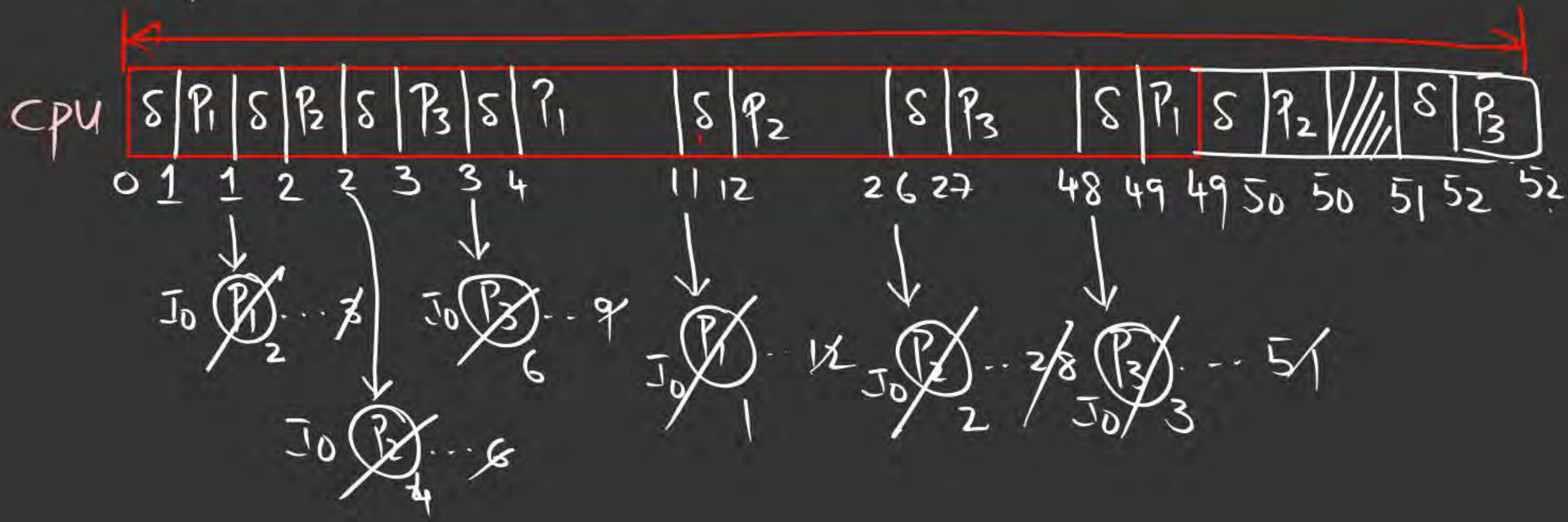
$\delta = 1$

$$\text{Av. TAT} = \frac{49 + 50 + 52}{3}$$

$\%$ cpu idleness $= 1/52 = x\%$

$\%$ cpu-ovhd $= 9/52 = y\%$

RQ: ~~P_1~~ ~~P_2~~ ~~P_3~~ ~~P_1~~ ~~P_2~~ P_3 ~~P_1~~ ~~P_2~~ P_3



Performance of FCFS

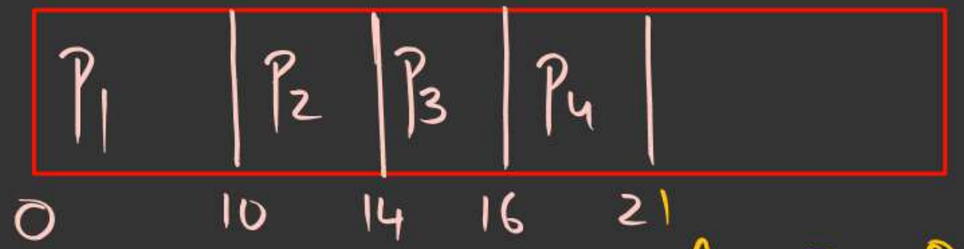
→ Simple to Implement

→ Convoy Effect:

When all Processes are waiting in the Ready 'Q' for one big process running on CPU [Leads to Starvation]

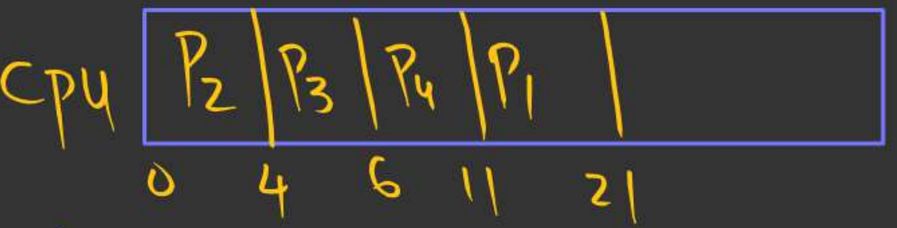
P.No	A.T	B.T
1	0	10
2	0	4
3	0	2
4	0	5

In general, FCFS is Starvation free, but however In some cases, FCFS potentially may have Starvation



$$\frac{Av.W.T}{Av\ R.T} = \frac{0+10+14+16}{4} = \frac{40}{4} = 10$$

Order matters



$$Av.W.T = \frac{4+6+11+0}{4} = \frac{21}{4} = 5.25$$

X

2) Shortest Job First (SJF) / Shortest Process Next (SPN)

Sel. criteria : Burst Time (B.T)

Mode of operation : Non-Preemptive

Tie breaking : Lower Pid rule

Among the Processes in R.Q, Select the process having least B.T, Schedule it & run till completion;

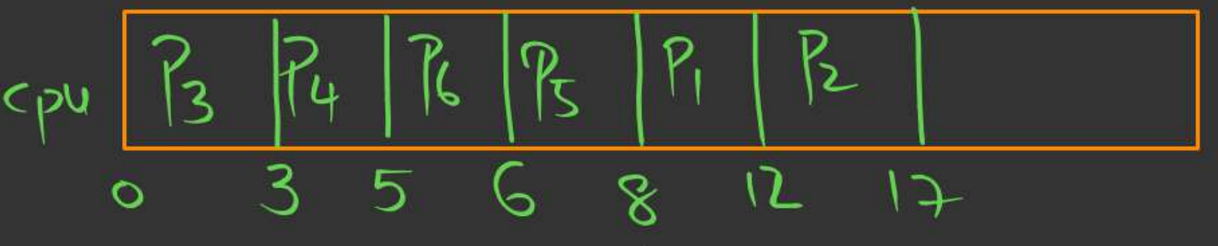
P.No	A.T	B.T
1	0	4
2	1	5
3	0	3
4	1	2
5	1	2
6	5	1

Av. T.A.T = $\frac{12+16+3+4+7+1}{6}$

Av. W.T = $\frac{8+11+0+2+5+0}{6}$

Av R.T = $\frac{8+11+0+2+5+0}{6}$

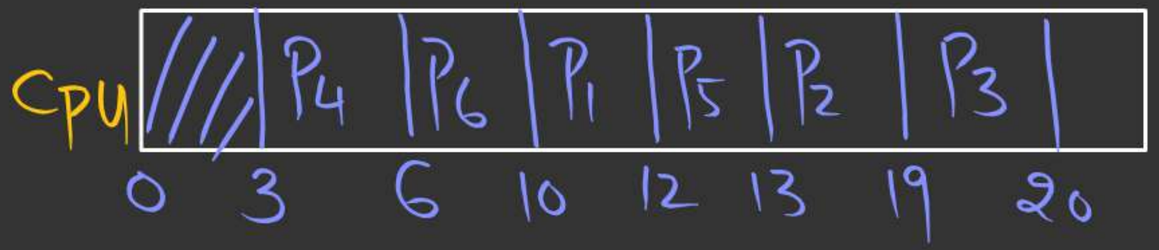
R.Q: P1; P3 P2; ~~P4~~; ~~P5~~; ~~P6~~



2)

P.No	A.T	B.T
1	10	2
2	3	6
3	15	1
4	3	3
5	12	1
6	4	4

R.Q: ~~P2~~; ~~P4~~; ~~P6~~; ~~P1~~; ~~P5~~; P3;



$$\text{Av.TAT} = \frac{2+16+5+3+1+6}{6} = \frac{33}{6} = 5.5$$

$$\text{Av.W.T} = \frac{0+10+4+0+0+2}{6} = \frac{16}{6} = 2.6$$

3) Shortest Remaining Time First (SRTF)

PreEmptive SJF

Sel criteria : B.T

Mode of opn : PreEmptive

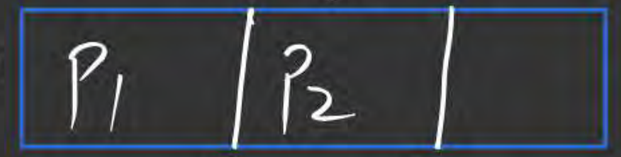
Tie breaking rule : "Lower Pid" "R.O"

Rule for PreEmption:

"PreEmption of running Process is based on arrival/availability of a Strictly Shorter procen"

P.No	A.T	B.T
1	0	~~6~~ 4
2	2	3

S.J.F (N.Pr)

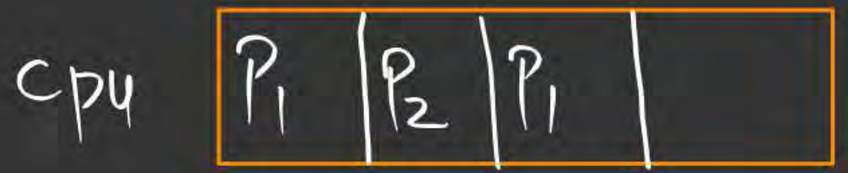


Av RT = (2) 0+4/2

Av.TAT = 6+7/2

Av.WT = 0+4/2 = (2) = 13/2 = 6.5

SRTF



Pr

Av TAT = 9+3/2 = 6

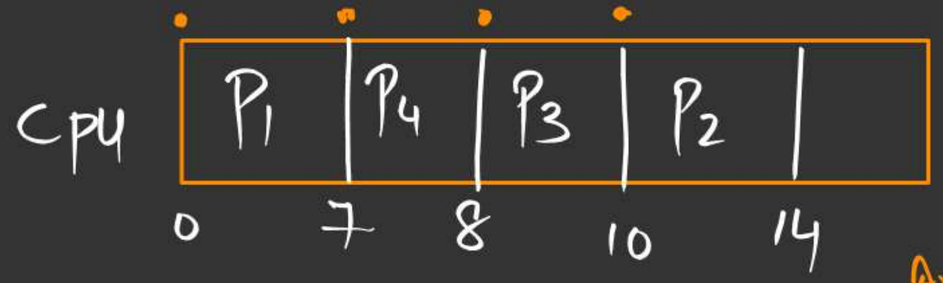
Av.WT = 3+0/2 = 1.5

Av RT = 0+0/2 = 0

P.No	A.T	B.T
1	0	~~7~~ 5
2	2	~~4~~ 2 x
3	4	~~2~~ 1 x
4	7	1

S = 0

① S.J.F



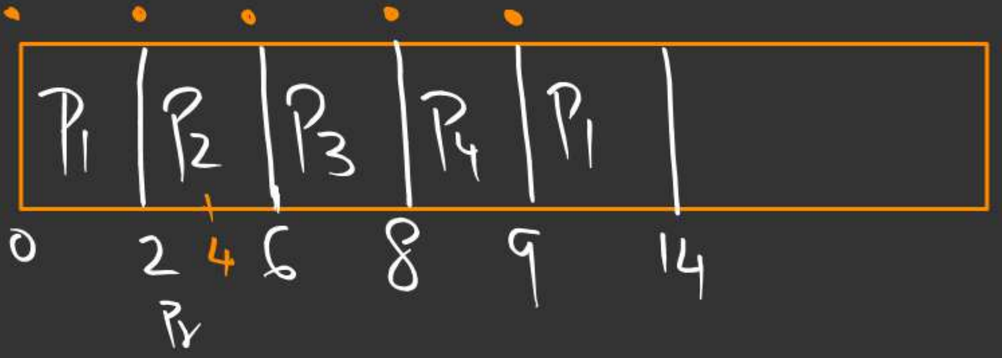
$$Av.TAT = \frac{7+12+6+1}{4} = \frac{26}{4} = 6.5$$

$$Av.W.T = \frac{0+8+4+0}{4} = \frac{12}{4} = 3$$

$$Av.R.T = \frac{0+8+4+0}{4} = 3$$

② S.R.T.F

$$Av.TAT = \frac{14+4+4+2}{4} = \frac{24}{4} = 6$$



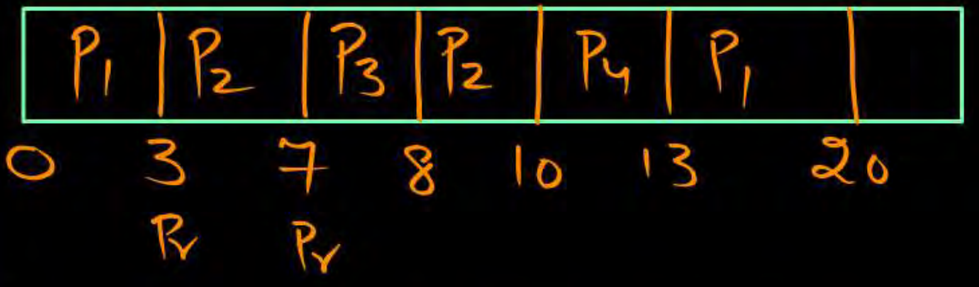
$$Av.W.T = \frac{7+0+2+1}{4} = \frac{10}{4} = 2.5$$

$$Av.R.T = \frac{0+0+2+1}{4} = 3/4 = 0.75$$

Q.

Consider the following processes, with the arrival time and the length of the CPU burst given in milliseconds. The scheduling algorithm used is preemptive Shortest Remaining-Time First (SRTF).

Process	Arrival Time	Burst Time
P1	0	~~10~~ 7
P2	3	~~6~~ 2
P3	7	1
P4	8	3



$$\text{Av. TAT} = \frac{20+7+1+5}{4} = \frac{33}{4} = 8.25$$

The average turnaround time of these processes is 8.25 milliseconds.

$$\text{Av. WT} = \frac{10+1+0+2}{4} = \frac{13}{4} = 3.25$$

$$\text{Av. RT} = \frac{0+0+0+2}{4} = \frac{2}{4} = 0.5$$


THANK YOU
GW
SOLDIERS !