Application without Service time

→ FCFS & RR can work; SPN cannot work.

→ SPN is non preemptive

Throughput

→ Number of process completed per time unit → High for shorter processes

Shortest Remaining Time

→ Preemptive version of SPN

→ Running process can be kept in ready queue

Example

A	0	3
B	2	6
C	4	4
D	6	5
E	8	2

→ T=0 [A]

T=2 [B|A] (A:1, B:6)

T=3 [B]

T=4 [B|C] (B:5, C:4)

T= 6  (C:2, B:5, D:5)

T= 8  (D:5, B:5, E:2)

FCFC Tie Breaker used

T= 10 

T= 15 

T= 20 

Highest Response Ratio Next

→ We are looking to minimize Normalized TAT.

→ $R = (W + S) / S$ (W: Waiting time, S: Service time)

→ Non-preemptive policy

→ Shorter process favoured (small denom)

→ Long / IO / old favoured (large denom)

→ Balances favour of short processes along with starvation prevention

Is HRRN the best?

→ For measurable performance ; SRT is better

→ For non-measurable (fair treatment); HRRN is better

Real World Strategies

→ Completely fair scheduling is used in Linux systems

Feedback Scheduling

→ If we want to avoid short process penalty; penalise longer processes.

→ If you can't estimate time remaining; use

time execution.

What is the main idea?

→ Penalise longer running jobs

→ Internally using Round Robin

→ Priority based queues after some fixed quantum of execution time.

Steps

① RQ0
② Preempted to RQ1
③ Every subsequent preemption has lower priority

→ All queue follows FCFS ; Last queue follows Round Robin (as no lower queue to demote)

→ Imagine a moving treadmill that is descending after every turn

Analysis for FB → Or multi level feedback

→ Turnaround is stretched alarmingly for longer processes

→ $q = 2^i$ reduces harshness on longer processes

Other possible strategies

→ Priority scheduling (Preemptive / Nonpreemptive)

→ Longest Job First (Non Preemptive)

→ Longest Remaining Time First (Preemptive)

→ None is used in general purpose OS in pure form; hybrid version is used.

HW-1

3 processes
(id = 0, 1, 2)
(y = 2, 4, 8)
Arrival = 0 for
all. Consider
LRTF; ties are
broken by high
priority to lowest
process id. What
is the average
turn around time?

HW-2

3 proc at t:0
arrival; total
s = <0, 20, 30.
20-1. is I/O,
70-1. is computation
& 10-1. is I/O.
Shortest rem
compute time
first. Non
preemptive. For
what % of time
does CPU remain

idle?

Summary: SPN - SRT - Throughput - HRRN - Perfect balance achieved - FB - Modified FB with $q = 2^i$ - Other possible scheduling algorithms - None used in real world