20160402
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HW #1. Scheduling (5P)

1. Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process	Burst Time (Runtime)	Priority
P1	8	3
P2	1	1
P3	3	3
P4	1	4
P5	5	2

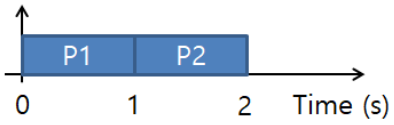
FCFS (First Come, First Served) arrived time
SJF (Shortest Job First) runtime
RR (Round Robin) time slice
MLFQ (Multi Level Feedback Queue) priority

The processes are assumed to have arrived in the order P1, P2, P3, P4, and P5, all at time 0.

a) Draw three Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, and RR (time slice = 1).
b) What is the turnaround time of each process for each of the scheduling algorithms?
c) What is the response time of each process for each of these scheduling algorithms?
d) Which of the algorithms results in the minimum average response time (over all processes)?

다음장에 선명

Note: An example of Gantt chart is as follows:



2. Explain the differences in how much the following scheduling algorithms discriminate in favor of short processes:
   a. FCFS
   b. RR
   c. Multilevel feedback queues

a. FCFS : Runtime에 관계 없이 먼저 도착한 Process 부터 실행. Long Process가 Short Process보다 먼저 도착한다면 나중에 도착한 Process가 모두 종료 될 때까지 대기해야하기 때문에 Turn around / Response time이 늘어날 가능성이 있다.

b. RR : 모든 Job들을 Time Slice를 기준으로 나누어 번갈아가며 실행. Runtime에 관계 없이 먼저 도착한 Process먼저 실행은 하지만, 모든 Process를 Time Slice로 나누어 번갈아가며 실행해 FCFS에 비해 Short Process가 먼저 Turn around 된다. Response time도 비교적 빠른 편 (Time Slice에 따라)

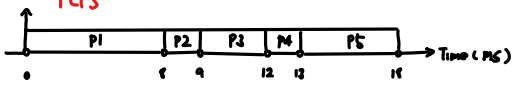
c. MLFQ : CPU-intensive Job에 비해 짧은 Runtime을 가진 Interactive Job 에 높은 우선순위를 주어 먼저 처리하기 때문에 대체로 Short Process가 먼저 실행되고 또한 먼저 반환된다. 같은 우선순위를 가진 Job에 경우 RR 방식으로 실행되기 때문에 우선순위 선정을 적절히 해준다면 위의 Scheduling Algorithm에 비해 Short Process를 우선적으로 처리하게 된다.

1.

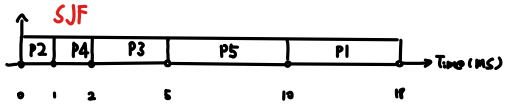
Process	Burst Time (Runtime)	Priority
P1	8	3
P2	1	1
P3	3	3
P4	1	4
P5	5	2

a)

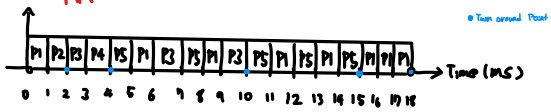
FCFS



SJF



RR



Turn around Time (average)

FCFS

$\frac{1}{5}(8+9+12+13+18) = 12$ ms

SJF

$\frac{1}{5}(1+2+5+10+18) = 7.2$ ms

RR

$\frac{1}{5}(2+4+10+15+18) = 9.8$ ms

Response Time (average)

FCFS

$\frac{1}{5}(0+8+9+12+13) = 8.4$ ms

SJF

$\frac{1}{5}(0+1+2+5+10) = 3.6$ ms

RR

$\frac{1}{5}(0+1+2+3+4) = 2$ ms

b)

	P1	P2	P3	P4	P5
FCFS	8	9	12	13	18
SJF	18	1	5	2	10
RR	18	2	10	4	15

Turn around time (ms)

c)

	P1	P2	P3	P4	P5
FCFS	0	8	9	12	13
SJF	10	0	2	1	5
RR	0	1	2	3	4

Response time (ms)

d) Algorithm result : The minimum average response time

Round Robin (RR)