

CSC 369 Worksheet 4 Solution

August 18, 2020

1. The following assumptions are made before calculation:

- Each job runs for the same amount of time
- All jobs arrive at the same time
- Once started, each job runs to completion
- All jobs only use the CPU (i.e they perform no I/O)
- The run-time of each job is known

First, I need to calculate the turnaround time when running three job of length 200 with the SJF and FIFO schedulers.

I will do so in parts.

- **Part 1:** Calculating turnaround time with FIFO schedulers

$$\frac{200 + 400 + 600}{3} = 400 \quad (1)$$

seconds.

- **Part 2:** Calculating turnaround time with SJF schedulers

$$\frac{200 + 400 + 600}{3} = 400 \quad (2)$$

seconds.

Second, I need to calculate the response time when running three job of length 200 with the SJF and FIFO schedulers.

I will do so in parts.

- **Part 1:** Calculating response time with FIFO schedulers

$$\frac{0 + 200 + 400}{3} = 200 \quad (3)$$

seconds.

- **Part 2:** Calculating response time with SJF schedulers

$$\frac{0 + 200 + 400}{3} = 200 \quad (4)$$

seconds.

Notes

- **Scheduling:**

- Is a process at which allows one process to use the CPU while another is on hold, to make full use of CPU

- **Turnaround Time:**

- Is a performance metric
- Is amount of time to execute a particular process ^[1]

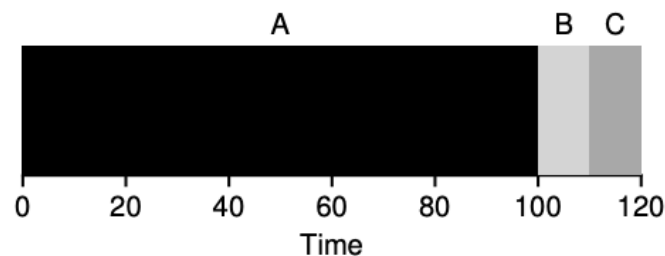
$$T_{turnaround} = T_{completion} - T_{arrival} \quad (5)$$

- $T_{completion} \rightarrow$ Time at which the job completes
- $T_{arrival} \rightarrow$ Time at which the job arrived in the system

- **FIFO scheduling algorithm:**

- Is the most basic scheduling algorithm

Example



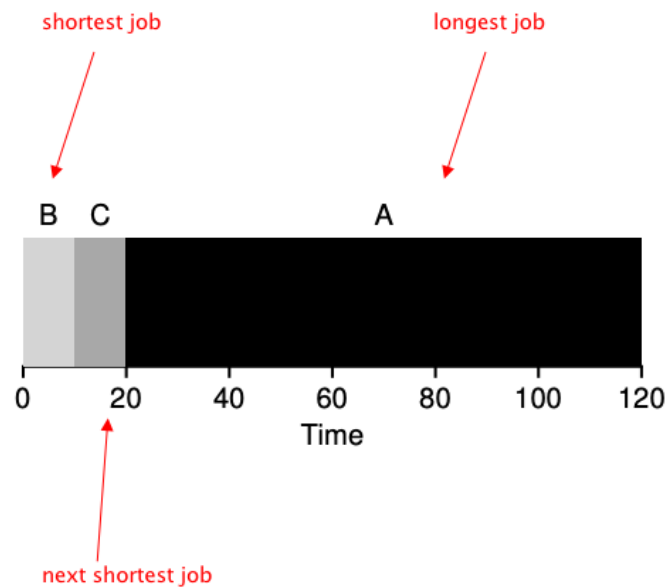
Here, the average turnaround time is:

$$\frac{100 + 110 + 120}{3} = 110 \quad (6)$$

- **SJF scheduling algorithm:**

- Is a scheduling policy where the shortest job is run first, then the next shortest and so on.

Example



Here, the average turnaround time is:

$$\frac{10 + 20 + 120}{3} = 50 \quad (7)$$

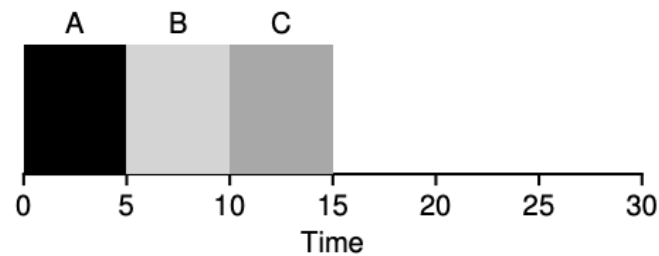
- **Response Time:**

- Is amount of time from when a request was submitted until the first response is produced ^[1]

$$T_{response} = T_{firstrun} - T_{arrival} \quad (8)$$

- $T_{firstrun} \rightarrow$ First time a job is scheduled
- $T_{arrival} \rightarrow$ Time at which the job arrived in the system

Example



Here, the average response time is

$$\frac{0 + 5 + 10}{3} = 5 \quad (9)$$

References

- 1) Old Dominion University, CPU Scheduling link
2. First, I need to calculate turnaround time when running three jobs of different lengths 100, 200, 300 with FIFO and SJF schedulers.

I will do so in parts.

- **Part 1:** Calculating turnaround time with FIFO schedulers

$$\frac{100 + 300 + 600}{3} \approx 333.33 \quad (10)$$

seconds.

- **Part 2:** Calculating turnaround time with SJF schedulers

$$\frac{100 + 300 + 600}{3} \approx 333.33 \quad (11)$$

seconds.

Second, I need to calculate response time when running three jobs of different lengths 100, 200, 300 with FIFO and SJF schedulers.

I will do so in parts.

- **Part 1:** Calculating turnaround time with FIFO schedulers

$$\frac{0 + 100 + 300}{3} \approx 133.33 \quad (12)$$

- **Part 2:** Calculating turnaround time with SJF schedulers

$$\frac{0 + 100 + 300}{3} \approx 133.33 \quad (13)$$

3. Let the time slice of round robin be 1.

First, I need to calculate turnaround time when running three jobs of different lengths 100, 200, 300 with Round Robin schedulers.

The answer is

$$\frac{298 + 499 + 600}{3} \approx 465.67 \quad (1)$$

Given that the time of completion are

$$\# \text{ of jobs} \times (\text{Len. job 1} - 1) + 1 \quad (2)$$

$$= 3 \times (100 - 1) + 1 \quad (3)$$

$$= 298 \quad (4)$$

for job 1,

$$\# \text{ of jobs} \times (\text{Len. job 1} - 1) + 2 + (2 \times (\text{Len. job 2} - \text{Len. job 1})) \quad (5)$$

$$= 3 \cdot (100 - 1) + 2 + (2 \times (200 - 100)) \quad (6)$$

$$= 299 + 200 \quad (7)$$

$$= 499 \quad (8)$$

for job 2, and 600 for job 3.

Second, I need to calculate response time when running three jobs of different lengths 100, 200, 300 with Round Robin schedulers.

The answer is

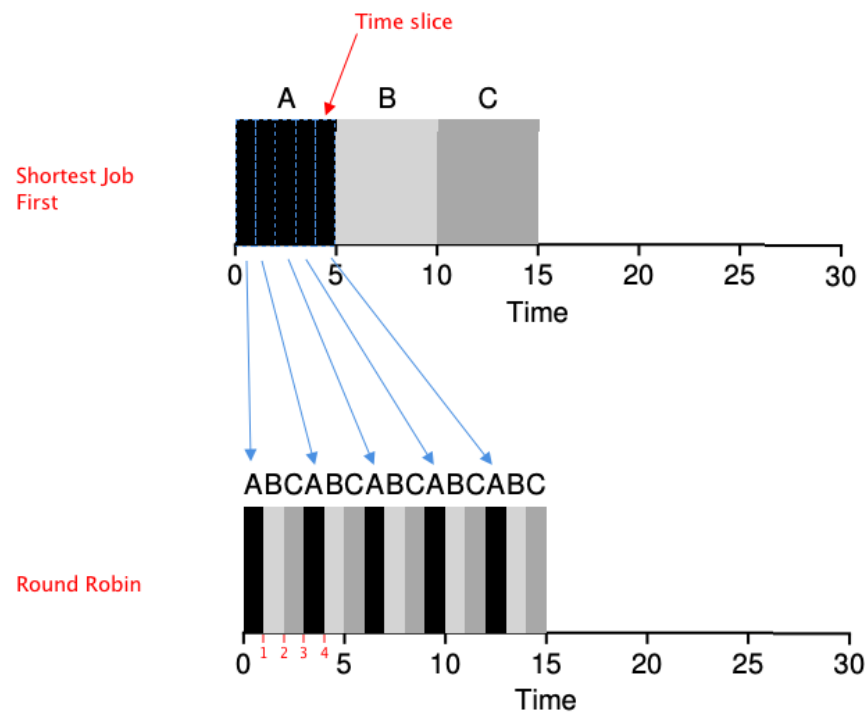
$$\frac{0 + 1 + 2}{3} = 1 \quad (9)$$

seconds.

Notes

- **Round Robin:**

- Solves the problem of having to wait for x number of seconds (e.g 10 seconds) before the next job.
- Is sometimes-called **time-slicing**
- Does so by running a job for **time slice** (sometimes called **scheduling quantum**)



Notes

In above example, the Response time of Round Robin is

$$\frac{0 + 1 + 2}{3} = 1 \quad (10)$$

seconds.