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

     $$\frac{200 + 400 + 600}{3} = 400 \tag{1}$$

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

     $$\frac{200 + 400 + 600}{3} = 400 \tag{2}$$

     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

$$\frac{0 + 200 + 400}{3} = 200 \tag{3}$$

  seconds.

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

$$\frac{0 + 200 + 400}{3} = 200 \tag{4}$$

  seconds.

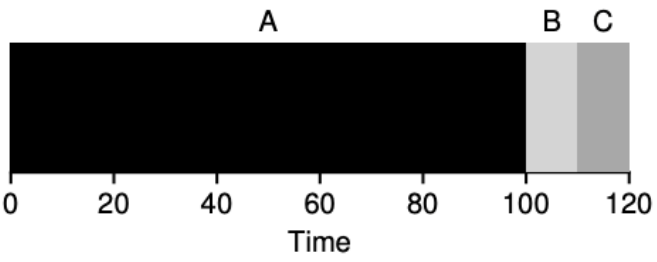
Notes

- **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]

$$T_{turnaround} = T_{completion} - T_{arrival} \tag{5}$$

  - $T_{completion} \rightarrow$ 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

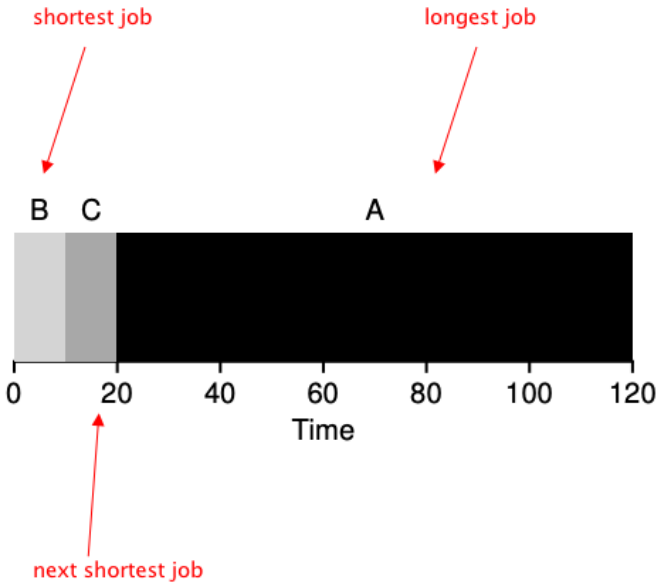


Here, the average turnaround time is:

$$\frac{100 + 110 + 120}{3} = 110 \tag{6}$$

- **SJF scheduling algorithm:**
  - Is a schduling policy where the shortest job is run first, then the next shortest and so on.

Example



Here, the average turnaround time is:

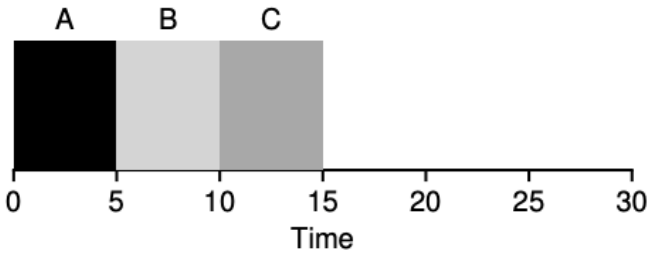
$$\frac{10 + 20 + 120}{3} = 50 \tag{7}$$

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

$$T_{response} = T_{firstrun} - T_{arrival} \tag{8}$$

  - $T_{firstrun} \rightarrow$ 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

$$\frac{0+5+10}{3} = 5 \tag{9}$$

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

   $$\frac{100+300+600}{3} \approx 333.33 \tag{10}$$

   seconds.

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

   $$\frac{100+300+600}{3} \approx 333.33 \tag{11}$$

   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

$$\frac{0 + 100 + 300}{3} \approx 133.33 \tag{12}$$

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

$$\frac{0 + 100 + 300}{3} \approx 133.33 \tag{13}$$

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

$$\frac{298 + +600}{3} = \tag{1}$$

   Given that the time of completetion are

$$\begin{aligned} &\#\text{ of jobs} \times (\text{Len. job } 1 - 1) + 1 && (2)\\ &= 3 \times (100 - 1) + 1 && (3)\\ &= 298 && (4) \end{aligned}$$

   for job 1,

$$\begin{aligned} &\#\text{ of jobs} \times (\text{Len. job } 2 - 1) + 2 + (2 \times (\text{Len. job } 2 - \text{Len. job } 1)) && (5)\\ &= 3 \cdot (200 - 1) + 2 + (2 \times (200 - 100)) && (6)\\ &= 298 && (7) \end{aligned}$$

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

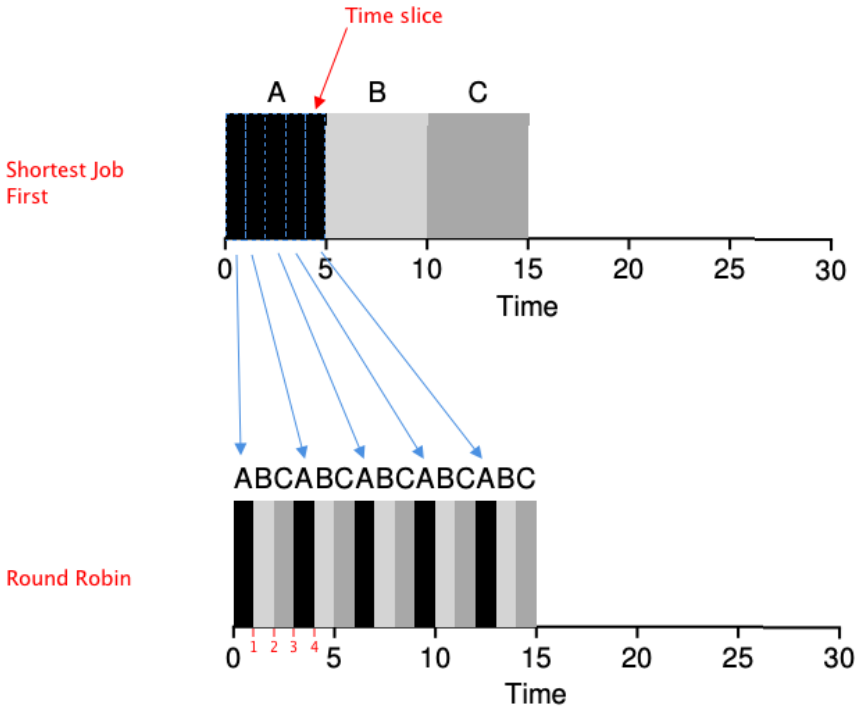
   The answer is

$$\frac{0 + 1 + 2}{3} = 1 \tag{8}$$

   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

$$\frac{0+1+2}{3} = 1 \tag{9}$$

seconds.