

Indian Institute of Technology Jodhpur
Operating Systems Lab (CS330)
Assignment 3

Dated 24th March, 2021

Total marks: 20

This assignment is on performance evaluation for various CPU scheduling algorithms. Arrival times and CPU bursts for a set of processes are generated randomly following some probability distribution. You are to implement the scheduler to evaluate the performance metrics for the chosen scheduling algorithms through simulation. Consider the following specifications for the implementation of your scheduler.

a) Read the number of processes N , and generate the arrival times and CPU bursts of the processes using some probability distribution. The first process is assumed to arrive at time 0; for all subsequent processes the *inter-arrival time* is generated as a random variable (between 0 and 10) following exponential distribution with some given mean. The CPU bursts of the processes are generated as uniform random variables (between 1 and 20). The priorities of the processes are also generated as uniform random variables (between 1 and 10 where lower number signifies higher priority). Process arrival time can be considered to break a tie between two processes having similar priority, if any. Save the generated table in a file.

Hint: If R is a uniform random number in the range $(0, 1)$, a random variable from an exponential distribution with mean μ can be generated as: $(-1.0 / \mu) * \ln R$

b) Simulate the following CPU scheduling algorithms on the process arrival trace as generated in (a) above, and compute the average turnaround times (ATT), average waiting time (AWT) and average response time (ART) for the processes:

- (i) First Come First Serve (FCFS)
- (ii) Non-preemptive Shortest Job First
- (iii) Preemptive Shortest Job First
- (iv) Round Robin with time quantum $\delta = 2$ time units
- (v) Priority based scheduling

c) Run the simulation for $N = 10, 20, 30, 40, 50$, ten times for each value of N using a shell script (bash/python), and generate the plot comparing the min, max, average values of ATT, AWT and ART obtained for various scheduling techniques for different values of N .

Print the activities of the processes as they enter and leave the ready queue, to reflect the working of the scheduler.

For example, you will have three plots, say x , y , and z . Plot x will compare ATT (along Y axis) taken as an average over 10 times run for all the five scheduling algorithms such that you have variation in N along X axis. Similarly, plot y and z will indicate comparative analysis of AWT and ART respectively.

Submission Guideline:

Upload a zip folder as 'Roll_zip' including the scheduler program (in .c or .cpp), a readme file containing the details of assumptions and bugs, if any; the file containing the process table and a pdf file containing all three plots (along with the caption reflecting the description of the analysis).

Evaluation Guidelines:

- Generating the table to simulate the process arrival using uniform/exponential distribution (4)
- Ready Queue management for scheduling (4)
- Simulation of five scheduling strategies (6)
- Generation of results and plots (3)
- Shell script for running the processes (3)

Deadline: 31st March, 2021