بسم الله الرحمن الرحيم

An-Najah National University
Faculty of Engineering & IT

Computer Engineering Department

جامعة النجاح الوطنية
كلية الهندسة وتكنولوجيا المعلومات
قسم هندسة الحاسوب

Operating Systems (1066451)
Scheduling Algorithms - Programming Project

Date: 18/03/2021 Deadline: 18/04/2021

Project description

You are required to implement a fully functional platform to test the performance of various scheduling algorithms. The scheduler will create a random set of processes (specifications will be defined below) and schedule them based on the implemented scheduling algorithms. The result should be a comparison table of various performance metrics such as average, minimum, and maximum values of turnaround time, waiting time, and response time.

Minimum required scheduling algorithms:

- First-come, first-served (FCFS)
- Shortest-job-first (SJF)
- Priority scheduling
- Round-robin scheduling (assume time quantum is 4ms)
- Priority scheduling with round-robin scheduling.

Process set creation

The project should start by creating the process set to be scheduled according to the following steps:

1. Ask the user to enter a number of processes (n) (strictly positive and not greater than MAX_NUM_PROC which can be defined as a constant at the header of the code).
2. Create (n) processes which random specifications. Each process should have:
   a. an ID which is a unique order number
   b. CPU Burst time which is a positive integer whose value is chosen randomly within the range 1ms to 15ms.
   c. Arrival time which is a positive integer whose value is chosen randomly within the range 0ms to 10ms.
   d. Static priority which is a positive integer whose value is chosen randomly within the range 1 to 5, where higher number means higher priority.
   e. For preemptive scheduling algorithms, a field called the remaining CPU burst (RemExecTime) which keeps the remaining execution time of each process
3. You can choose the best programming form for implementing the process set such as arrays or lists (ordered or unordered).

Scheduling Implementation

1. You should implement a console-based menu which shows the implemented scheduling algorithms for the user to choose from. Extra choice is to run all scheduling algorithms and compare their performance. The menu should contain also the option to show process set.
2. The selected scheduling algorithm/s should execute the process set created by the user (described in Section Process set creation).
3. The program should show the order of execution for all processes based on the selected scheduling algorithm in a clear way of your choice.
4. Finally, you should print a table with statistics of performance metrics for all selected scheduling algorithms. The metrics should be the maximum / minimum / average values of:
    a. Response time
    b. Waiting time
    c. Turnaround time
    d. The throughput of the algorithm (the number of processes executed by the CPU in a given amount of time defined in your code).

Interface design

The project should provide the user with a console-based interface.

1. Start the program by asking the user to create the process set (as defined in Section Process set creation).
2. Show an infinite-loop menu with the following options:
    a. Show process set
    b. Schedule by using FCFS
    c. Schedule by using SFJ
    d. Schedule by using Priority scheduling
    e. Schedule by using RR scheduling
    f. Schedule by using Priority scheduling with RR.
    g. Run all scheduling algorithms.