

Handed Out: Tuesday Feb. 13, 2024

Due: Tuesday Feb. 27, 2024

CPU Scheduling

In class, you learned the importance of multiprogramming and the need for and importance of CPU scheduling. We also studied number of different CPU scheduling algorithms. In this homework, you will be implementing some of these algorithms. The algorithms you need to implement are following:

- First-In-First_Out (FIFO)
- Shortest Remaining Time First (SRTF)
- Round Robin (RR), and
- Priority Scheduling
- Multilevel Feedback Queue

Here, assume that there are 10 queues (you may or may not need all 10 queues, will depend on your data input). Queues are numbered 1-10 with round robin scheduling and **time quantum** $q = 2i$, where i is the queue level number. For example, queue at level 1, q will be $2*1=2$ and queue at level 2, it will be $2*2=4$ and so on. All newly arriving processes are initially placed in the first queue (i.e., level 1). In this scheduling policy, each process executes at a particular level for only **one** time quantum and, if not finished, moves down a level; processes never move up a level. If in the last queue, i.e., level 10, and not finished yet, will stay there until complete their CPU requirements.

For the purposes of this homework assignment, you will be writing a C program, allowing user to choose from one of the above four CPU scheduling algorithms. Once a user makes a choice, the user will be provided with following **options**:

1. Enter relevant information (e.g., process number, arrival time, CPU burst time). The information user will be entering will depend on the type of CPU scheduling algorithm. For example, RR will not contain any priorities.
2. Read information from a given from a text file.

In the case of option 1 above:

- The program will prompt the user to enter the number of processes (an integer).
- In the case of RR, should also ask for the time quantum value (an integer).
- Enter relevant information for each process such as process number, arrival time & burst time, etc.
- The information needed for different algorithms is as follows:

• FIFO	P? (? represents process number)	Arrival Time	Burst Time
• SRTF	P?	Arrival Time	Burst Time
• RR	P?	Arrival Time	Burst Time
• Priority Scheduling	P?	Priority	Arrival Time Burst Time
• Multilevel Feedback	P?	Arrival Time	Burst Time

In case of option 2 above:

- Ask the user for file name (it should be a text file with all the necessary information as above).

For each of these CPU scheduling algorithms, your job is to output a table with the following:

- Process Number
- Process completion time (i.e., exit time).
- Process turnaround time.
- Process wait time.

Following the table (that will be representing pseudo-GANTT chart), your program should calculate the following:

1. Average turnaround time for each scheduling algorithm
2. Average wait time for each scheduling algorithm

Once done with all of the above algorithms, you should create two plots in Microsoft Excel (or something similar), one representing the average wait time for all of the above algorithms, and one representing the average turnaround time for all of the above algorithms and provide a short (up to 1-page) analysis of your results and commenting about the results generated.

What you need to do to finish the assignment:

- A careful study and understanding of the problem statement and its details.
- Some thoughts and efforts in program design.
- Looking up the UNIX/LINUX man pages and the auxiliary sources.
- A careful walk-through of the code to make sure everything is according to specifications described in this handout.

General Instructions:

- Make sure that your program compiles and runs on the CS server.
- This is an individual programming assignment.
- To test your program, take any example from the book and compare your results with it.
- In the program header, you **MUST** tell us about yourself (your name, student id, homework number, date, class, etc.).
- The program **MUST** include reasonable comments to indicate what you are doing and also **MUST** include proper white spaces to make it readable.
- Your analysis **MUST** be in typed format.
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How to submit your assignment?

- Submit your source code and screen shots of results of execution through the Brightspace site.

Due date:

- Your homework assignment is due on the date mentioned above **before the start of class time (i.e., 10:00 AM)** on its due date. As stated in the course outline, late submission is not allowed / accepted. However, as mentioned before, every student is allowed to submit one homework assignment up to 48 hours late (from its original submission date/time). If you have not used this relaxation before, your submission will be accepted and evaluated.
- Late submission is determined using Brightspace site clock.

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| <ul style="list-style-type: none">- Your submission will be checked against all other submissions for similarity/plagiarism detection.- For homework assignment, ONLY one submission/attempt will be allowed. |
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