

Programming Assignment #4

CSci 530, Summer 2015

Dates:

Assigned: Monday July 20, 2015

Due: Friday July 31, 2015 (before Midnight)

Objectives:

- Understand short-term process scheduling.
- Work with data structures to implement a round-robin scheduler.
- Look at effects of different time slice quantum sizes on the round-robin scheduling algorithm.
- Use C/C++ to implement vector and matrix data structures, get practice in creating and using such data structures in C/C++.

Description:

Our textbooks chapter 9 discusses several possible short-term process scheduling policies. In this programming assignment exercise we will implement two of the preemptive policies, the simple shortest remaining time policy (SRT) and the round-robin scheduler with preemptive time slicing. Your program will be given a simple input file, indicating the process name, its arrival time and its total service time, the same as the process scheduling examples from our textbook in Table 9.4 and Figure 9.5. You will simulate the execution of the required schedulers. As in previous assignments, your program will need to work non-interactively and be callable from the command line. The program will be provided with the file name of a file with process information, in the format discussed below. Your program will also be given the time slicing quantum parameter it is to use for the simulation, if round-robin scheduling is selected. Your program will need to output the results of running the set of simulated processes using the selected scheduling policy with the indicated time slice for the round-robin scheduler. Your program will have to output its results exactly as shown below in the required output format. Your program will also need to calculate some summary statistics for the simulated processes, including the turnaround time and T_r/T_s ratio for each process, and the mean T_r and T_r/T_s values for the given simulation.

Process simulation file formats

The files with the information about the processes to be simulated are fairly simple, and have the same information that our textbook uses to illustrate the process scheduling examples. Each simulation file contains multiple rows of data, where each row consists of the process name, its arrival time, and its service time. Here is an example:

```

A 0 3
B 2 6
C 4 4
D 6 5
E 8 2

```

This file is named process-01.sim in the zip archive of files I have given you to get started on this assignment. This is also the same set of processes and start/service times used for all of the examples in table 9.4 and figure 9.5.

Running Simulations

As with previous assignments you are required to support using your simulation from the command line. Your program will take the name of the file containing the process information first. The next parameter will be either 'rr' to perform round-robin scheduling, or 'srt' if shortest remaining time policy is to be simulated. Finally, a 3rd parameter will be supplied for the round-robin scheduler, the time slice quantum to use. An example of running your finished program should look like this:

```

$ ./p3 process-01.sim rr 4
A A A B B B C C C C D D D D B B E E D
Name Fnsh T_r  T_r/T_s
-----
A         3   3       1
B        17  15      2.5
C        11   7      1.75
D        20  14      2.8
E        19  11      5.5

```

Here we are running the simulation using the set of process information given in the previous section and with a time slice quantum of 4.

Required Output

As shown above, your program must generate 2 bits of output. First of all, while running the simulation of the selected scheduling policy, you should display the process names in the order they are run. In the previous example, the sequence of scheduled/run processes was:

```

A A A B B B C C C C D D D D B B E E D

```

This indicates that process A ran first (times 0, 1 and 2), followed by B running 4 times (times 3 to 7), etc. You are required to output the sequence of process runs as the first line of output, with a single space in between each process name as shown.

After the processes have run, you need to calculate and display the statistics for the processes that you just simulated. In our previous example, the statistics for our round-robin simulation with a time quantum of 4 time slices were:

```

Name Fnsh T_r  T_r/T_s
-----
A         3   3       1
B        17  15      2.5
C        11   7      1.75

```

D	20	14	2.8
E	19	11	5.5

For each process, you need to output the time when it finished, the turnaround time (T_r) and the ratio of the turnaround time to the service time (T_r/T_s).

I have provided a zip file with a file named p3-start.cpp as a template to get you started. In addition, I have provided you with two process simulation files, named process-01.sim and process-02.sim, with 2 sets of process information you can simulate. There are several examples of correct results generated for the two sets of inputs, named things like process-01-q1.res, process-01-q4.res, process-01-srt.res, etc. These are the correct results you should get for running your simulation with round-robin scheduling for various time quantum or for shortest remaining time scheduling.