CS 520: Introduction to Operating Systems

Homework Assignment #3

This assignment is somewhat **open-ended**—start working on it as soon as you can!

<u>A reminder:</u> You may work in groups; **however, you may not show anyone your code or copy of any part of anyone else's code or report.**
Those who submit isomorphic programs, get 0 points each as a minimum. (For the rest of the penalties please check the Syllabus.)

I recommend that you write everything in small—no longer than one-page-long—methods and test each method separately. **Start by testing your pseudo-random variable package and check the distributions to ensure that everything works. Include this test in a separate method.**

Then prepare and test the event data structure. After that, writing and debugging the rest of the program will be straight-forward. I recommend that you **finish the program in the first week** and **spend the second week on experimenting and writing the report**.

As a minimum, a program must be written and a report prepared with the specific questions answered, but there is much room for using your creativity—please use it! The most important thing that you will have learned from this assignment is the discreet simulation technique, which you will apply (by re-using most of the code you develop to deal with this particular problem) later.

Write the bus simulation, as explained in the class and described in the notes. Feel free to look on the web for and then re-use any suitable code for the random number generator or for linked list algorithms. With that, 1) don't **forget** to include a reference to the source of any code you re-use and 3) remember to test all re-used code as you are the only one responsible for its performance..

The purpose of the simulation is to observe the behavior of the system, and answer the following questions:

1.   Does the distance between the adjacent buses remain the same? If not, what should be done to ensure that it be the same?

2.   What is the average size of a waiting queue at each stop (and what are its maximum and minimum)? (You may provide this information on an hourly [simulation time] base.)

Plot the positions of buses as a function of time (you will need to generate periodic snapshots of the system for that). Feel free to change parameters; then observe and document the results.

What you hand in must include

1. Your working Java program (it **must** be well-commented) as well as all required input files in the *txt* format.

2. A README txt file explaining what you are submitting.

3. Your report, in the PDF format, including plots, observations, and—especially—your recommendations for change in the scheduling policies. Needless, to say you will need runs that demonstrate that your recommendations solve the problems you observe. **Remember that preparing a report is a very essential part of this assignment; this is not merely a programming exercise. The program must be working (or the assignment will get a grade of 0), but the quality of your report will determine your grade.**

Feel free to change the simulation parameters. My initial suggestion is that there are

- 15 bus stops
- 5 buses
- The time to drive between any two contiguous stops is 5 minutes
- The passenger's mean arrival rate at each stop is 5 persons/min
- The boarding time is 2 seconds for each passenger
- The total simulation time is 8 hours.

Make sure you start this project as early as possible, and then… experiment, experiment, experiment! (**100 points**)