Assignment 8 Simulation of a Bank System

Due Date: 11:50 pm on August 4, Tuesday

### Objectives:

* Students will gain an experience to use queues to solve problems.

**Problem**

Implement the event-driven simulation of a bank that Chapter 13 described. A queue of arrival events will represent the line of customers in the bank. Maintain the arrival events and departure events in a priority queue, sorted by the time of event. Use a link-based implementation for the event list.

The input is a text file of arrival and transaction times. Each line of the file contains the arrival time and required transaction time for a customer. The arrival times are ordered by increasing time.

Your program must count customers and keep track of their cumulative waiting time. These statistics are sufficient to compute the average waiting time after the last event has been processed.

**Other requirement:**

In the class **Event**, comparison operators (<, <=, >, >= , == and !=)must be defined to use priority queue.

**[Hint:** You should test the Event class before you use it in this project.**]**

**Output**

Display a trace of the events executed and a summary of the computed statistic (total number of the arrivals and average time spent waiting in line). For example, if an input file contains the following customer samples:

|  |  |
| --- | --- |
| Arrival time | Transaction time |
| 1 | 5 |
| 2 | 5 |
| 4 | 5 |
| 20 | 5 |
| 22 | 5 |
| 24 | 5 |
| 26 | 5 |
| 28 | 5 |
| 30 | 5 |
| 88 | 3 |

then the following output should be produced by your program:

Processing an arrival event at time: 1

Processing an arrival event at time: 2

Processing an arrival event at time: 4

Processing a departure event at time: 6

Processing a departure event at time: 11

Processing a departure event at time: 16

Processing an arrival event at time: 20

Processing an arrival event at time: 22

Processing an arrival event at time: 24

Processing a departure event at time: 25

Processing an arrival event at time: 26

Processing an arrival event at time: 28

Processing an arrival event at time: 30

Processing a departure event at time: 30

Processing a departure event at time: 35

Processing a departure event at time: 40

Processing a departure event at time: 45

Processing a departure event at time: 50

Processing an arrival event at time: 88

Processing a departure event at time: 91

Simulation ends.

Final Statistics:

Total number of customers processed: 10

Average amount of time spent waiting: 5.6

**What to Hand In**

* Submit all source programs to your class account in **centOS** system.
* Submit the following documents to D2L:
  + all source programs
  + a script file for a test run on **centOS**
  + a word file that contains
    - design document
    - user document

(Please follow the details of the document About Programming Assignments posted on D2L.)

**Grading**

|  |  |
| --- | --- |
| **Requirements** | **points** |
| Comments in the program | 10 |
| Program correctness for **Event** class | 10 |
| Program correctness for the project | 35 |
| Script file from a test run on centOS | 10 |
| Design document | 10 |
| User document | 5 |
| **TOTAL POINTS** | **80** |