**Sarah Wallis  
Data Structures and Algorithms II  
Project 2  
User's Manual**

**Setup and Compilation**  
1. Download and unzip the submission from eLearning on a Linux box in the multi-platform lab.  
2. The submission includes:

* customer.cpp
* customer.hpp
* fifo-queue.cpp
* fifo-queue.hpp
* main.cpp
* makefile
* math-model.cpp
* math-model.hpp
* priority-queue.cpp
* priority-queue.hpp
* simulation-controller.cpp
* simulation-controller.hpp
* test1.txt
* test2.txt
* UMLDiagram.png
* UsersManual.docx (this file)

3. Environment: This program has been tested in the multi-platform lab and will run there.

4. Compiling. This program includes a Makefile. At the command line in Linux, type make. The program produces an executable entitled sim.

**Running the program.** Be sure test1.txt and test2.txt are in the same directory as the executable. Issue the command ‘./sim’ No command line arguments are required or checked.

User input: no user interaction with the program is required.

**Output:** All output goes to the console. Output will be similar to this:

Running test1.txt simulation...

Simulation complete. Printing results...

Variables

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λ: 2.000000

μ: 3.000000

M: 2.000000

events: 5000

numCustomers: 5000

eventCount: 10000

customerWaitedCount: 808

totalWaitTime: 212.051941

totalServiceTime: 1667.776855

totalIdleTime: 1279.466187

currentTime: 2537.834961

Statistic type Actual : Model prediction

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Percentage idle time (P0) 50.41566% : 50.00000%

Average number of customers in the system (L) 0.740721 : 0.750000

Average time spent in the system by a customer (W) 0.375966 : 0.375000

Average number of customers in the queue (Lq) 0.083556 : 0.083333

Average time spent waiting in the queue (Wq) 0.042410 : 0.041667

Utilization factor (ρ) 0.328583 : 0.333333

Probability of waiting for service 16.16000% : N/A

Running test2.txt simulation...

Simulation complete. Printing results...

Variables

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λ: 5.000000

μ: 6.000000

M: 4.000000

events: 5000

numCustomers: 5000

eventCount: 10000

customerWaitedCount: 47

totalWaitTime: 2.449835

totalServiceTime: 845.447388

totalIdleTime: 432.397797

currentTime: 1009.983765

Statistic type Actual : Model prediction

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Percentage idle time (P0) 42.81235% : 43.43317%

Average number of customers in the system (L) 0.839516 : 0.836234

Average time spent in the system by a customer (W) 0.169579 : 0.167247

Average number of customers in the queue (Lq) 0.002426 : 0.002901

Average time spent waiting in the queue (Wq) 0.000490 : 0.000580

Utilization factor (ρ) 0.209273 : 0.208333

Probability of waiting for service 0.94000% : N/A