Simulation project
Task 3 – Statistical estimation of performance metrics

Remember that any exchange of code with another student is forbidden as it constitutes cheating. Keep the code to yourselves! We will run Moss at the end of this assignment to verify that there has not been any code sharing. Offenders will receive an automatic zero for the entire project.

The objective of this task is to use the simulation in order to calculate:

a. The mean and 95th percentile and their confidence interval of the time T it takes to certify an IoT device.
b. The mean and 95th percentile and their confidence interval of the time D it takes a new request to enter the queue if it is rejected the first time it arrived.

For this, you have to modify your program as follows: stop printing a line of output each time you handle an event, add additional data structures to collect data on T and D, implement the batch means method to construct the confidence intervals, and calculate the mean, 95th percentile and their confidence interval, after the simulation has run.

The length of the simulation is controlled by m, the number of batches and the number of observations b within a batch. Set $m = 50$, and $b = 1{,}000$. (Recall that we need a large batch size in order to estimate the percentile accurately.) In order to allow for the initial conditions, ignore the results from the first batch, and calculate all your performance metrics using the remaining 50 batches. As before, the inter-arrival times and retransmission times are exponentially distributed with mean 6 and 5 respectively. The buffer size B including the one being processed is the same as above, i.e., $B = 5$. The service time s is constant.

Obtain the following results:

1. Vary the service time as follows: 10, 11, 12, 13, 14, 15. For each value obtain the statistics:

   a. Mean and 95th percentile, and confidence intervals of T.
   b. Mean and 95th percentile and confidence intervals of D.

   Graph your results, and comment on your results.

2. Investigate the effect of varying B on all the above statistics for $s = 16$. Graph your results and comments on your findings.

(Increase m and b if the confidence intervals are not sufficiently small.)

Deliverables

Submit your code, and a text file named “output.txt” with all your results and comments.

Grading

- 60 points if the code compiles and runs on eos correctly
- 30 points if the code gives correct results on test data designed by TA
- 10 points for summarizing your results.