

COMPENG 4DK4 Lab 2 Report

Aaron Pinto
pintoa9

Raeed Hassan
hassam41

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Random Number Generator Seeds

For the experiments in this lab, we used the same set of 18 random number seeds for all experiments. Experiment 2 instructs us to include runs with our *McMaster Student ID numbers* as our seeds. We used our *McMaster IDs* and shifted them by one digit at a time to create 9 different seeds from each our IDs, for a total of 18 different seeds. All the random number generator seeds can be seen in Table 1. In the C code used for the experiments, leading zeroes are removed.

| | |
|-----------|-----------|
| 400188200 | 400190637 |
| 001882004 | 001906374 |
| 018820040 | 019063740 |
| 188200400 | 190637400 |
| 882004001 | 906374001 |
| 820040018 | 063740019 |
| 200400188 | 637400190 |
| 004001882 | 374001906 |
| 040018820 | 740019063 |

Table 1: Random Number Generator Seeds

Experiment 2

A plot of the mean delay vs. packet arrival rate is shown in Figure 1. At low packet arrival rate values, we see the mean delay approaches 0.5 msec. The mean delay axis intercept at these low packet arrival rates equal to the packet length divided by the link bit rate, in this experiment this is 500 bits divided by 1000 bits per msec, or 0.5 msec. Similar to Lab 1, we can observe that the mean delay begins to increase exponentially from this mean delay axis intercept value as we begin to increase the packet arrival rate.

Experiment 3

The code was modified to add a check to see if the delay for any packet is greater than 20 msec. The function used to check this is shown in Listing 1. The modified code was run with different values of `PACKET_ARRIVAL_RATE` λ to determine the maximum value of λ where the average probability was less than 2%. The maximum value determined as 401 packets per second, with the probability of a packet's delay exceeds 20 msec beginning to exceed 2% at 402 packets per second.

Listing 1: Modifications to Experiment 3 Code

```
1 void check_delay(Simulation_Run_Ptr simulation_run, int arr[]) {  
2     Simulation_Run_Data_Ptr data;  
3  
4     data = (Simulation_Run_Data_Ptr) simulation_run_data(  
        simulation_run);
```

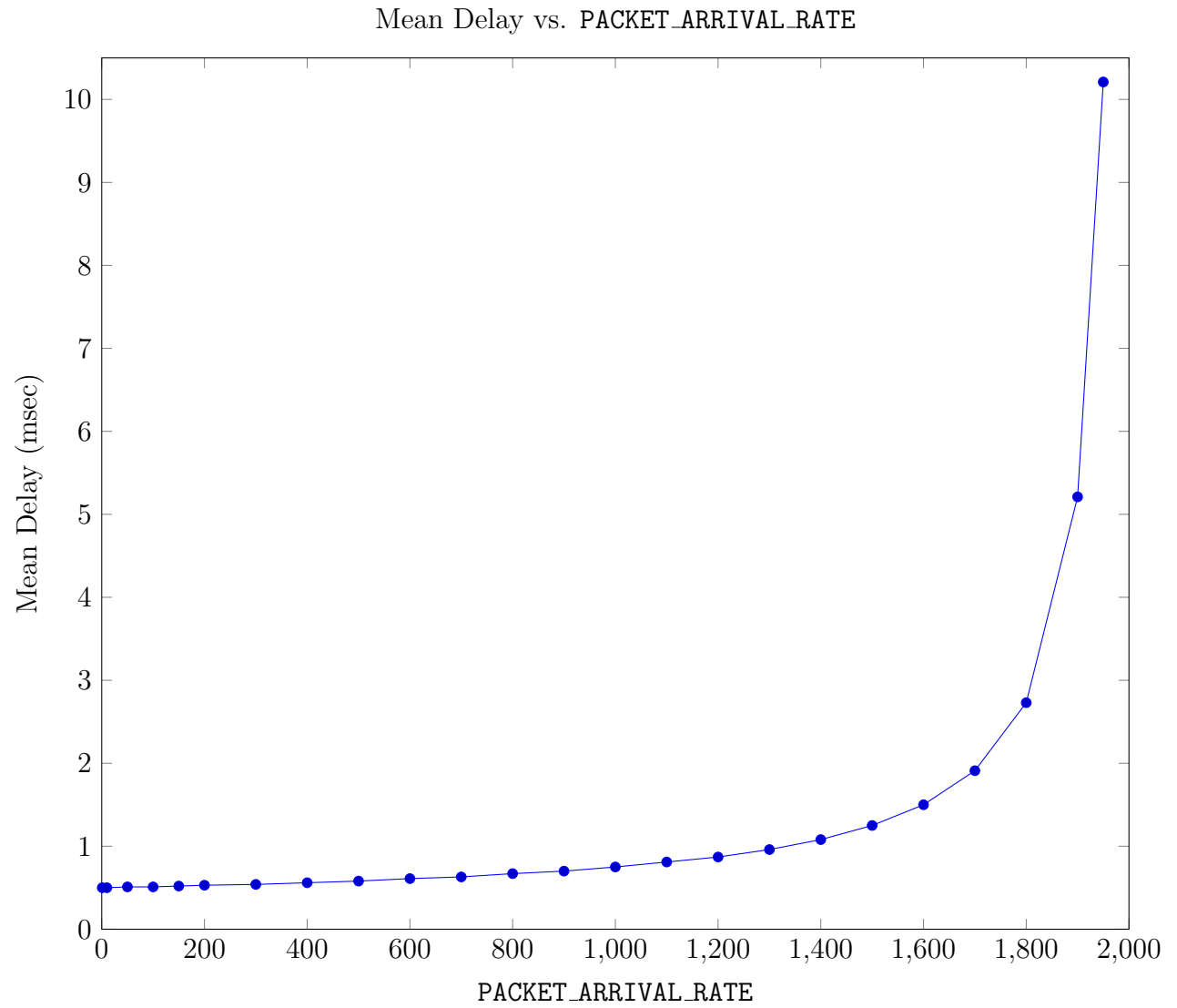


Figure 1: Experiment 2: Mean Delay vs. Packet Arrival Rate

```

5
6      // Get current packet and time
7      double a = 1e3 * data->accumulated_delay;
8      int b = data->number_of_packets_processed;
9
10     // Check if packet has changed
11     if (arr[1] + 1 == b) {
12         // Check if change in time is greater than 20 (
13             packet delay > 20 msec)
14         if (a > arr[2] + 20) arr[0]++;
15         // Update with new packet and time
16         arr[1] = b;
17         arr[2] = a;
18     }

```

Experiment 4

Experiment 5

Experiment 6

Experiment 7