

COMPENG 4DK4 Lab 3 Report

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November 1, 2022

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

The set of curves that show the tradeoffs between blocking probability, offered load (in Erlangs) and the number of channels can be seen in Figure 1. We can observe that the blocking probability decreases as the number of channels increase, and increasing the offered load will increase the blocking probability at a given number of channels.

When plotting these results with the Erlang B formula in MATLAB, we observe the same results with essentially identical curves as seen in Figure 2. The MATLAB code used to calculate the Erlang B formula can be seen in Listing 1. We compared several of our results of from our program with an [online Erlang B calculator](#) and had matching results. For example, for $A = 5$, $N = 10$, both calculated $P_B = 0.184$.

Listing 1: Erlang B Formula

```
3 syms k
4
5 for A = 1:20
6     for N = 1:20
7         PB(A,N) = ((A^N)/factorial(N))/symsum(A^k/
8             factorial(k),k,0,N);
9     end
10 end
```

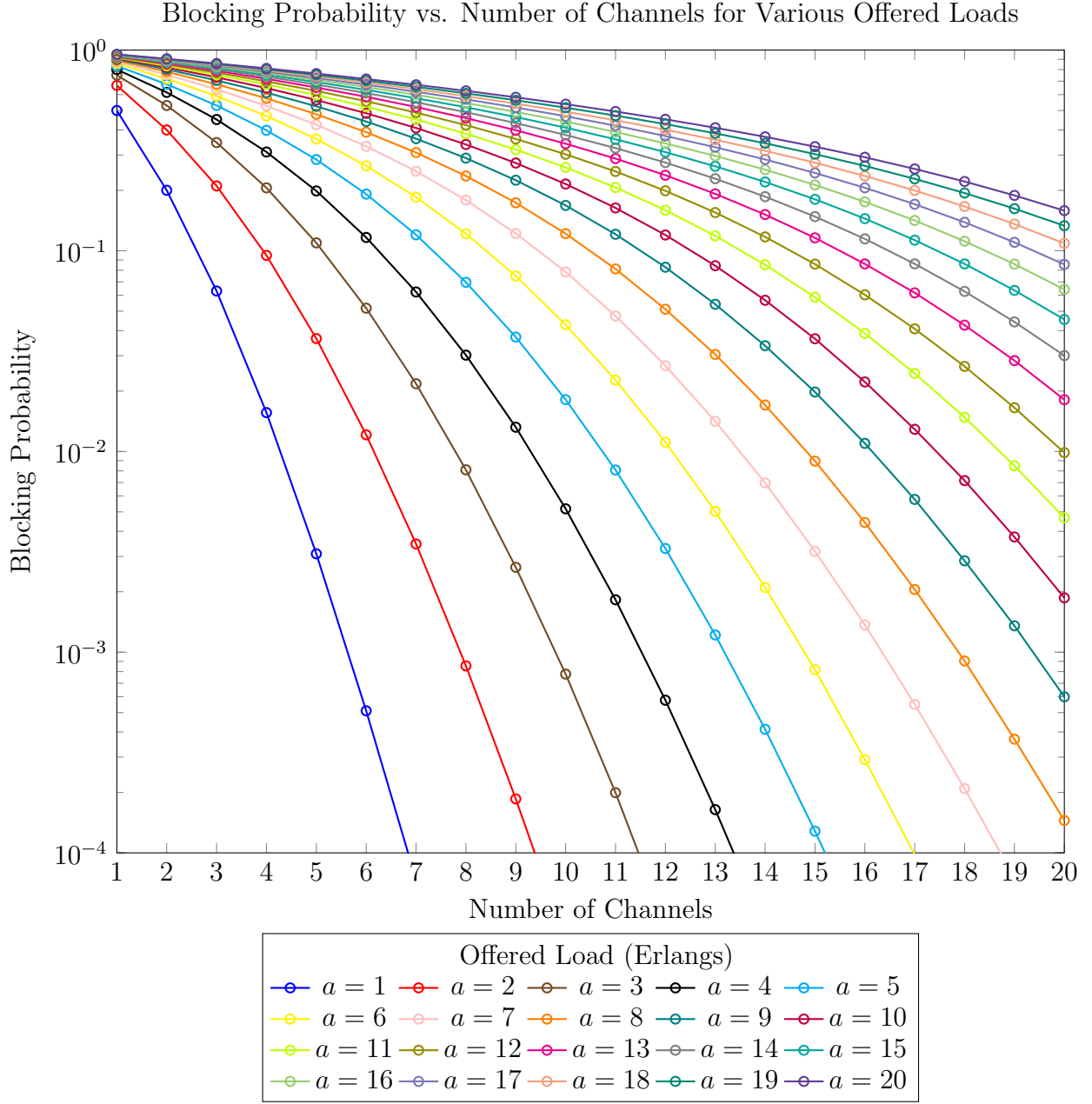


Figure 1: Experiment 2: Simulation

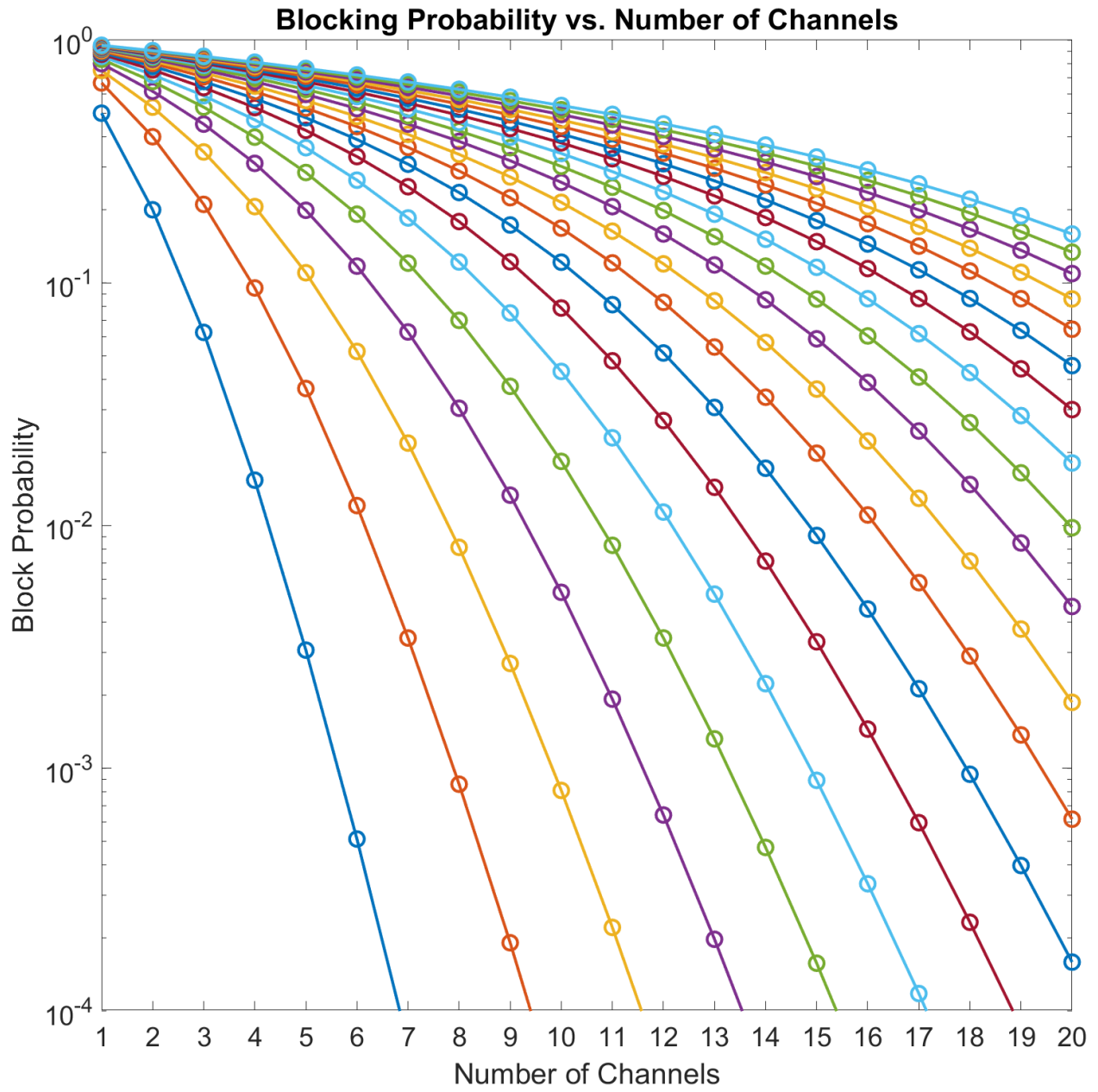


Figure 2: Experiment 2: MATLAB

Experiment 3

The maximum offered loading (in Erlangs) versus the number of cellular channels needed to achieve a 1% blocking probability is graphed on Figure 3.

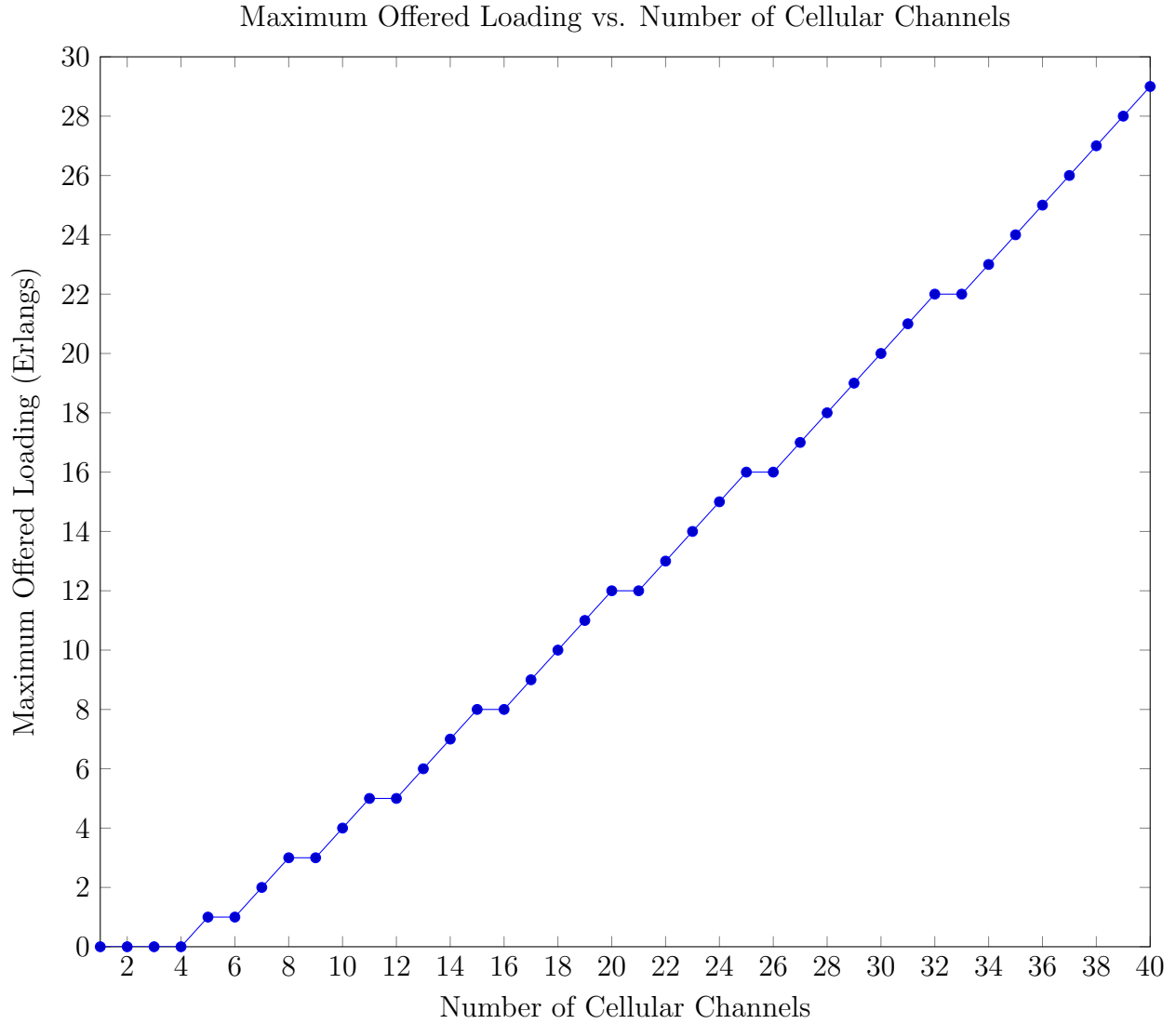


Figure 3: Experiment 2: Mean Delay vs. Packet Arrival Rate