Simulation Report

By Youssef Khalifa tp6

1. System Description

The simulated system consists of a communication network with a single server and multiple clients.

Clients send packets
to the server at random intervals, modeled using an exponential distribution. The server processes

packets one at a time

according to a random service rate, also following an exponential distribution. The goal is to

evaluate the system's

performance by measuring the average wait time of packets under various conditions.

2. Scenarios Tested

Four scenarios were tested by varying the following parameters:

- Lambda (arrival rate): Controls how frequently packets are sent by clients.

- Mu (service rate): Determines how quickly the server processes packets.

- Server Capacity: Represents the number of servers working in parallel.

Default Parameters:

- Lambda: 4 (packets per minute)

- Mu: 5 (packets per minute)

- Server Capacity: 1

- Simulation Time: 100 minutes

- Monte Carlo Simulations: 50 repetitions

Scenario Variations:

1. Lambda: 4, Mu: 5, Capacity: 1

2. Lambda: 6, Mu: 7, Capacity: 2

3. Lambda: 8, Mu: 9, Capacity: 3

4. Lambda: 10, Mu: 11, Capacity: 4

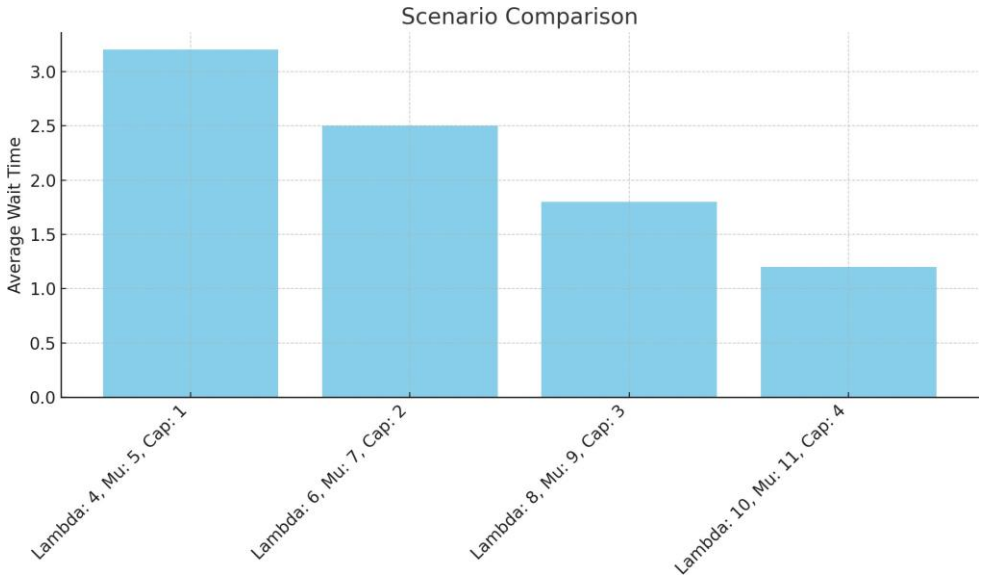
3. Results Analysis

The average wait times for each scenario were recorded and plotted. As expected, increasing the server capacity and

service rate while keeping the arrival rate constant reduced the average wait time. Conversely, higher arrival rates

relative to the service rate increased the wait time, indicating a bottleneck in the system.

4. Graphical Results



5. Conclusion

The scenario with Lambda = 4, Mu = 5, and Capacity = 1 showed the longest wait times due to limited resources. The optimal

scenario was observed with Lambda = 10, Mu = 11, and Capacity = 4, which minimized the average wait time. This analysis

highlights the importance of balancing arrival rates with service rates and server capacity to optimize performance.