

CS 342 – Computer Networks Lab

Assignment – 4

Group – CS8

Airport Security Queue Optimization Report

Introduction:

Airport security screening is a critical component of ensuring passenger safety and satisfaction. This report aims to analyze the efficiency of airport security screening processes and explore optimization strategies to enhance passenger experience and overall airport efficiency.

Methodology:

A discrete-event simulation model was developed to simulate the airport security screening process. The key parameters considered in the simulations include the arrival rate (λ) and service rate (μ), which represent passenger arrivals and the rate at which passengers are processed.

Simulation Results:

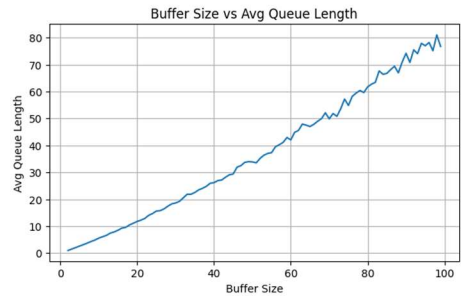
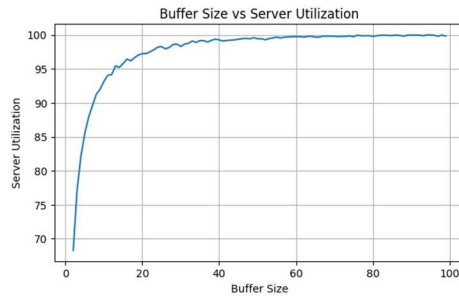
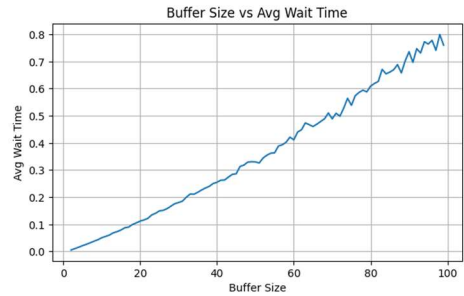
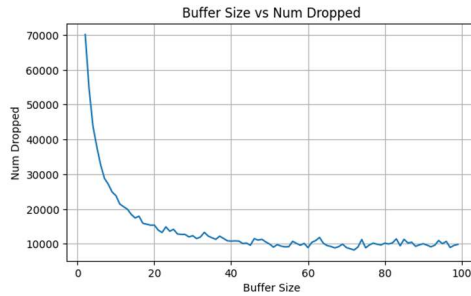
Input Parameters:

Number of passengers (n) = 100000

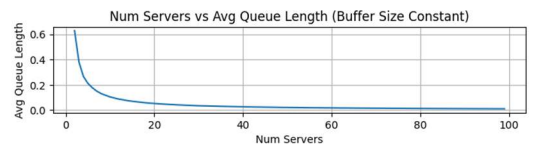
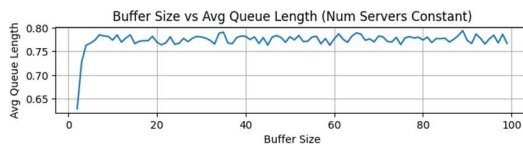
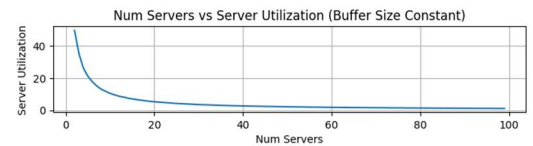
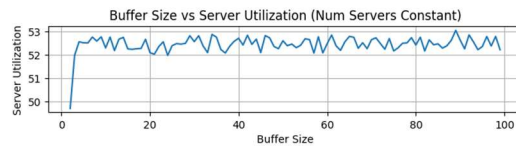
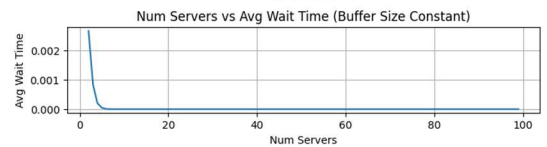
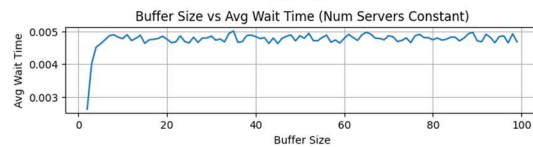
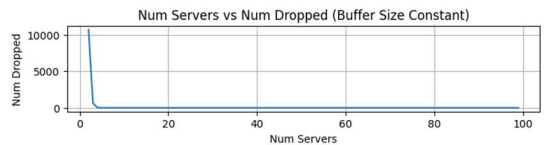
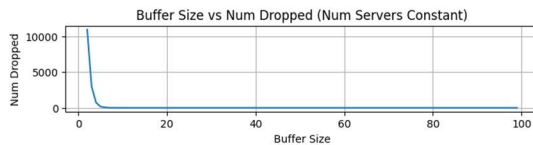
Arrival rate (λ) = 100

Service rate (μ) = 105

Single Server Model:



Multi Server Model:



Optimization Strategies:

1. Buffer Size Optimization:

Increasing the buffer size (K) significantly reduces the number of dropped packets, and increases the server utilization. But it also increases the average waiting time and average queue length. In our single server model, we can take buffer size close to 50, which ensures us close to 100% server utilization, with an average packet drop rate 10%. We can increase the buffer size further if we want to prioritize fewer dropped packets over shorter average waiting time and queue size.

2. Multi-Server Configuration:

Introducing multiple security scanners improves overall system efficiency, reducing packet drop rate, average waiting time and average queue length. But it comes at the cost of a very low server utilization, leading to huge wastage of resources. 5-8 servers seem to be optimal for our case.

Conclusion:

The results of our simulation indicate that optimizing the airport security screening process can significantly enhance passenger satisfaction and airport efficiency. By adjusting parameters such as buffer size, the number of security scanners, and the presence of buffers in multi-server scenarios, airports can tailor their security screening processes to accommodate varying passenger flows and minimize waiting times. These optimizations are essential for ensuring a smoother and more efficient passenger experience.