**THE OPEN UNIVERSITY OF SRILANKA**

**FACULTY OF ENGINEERING TECHNOLOGY**

**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

**BACHELOR OF SOFTWARE ENGINEERING HONOURS**

**EEX5362**

**Performance Modelling**

**Mini Project**

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1. **Introduction (High-Level Problem)**

This project focuses on the performance modeling of a telemedicine call center. The system connects patients with available doctors for remote consultations through voice or video calls. When patients call the center, they are added to a queue if all doctors are busy. The call waits until a doctor becomes available. If the waiting time becomes too long, the patient may drop the call.

This type of system is widely used in healthcare and is important because delays can affect service quality and patient satisfaction. The goal of this study is to understand the performance of the call center and identify areas for improvement by measuring waiting time, service time, and doctor utilization.

1. **System Description**

The telemedicine call center is a service-based system that handles patient calls throughout the day. The key operations of the system are

* A patient calls the center to speak with a doctor.
* If a doctor is available, the call is immediately connected.
* If all doctors are busy, the call enters a waiting queue.
* Calls waiting too long (more than a fixed time) are dropped.
* After a doctor completes one consultation, they attend to the next patient in the queue.

**Main entities of the system**

**Patients (Callers):** people requesting consultation.

**Doctors (Servers):** available medical professionals.

**Queue:** waiting area for incoming calls.

**Call handling system:** software that manages call assignments.

This system can be modeled as a queueing system with multiple servers (doctors). The model helps measure the effect of workload, doctor availability, and service time on overall performance.

1. **Performance Objectives**

The main performance objectives for this system are

* Minimize patient waiting time before being connected to a doctor.
* Reduce the number of dropped calls due to long waiting times.
* Maximize doctor utilization while avoiding overloading.
* Analyze system behavior under different load conditions (normal and peak hours).
* Identify possible bottlenecks and suggest improvements for better performance.

1. **Dataset (Sample or Simulated Data)**

Since this is a performance modeling study, a small, simulated dataset is used to represent system behavior over a few days.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Day** | **Total Calls** | **Avg. Call Interval (minutes)** | **Avg. Service Time (minutes)** | **No. of Doctors** | **Dropped Calls** |
| Monday | 70 | 10 | 12 | 5 | 8 |
| Tuesday | 90 | 7 | 13 | 5 | 15 |
| Wednesday | 65 | 11 | 11 | 5 | 6 |
| Thursday | 80 | 9 | 14 | 6 | 7 |
| Friday | 95 | 7 | 15 | 6 | 12 |

**Explanation:**

* “Total Calls” shows the number of patients who contacted the center per day.
* “Avg. Call Interval” is the average time between new incoming calls.
* “Avg. Service Time” is how long each doctor spends with a patient.
* “No. of Doctors” indicates available doctors during the day.
* “Dropped Calls” show how many patients left the queue without service.

1. **Modeling Approach and Assumptions**

The system will be modeled using a discrete-event simulation approach.

Simulation allows observing how patients move through the system, how long they wait, and how busy doctors are.

**Modeling Tool (planned):** Python with SimPy library.

**Main Assumptions**

* Each doctor can handle only one patient at a time.
* Call arrivals follow a random pattern (Poisson distribution).
* Service times vary between 5 and 20 minutes.
* A call is dropped if waiting time exceeds 30 minutes.
* The system operates for 12 hours per day.

The simulation will measure performance indicators such as average waiting time, dropped call percentage, and doctor utilization rate.

1. **Expected Outcomes**

After modeling and simulation,

The Results are expected as

* Identification of the average patient waiting time.
* Doctor utilization rate under different loads.
* Number of calls dropped for various workloads.
* Understanding of system behavior during peak hours.
* Suggestions for improving service performance (e.g., adding more doctors or reducing service time)

This Deliverable will help to understand how a telemedicine call center performs under different conditions.

By analyzing the waiting time, dropping calls, and utilization, it will be possible to suggest changes to improve system performance. The simple dataset and model can later be extended with real data or additional parameters to make the analysis more accurate

1. **References**

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