EEX5362 Performance Modelling

Deliverable 01

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**System Name**

University Registration Queue System

**System Description**

The **University Registration Queue System** is designed to manage the process of student registration for courses at the beginning of each semester.  
Traditionally, students must wait in long queues to get approval for subjects, submit documents, or complete payments.

This system digitizes the registration process, allowing students to register online or in-person while the system manages and optimizes the queue in real time.  
It tracks registration requests, manages available counters (staff members handling registration), and prioritizes requests based on student type (e.g., final-year students first).

**High-Level Problem**

During peak registration periods, a large number of students attempt to register simultaneously.  
This causes:

* Long waiting times
* Server delays
* Uneven workload among counters

As a result:

* Students face frustration and delays
* Staff experience workload imbalances

**Key performance challenges:**

* Increased average waiting time per student
* Bottlenecks at specific counters
* Low throughput (fewer students registered per hour)

**Data Set**

The system collects and analyzes data from multiple sources to monitor and improve performance.

|  |  |
| --- | --- |
| **Data Field** | **Description** |
| Student\_ID | Unique identifier for each student |
| Arrival\_Time | Time student joins the registration queue |
| Service\_Start\_Time | When the student is served |
| Service\_End\_Time | When the registration is completed |
| Counter\_ID | Which counter or staff member handled the registration |
| Registration\_Type | Type of registration (new admission, course add/drop, etc.) |
| Waiting\_Time | Time between arrival and being served |
| Processing\_Time | Time taken to complete the registration |

**Example Data:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Student\_ID** | **Arrival\_Time** | **Service\_Start\_Time** | **Service\_End\_Time** | **Counter\_ID** | **Waiting\_Time (min)** | **Processing\_Time (min)** |
| S001 | 9:00 | 9:05 | 9:10 | C1 | 5 | 5 |
| S002 | 9:02 | 9:12 | 9:17 | C2 | 10 | 5 |
| S003 | 9:05 | 9:15 | 9:22 | C3 | 10 | 7 |
| S004 | 9:07 | 9:14 | 9:20 | C1 | 7 | 6 |
| S005 | 9:10 | 9:20 | 9:27 | C2 | 10 | 7 |
| S006 | 9:12 | 9:22 | 9:30 | C3 | 10 | 8 |
| S007 | 9:15 | 9:23 | 9:28 | C1 | 8 | 5 |

**Performance Objectives**

* **Minimize Average Waiting Time**  
  Reduce the time students spend waiting before being served by optimizing queue distribution.
* **Maximize Throughput**  
  Increase the number of students registered per hour.
* **Identify Performance Bottlenecks**  
  Detect which counters or processes cause the most delays.
* **Optimize Resource Allocation**  
  Balance workload among registration counters to ensure fair and efficient operation.
* **Improve System Scalability**  
  Ensure the system can handle increased student load during peak periods without performance degradation.

**Expected Outcomes**

* Reduced average waiting time from 15 minutes to **under 5 minutes**
* **25% improvement** in registration throughput
* **Balanced resource utilization** across all counters
* **Higher student satisfaction** and smoother registration experience

**Conclusion**

The University Registration Queue System provides an efficient, data-driven approach to managing student registration.  
By tracking queue metrics and optimizing performance parameters, the system aims to enhance the registration experience for both students and staff while ensuring scalability during high-demand periods.