

Project Proposal

Team Members

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Problem

An office that dispenses automotive license plates has divided its customers into categories to level the office workload. Customers arrive and enter one of three lines based on their residence location. Model this arrival activity as three independent arrival streams using an exponential interarrival distribution with mean 10 minutes for each stream, and an arrival at time 0 for each stream. Each customer type is assigned a single, separate clerk to process the application forms and accept payment, with a separate queue for each. The service time is UNIF(8, 10) minutes for all customer types. After completion of this step, all customers are sent to a single, second clerk who checks the forms and issues the plates (this clerk serves all three customer types, who merge into a single first-come, first-served queue for this clerk). The service time for this activity is UNIF(2.65, 3.33) minutes for all customer types. Develop a model of this system and run it for a single replication of 5,000 minutes; observe the average and maximum time in system for all customer types combined. A consultant has recommended that the office not differentiate between customers at the first stage and use a single line with three clerks who can process any customer type. Develop a model of this system, run it for a single replication of 5,000 minutes, and compare the results with those from the first system. Put text boxes in your Arena files with the numerical results requested.

Approach

In this project, we develop two models in Arena for an automotive license plate office. In the first model (separate lines and clerks), we model three independent customer arrival streams, each following an Exponential(10) minutes interarrival time, with arrivals beginning at time 0. Each customer type enters a separate queue and is served by a dedicated clerk with a service time distributed uniformly between 8 and 10 minutes (UNIF(8, 10)). After completing the first stage, all customers merge into a single, first-come, first-served queue to be processed by a second clerk, who checks the forms and issues license plates, with a service time of UNIF(2.65, 3.33) minutes. The simulation is run for 5,000 minutes, and we record both the average and maximum time in system for all customer types combined.

In the second model (single line and flexible clerks), customers still arrive independently but now form a single common queue. Three clerks are available, and any clerk can serve any customer, using the same UNIF(8, 10) minutes service time as in the first model. After the initial service, customers proceed to the same final clerk for form checking and plate issuance. This model is also run for 5,000 minutes, and the average and maximum time in system are recorded.

Finally, we compare the results from both models and insert text boxes in the Arena files to display the numerical results clearly for easy reference.