

IE306 Assignment 1

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1. Definition of Events

- Arrival of a call to operators : New call arriving to system and coming to the operator one with probability 0.3 or the operator two with probability 0.7.
- Departure of call from : Call is served by operator one (logNormally distributed with mean 12 minutes and standard deviation 6 minutes) or operator two (uniformly distributed between 1 and 7 minutes) and leaves the system.
- Operators starting the break : Operators decides to take a break, serves the calls that arrived to them before he decided to take the break and stops operating.
- Operators returning from break : The operators resumes service after the break.
- Reneging : An arriving customer that has been waiting on hold for 10 minutes hangs up and leaves the system.
- Dropping from answering system : When all channels are busy it drops any incoming call without answering.

2.Simulation Logic

There are 3 operators. 2 of them have only 1 capacity and one of them has 100. We created the 2 of them as a resource in Simpy environment. However, the other one is not defined as a resource because it is not necessary. We used a queue as a counter to measure the number of customers who use an automated operator. Other operators can be allocated by customers or break generators. First customers come to the automated operator without waiting. After the timeout, they try to reach one of the operators or quit the call. If they try the former one, they automatically enter the queue of the operator. That queue is Simpy's attribute. If the queue is empty, the customer will directly reach the operator. If the customer reaches the operator with waiting more than 10 minutes, he or she will hang up the call. In our code, we save the event as it took only 10 minutes in the queue, and the customer never reached the operator.

Breaks work with the same saving logic. If a break allocates a customer when there is another customer in the queue, it will leave immediately and enters the queue again. We do not save the entrance of the break in the code which takes zero event time. The scheduling times are done as in the description of the project.

3.Simulation Outputs

For 1000 answered calls

Utilization of The answering System: 0.00843566

Utilization of operator1: 0.579901

Utilization of operator1: 0.579901

Utilization of operator2: 0.419774

Average waiting times of customers: 2352.06

Maximum Total Waiting Time to Total System Time Ratio: 0.435765

Average number of people waiting to be served by operator1: 273.9

Average number of people waiting to be served by operator2: 627.4

Average number of Unsatisfied Customer leaving: 213.4

For 5000 answered calls

Utilization of the answering System: 0.00838902

Utilization of operator1: 0.584625

Utilization of operator2: 0.418326

Average waiting times of customers: 11924.7

Maximum Total Waiting Time to Total System Time Ratio: 0.419503

Average number of people waiting to be served by operator1: 1360.7

Average number of people waiting to be served by operator2: 3139.4

Average number of Unsatisfied Customer leaving: 1106.1