Tutorial

1BK20 – Business Process Simulation

A travel agency gives its customers the opportunity to book holidays by phone. Calls are received according to an exponential distribution of 4 calls per hour. Currently, there is one employee who handles the phone calls. Calls have a duration which is uniformly distributed between 10 and 15 minutes.

1. Make a SimPN model for the described process using basic Petri net concepts. Do not use prototypes. Simulate 1 hour. Use a SimpleReporter to check if the model behaves as you would expect.
2. Make a SimPN model for the described process using task, start\_event, and end\_event protoypes. Simulate 40 hours. Use an EventLogReporter to store the event log to disc. Use the process mining tool ‘Disco by Fluxicon’ to check if the model behaves as expected. Especially check if the average processing time and the number of cases that are produced are in line with what you would expect.
3. Generally, January is a busy month at the travel agency. During this period, phone calls arrive according to an exponential distribution of 7 calls per hour. To make sure the travel agency can handle all these calls, an extra employee will be appointed to answer the phone. Adapt your SimPN model to account for the new arrival rate and the extra employee using task, start\_event, and end\_event prototypes. Use a Visualization to check if the model behaves as you would expect.
4. Use the model from the previous exercise, but remove the Visualization.
   1. Use a WarmupTimeReporter to report on the warmup time of the model.
   2. Reset the simulator (using a checkpoint). Use two ProcessReporters, one with a warmup time of 20 hours and one without warmup time. Check the differences between the results from the ProcessReporters.
   3. Reset the simulator (using a checkpoint). Use 20 replications and a 20 hours warmup time to create a boxplot of the average waiting time of customers.
5. The travel agency divides its customers into two categories: customers that want to book a holiday within Europe and customers that want to book a holiday outside Europe. On average 70% of the customers wants to book a holiday within Europe. On average, it takes less time to book a holiday within Europe. Therefore, calls of customers that want to book a holiday within Europe have a duration which is uniformly distributed between 8 and 12 minutes. The duration of phone calls from customer that want to book a holiday outside Europe is still uniformly distributed between 10 and 15 minutes. Extend your model such that it divides the customers into these two categories. Use an EventLogReporter to export the results of the simulation to Disco. Use Disco to check the throughput times of the different types of customers. To detect the different types of customers in Disco, you need to distinguish the paths that the customers take. These paths are called variants in Disco. For example, you can distinguish the customers by completing them with different end-events.
6. Since there are two employees handling the phone calls, the manager decides that it would be logical to appoint all the phone calls for the holidays within Europe to one employee and the ones for holidays outside Europe to the other. Extend your model such that this division of customers per employee is included. Again, record the throughput time of both types of customers and compare the results with those from the previous exercise.
7. In case both employees are in a phone call, customers receive an “in conversation” message. If this is the case, they will be set in line and will have to wait until an employee is available. However, some customers do not have the patience to wait that long. After a customers has waited 10 minutes, there is a chance of 70% that he will hang up. Extend your model such that the patience of customers is included in your model.
8. A new phone system does not enable the travel agency to create a waiting queue when all employees are in a conversation anymore. Therefore, when new customers will receive an “in conversation” message, they will hang up the phone immediately. Extend your model such that customers receiving this message will leave the system.