SIE 431 - Simulation Modeling and Analysis
Fall 2018
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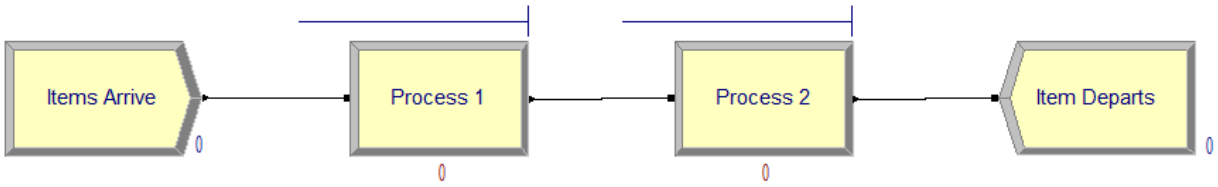
Homework 3

4-2 Model



Problem 4-2

Results:

Run 1 (exp arrival, exp service)
time-average numbers in the queue (process 1)=4.2180 items
time-average numbers in the queue (process 2)=4.7433 items
average total time in the system=108.19 minutes

Run 2 (constant arrival, exp service)
time-average numbers in the queue (process 1)=2.8827 items
time-average numbers in the queue (process 2)=3.8410 items
average total time in the system=85.2666 minutes

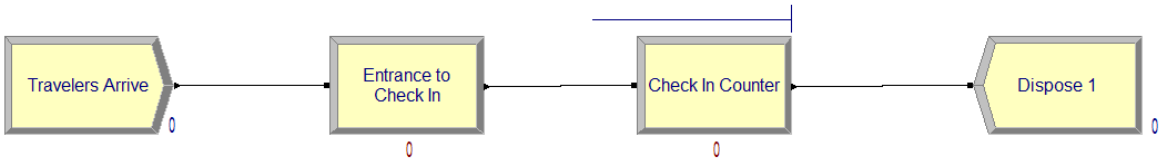
Run 3 (exp arrival, constant service)
time-average numbers in the queue (process 1)=3.1947 items
time-average numbers in the queue (process 2)=0.00 items
average total time in the system=50.1366 minutes

Run 4 (constant arrival, constant service)
time-average numbers in the queue (process 1)=0.00 items
time-average numbers in the queue (process 2)=0.00 items
average total time in the system=18.2000 minutes

4-2 Summary

This model simply includes items that arrive on average every 10 minutes and both processes take on average 9.1 minutes. Four different runs were done using this model, with different combinations in the distributions for the arrival time and the service times (exponential distribution and constant). The results of the runs are included in the textbox.

4-3 Model



Problem 4-3

Results:

Problem 4-1 (without scheduled breaks)
average time in the system=6.2079 minutes
number of passengers completing check-in=583 passengers
time-average length of the check-in queue=0.04825325 passengers

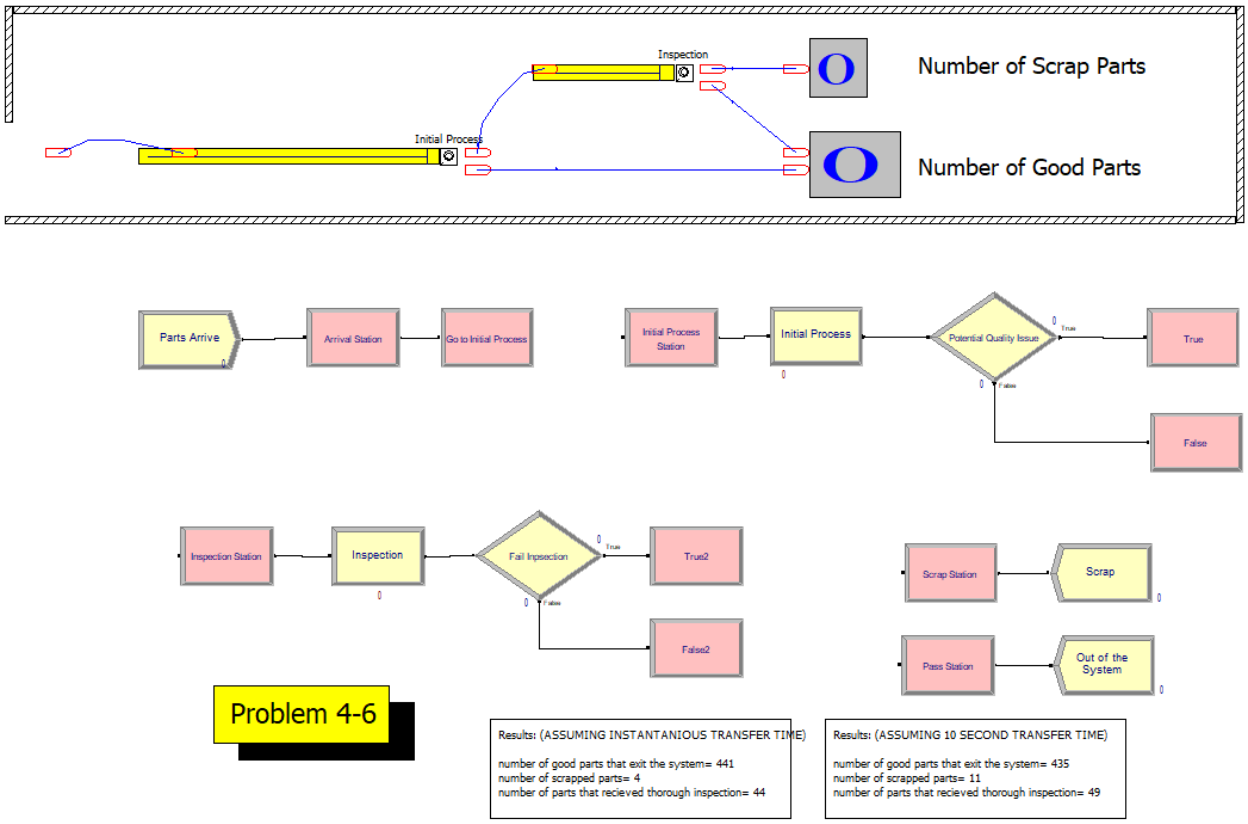
Problem 4-3 (with scheduled breaks)
average time in the system=6.3276 minutes
number of passengers completing check-in=596 passengers
time-average length of the check-in queue=0.1192 passengers

Now that the agents take breaks, the capacity will be lower than problem 4-1. This means that the travelers will spend more time in the system because they have less servers to go to. The number of passengers completing check-in goes up because there are more passengers that entered the system. If the number of passengers that entered the system were the same for both prooblems, then 4-3 would have less passengers that completed check-in because there is less capacity. There is an increase in the average length of the queue because there are less people to make the queue go down.

4-3 Summary

This model simulates travelers at an airport from the time they enter the check-in area to the time they complete the check-in process. Travelers arrive at an exponential distribution with parameter 1.6 minutes. Then, the traveler takes from 2 to 3 minutes uniformly distributed to get to the check-in counter. After that, the traveler is served by one of 5 servers who take staggered breaks. The results and explanations are included in the textbox.

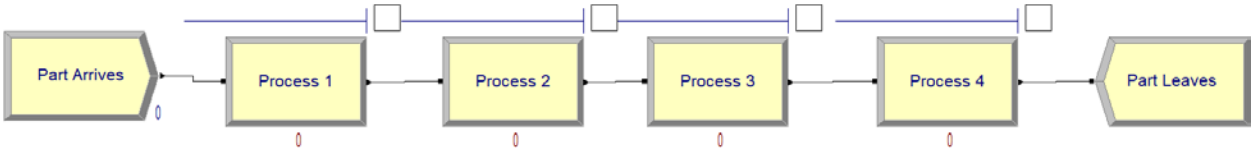
4-6 Model



4-6 Summary

This model simulates a part inspection process. First, the part arrives and gets an initial inspection. From there, it can be selected for further inspection or leave the system as a good part. If the part was selected for further inspection, it either fails the inspection and goes into the scrap pile, or passes the inspection and leaves the system as a good part. The results are captured in the textbox.

4-8 Model



Problem 4-8

Results:

percent of time each resource spends in the failure state:
station 1= 11.65%
station 2= 9.83%
station 3= 9.38%
station 4= 9.23%

ending status of each workstation queue:
station 1= Resource Busy, 4 in queue
station 2= Resource Busy, 3 in queue
station 3= Resource Busy, 5 in queue
station 4= Resource Busy, 0 in queue

4-8 Summary

This model simulates 4 serial automatic workstations. The parts arrive every 9.8 minutes. Process 1 takes 8.5 minutes, Process 2 takes 8.3 minutes, Processes 3 and 4 both take 8.6 minutes. The results from the problem reside in the textbox.