IE 415/515: WINTER 2014

LAB 6

Additional Arena Modeling Concepts

1. Introduction

In this laboratory you will be introduced and shown several new Arena modeling features.

- Read and write data to text files
- Decisions by condition
- Hold module
- Sets of resources
- Sets of resources with different capability
    - Variables, arrays

2. Arena Models

The TAs will review the new modeling features by reviewing two Arena models.

1. Read Interarrivals.doe
2. Sets and Arrays.doe

Read Interarrivals.doe is a simulation that reads interarrival times from a text file and creates arrivals based on these times. This model then records the arrival time of each arrival in a text file. This is helpful if you have historical interarrival times and are trying to simulate the systems over the time period that the interarrival data was collected. Writing data to files allows you to obtain more detailed data about system operation. For example you can write data to a file that contains queue sizes and the times that the queue size changes.

Sets and Arrays.doe is a model of a system with two server locations. Sets of resources are used to provide service at each location. One resource is shared between the sets. As an example consider a food service system where some customers go to drive-thru, and others go to the counter. In this system one person only serves at drive-thru, and one person only serves at the counter, but the manager "floats" and serves at both locations as needed. Arrays are used to implement different service rates for the different servers, and there is a "Hold" module used to control queue lengths at each service location.

3. Lab Assignment

Construct an Arena model of the following truck shipment receiving area.

The time between truck arrivals to an unloading area is exponentially distributed with a mean time between arrivals of 0.5 hours. Upon arrival they can choose one of two unload docks. The drivers naturally pick the dock with the fewest trucks waiting, but once they join a queue they cannot change. Once at a dock, the time it takes to unload the truck is uniformly distributed with a minimum of 30 minutes and maximum of 60 minutes. After unloading the trucks must cross a draw bridge. The draw bridge is down unless a ship needs to pass by the bridge. Therefore if the bridge is down when the truck finishes unloading, the truck leaves right away (once the truck enters the bridge it assumed out of the system). If not the truck must wait at a holding area until the bridge is down.

The time between ship arrivals that require the draw bridge to go up is exponentially distributed with a mean time of 1.0 hour. When a ship arrives to a bridge that is down, it takes a uniformly distributed amount of time with a minimum of 15 minutes and maximum of 20 minutes to open the bridge. As soon as the bridge starts opening no trucks can cross. It takes a ship a uniformly distributed amount of time with a minimum of 3 minutes and maximum of 5 minutes to pass the raised bridge after it is raised. Ships pass through the draw bridge one at a time. If the bridge is up when new ships arrive, the bridge does not have to be raised again. It will be assumed that lowering the bridge is instantaneous and occurs after a ship passes the raised bridge, and there are no other ships waiting.

Simulate this system for 10 hours to simulate a single day. Conduct 30 replications of this 10 hour simulation.

You are interested in the sizing requirements for the unloading docks and the holding area. Find both average and maximum values to help make sizing decisions.

What to turn in

- E-mail your completed models (*.doe file) with your names in the program model window to the TAs (ie415lab@gmail.com) (File Name: Last Name-Last Name-Lab#).

- Names of team members if you work in pairs.