“Airport Shuttle Bus” Code

This code simulates a shuttle bus system, which ferries passengers between a car rental and an airport terminal.

There are two streams of arriving customers -- one at the car rental facility (who will ride the shuttle towards departures) and the other at the airport terminal who have just arrived at the terminal and will ride the shuttle to the car rental.

Customers Arriving at Car Lot

Customers arrive in groups at the car lot. Each customer then joins the queue at the rental car lot. When a new customer arrives, he must join the queue (if queue is not empty) and wait for his turn to ride. If there is no queue, the customer immediately becomes the head of the queue. To request a ride, a customer must push a “call button”. There is only a single call button at the rental facility, therefore the only head of the customer queue can push the call button, and the next customer must wait until he/she becomes the head of the queue before he/she can push the call button.

One of two things can happen when the customer is the head of the queue: the shuttle is already at the car lot and boarding passengers, in which case the customer immediately boards and resets the call button; or there is no shuttle and the head of the queue must wait until it arrives before he/she can board. When the shuttle arrives, each customer takes a finite (but small predefined) amount of time to board. When the customer has boarded, the next in line becomes the head of the queue.

Events: pushing the call button at car lot, releasing the call button, boarding the shuttle.
Facilities: queue at the car lot.

Customers arriving at the Terminal

Everything is similar to the customers arriving at the car lot, except that these customers ride from the terminal to the car lot.

Events: pushing call button at terminal, releasing call button, boarding the shuttle.
Facilities: queue at the terminal.

Shuttle

There is a single shuttle, which is normally in the idle state in a garage at the start, when neither of the two call buttons are in the “pushed” state. When a customer at either the car lot or the terminal pushes the button, the shuttle gets an indication about which call button was pushed, and heads towards the location where the ride has been requested. The time taken for it to travel from the garage to either location is 2 minutes.

Suppose the shuttle needs to head towards the car lot.. When it reaches the car lot, it loads customers one by one, starting at the head of the customer queue. Each customer takes some time to board the shuttle and take a seat. The boarding continues until one of the following is true: all the seats in the shuttle are occupied, or the customer queue is empty. The shuttle then drives to the airport terminal. The driving time is a uniform random number between 3 and 5 minutes. Next the customers are dropped-off. The number of seats occupied then becomes zero.

Next the shuttle picks up customers waiting at the terminal. Similar to the previous case, the customers are let in one by one, starting at the head of the queue. As described before, each customer takes a finite time to board the shuttle. Boarding continues until all seats are taken or the queue is empty. The shuttle then drives to the car lot. The time taken to drive in the reverse direction is also a uniform random number between 3 and 5 minutes. When the shuttle reaches the car lot it drops off all the passengers.

The shuttle keeps going around in the (car-lot to terminal and back) loop forever.

Events: Indication that shuttle was called, boarding of a customer at car lot, getting off of customers at the terminal, boarding of customer at the terminal, getting off of customers at the car lot.
Facilities: Rest state

Code:

Constants: Number of seats in the shuttle, time taken by a single customer to board shuttle

Entities: customer at airport terminal, customer at car lot, shuttle

Processes: main process, arrival of customers at terminal, activities of a customer at terminal, arrival of customers at car lot, activities of a customer at car lot, interaction of customers with the shuttle

Functions: function to generate the number of customers in a group

Events and Facilities as mentioned before.