Department of Mechanical, Industrial and Aerospace Engineering

Assignment 1

Take the call center model from Lab2 and make these modifications:

Call arrivals

The call-arrival rate to this system actually varies over the course of the day according to a nonstationary Poisson process, which is typical of these types of systems. So we might collect data expressed in calls per hour for each 30-minute period during which the system is open. These call-arrival rates are given in table 1:

Time	Rate	Time	Rate	Time	Rate	Time	Rate
8:00–8:30	20	10:30–11:00	75	1:00–1:30	110	3:30–4:00	90
8:30–9:00	35	11:00–11:30	75	1:30–2:00	95	4:00–4:30	70
9:00–9:30	45	11:30–12:00	90	2:00–2:30	105	4:30–5:00	65
9:30–10:00	50	12:00–12:30	95	2:30–3:00	90	5:00–5:30	45
10:00–10:30	70	12:30–1:00	105	3:00–3:30	85	5:30–6:00	30

Staff scheduling

Assume that the staffing level actually varies over the day.

there are six salespeople with staggered daily schedules summarized as (number of people @ time period in minutes): 1@60, 3@60, 4@90, 5@60, 6@60, 5@90, 6@90, 5@30, 3@60, and 2@60.

Our technical support employees work an 8-hour day with 30 minutes off for lunch (lunch is not included in the 8 hours). There are 11 technical support people whose work schedules are shown in Table 2. Charity and Noah are only qualified to handle calls for product Type 1; Tierney, Aidan, and Emma are only qualified to handle calls for product Type 2; Mya, Ian, and Christie are only qualified to handle calls for product Type 3. Molly is qualified to handle product Types 1 and 3, and Anna and Sammy are qualified to handle calls for all three product types.

Use the set module to put resources who are specialists for the same products in a group. For example, create a set called product 1 and put resources who can handle product 1 in that set. The contents of these sets correspond to the technical staff qualified to handle the calls for each product type. Note that Molly, Anna, and Sammy are included in more than one set. Also, note that we've consistently listed these three versatile staff members at the end of each set for a deliberate reason. For instance, take the Product 1 set, which consists of Charity, Noah, Molly, Anna, and Sammy, in that order. If possible, we'd like to allocate

Charity or Noah to an incoming call first because they can only handle product Type 1 calls. We'll use the Preferred Order selection rule, which allocates resources based on their order in the set, starting with the first (Charity). In our model, this will try to keep Molly, Anna, and Sammy available since they can handle other product types as well.

Hint 2: when you use set for your resource, use Tech Agent Index to specify which one has done this work.

Scheduling rules for sail people is "wait" and for technical support "ignore"

Table 2: technical support schedule

Name	Product Lines	Time Period (30 minutes)																				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Charity	1	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●					
Noah	1						●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●
Molly	1, 3			●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●			
Anna	1, 2, 3					●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	
Sammy	1, 2, 3				●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●		
Tierney	2	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●					
Aidan	2						●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Emma	2				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●			
Mya	3	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●					
Ian	3						●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Christie	3				●	●	●	●	●		●	●	●	●	●	●	●	●	●	●			

We want to also consider the cost of our resources as you can see in table 3(your resource table should look like this).

	Name	Type	Capacity	Schedule Name	Schedule Rule	Busy / Hour	Idle / Hour
1	Sales	Based on Schedule	Sales Schedule	Sales Schedule	Wait	20	20
2	Trunk Line	Fixed Capacity	26	26	Wait	0.0	0.0
3	Charity	Based on Schedule	Charity Schedule	Charity Schedule	Ignore	18	18
4	Noah	Based on Schedule	Noah Schedule	Noah Schedule	Ignore	18	18
5	Molly	Based on Schedule	Molly Schedule	Molly Schedule	Ignore	20	20
6	Anna	Based on Schedule	Anna Schedule	Anna Schedule	Ignore	22	22
7	Sammy	Based on Schedule	Sammy Schedule	Sammy Schedule	Ignore	22	22
8	Tierney	Based on Schedule	Tierney Schedule	Tierney Schedule	Ignore	18	18
9	Aidan	Based on Schedule	Aidan Schedule	Aidan Schedule	Ignore	18	18
10	Emma	Based on Schedule	Emma Schedule	Emma Schedule	Ignore	18	18
11	Mya	Based on Schedule	Mya Schedule	Mya Schedule	Ignore	18	18
12	Ian	Based on Schedule	Ian Schedule	Ian Schedule	Ignore	18	18
13	Christie	Based on Schedule	Christie Schedule	Christie Schedule	Ignore	18	18

Counter of rejected calls
Change the counter in a way that you can count the number of rejected calls at each hour. Hint: check the "record into set" option in the count module. In the set index part, find a way that records the numbers each hour.

Calls for more investigations
The last bit of detail that we omitted from our initial model is that 4% of technical calls require further investigation after the completion of the phone call. The questions raised by these callers are forwarded to another technical group, outside the boundaries of our model, that prepares a response. The time to prepare these responses is estimated to be EXPO(60) minutes. **The resulting response is sent back to the same technical support person who answered the original call.** This person then calls the customer, which takes TRIA(2, 4, 9) minutes. These returned calls require one of the 26 trunk lines and receive priority over incoming calls. If a returned call is not completed on the same day the original call was received, it's carried over to the next day.
Also, for each product type use different entity pictures and entity types.
Hint: Use an index for the member of the set in process of each product type to be able to assign the same specific member in the return call.

Staffing cost:
Define a cost of $20/hour for sales staff and $18 to $22/hour for tech support staff (when they are busy or Idle they will be paid.)

Animation:
Add a plot that shows the trunk line's busy times.

Pay attention:
You might need to modify the initial model to be adapted for the new requirements. For example, as your arrival is based on schedule, do you still need the logic for stopping arrivals after 6 pm?
Remove the WIP variable. Change the termination rule to "number of busy of resource trunk line be equal to 0". It means no trunk line is busy before closing the system.

Reporting:
Find the useful KPIs and report them and explain your report document. It should include the total cost of the staff for one day.

Submission:
Submit your ARENA file and your PDF file that explains the KPIs you recorded. No more file is required.