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Lab 6 - StoreSimulator

For the Queue example, my advice to Safeway.

nQueues	Max duration	nArrivals	Max throughout	Min throughout	Ave throughout
1	5	3	19	2	8.72033898305085
2	5	3	6	1	4.00835073068894
3	5	3	6	1	3.57287449392713
4	5	3	6	1	3.33864541832669

From the under figure, we can see that adding queues is a good idea to make the user experience better, but for first adds there is a great promotion and for the follow adds the promotion is not worthy. So from this section I advise to Safeway increasing the number of queues appropriately.

nQueues	Max duration	nArrivals	Max throughout	Min throughout	Ave throughout
1	5	3	16	1	7.51619870410367
1	6	3	16	2	9.09643605870021
1	7	3	25	3	14.3099173553719
1	8	3	36	2	20.5228215767635

From the under figure, we can see that the greater duration of customers may significantly reduce the user experience. So from this section, I advise to Safeway that if their marketing department investigates that the number of items purchased by users has increased significantly, they should take some measures like adding queues.

nQueues	Max duration	nArrivals	Max throughout	Min throughout	Ave throughout

1	5	3	19	1	9.22784810126582
1	5	4	189	5	97.1090909090909
2	5	4	8	1	4.59533607681756
1	5	5	23	1	11.6942148760331

From the under figure, we can see that more customers may significantly reduce the user experience, and adding queues can solve this problem well. So from this section, I advise to Safeway that they can take some measures like adding queues during peek hours like 6 pm - 9pm to balance the user experience.

My advice is as follows.

My results for the Priority Queue experiments.

-If we have at least 2 queues, how should we allocate the customers? Obviously, add the new arrival to the shortest queue is better than add the customer randomly (Not always true because the wait time of short queue may be longer than the wait time of long queue because of the random duration. But if we have many enough customers, the shorter queue can be said as the better election.)

	nQueues	Max duration	nArrivals	Max throughout	Min throughout	Ave throughout
Randomly	2	5	5	57	3	22.8756371049
Shortest queue	2	5	5	15	2	7.83591331269

From the figure under, we can get that allocating the customers into the shortest queue is the better measure. May be there is a better method like allocating the customers into the shortest waiting time queue, but to compute every queues waiting time on time is not possible in the store. So Safeway should allocate their customers into the shortest queue.

-How about set priority of every customer if we set the highest priority to the shortest rest duration customer? Or set the priority over arrival time?

For this question, we can find that if we set the highest priority to the shortest rest duration customers, there may some customers never getting out fo the queue, which is called starvation. So we should better to set the priority over arrival time.

-Assume that some customers will be frustrated and leave if they have waited for 7 unit of time.

	nQueues	Max duration	nArrivals	Max throughout	Min throughout	Ave throughout
None	2	5	5	21	1	8.37421383647
Give up customers greater than 7 duration,	2	5	5	6	1	5.06697459584

From the figure under, we can get that this case can significantly reduce the throughout. This cannot make sense in the store but can make sense in the network analysis: if some packet cannot access next node for a long time, the best way is to give up this packet, which can make the queue waiting time shorter.

-How about set multiple levels of queues? For example, we have 2 queues, one is to parse the customers with duration less than 3, one is to parse other customers.

	nQueues	Max duration	nArrivals	Max throughout	Min throughout	Ave throughout
Shortest queue	2	5	5	26	3	16.1714285714
Parse different duration customers in different queue	2	5	5	114	1	32.9182795698

From the figure under, we can get that maybe this is not a better idea because the duration is random. This method may make some queue very busy. So if we can allocate the number of different queues by numbers of different packets, we may use this method, which may make the network better.