DSA Final Project

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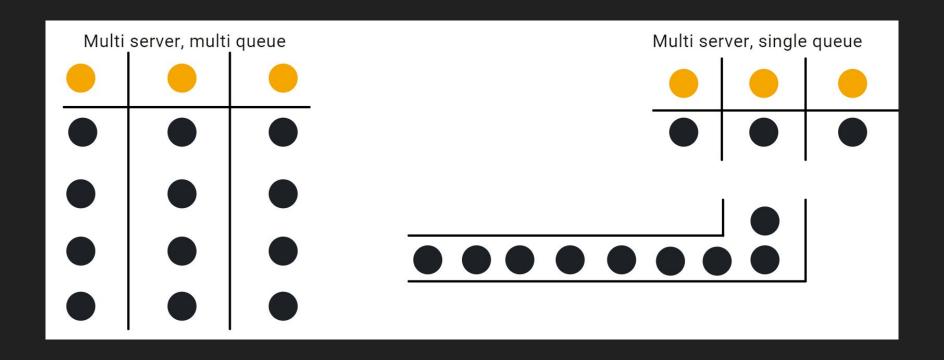
Background

- After noticing that stores in Jakarta implement different kinds of queuing systems, we decided to compare each of them.
- Some stores in Jakarta such as SOGO implements a multi-POS, multi-queue system.
- On the other hand, stores like Uniqlo implements a multi-POS, single-queue system.





Visual Representation



Research Questions

- Why implement different queueing systems?
- Which is one is more efficient or more effective?



Solution

 We decided to investigate the problem by creating a simulation of both queues and see which one's better

- Subsequently, we will able to gather data of which one is more efficient

overall.



Solution Implementation

- Use queue data structures to store customers
- Each customer has their own variables that will be randomly generated with respect to time
- Simulate different scenarios by changing the variables (queues, servers, times, number of customers) involved
- Analyze the output and display it in a graph

Initial thought(s)

- Single queue would be faster in the long term

Based on

<u>www.ijstr.org/final-print/dec2019/A-Comparative-Study-Between-Multi-Queue-Multi-Server-And-Single-Queue-Multi-Server-Queuing-System.pdf</u>

Program Demo

Start Time	Range	Arrival Time	Simulation Time		Start Time	Range	Arrival Time	Simulation Time
50	20	5	35		50	20	5	35
Service Time	Processed Customers				Service Time	Processed Customers		
1	616414				1	516358		
2	1240687				2	1030188		
3	1870181				3	1536291		
4	2501859	Single	Queue		4	2052575	Multi	Queue
5	3128920	Single	Queue		5	2564900		
6	3745018				6	3077271		
7	4374753				7	3589845		
8	5004848				8	4100531		
9	5637911				9	4597659		
10	6268278				10	5110576		
11	6900127				11	5622825		
12	7531511				12	6133551		
13	8161206				13	6643022		
14	8795834				14	7154203		
15	9423853			Gathered	15	7666236		
16	10055777				16	8177141		
17	10686350			Data of	17	8689315		
18	11316748			Arrival = 5	18	9202065		
19	11947475			Amvai – 5	19	9712791		
20	12578411				20	10221470		
21	13208517				21	10731954		
22	13838599				22	11238947		
23	14468004				23	11749133		
24	15097797				24	12253517		
25	15729112				25	12762851		
26	16352591				26	13273574		
27	16980690				27	13780101		
28	17611920				28	14291171		
29	18241167				29	14802380		
30	18870731				30	15307414		
31	19502088				31	15814696		
32	20131316				32	16326188		
33	20762794				33	16831231		
34	21390619				34	17326393		
35	22020219				35	17822476		

Start Time	Range	Arrival Time	Simulation Time	
50	20	5	35	Graphical representation of the gathered data
				Grapilical representation of the gathered data
Service Time		Multi Queue		Single Vs Multi Arrival Time = 5
1				
2				J
3				
4	2501859	2052575	5	
5	3128920	2564900		
6	3745018	3077271		
7	4374753	3589845	20000000	
8	5004848	4100531		
9	5637911	4597659		
10	6268278	5110576	5	
11	6900127	5622825	5	
12	7531511	6133551		
13	8161206	6643022	<u>\$</u> 15000000	3
14	8795834	7154203	E E	
15	9423853	7666236	Cust	
16	10055777	8177141	l e	
17	10686350	8689315	Sess	
18	11316748	9202065	2 15000000 3 5 70 5 70 5 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	
19	11947475	9712791		
20	12578411	10221470)	and the second s
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22	13838599	11238947		
23	14468004	11749133	3	
24		12253517	5000000	
25	15729112	12762851		
26				
27	16980690	13780101		
28				
29	18241167			0
30				1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
31				Time (s)
32				
33				Single Queue — Multi Queue
34				
35				

Start Time	Range	Arrival Time	Simulation Time	St	art Time	Range	Arrival Time	Simulation Time
50		30	35		50		30	35
Service Time	Processed Customers			Se	ervice Time	Processed Customers	3	
1	507987				1	738770		
1	1013224				2	1476593		
	1521992	Cinala	Ougue		3	2213626		
	2027835	Single	e Queue		4	2947032	Multi	Queue
	2537627				5	3678279		40.00.0
(3048223				6	4417493		
	3551964				7	5149954		
	4056817				8	5889594		
9	4564948				9	6627385		
10	5066701				10	7365424		
1:	5575180				11	8104421		
12	6076160			0 11 1	12	8838525		
13	6585740			Gathered	13	9578081		
14	7092325			Data of Arrival	14	10316082		
15	7599648			Dala Ol Allival	15	11053690		
10	8106874			Time = 30	16	11790881		
1	8610355			111118 88	17	12526186		
18	9108332				18	13261244		
19	9589772				19	13997096		
20	10057979				20	14732746		
2:	10533011				21	15461341		
2:	11028265				22	16188695		
23	11515678				23	16922821		
24					24	17646112		
2.	12506862				25	18376026		
20	12986102				26	19108911		
2	13468099				27	19845145		
28	13970476				28	20582425		
25	14474938				29	21315489		
30	14968505				30	22048839		
3:	15475820				31	22785118		
33	15978815				32	23518511		
33	16484222				33	24228167		
34	16989368				34	24948620		
3!	17490290				35	25682563		

Service Time Single Queue Multi Queue Multi Queue Multi Queue Multi Queue Single Queue Multi Queue	Start Time	F	Range	Arrival Time	Simulation Time	
Service Time Single Queue Multi Queue	!	50	20	30	3	Graphical representation of the gathered data
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						Time (s)
34 16989368 24948620						
35 17490290 25682563 → Single Queue → Multi Queue						→ Single Queue → Multi Queue

Conclusion

- What we think is true is not true
- Single queue is OVERALL faster than Multi queue
- However this seem to only apply for queues that are very busy with people coming in every short intervals
- When the queue is not as crowded, it is shown that single queue is slower than multi queue
- Let's go back to WHY convenient stores use different systems.

Practical Explanation (IRL)





Thank u