DSA Final Project

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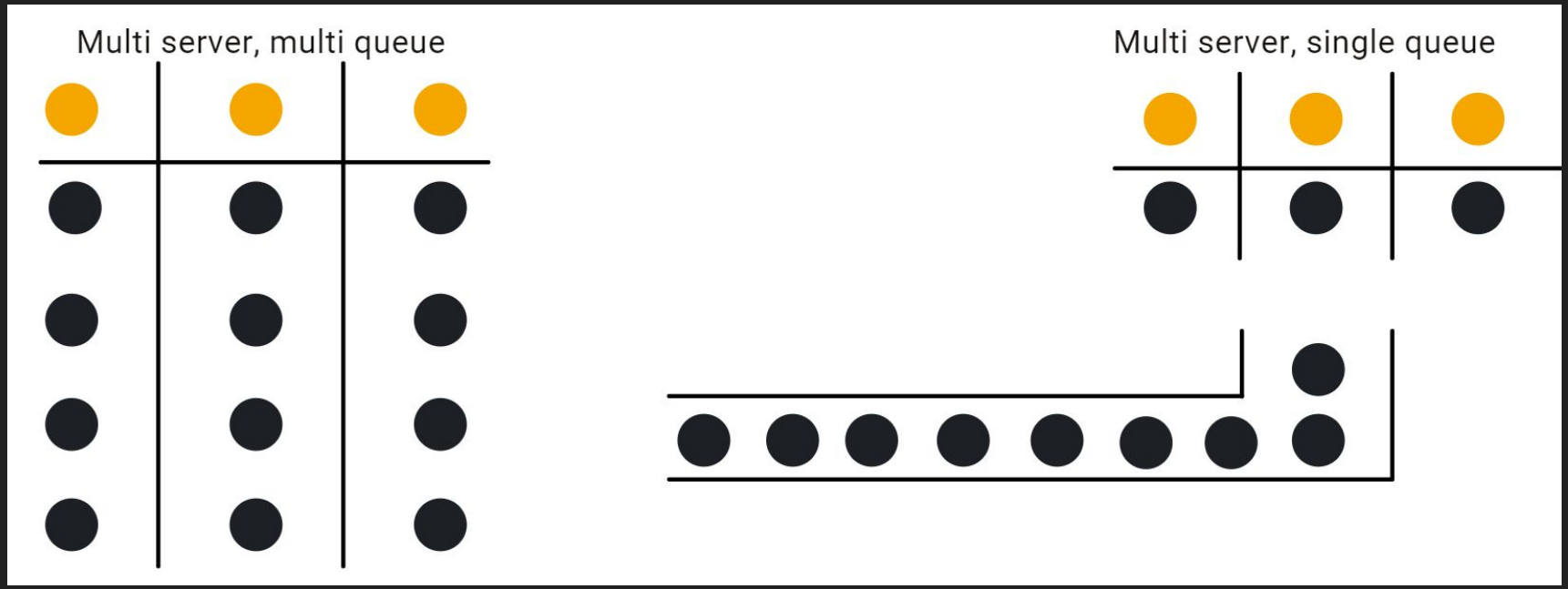
Background

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

Program Demo

Start Time	Range	Arrival Time	Simulation Time
50	20	5	35

Service Time	Processed Customers
1	616414
2	1240687
3	1870181
4	2501859
5	3128920
6	3745018
7	4374753
8	5004848
9	5637911
10	6268278
11	6900127
12	7531511
13	8161206
14	8795834
15	9423853
16	10055777
17	10686350
18	11316748
19	11947475
20	12578411
21	13208517
22	13838599
23	14468004
24	15097797
25	15729112
26	16352591
27	16980690
28	17611920
29	18241167
30	18870731
31	19502088
32	20131316
33	20762794
34	21390619
35	22020219

Single Queue

Gathered Data of Arrival = 5

Start Time	Range	Arrival Time	Simulation Time
50	20	5	35

Service Time	Processed Customers
1	516358
2	1030188
3	1536291
4	2052575
5	2564900
6	3077271
7	3589845
8	4100531
9	4597659
10	5110576
11	5622825
12	6133551
13	6643022
14	7154203
15	7666236
16	8177141
17	8689315
18	9202065
19	9712791
20	10221470
21	10731954
22	11238947
23	11749133
24	12253517
25	12762851
26	13273574
27	13780101
28	14291171
29	14802380
30	15307414
31	15814696
32	16326188
33	16831231
34	17326393
35	17822476

Multi Queue

Graphical representation of the gathered data

Start Time	Range	Arrival Time	Simulation Time
50	20	5	35

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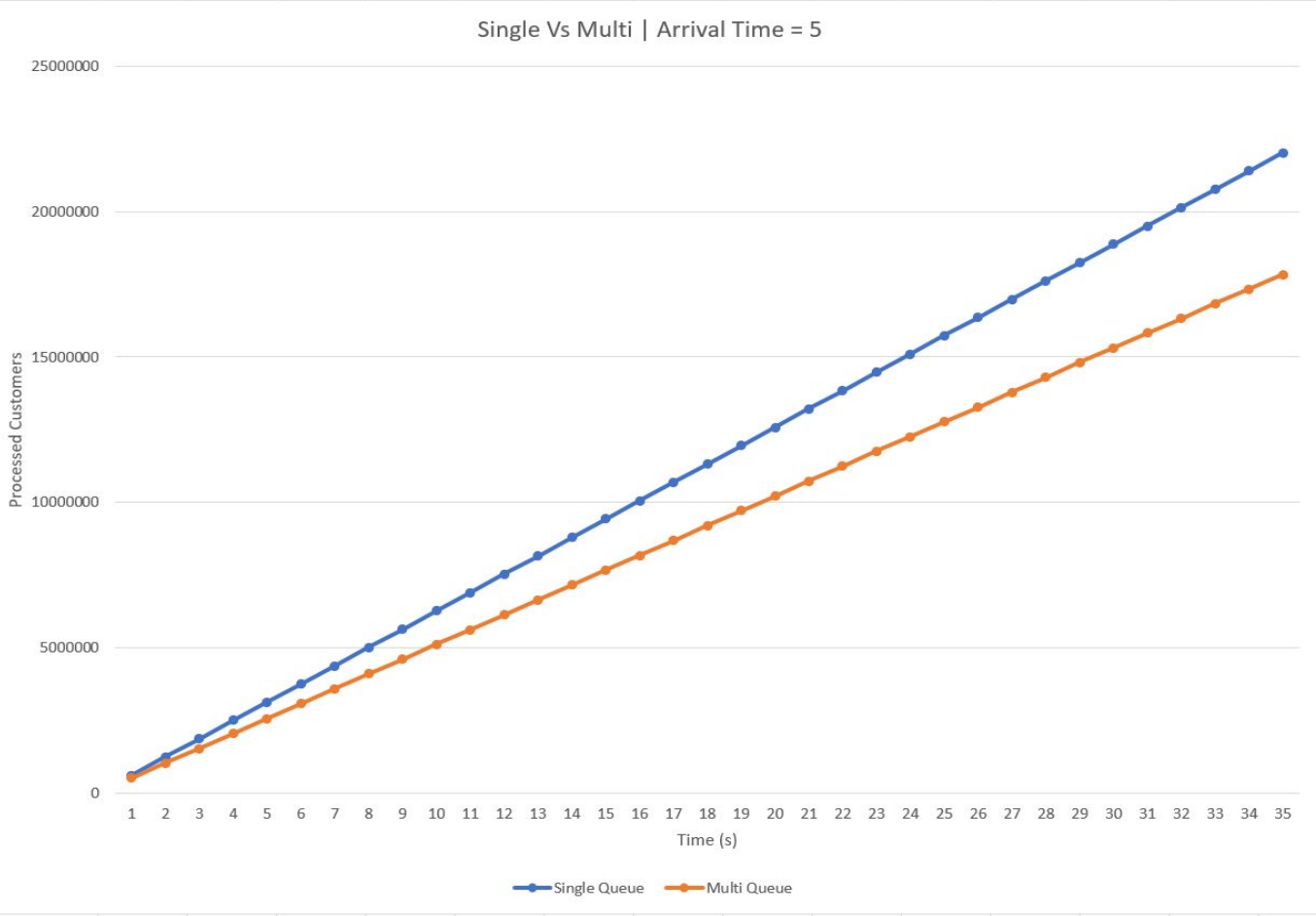


Start Time	Range	Arrival Time	Simulation Time
50	20	30	35
Service Time	Processed Customers		
1	507987		
2	1013224		
3	1521992		
4	2027835		
5	2537627		
6	3048223		
7	3551964		
8	4056817		
9	4564948		
10	5066701		
11	5575180		
12	6076160		
13	6585740		
14	7092325		
15	7599648		
16	8106874		
17	8610355		
18	9108332		
19	9589772		
20	10057979		
21	10533011		
22	11028265		
23	11515678		
24	12015873		
25	12506862		
26	12986102		
27	13468099		
28	13970476		
29	14474938		
30	14968505		
31	15475820		
32	15978815		
33	16484222		
34	16989368		
35	17490290		

Single Queue

Gathered Data of Arrival Time = 30

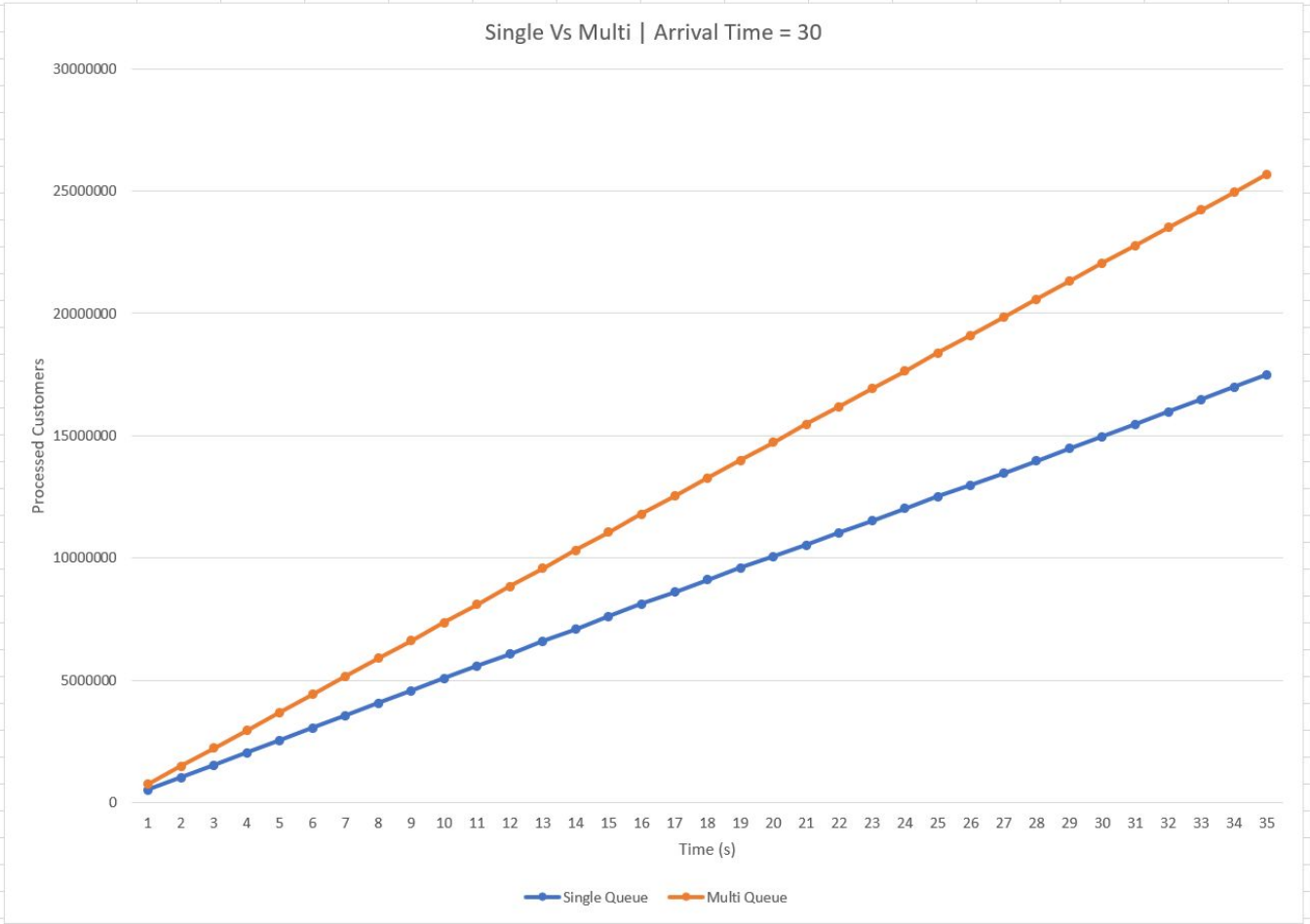
Start Time	Range	Arrival Time	Simulation Time
50	20	30	35
Service Time	Processed Customers		
1	738770		
2	1476593		
3	2213626		
4	2947032		
5	3678279		
6	4417493		
7	5149954		
8	5889594		
9	6627385		
10	7365424		
11	8104421		
12	8838525		
13	9578081		
14	10316082		
15	11053690		
16	11790881		
17	12526186		
18	13261244		
19	13997096		
20	14732746		
21	15461341		
22	16188695		
23	16922821		
24	17646112		
25	18376026		
26	19108911		
27	19845145		
28	20582425		
29	21315489		
30	22048839		
31	22785118		
32	23518511		
33	24228167		
34	24948620		
35	25682563		

Multi Queue

Graphical representation of the gathered data

Start Time	Range	Arrival Time	Simulation Time
50	20	30	35

Service Time	Single Queue	Multi Queue
1	507987	738770
2	1013224	1476593
3	1521992	2213626
4	2027835	2947032
5	2537627	3678279
6	3048223	4417493
7	3551964	5149954
8	4056817	5889594
9	4564948	6627385
10	5066701	7365424
11	5575180	8104421
12	6076160	8838525
13	6585740	9578081
14	7092325	10316082
15	7599648	11053690
16	8106874	11790881
17	8610355	12526186
18	9108332	13261244
19	9589772	13997096
20	10057979	14732746
21	10533011	15461341
22	11028265	16188695
23	11515678	16922821
24	12015873	17646112
25	12506862	18376026
26	12986102	19108911
27	13468099	19845145
28	13970476	20582425
29	14474938	21315489
30	14968505	22048839
31	15475820	22785118
32	15978815	23518511
33	16484222	24228167
34	16989368	24948620
35	17490290	25682563



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