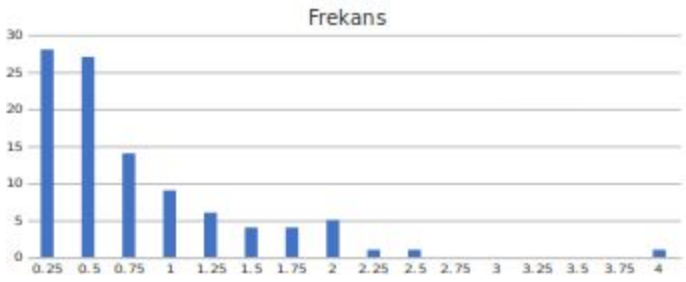
Step 1:

We have some statistic about the given data. We calculated the Mean, Standart deviation, Median, Mode, Standart error, Sample variance, Kurtosis, Skewness, Range, Minumum, Maximum, Maximum, Sum and Count. The divided the data with 0.25 bin frekans from 0 up to 4 and we have such graph:



it looks like exponential distribution so we try chi squared test with exponential distribution
We applied the chi-squared test from this data. Degrees of freedom is equal to 15, X^2(0,05,15) is equal to ~25 , and lambda =~ 1.57. The result of this test is 17.35 and it is less than 25. So,
We fail to reject the exponential distribution claim

Step 2-3

We built the model with 3-movie case. The summary of the 30 replication is given below at the table .

Identifier	Average	Half-width	Minimum	Max	#Replications
Moviegoer.NumberIn	191.36	5.7269	159.00	228.00	30
Moviegoer.NumberOut	166.60	4.7658	141.00	192.00	30
counter.NumberSeized	119.00	.74026	113.00	121.00	30
counter.ScheduledUtilization	.98697	.00625	.93419	1.0000	30
System.NumberOut	166.60	4.7658	141.00	192.00	30

We took the ID of course, definition, replication and counted them. Definitions are given listed then, the result of Standart deviation, mean and the condifence interval is listed below.

Note: There two different column for mean-Standart deviation and confidence interval. Arena gives output for both average and max. So, we place down the both results. Also, we calculated the mean of other statistics. The step 3-4-5-6 is done in such a way.

ID Meaning

1-Moviegoer.VATime
2-Moviegoer.NVATime
3-Moviegoer.WaitTime
4-Moviegoer.TranTime
5-Moviegoer.OtherTime
6-Moviegoer.TotalTime
7-Join Counter Queue.Queue.WaitingTime
8-Moviegoer.WIP
9-counter.NumberBusy
10-counter.NumberScheduled
11-counter.Utilization
12-Join Counter Queue.Queue.NumberInQueue
13-Seize Counter for Movie Cust.Queue.NumberInQueue
14- Record Reneging Movie3 Customers
15- Record Reneging Movie2 Customers
16- Record Reneging Movie1 Customers
17-Moviegoer.NumberIn
18- Moviegoer.Numberout
19. counter.NumberSeized
20. counter.ScheduledUtilization
21. System.NumberOut

ID	Standard Deviation	Mean	Confidence Interval for %95(average)		Std Dev	Mean	Confidence Interval for %95(max)	
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	2.2055646	8.4635759	7.6400969606	9.2870547403	5.1345182465	21.169823	19.2527778652	23.0868685632
4	0	0	0	0	0	0	0	0
5	0.0551663	0.7122367	0.6916395596	0.7328338393	3.789144E-015	1	1	1
6	2.1868372	9.1758125	8.3593258085	9.9922992913	5.0651499094	21.87263	19.9814848041	23.7637761933
7	2.206834	8.5039171	7.6799642915	9.3278699348	5.116312022	21.246709	19.3364611383	23.156956731
8	4.0819927	14.699056	13.1749860762	16.2231260037	8.8743463415	36.266667	32.9533033553	39.580029978
9	0.016747	0.9869749	0.9807222045	0.993227631	0	1	1	1
10	0	1	1	1	0	1	1	1
11	0.016747	0.9869749	0.9807222045	0.993227631	0	1	1	1
12	4.0758474	13.712081	12.1903055903	15.2338566541	8.8743463415	35.266667	31.9533033553	38.580029978
13	0	0	0	0	0	0	0	0
14	13.466049	17.1	12.0722591546	22.1277408454				
15	12.561389	13.933333	9.243360072	18.6233065946				
16	12.748028	17.566667	12.8070091995	22.3263241338				
17	15.33867	191.3667	185.6397572903	197.093576043				
18	12.76471	166.6	161.8341125309	171.3658874691				
19	1.982684	119	118.2597368828	119.7402631172				
20	0.016747	0.986975	0.9807222045	0.993227631				
21	12.76471	166.6	161.8341125309	171.3658874691				

Step 4

We increased the capacity to three and gave each counter to a different movie, made 30 replication and collected some statistics :

Output Summary for 30 Replications

OUTPUTS

Identifier	Average	Half-width	Minimum	Maximum	# Replications
Moviegoer.NumberIn	191.36	5.7269	159.00	228.00	30
Moviegoer.NumberOut	189.13	5.8508	152.00	226.00	30
counter1.NumberSeized	66.266	3.8289	44.000	95.000	30
counter1.ScheduledUtilization	.54994	.03181	.36405	.78499	30
counter3.NumberSeized	61.333	3.2152	39.000	77.000	30
counter3.ScheduledUtilization	.50929	.02681	.31963	. 64077	30
counter2.NumberSeized	63.100	2.8976	45.000	77.000	30
counter2.ScheduledUtilization	.52400	.02419	.37500	.64167	30
System.NumberOut	189.13	5.8508	152.00	226.00	30

Since there is more counter, the numberout is going to more equal or more. The utilization of counter decreased from 0.98 to ~.50 but the total number of Outs increased as expected.

ID Meaning

37-Moviegoer.VATime
38-Moviegoer.NVATime
39-Moviegoer.WaitTime
40-Moviegoer.TranTime
41-Moviegoer.OtherTime
42-Moviegoer.TotalTime
43-Join Counter Queue2.Queue.WaitingTime
44-Join Counter Queue1.Queue.WaitingTime
45-Join Counter Queue3.Queue.WaitingTime
46-Moviegoer.WIP
47-counter1.NumberBusy
48-counter1.NumberScheduled
49-counter1.Utilization
50-counter3.NumberBusy
51-counter3.NumberScheduled
52-counter3.Utilization
53-counter2.NumberBusy
54-counter2.NumberScheduled

55-counter2.Utilization
56-Join Counter Queue2.Queue.NumberInQueue
57-Join Counter Queue1.Queue.NumberInQueue
58-Join Counter Queue3.Queue.NumberInQueue
59-Join Counter Queue.Queue.NumberInQueue
60-Seize Counter for Movie Cust.Queue.NumberInQueue
61-Record Reneging Movie3 Customers
62-Record Reneging Movie2 Customers
63-Record Reneging Movie1 Customers
64-Moviegoer.NumberIn
65-Moviegoer.NumberOut
66-counter1.NumberSeized
67-counter1.ScheduledUtilization
68-counter3.NumberSeized
69-counter3.ScheduledUtilization
70-counter2.NumberSeized
71-counter2.ScheduledUtilization
72-System.NumberOut

ID	Standard Deviation	Mean	Confidence Interval for %95(average)		Std Dev	Mean	Confidence Interval for %95(max)	
37	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
39	0.1816184	0.5945556	0.526745758	0.6623653671	1.0832234	3.8251593	3.42072249	4.2295961988
40	0	0	0	0	0	0	0	0
41	0	1	1	1	5.04E-015	1	1	1
42	0.1816184	1.5945556	1.526745758	1.6623653671	1.0832234	4.8251593	4.42072249	5.2295961988
43	0.1915775	0.5605653	0.4890370948	0.632093436	0.868506	2.8582748	2.5340057714	3.1825438951
44	0.3013692	0.598158	0.4856375305	0.7106785027	0.9511027	2.9906574	2.6355497264	3.3457651561
45	0.3912125	0.5686466	0.422581857	0.7147113823	1.3165331	2.8592473	2.3677009401	3.35079363
46	0.4517538	2.5431541	2.3744854546	2.7118228251	1.1885469	8.6333333	8.1895724676	9.077094199
47	0.0851911	0.5499356	0.5181282713	0.5817428953	0	1	1	1
48	0	1	1	1	0	1	1	1
49	0.0851911	0.5499356	0.5181282713	0.5817428953	0	1	1	1
50	0.0718186	0.5092948	0.4824803078	0.536109269	0	1	1	1
51	0	1	1	1	0	1	1	1
52	0.0718186	0.5092948	0.4824803078	0.536109269	0	1	1	1
53	0.06478	0.5239969	0.4998103372	0.5481834217	0	1	1	1
54	0	1	1	1	0	1	1	1
55	0.06478	0.5239969	0.4998103372	0.5481834217	0	1	1	1
56	0.1236297	0.3026198	0.2564609475	0.3487787349	0.9278575	3.3666667	3.0202378842	3.7130954492
57	0.2327506	0.3505138	0.2636130525	0.4374145142	0.9371024	3.5333333	3.1834528338	3.8832138329
58	0.2371985	0.3067933	0.2182318284	0.3953547001	1.422318	3.3333333	2.8022906952	3.8643759715
59	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0
61	0	0	0	0				
62	0	0	0	0				
63	0	0	0	0				
64	15.338667	191.36667	185.6397572903	197.093576043				
65	15.670604	189.13333	183.2824908125	194.9841758541				
66	10.255136	66.266667	62.4377658841	70.0955674493				
67	0.0851911	0.5499356	0.5181282713	0.5817428953				
68	8.6116734	61.333333	58.1180426801	64.5486239866				
69	0.0718186	0.5092948	0.4824803078	0.536109269				
70	7.7608656	63.1	60.2023705552	65.9976294448				
71	0.06478	0.5239969	0.4998103372	0.5481834217				
72	15.670604	189.13333	183.2824908125	194.9841758541				

One important difference from step 3 is that reneging movie customers decreased to 0. We don't lose customer at all. This may also mean that we may waste our counters or utilized more efficiently by extra operation. The cause of the other differences is the increase in counter. There will be less queue, more total utilization, less time, more outcome if it is possible.

Step 5

We increased the inter-arrival rate by %50. Here are the results:

Output Summary for 30 Replications

OUTPUTS

Identifier	Average	Half-width	Minimum	Maximum	# Replications
Moviegoer.NumberIn	285.16	6.8747	242.00	319.00	30
Moviegoer.NumberOut	278.50	6.3541	237.00	304.00	30
counter1.NumberSeized	96.466	3.9118	72.000	117.00	30
counter1.ScheduledUtilization	.80058	.03288	.59271	.97254	30
counter3.NumberSeized	90.600	3.5953	71.000	115.00	30
counter3.ScheduledUtilization	.75235	.02957	.59167	.95034	30
counter2.NumberSeized	93.833	3.6740	73.000	109.00	30
counter2.ScheduledUtilization	.77836	.03046	.60581	.90262	30
System.NumberOut	278.50	6.3541	237.00	304.00	30

For each counter, utilization increase almost %50(not exactly but almost). The number of output increased by almost the same percentage.

ID Meaning

73-Moviegoer.VATime
74-Moviegoer.NVATime
75-Moviegoer.WaitTime
76-Moviegoer.TranTime
77-Moviegoer.OtherTime
78-Moviegoer.TotalTime
79-Join Counter Queue2.Queue.WaitingTime
80-Join Counter Queue1.Queue.WaitingTime
81-Join Counter Queue3.Queue.WaitingTime
82-Moviegoer.WIP
83-counter1.NumberBusy
84-counter1.NumberScheduled
85-counter1.Utilization
86-counter3.NumberBusy
87-counter3.NumberScheduled
88-counter3.Utilization
89-counter2.NumberBusy
90-counter2.NumberScheduled
91-counter2.Utilization

92-Join Counter Queue2.Queue.NumberInQueue
93-Join Counter Queue1.Queue.NumberInQueue
94-Join Counter Queue3.Queue.NumberInQueue
95-Join Counter Queue.Queue.NumberInQueue
96-Seize Counter for Movie Cust.Queue.NumberInQueue
97-Record Reneging Movie3 Customers
98-Record Reneging Movie2 Customers
99-Record Reneging Movie1 Customers
100-Moviegoer.NumberIn
101-Moviegoer.NumberOut
102-counter1.NumberSeized
103-counter1.ScheduledUtilization
104-counter3.NumberSeized
105-counter3.ScheduledUtilization
106-counter2.NumberSeized
107-counter2.ScheduledUtilization
108-System.NumberOut

ID	Standard Deviation	Mean	Confidence Interval for %95(average)		Std Dev	Mean	Confidence Interval for %95(max)	
73	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0
75	0.9035752	1.7790906	1.4417279336	2.1164532181	3.1872742	7.5885179	6.3985037564	8.7785320045
76	0	0	0	0	0	0	0	0
77	0	1	1	1	5.08E-015	1	1	1
78	0.9035752	2.7790906	2.4417279336	3.1164532181	3.1872742	8.5885179	7.3985037564	9.7785320045
79	0.6423366	1.5268209	1.2869954108	1.7666464012	1.5643259	5.179932	4.5958687267	5.7639953049
80	2.0090035	2.0687247	1.3186347434	2.8188147448	3.3316296	6.2605294	5.016618189	7.5044406598
81	1.1888952	1.5666572	1.1227662255	2.0105480785	2.3900493	5.4040028	4.5116438992	6.2963616211
82	2.5719556	6.6541553	5.693879191	7.6144315066	4.1517203	14.933333	13.3832295561	16.4834371106
83	0.0880514	0.800584	0.767708786	0.8334592965	0	1	1	1
84	0	1	1	1	0	1	1	1
85	0.0880514	0.800584	0.767708786	0.8334592965	0	1	1	1
86	0.0792094	0.7523523	0.7227783851	0.7819262882	0	1	1	1
87	0	1	1	1	0	1	1	1
88	0.0792094	0.7523523	0.7227783851	0.7819262882	0	1	1	1
89	0.0815809	0.7783581	0.7478987039	0.8088174848	0	1	1	1
90	0	1	1	1	0	1	1	1
91	0.0815809	0.7783581	0.7478987039	0.8088174848	0	1	1	1
92	0.6403816	1.2550505	1.0159548732	1.4941460323	1.684616	5.7	5.0710246816	6.3289753184
93	2.1134142	1.8262076	1.0371344247	2.6152808505	3.2098985	6.8	5.6015387883	7.9984612117
94	0.9755441	1.2416028	0.8773695263	1.605836046	2.5179813	6.0666667	5.1265425634	7.0067907699
95	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0
97	0	0	0	0				
98	0	0	0	0				
99	0	0	0	0				
100	18.413045	285.16667	278.2918946283	292.041438705				
101	17.018752	278.5	272.1458069788	284.8541930212				
102	10.477343	96.466667	92.5548018401	100.3785314933				
103	0.0880514	0.800584	0.767708786	0.8334592965				
104	9.6296955	90.6	87.004616365	94.195383635				
105	0.0792094	0.7523523	0.7227783851	0.7819262882				
106	9.8403929	93.833333	90.1592827946	97.5073838721				
107	0.0815809	0.7783581	0.7478987039	0.8088174848				
108	17.018752	278.5	272.1458069788	284.8541930212				

Although the utilization increased highly amount, reneging customers for each movie is still 0. The expected result for step 4 is confirmed, we can increase the utilization of counters.

Step 6

We decrease the total amount of counters from 120 to 60.

Output Summary for 30 Replications

OUTPUTS

Identifier	Average	Half-width	Minimum	Maximum	# Replications
Moviegoer.NumberIn	144.03	4.6741	115.00	174.00	30
Moviegoer.NumberOut	135.73	3.7541	114.00	155.00	30
counter1.NumberSeized	47.233	2.1474	29.000	57.000	30
counter1.ScheduledUtilization	.78080	.03584	.47589	.94509	30
counter3.NumberSeized	45.366	2.3541	32.000	59.000	30
counter3.ScheduledUtilization	.74858	.03906	.52777	.97153	30
counter2.NumberSeized	45.366	2.1402	34.000	57.000	30
counter2.ScheduledUtilization	.74973	.03506	.55963	.94040	30
System.NumberOut	135.73	3.7541	114.00	155.00	30

As expected, the number of customers which are in and out decreased and utilization is almost the same.

Note: the ID of variables are the same with step 4.

ID Meaning

37-Moviegoer.VATime
38-Moviegoer.NVATime
39-Moviegoer.WaitTime
40-Moviegoer.TranTime
41-Moviegoer.OtherTime
42-Moviegoer.TotalTime
43-Join Counter Queue2.Queue.WaitingTime
44-Join Counter Queue1.Queue.WaitingTime
45-Join Counter Queue3.Queue.WaitingTime
46-Moviegoer.WIP
47-counter1.NumberBusy
48-counter1.NumberScheduled
49-counter1.Utilization
50-counter3.NumberBusy
51-counter3.NumberScheduled
52-counter3.Utilization
53-counter2.NumberBusy
54-counter2.NumberScheduled
55-counter2.Utilization

56-Join Counter Queue2.Queue.NumberInQueue
57-Join Counter Queue1.Queue.NumberInQueue
58-Join Counter Queue3.Queue.NumberInQueue
59-Join Counter Queue.Queue.NumberInQueue
60-Seize Counter for Movie Cust.Queue.NumberInQueue
61-Record Reneging Movie3 Customers
62-Record Reneging Movie2 Customers
63-Record Reneging Movie1 Customers
64-Moviegoer.NumberIn
65-Moviegoer.NumberOut
66-counter1.NumberSeized
67-counter1.ScheduledUtilization
68-counter3.NumberSeized
69-counter3.ScheduledUtilization
70-counter2.NumberSeized
71-counter2.ScheduledUtilization
72-System.NumberOut

ID	Standard Deviation	Mean	Confidence Interval for %95(average)		Std Dev	Mean	Confidence Interval for %95(max)	
37	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
39	0.5883555	1.4778649	1.2581940149	1.6975357857	2.2801465	6.2607221	5.4093970128	7.1120471721
40	0	0	0	0	0	0	0	0
41	0	1	1	1	0	1	1	1
42	0.5883555	2.4778649	2.2581940149	2.6975357857	2.2801465	7.2607221	6.4093970128	8.1120471721
43	0.6049568	1.2883889	1.0625196311	1.5142581033	1.3158428	4.1023486	3.6110599448	4.593637193
44	1.2309115	1.596504	1.1369256654	2.0560822674	2.7189494	4.9028817	3.8877232715	5.9180400429
45	0.9858697	1.439811	1.0717225751	1.8078994926	2.0908573	4.3518686	3.5712172684	5.1325198473
46	2.1284266	6.0356958	5.2410175177	6.8303741664	4.0093282	13.166667	11.6697270092	14.6636063241
47	0.0959804	0.7808027	0.7449670089	0.8166383251	0	1	1	1
48	0	1	1	1	0	1	1	1
49	0.0959804	0.7808027	0.7449670089	0.8166383251	0	1	1	1
50	0.1046218	0.748576	0.7095139369	0.7876379808	0	1	1	1
51	0	1	1	1	0	1	1	1
52	0.1046218	0.748576	0.7095139369	0.7876379808	0	1	1	1
53	0.093897	0.7497252	0.7146674022	0.7847829648	0	1	1	1
54	0	1	1	1	0	1	1	1
55	0.093897	0.7497252	0.7146674022	0.7847829648	0	1	1	1
56	0.6190597	1.0613489	0.8302142017	1.2924836417	1.4076964	4.8666667	4.3410832069	5.3922501264
57	1.5022476	1.4703952	0.9095097322	2.031280728	3.2941955	5.9	4.6700652912	7.1299347088
58	0.9493257	1.2248479	0.870403649	1.5792921128	2.6961019	5.2	4.1933720396	6.2066279604
59	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0
61	0	0	0	0				
62	0	0	0	0				
63	0	0	0	0				
64	12.518905	144.03333	139.3592221665	148.7074445002				
65	10.054792	135.73333	131.979233705	139.4874329616				
66	5.7516614	47.233333	45.0858688075	49.3807978592				
67	0.0959804	0.7808027	0.7449670089	0.8166383251				
68	6.3053526	45.366667	43.0124736785	47.7208596548				
69	0.1046218	0.748576	0.7095139369	0.7876379808				
70	5.7324445	45.366667	43.2263770676	47.5069562658				
71	0.093897	0.7497252	0.7146674022	0.7847829648				
72	10.054792	135.73333	131.979233705	139.4874329616				

Some total time variables are decreased by less than half because we have short simulation. Ratios is not affected by significant amount.
Also, we can't sell all of the tickets because the total time of simulation is limited with this inter-arrival rate, they are 47,45 and 45. If we increase the simulation time from 60 to 70, we can both sell the tickets and don't waste the counters.