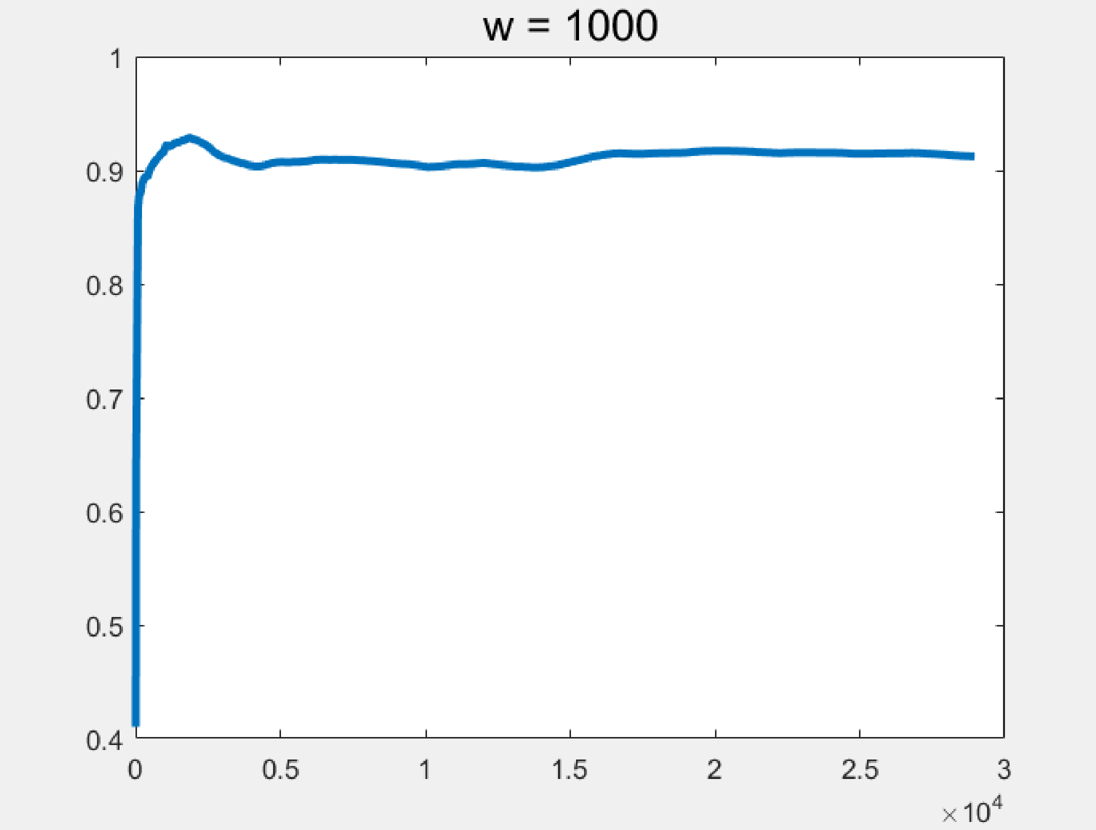
COMP9334 Project, Session 1, 2017 Getting the best response time out of the power bill

Report

Data generation

I use the program sim_ps_function.m to generate a set of data containing the average response time of an increasing number of jobs in the system during a given time period(10000 time units in my simulation),and put them in the file called data1.mat.

Transient removal



I used the transient_removal.m program to remove the transient part , as we can see in the graph, when I select the number of 1000(out of more than 10 thousand) jobs to observe the response time, the graph is smooth enough applying transient removal procedure in Law and Kelton. So when I analyze the data , I cut off the first 1000 jobs, which is the transient part.

Analyzing the mean response time of different number of running server

Here, I use five set of replication(in each replication, the arrival time and the service time sequences are the same) to test the mean response time of different number of running servers and generate a table.(simulation results are in the file called data_file)

Here is the table:

the mean response time of different number of servers over 10000 time units

3 servers	4 servers	5 servers	6 servers	7 servers	8 servers	9 servers	10 servers
1.0242	0.6247	0.5433	0.5212	0.5139	0.5236	0.5308	0.5430
1.0049	0.6171	0.5359	0.5195	0.5147	0.5206	0.5294	0.5432
1.0324	0.6416	0.5418	0.5166	0.5196	0.5228	0.5366	0.5433
0.9506	0.6303	0.5349	0.5161	0.5165	0.5177	0.5304	0.5416
1.0404	0.6304	0.5394	0.5193	0.5142	0.5253	0.5322	0.5434

Using the program confidence_interval.m to generate confidence interval for the difference of the response time of two system with different number of servers:

System with 3 servers and 4 servers	[0.3377 0.4256]
System with 3 servers and 5 servers	[0.4301 0.5128]
System with 3 servers and 6 servers	[0.4486 0.5353]
System with 3 servers and 7 servers	[0.4497 0.5397]
System with 3 servers and 8 servers	[0.4473 0.5297]
System with 3 servers and 9 servers	[0.4356 0.5217]
System with 3 servers and 10 servers	[0.4238 0.5114]
System with 4 servers and 5 servers	[0.0794 0.1001]
System with 4 servers and 6	[0.0973 0.1233]

servers	
System with 4 servers and 7 servers	[0.1041 0.1220]
System with 4 servers and 8 servers	[0.0957 0.1179]
System with 4 servers and 9 servers	[0.0888 0.1050]
System with 4 servers and 10 servers	[0.0747 0.0971]
System with 5 servers and 6 servers	[0.0164 0.0247]
System with 5 servers and 7 servers	[0.0181 0.0285]
System with 5 servers and 8 servers	[0.0141 0.0200]
System with 5 servers and 9 servers	[0.0033 0.0111]
System with 5 servers and 10 servers	[-0.0079 0.0002]
System with 6 servers and 7 servers	[-0.0026 0.0081]
System with 6 servers and 8	[-0.0065 -0.0004]

servers	
System with 6 servers and 9 servers	[-0.0186 -0.0081]
System with 6 servers and 10 servers	[0.0267 -0.0221]
System with 7 servers and 8 servers	[-0.0114 -0.0010]
System with 7 servers and 9 servers	[-0.0182 -0.0140]
System with 7 servers and 10 servers	[-0.0303 -0.0240]
System with 8 servers and 9 servers	[-0.0138 -0.0059]
System with 8 servers and 10 servers	[-0.0238 -0.0180]
System with 9 servers and 10 servers	[-0.0143 -0.0077]

We can see from the table, in 10000 time units ,systems with 6 or 7 servers running are better than systems with other number of servers running. When comparing the mean response time of system with 6 servers running minus mean response time of system with 7 servers running, I find the 95% confidence interval for this difference is [-0.0026 , 0.0081], therefore I think both 6 and 7 running servers can be a good choice.