Chris Silos
SYS 611

Homework 6

6.1 Cafe Java Operations

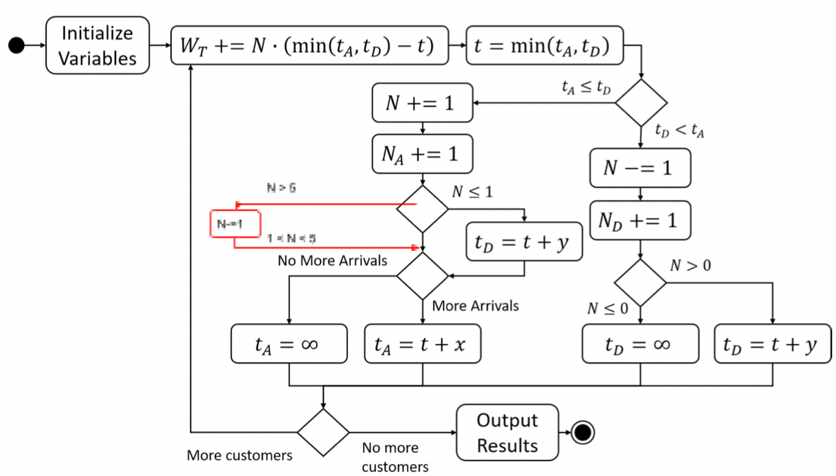
a.

Customer	x	t_enter	L_q	t_service	y	t_exit	W_i
1	1.7	1.7	0	1.7	1	2.7	1
2	0.2	1.9	1	2.7	0.4	3.1	1.2
3	1.3	3.2	0	3.2	3.3	6.5	3.3
4	0.8	4	1	6.5	0.8	7.3	3.3
5	1.9	5.9	2	7.3	1.5	8.8	2.9
W_bar	2.34						

b.

Event	t	t_A	t_D	N	N_A	N_D	W_T		
0	0	1.7	999999	0	0	0	0		
1	1.7	1.9	2.7	1	1	0	0.2		
2	1.9	3.2	2.7	2	2	0	1.8		
3	2.7	3.2	3.1	1	2	1	2.2		
4	3.1	3.2	999999	0	2	2	2.2		
5	3.2	4	6.5	1	3	2	3		
6	4	5.9	6.5	2	4	2	6.8		
7	5.9	999999	6.5	3	5	2	8.6		
8	6.5	999999	7.3	2	5	3	10.2		
9	7.3	999999	8.8	1	5	4	11.7		
10	8.8	999999	999999	0	5	5	11.7		
								W_bar	2.34
	x	1.7	0.2	1.3	0.8	1.9			
	y	1	0.4	3.3	0.8	1.5			

c. In the event-centric perspective, a max queue of 5 could be enforced by checking if there are 5 people in line when a new customer arrives. If there are 5 people already in line, then the person is asked to leave (N-=1), and the simulation continues as normal. This is shown in the activity diagram below.



6.2 Logistics for Submarine Upgrades

a.

Demand:

D = 2 if $r_d <= 0.13$

3 if $0.13 < r_d <= 0.55$

5 $otherwise$

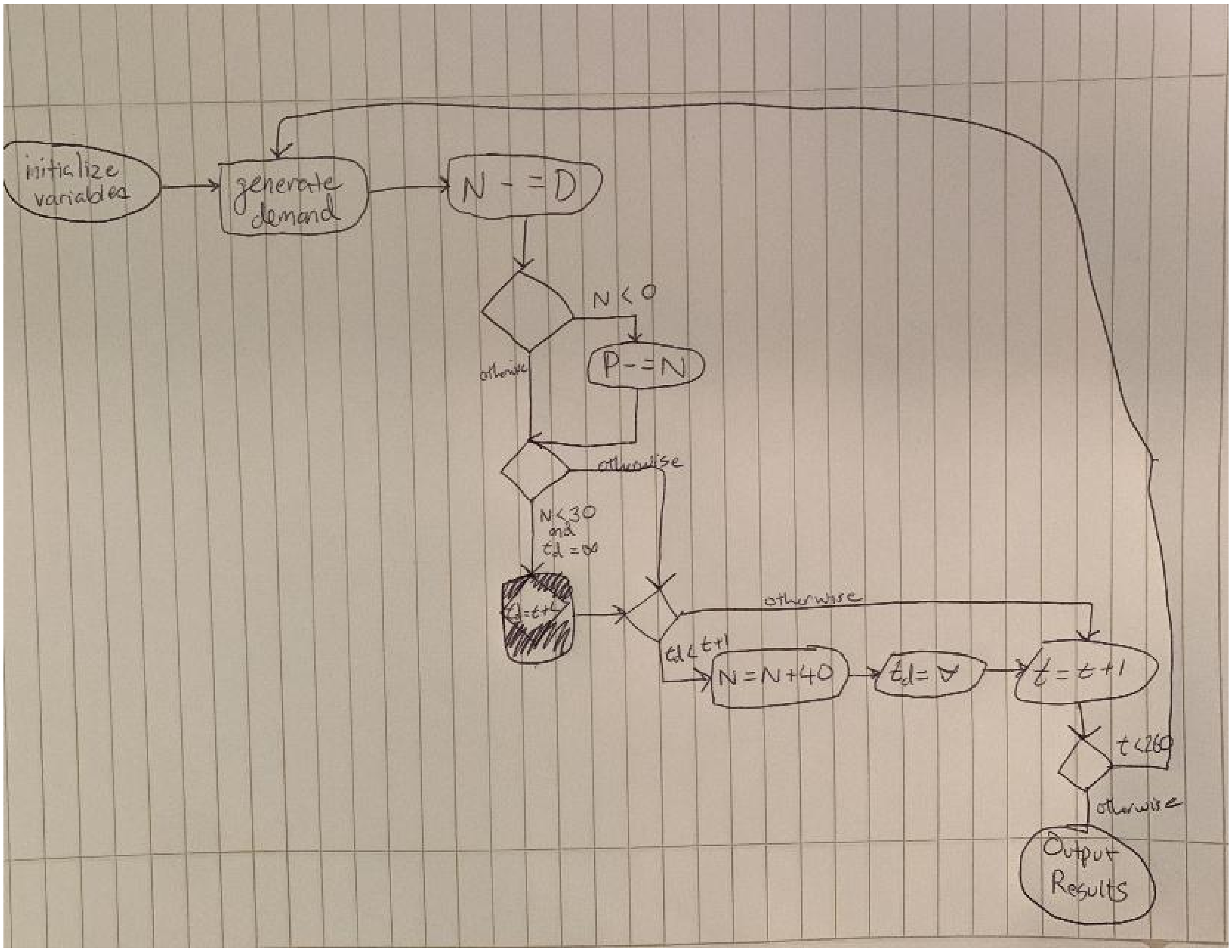
Lead Time:

$L = 5 - ln(1 - r_s)/0.25$

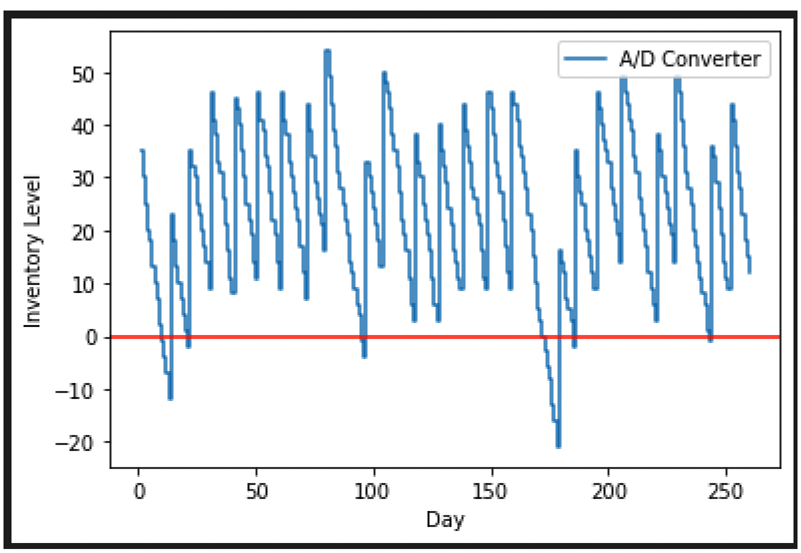
b.

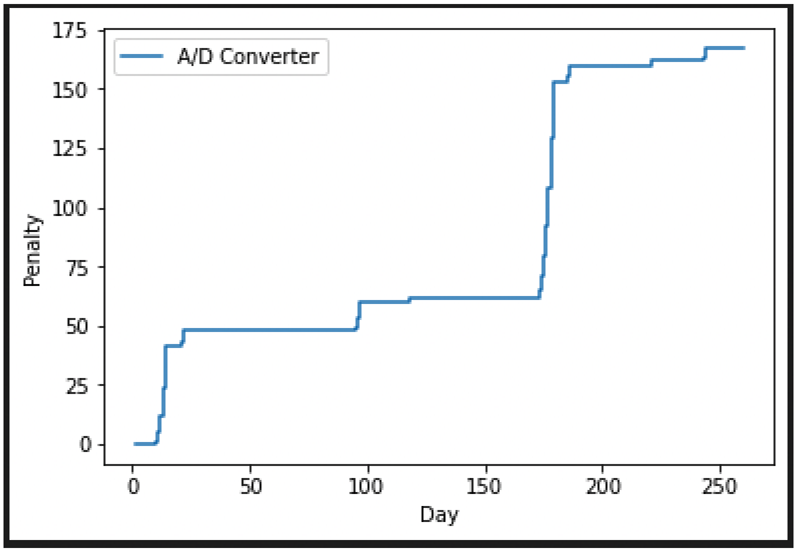
t	r_d	r_s	N	D	P	t_d	N(t+1)
0	-	-	40	-	0	999.00	40
1	0.05	0.88	40	2	0	999.00	38
2	0.20	0.55	38	3	0	999.00	35
3	0.70	0.56	35	5	0	999.00	30
4	0.04	0.55	30	2	0	12.19	28
5	0.84	0.27	28	5	0	12.19	23
6	0.33	0.62	23	3	0	12.19	20
7	0.26	0.16	20	3	0	12.19	17
8	0.44	0.60	17	3	0	12.19	14
9	0.43	0.22	14	3	0	12.19	11
10	0.73	0.90	11	5	0	12.19	6
11	0.05	0.84	6	2	0	12.19	4
12	0.67	0.22	4	5	1	999.00	39
13	0.43	0.84	39	3	1	999.00	36
14	0.49	0.73	36	3	1	999.00	33
15	0.17	0.22	33	3	1	999.00	30

c.



d. Graphs of the inventory level and penalty for the converters, as well as the 95% confidence interval are shown below.



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95% confidence interval for P for 10 simulation runs = [1325.64, 5111.96]
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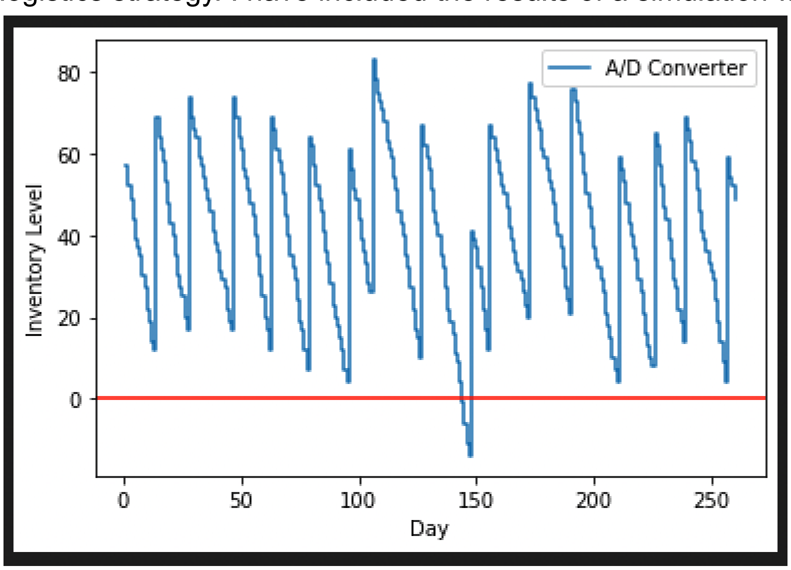
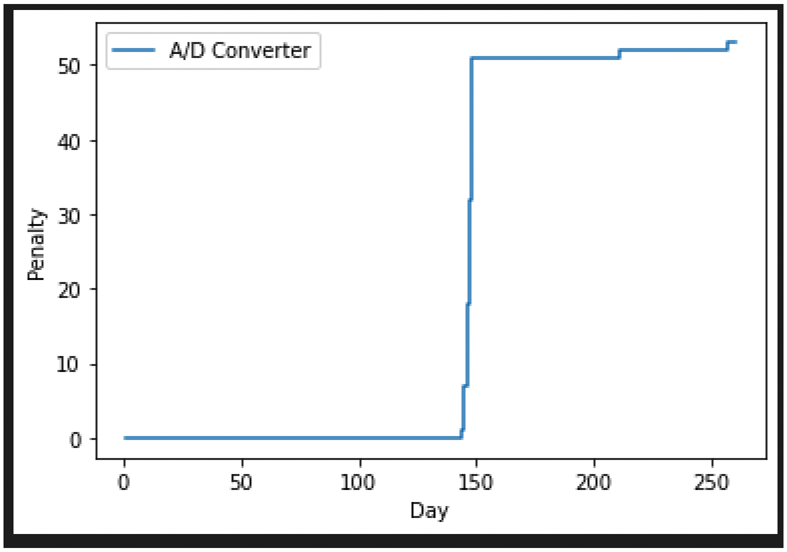
The biggest problem with the current logistics strategy appears to be that only one order can be pending at any given time. This can result in time periods where demand plummets when the lead time is longer than usual. For example, from roughly day 155 to 175, the inventory level decreases from ~45 to -20, resulting in a large spike in penalties.

e. I would suggest that the Navy should consider placing a larger order of 60 converters whenever the inventory drops below 40. This would allow them to rely on their inventory for a longer period of time during an unusually long lead time. However, this would have an impact on the Navy's holding costs. It was not specified in the problem, but it might be costly to hold on to a larger amount of inventory. If the extra cost is not significant, then I believe placing larger orders when the inventory drops below 40 would benefit the logistics strategy. I have included the results of a simulation with these changes below.



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95% confidence interval for P for 10 simulation runs = [76.85, 218.75]
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