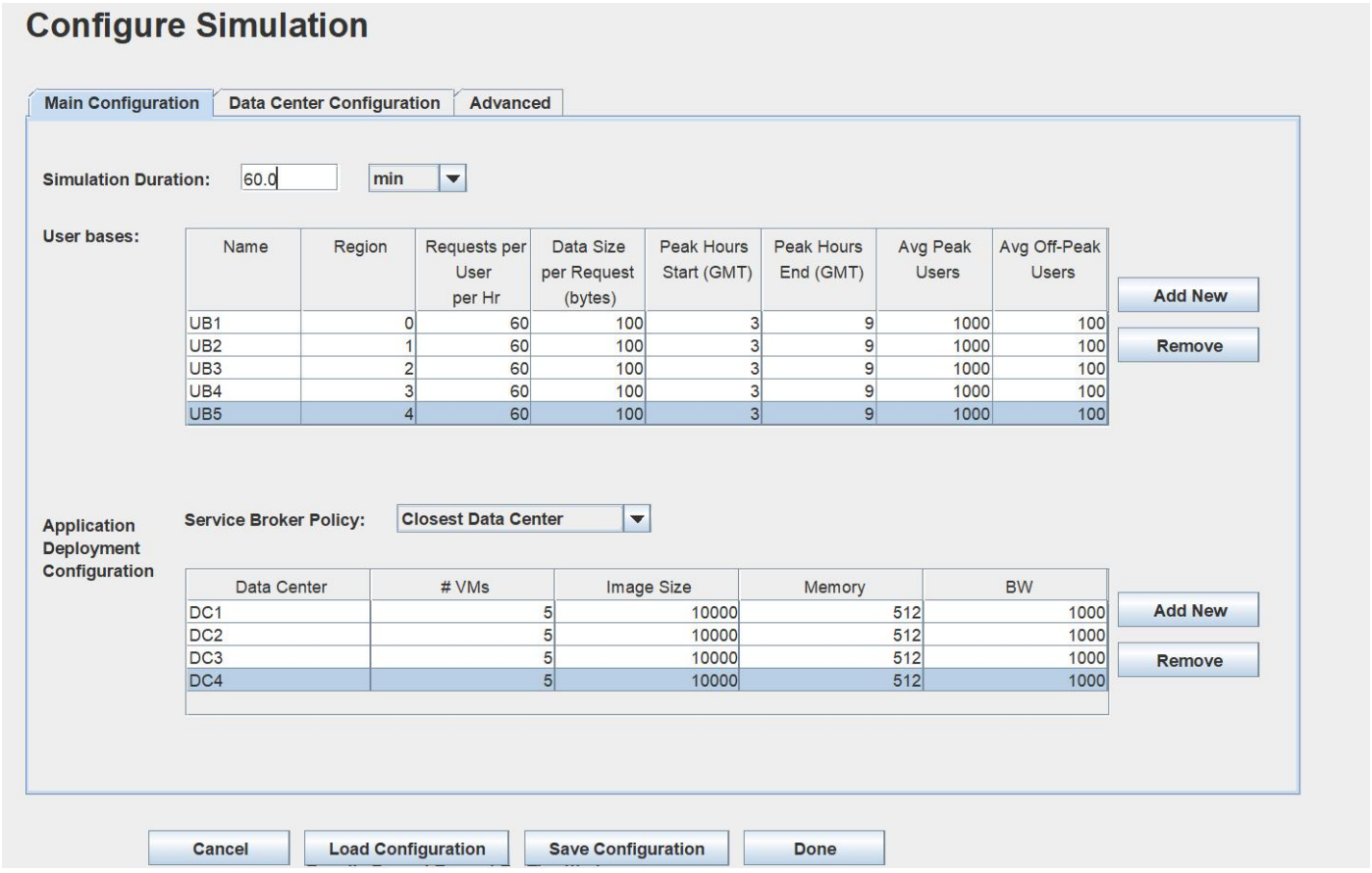
CLOUD COMPUTING LAB06

Name: Drishti.
Roll No.: 1928228
Date: 09/02/2022

Q: For five user bases with 170 request per user base and 4 data centers for the service broker policy(closest data centre, optimize response time and reconsider dynamically), use all three load balancing algorithms (Round robin, Equally spread current execution load and Throttled) and analyze the performance based on average response time.



Configure Simulation

Main Configuration | Data Center Configuration | Advanced

Data Centers:

Name	Region	Arch	OS	VMM	Cost per VM $/Hr	Memory Cost $/s	Storage Cost $/s	Data Transfer Cost $/Gb	Physical HW Units
DC1	0	x86	Linux	Xen	0.1	0.05	0.1	0.1	2
DC2	1	x86	Linux	Xen	0.1	0.05	0.1	0.1	1
DC3	2	x86	Linux	Xen	0.1	0.05	0.1	0.1	1
DC4	3	x86	Linux	Xen	0.1	0.05	0.1	0.1	1

Add New | Remove

Physical Hardware Details of Data Center : DC4

Id	Memory (Mb)	Storage (Mb)	Available BW	Number of Processors	Processor Speed	VM Policy
0	204800	100000000	1000000	4	10000	TIME_SHARED

Add New | Copy | Remove

Cancel | Load Configuration | Save Configuration | Done

Configure Simulation

Main Configuration | Data Center Configuration | Advanced

User grouping factor in User Bases: (Equivalent to number of simultaneous users from a single user base) — 170

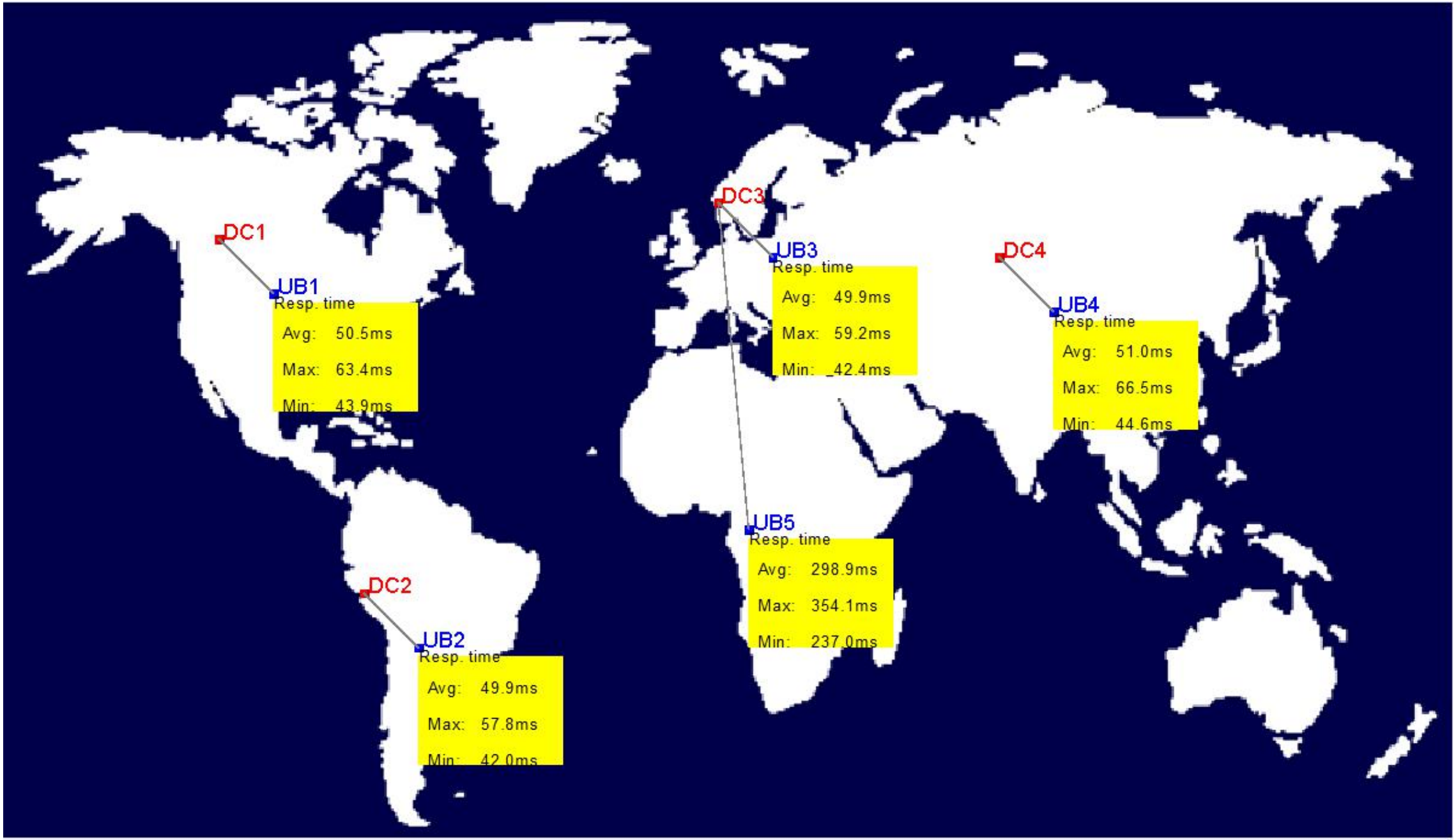
Request grouping factor in Data Centers: (Equivalent to number of simultaneous requests a single applicaiton server instance can support.) — 10

Executable instruction length per request: — 100

Load balancing policy across VM's in a single Data Center: — Round Robin

Cancel | Load Configuration | Save Configuration | Done

1. Round robin- Closest data centre------- t1



Results of the Simulation Completed at: 09/02/2022 09:36:51

Overall Response Time Summary

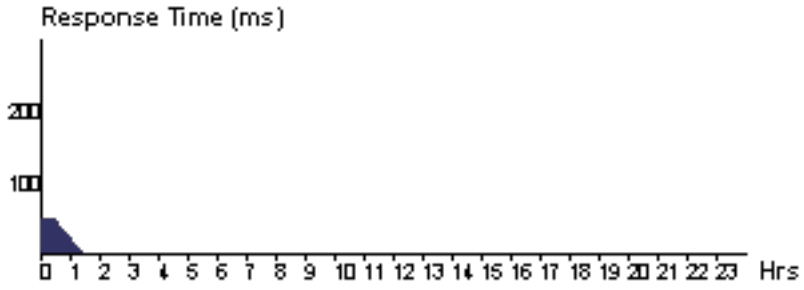
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.29	41.97	354.14
Data Center processing time:	0.52	0.03	1.01

Response Time by Region

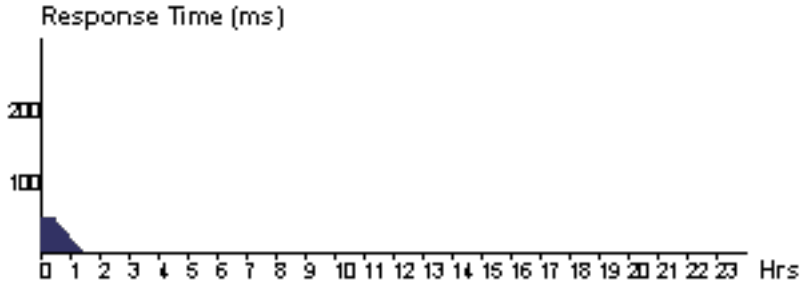
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	50.47	43.86	63.44
UB2	49.92	41.97	57.79
UB3	49.94	42.38	59.21
UB4	50.99	44.64	66.46
UB5	298.86	237.04	354.14

User Base Hourly Response Times

UB1

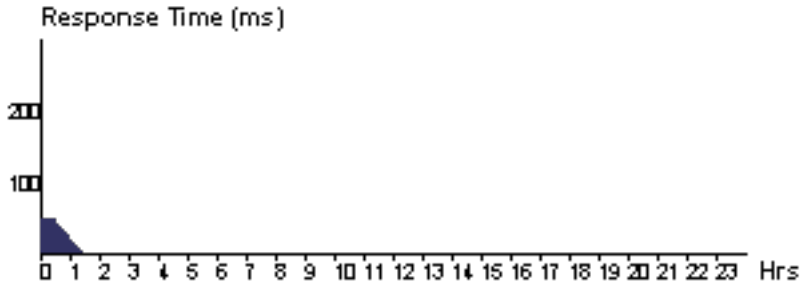


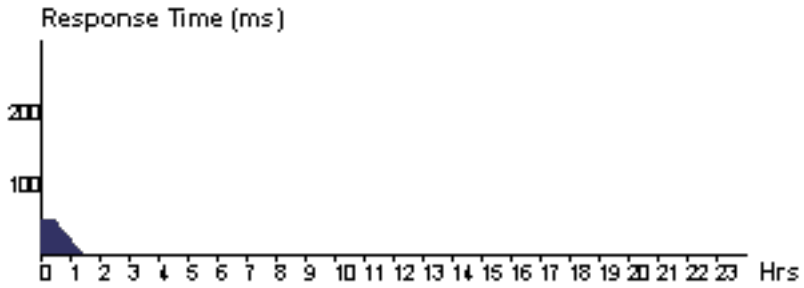
UB2



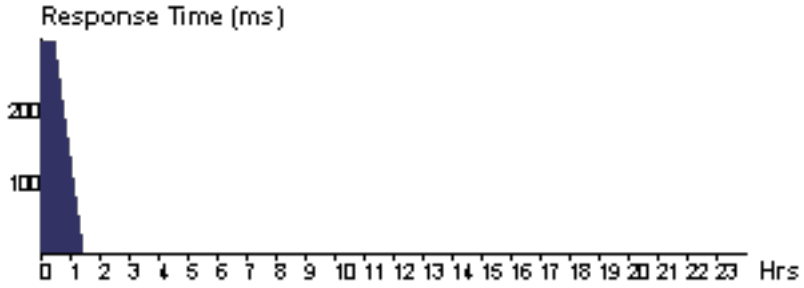
UB3

UB4





UB5



Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.55	0.03	0.96
DC2	0.54	0.05	1.01
DC3	0.47	0.03	1.00
DC4	0.55	0.03	1.01

Data Center Hourly Average Processing Times

DC1

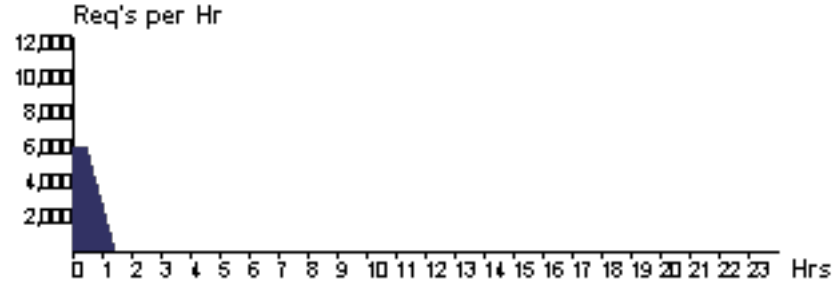
DC2

DC3

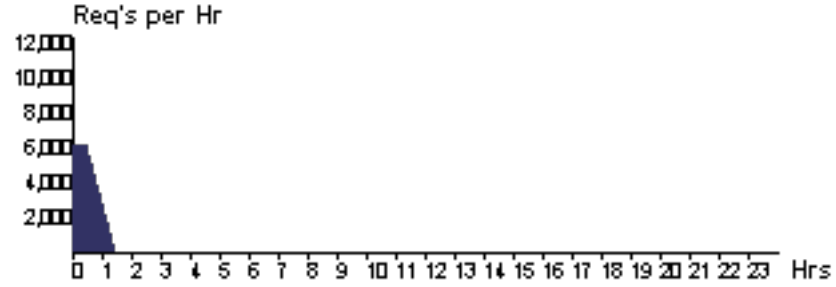
DC4

Data Center Hourly Loading

DC1

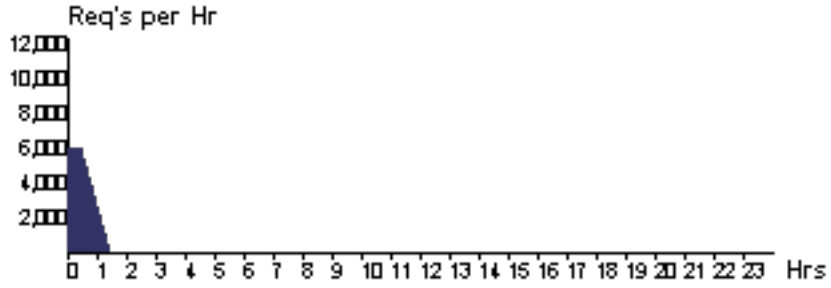


DC2



DC3

DC4

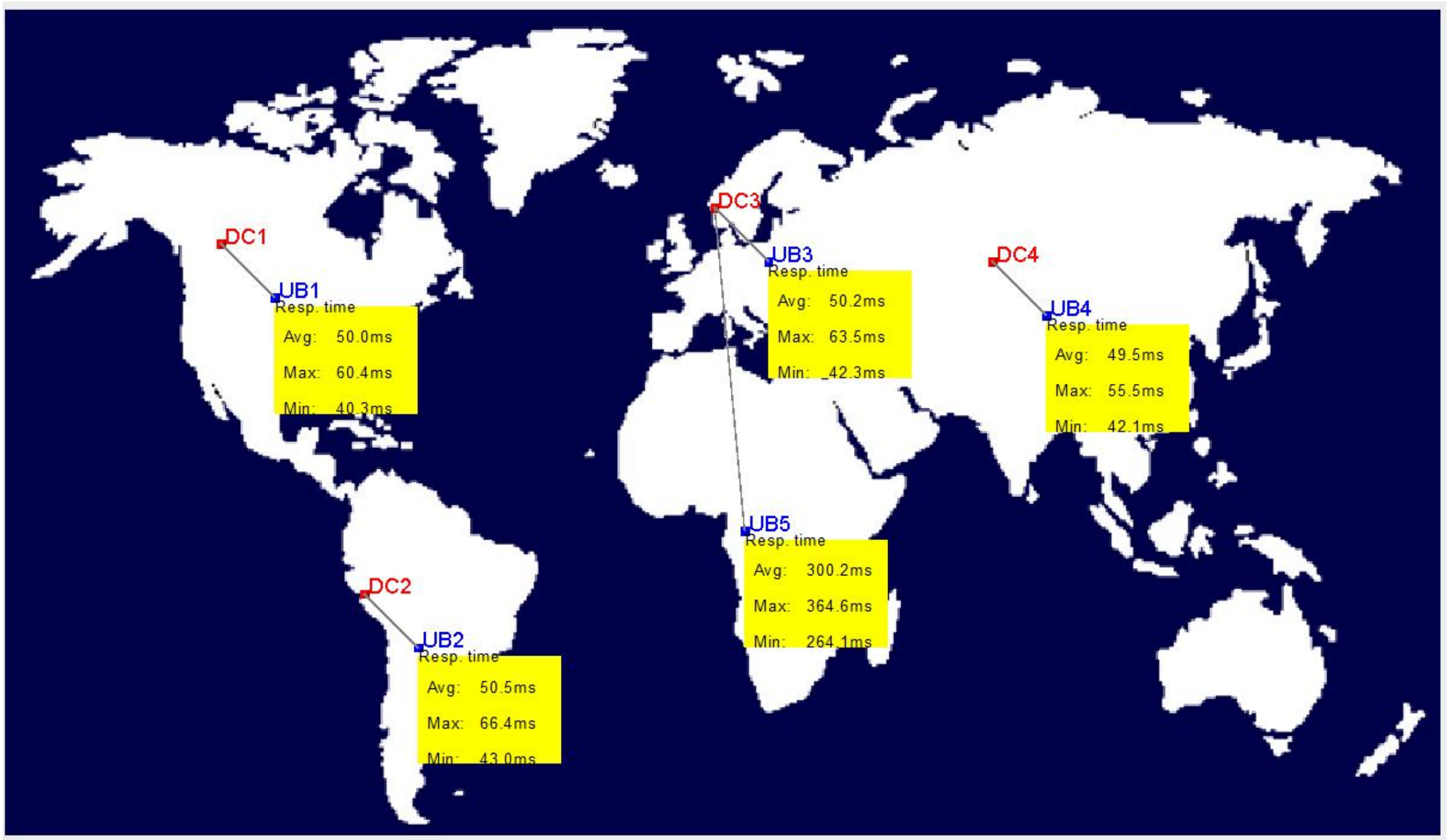


Cost

Total Virtual Machine Cost ($):	2.01
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	2.30

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	0.50	0.06	0.56
DC1	0.50	0.06	0.56
DC4	0.50	0.06	0.56
DC3	0.50	0.12	0.62

2. Round robin - Optimize response time ----t2



Results of the Simulation Completed at: 09/02/2022 09:39:19

Overall Response Time Summary

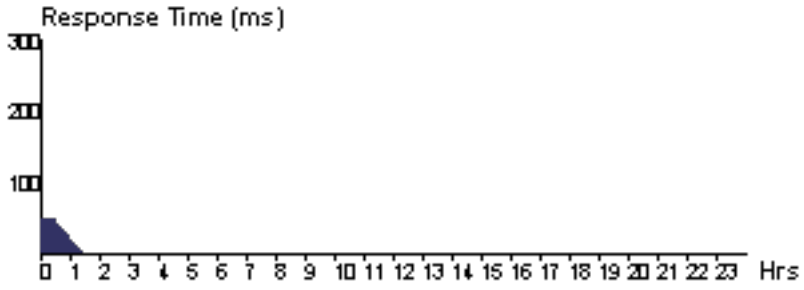
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.34	40.34	364.63
Data Center processing time:	0.49	0.03	1.01

Response Time by Region

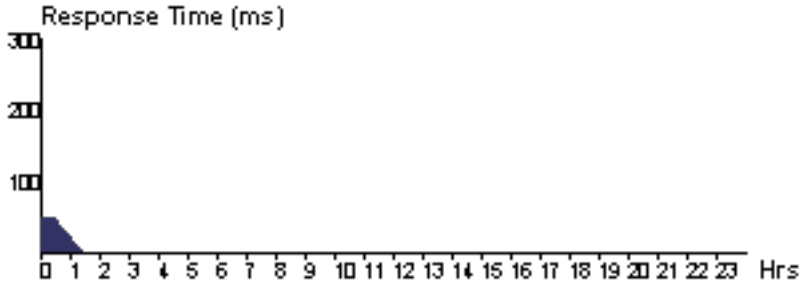
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	49.99	40.34	60.38
UB2	50.53	43.02	66.40
UB3	50.17	42.26	63.48
UB4	49.47	42.14	55.49
UB5	300.21	264.12	364.63

User Base Hourly Response Times

UB1

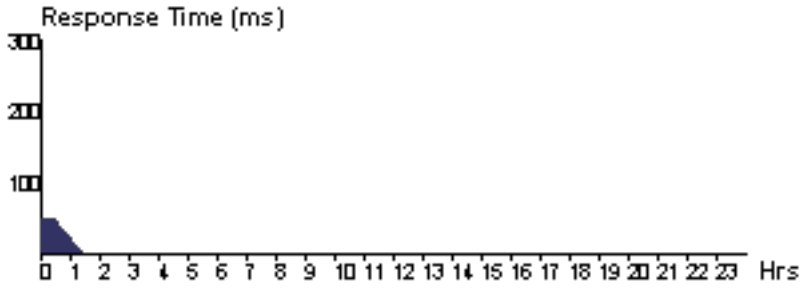


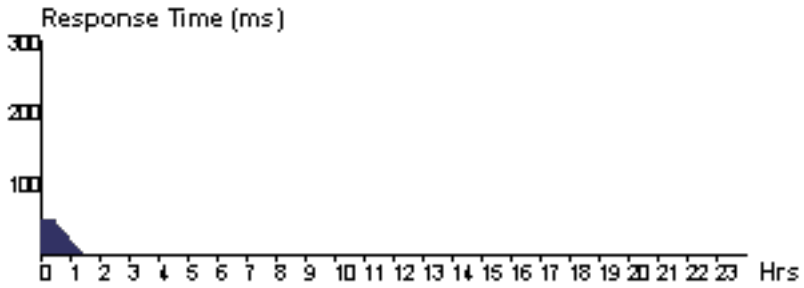
UB2



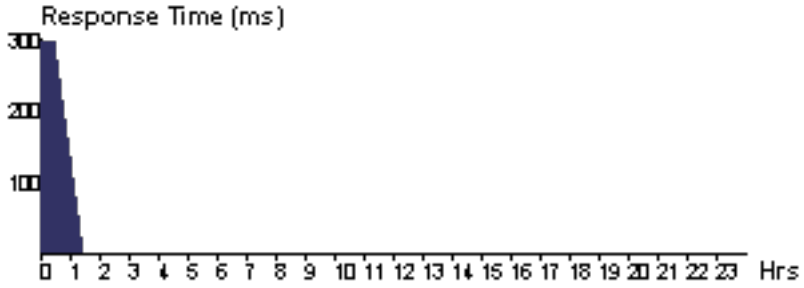
UB3

UB4





UB5



Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.47	0.03	0.96
DC2	0.53	0.05	1.01
DC3	0.48	0.03	1.00
DC4	0.51	0.03	0.96

Data Center Hourly Average Processing Times

DC1

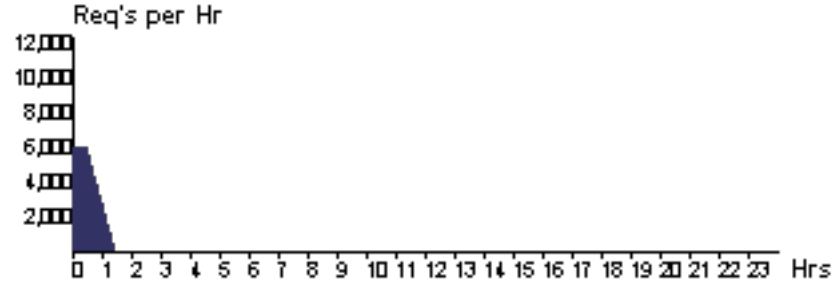
DC2

DC3

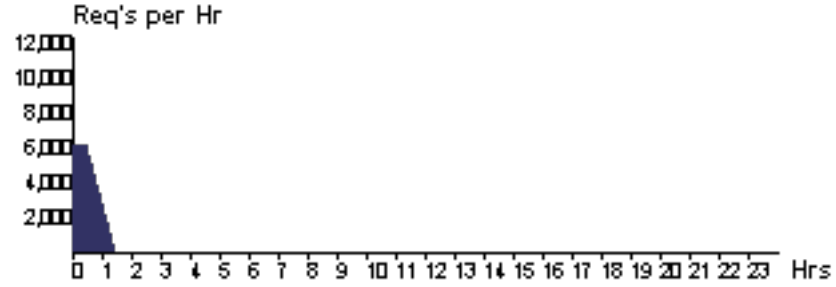
DC4

Data Center Hourly Loading

DC1

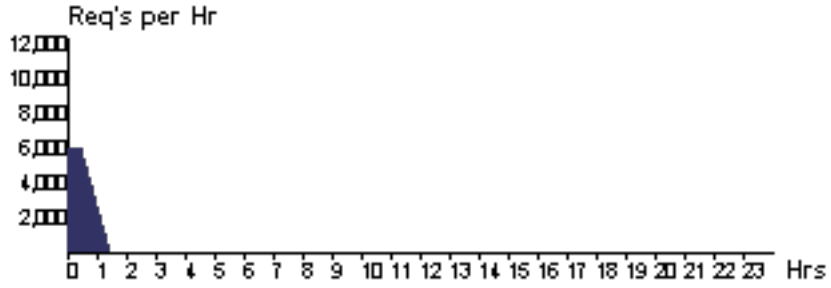


DC2



DC3

DC4

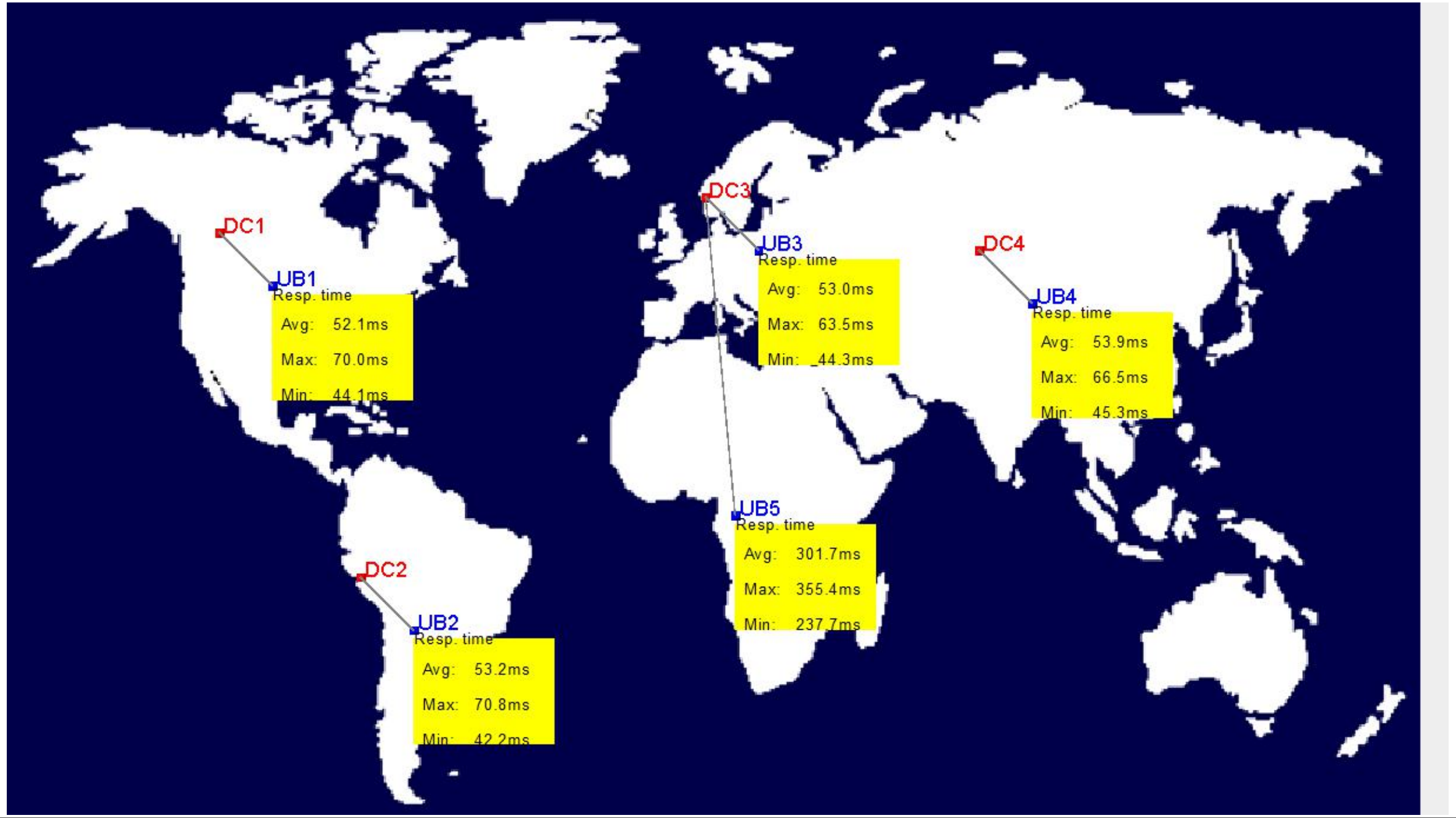


Cost

Total Virtual Machine Cost ($):	2.01
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	2.30

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	0.50	0.06	0.56
DC1	0.50	0.06	0.56
DC4	0.50	0.06	0.56
DC3	0.50	0.12	0.62

3. Round robin- Reconfigure dynamically-----t3



Results of the Simulation Completed at: 09/02/2022 09:41:14

Overall Response Time Summary

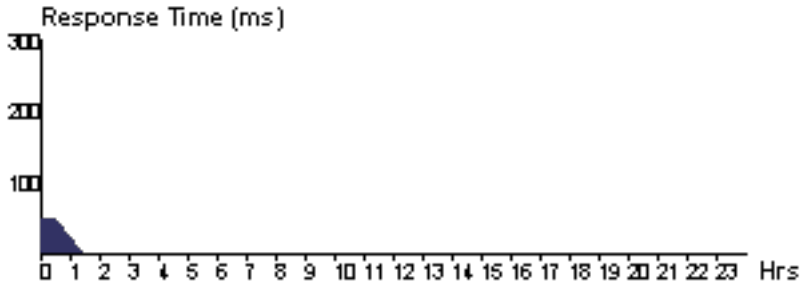
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	104.02	42.23	355.39
Data Center processing time:	3.25	0.03	17.29

Response Time by Region

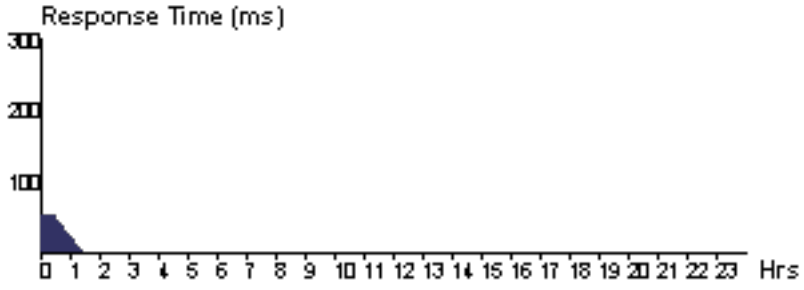
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	52.08	44.11	70.00
UB2	53.23	42.23	70.80
UB3	52.99	44.28	63.51
UB4	53.89	45.29	66.46
UB5	301.66	237.74	355.39

User Base Hourly Response Times

UB1

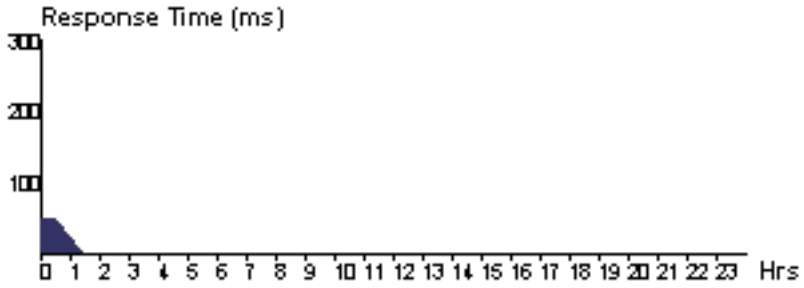


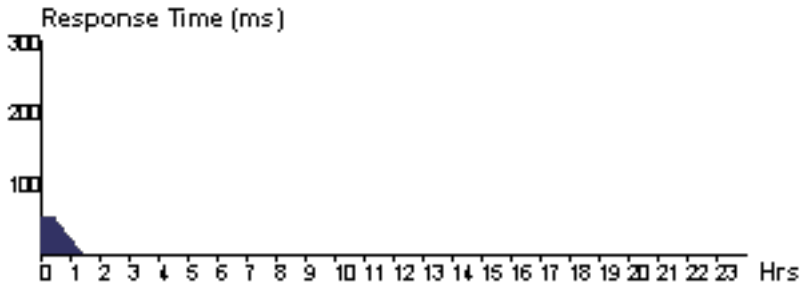
UB2



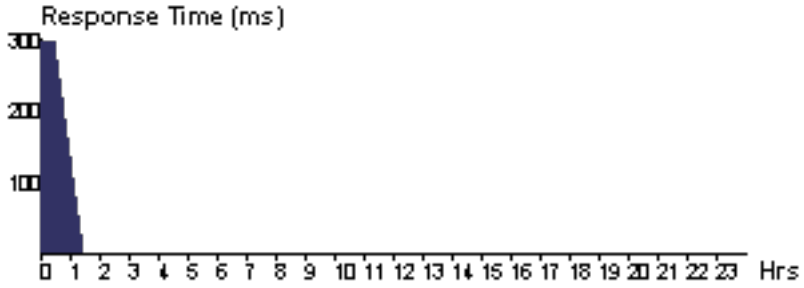
UB3

UB4





UB5

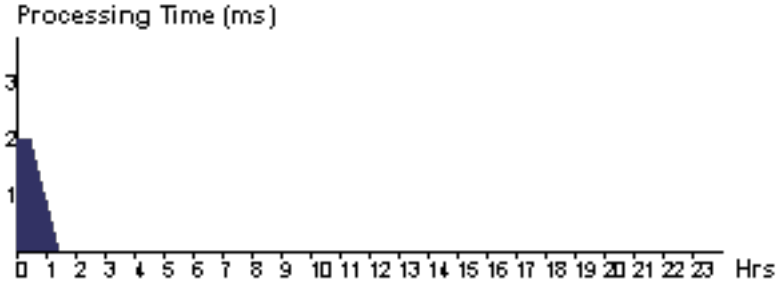


Data Center Request Servicing Times

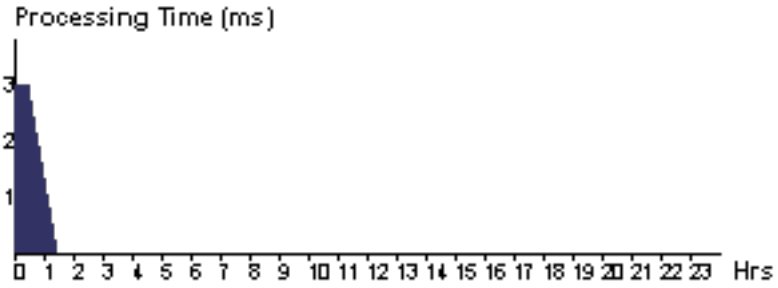
Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	2.21	0.08	7.25
DC2	3.80	0.05	17.29
DC3	3.40	0.03	14.51
DC4	3.43	0.08	12.61

Data Center Hourly Average Processing Times

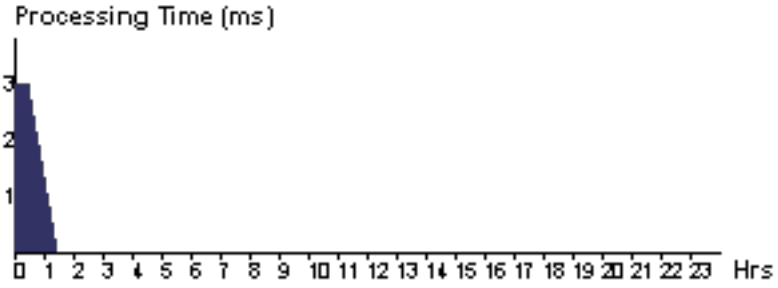
DC1



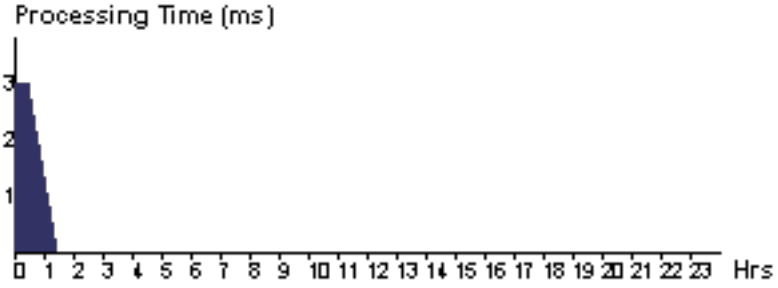
DC2



DC3

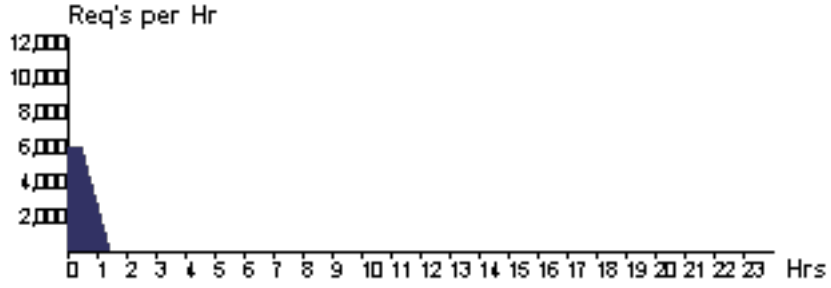


DC4

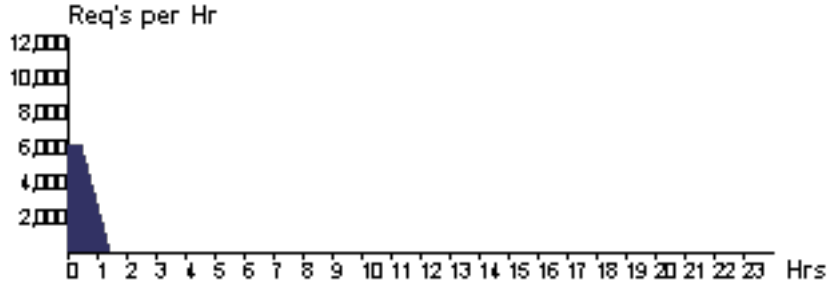


Data Center Hourly Loading

DC1

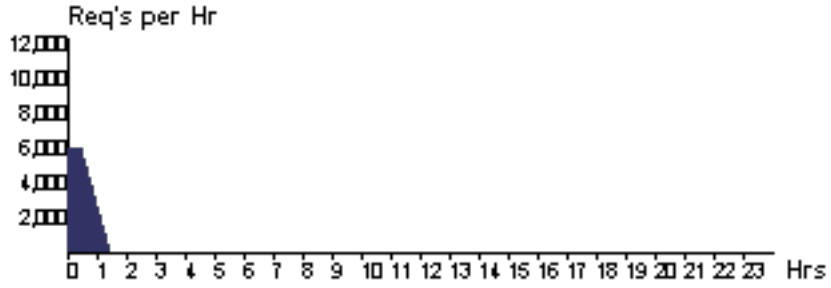


DC2



DC3

DC4

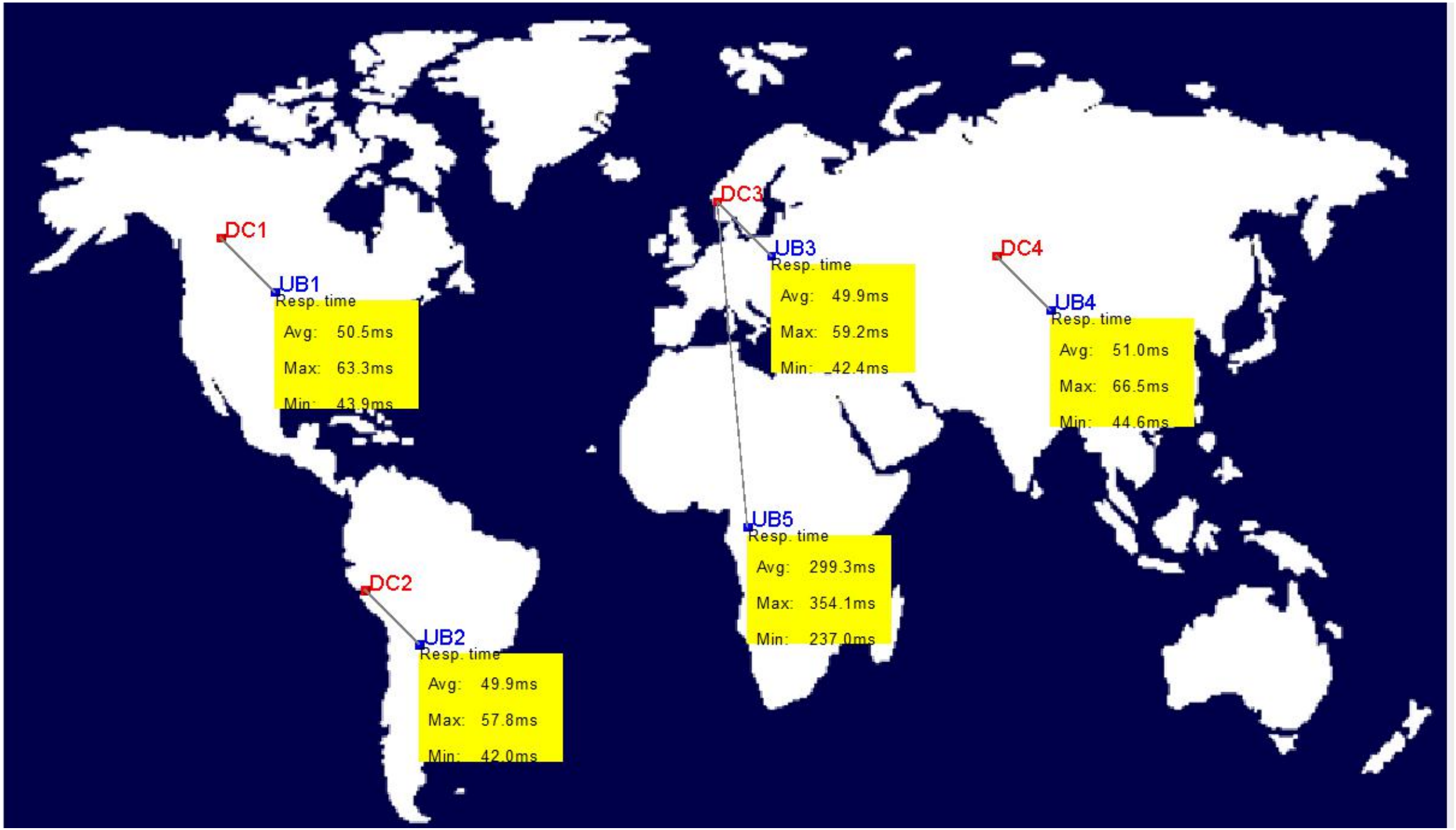


Cost

Total Virtual Machine Cost ($):	12.66
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	12.95

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	3.16	0.06	3.22
DC1	3.17	0.06	3.23
DC4	3.16	0.06	3.22
DC3	3.17	0.12	3.29

4. Equally spread current execution load- Closest data centre----t4



Results of the Simulation Completed at: 09/02/2022 09:43:30

Overall Response Time Summary

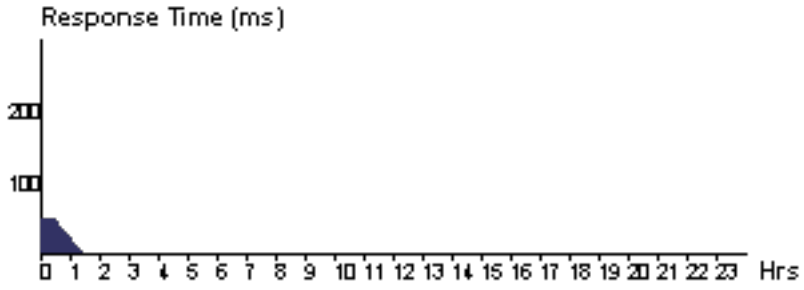
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.36	41.97	354.14
Data Center processing time:	0.52	0.02	1.01

Response Time by Region

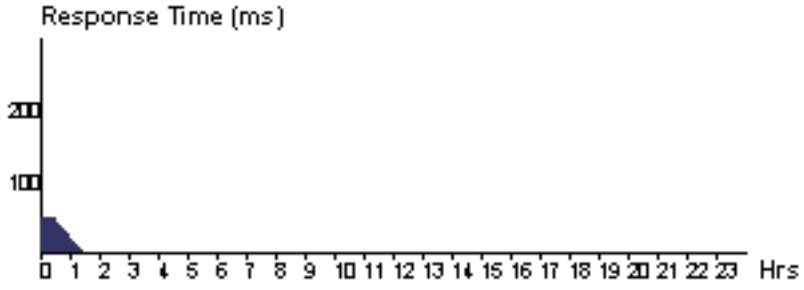
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	50.49	43.86	63.35
UB2	49.86	41.97	57.78
UB3	49.87	42.41	59.21
UB4	51.00	44.64	66.46
UB5	299.32	237.04	354.14

User Base Hourly Response Times

UB1

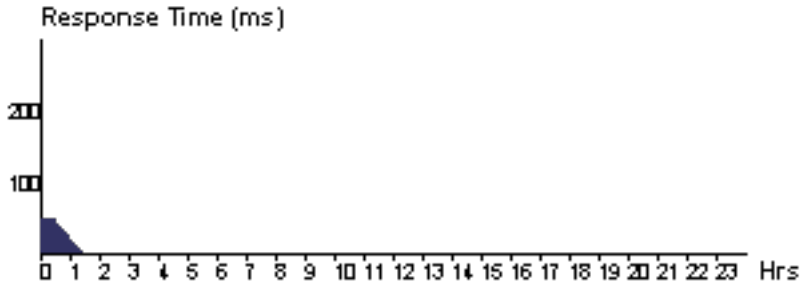


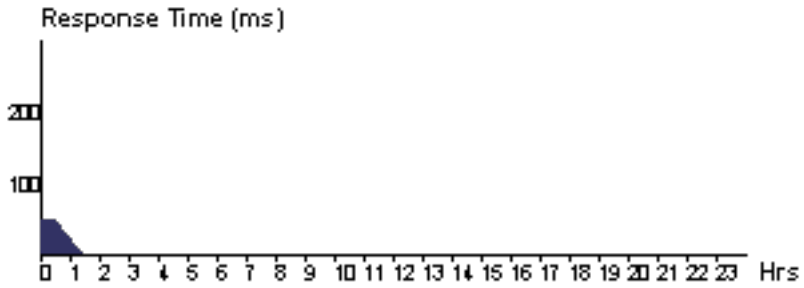
UB2



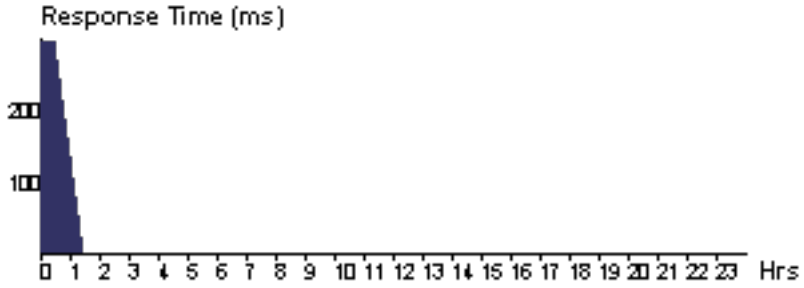
UB3

UB4





UB5



Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.55	0.03	0.96
DC2	0.54	0.05	1.01
DC3	0.47	0.02	1.00
DC4	0.55	0.02	1.01

Data Center Hourly Average Processing Times

DC1

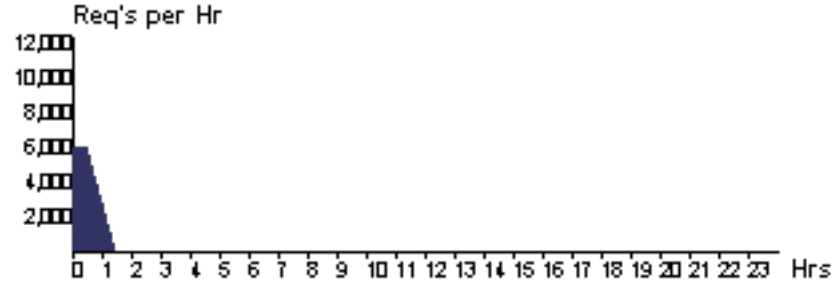
DC2

DC3

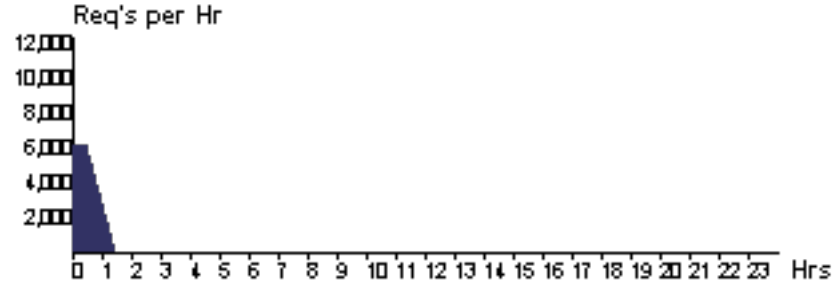
DC4

Data Center Hourly Loading

DC1

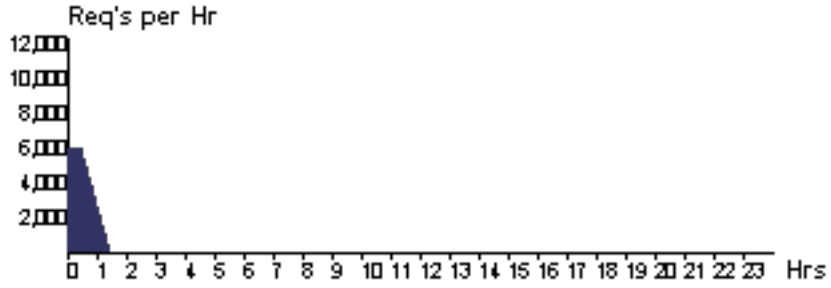


DC2



DC3

DC4

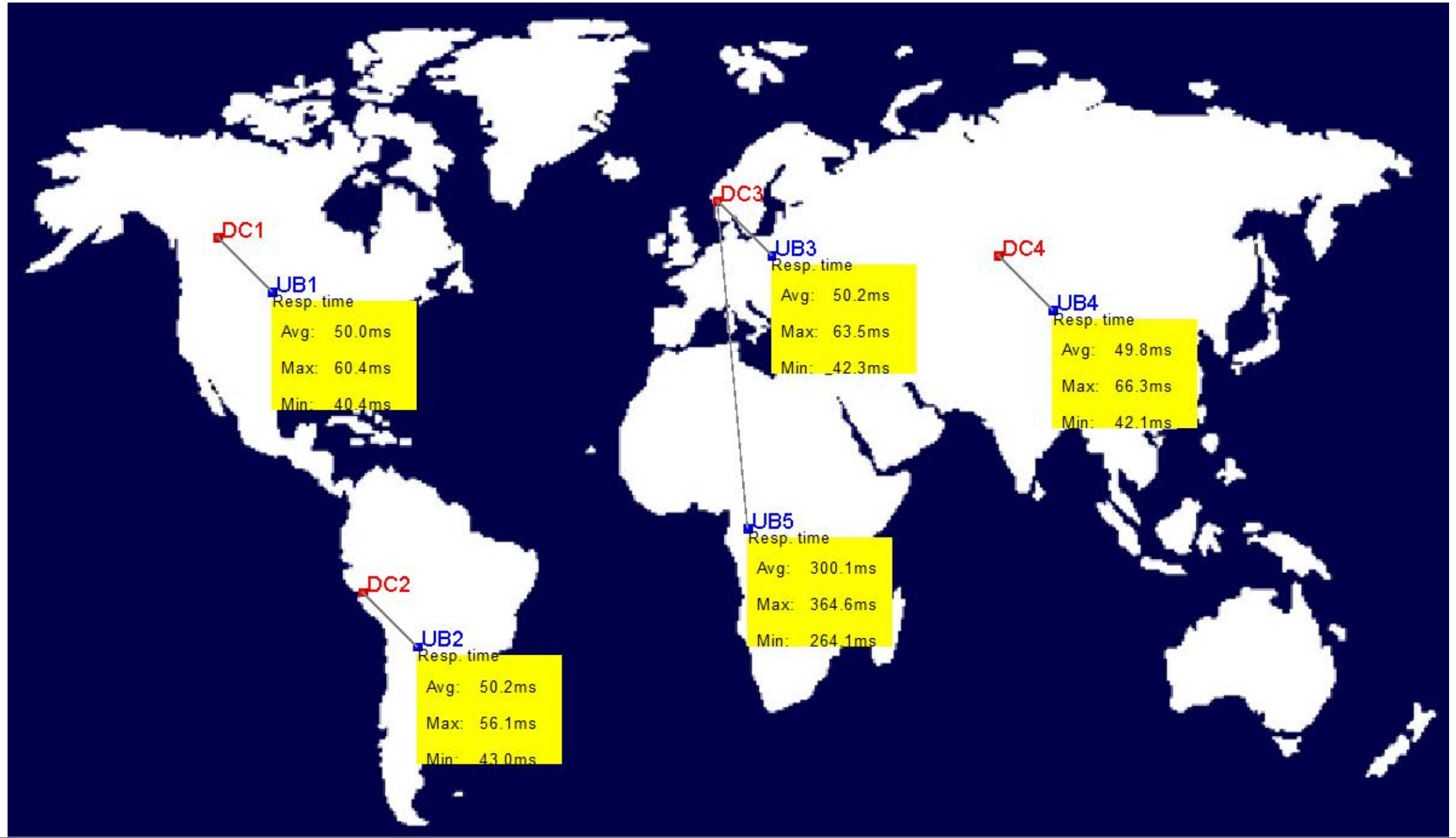


Cost

Total Virtual Machine Cost ($):	2.01
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	2.30

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	0.50	0.06	0.56
DC1	0.50	0.06	0.56
DC4	0.50	0.06	0.56
DC3	0.50	0.12	0.62

5. Equally spread current execution load - Optimize response time ----t5



Results of the Simulation Completed at: 09/02/2022 09:46:34

Overall Response Time Summary

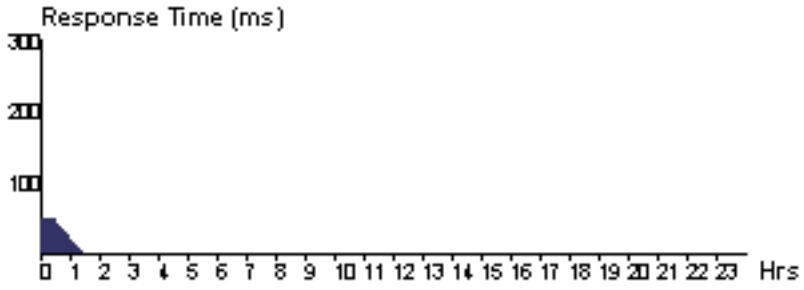
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.30	40.36	364.63
Data Center processing time:	0.49	0.03	1.01

Response Time by Region

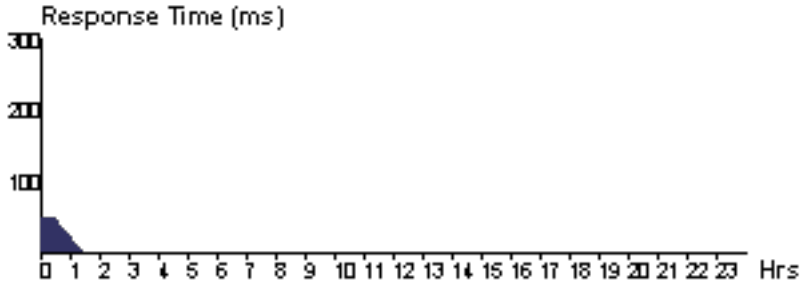
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	49.95	40.36	60.38
UB2	50.21	43.02	56.14
UB3	50.22	42.26	63.48
UB4	49.77	42.14	66.34
UB5	300.07	264.12	364.63

User Base Hourly Response Times

UB1

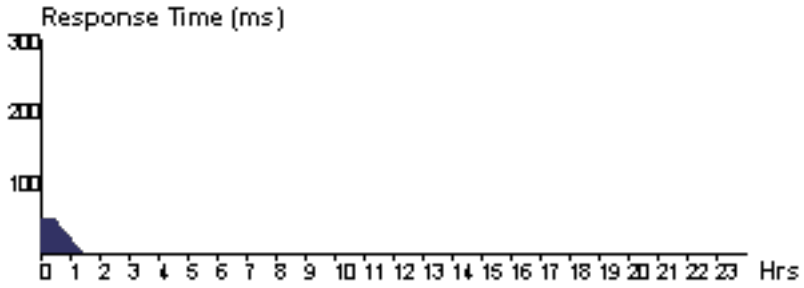


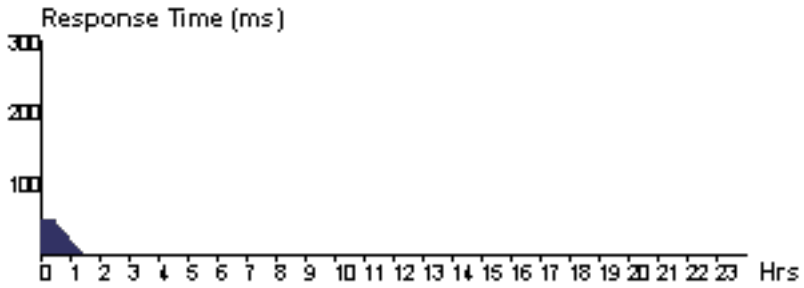
UB2



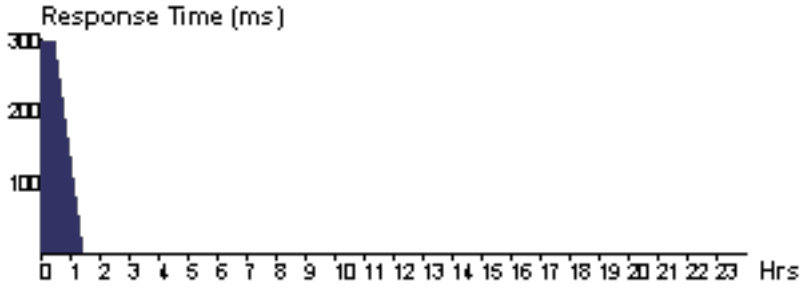
UB3

UB4





UB5



Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.46	0.03	0.96
DC2	0.54	0.05	1.01
DC3	0.47	0.03	1.00
DC4	0.52	0.03	0.96

Data Center Hourly Average Processing Times

DC1

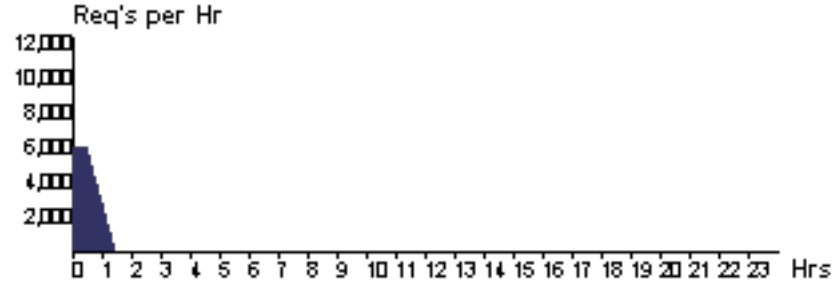
DC2

DC3

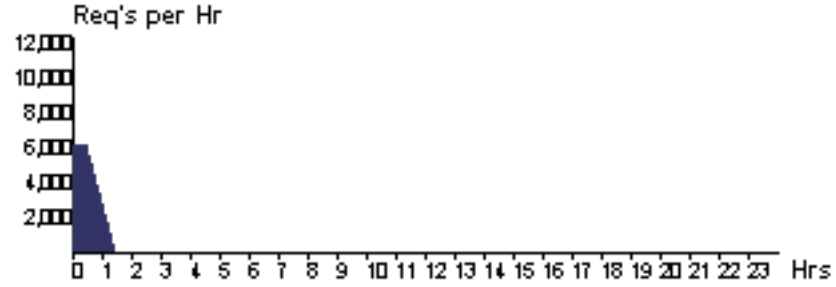
DC4

Data Center Hourly Loading

DC1

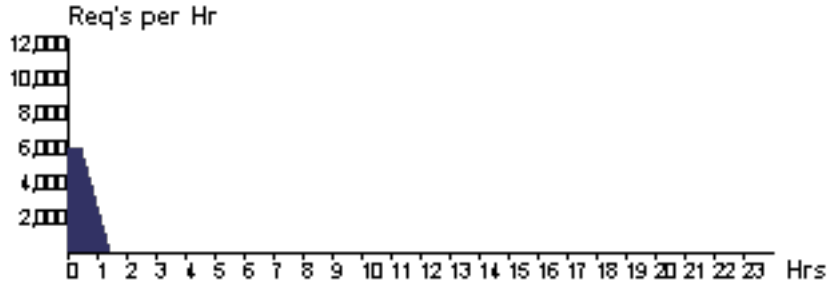


DC2



DC3

DC4

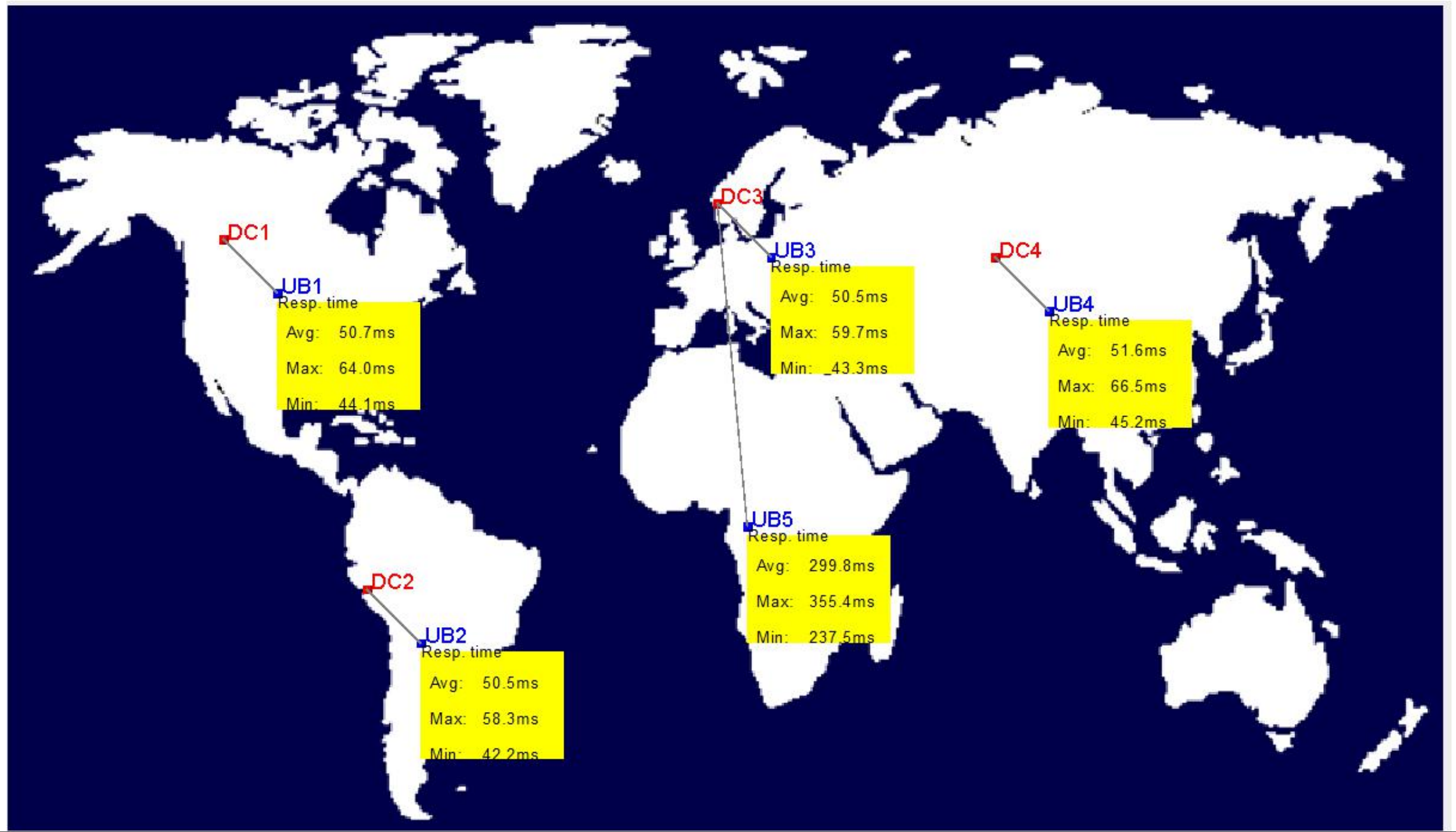


Cost

Total Virtual Machine Cost ($):	2.01
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	2.30

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	0.50	0.06	0.56
DC1	0.50	0.06	0.56
DC4	0.50	0.06	0.56
DC3	0.50	0.12	0.62

6. Equally spread current execution load- Reconfigure dynamically---t6



Results of the Simulation Completed at: 09/02/2022 09:48:32

Overall Response Time Summary

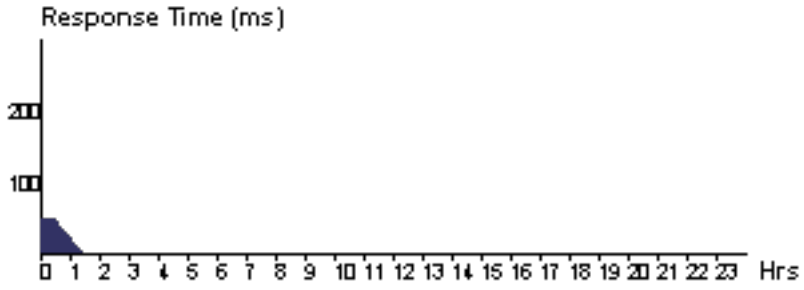
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.87	42.23	355.39
Data Center processing time:	1.05	0.05	2.28

Response Time by Region

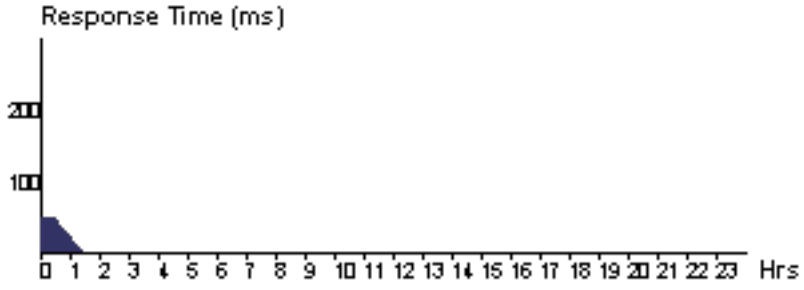
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	50.70	44.11	63.98
UB2	50.47	42.23	58.33
UB3	50.52	43.26	59.73
UB4	51.61	45.16	66.46
UB5	299.78	237.45	355.39

User Base Hourly Response Times

UB1

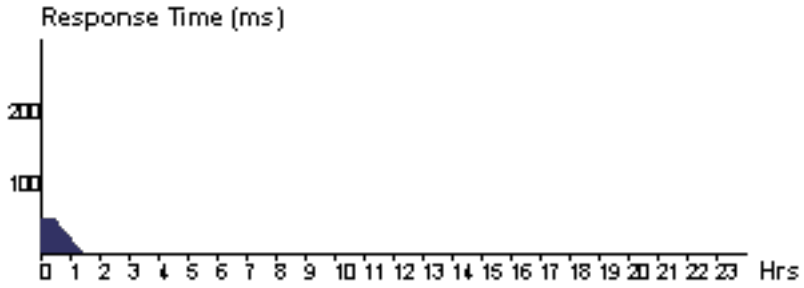


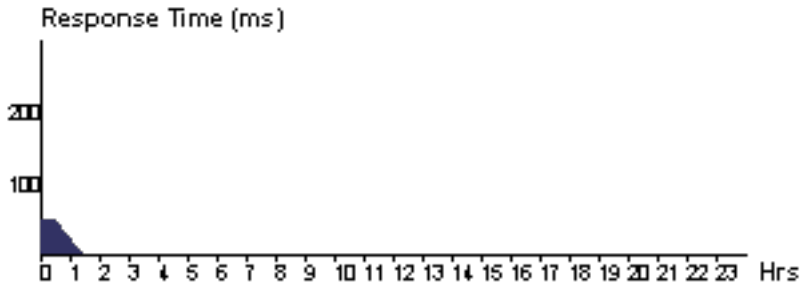
UB2



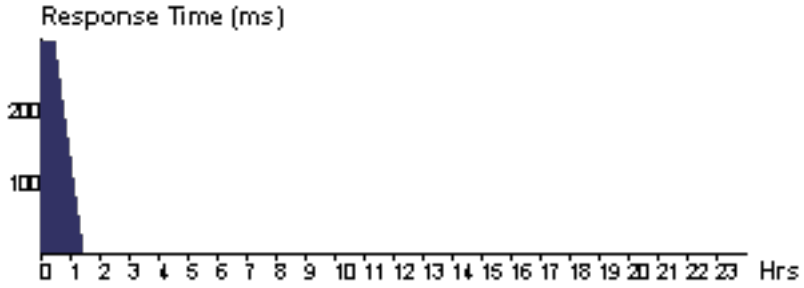
UB3

UB4





UB5



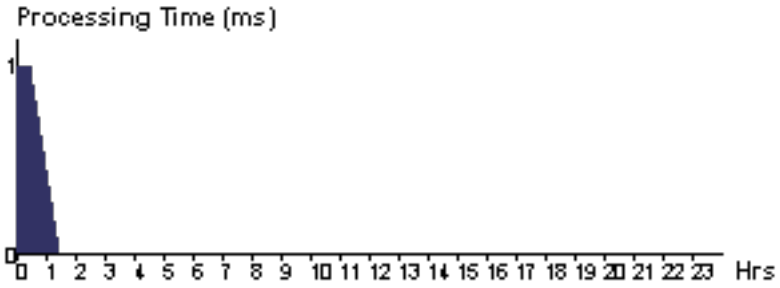
Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.82	0.05	1.51
DC2	1.14	0.05	2.16
DC3	1.08	0.15	2.28
DC4	1.14	0.12	2.21

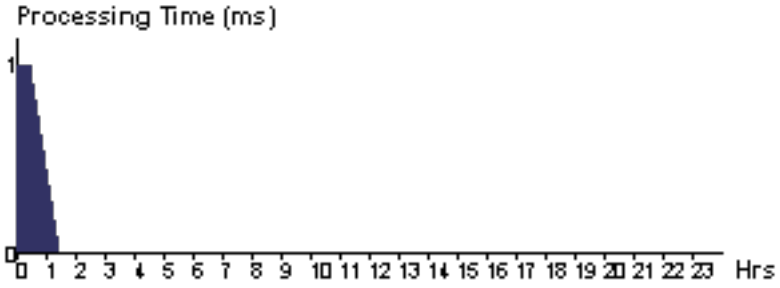
Data Center Hourly Average Processing Times

DC1

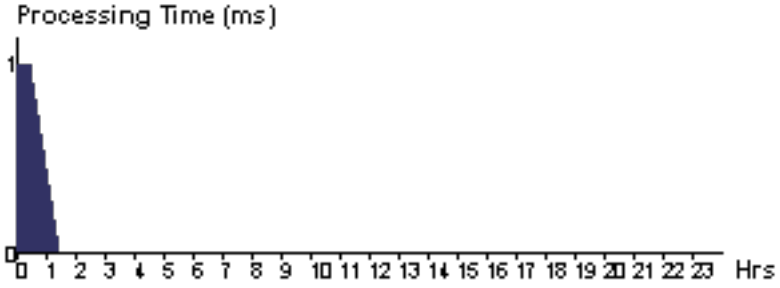
DC2



DC3

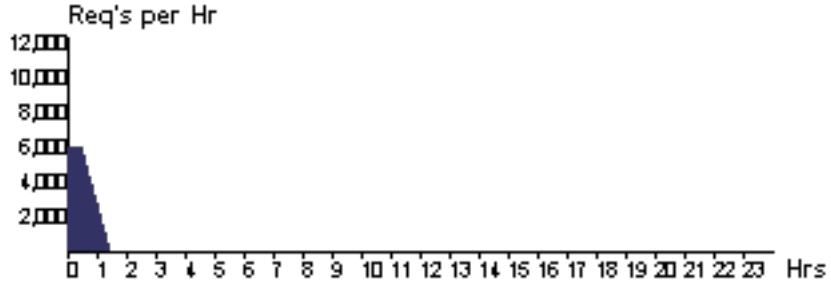


DC4

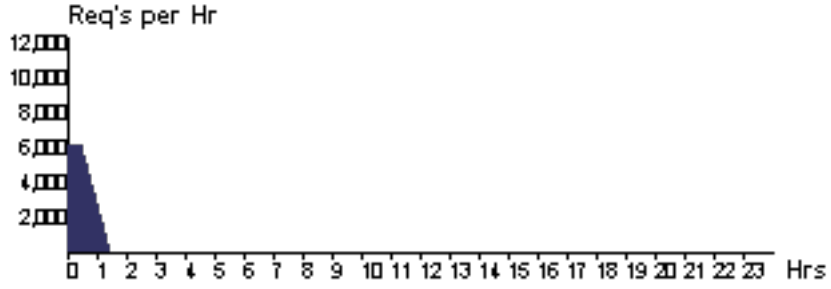


Data Center Hourly Loading

DC1

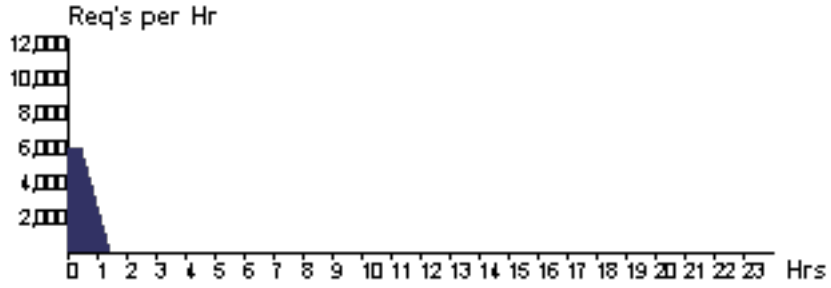


DC2



DC3

DC4

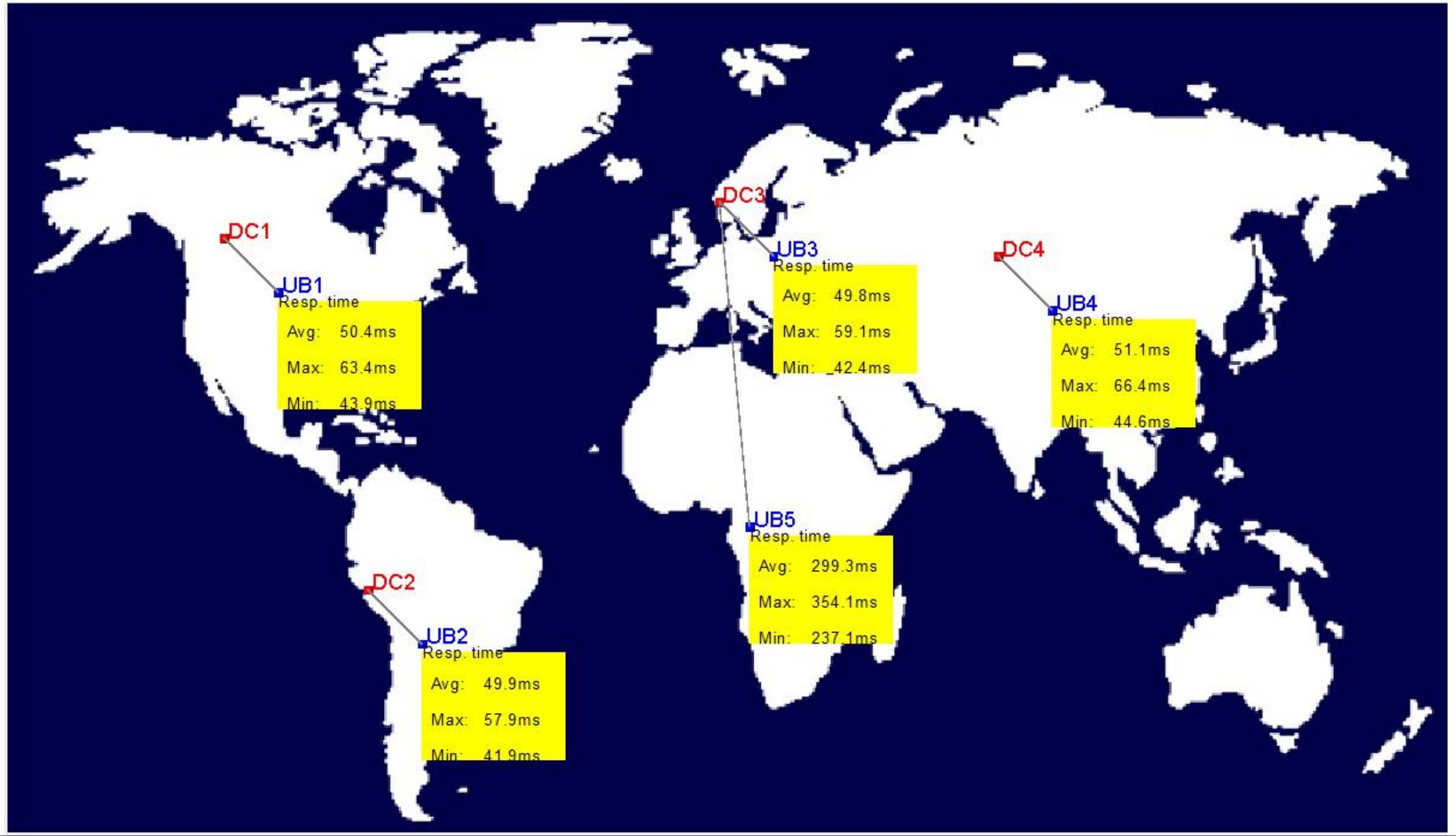


Cost

Total Virtual Machine Cost ($):	12.55
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	12.85

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	3.16	0.06	3.22
DC1	3.07	0.06	3.13
DC4	3.16	0.06	3.22
DC3	3.16	0.12	3.28

7. Throttled- Closest data centre---t7



Results of the Simulation Completed at: 09/02/2022 09:50:47

Overall Response Time Summary

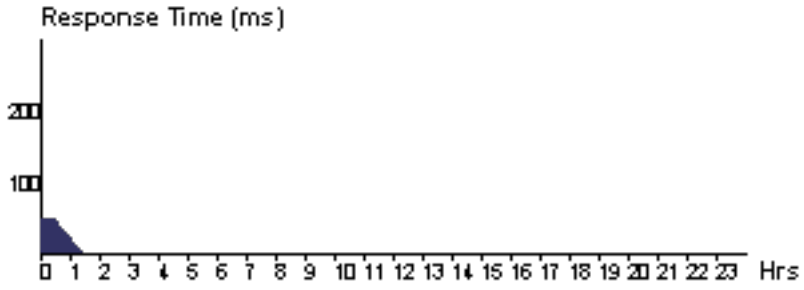
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.35	41.90	354.14
Data Center processing time:	0.50	0.10	0.89

Response Time by Region

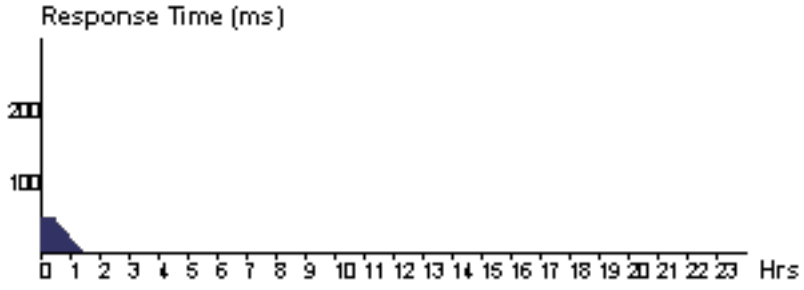
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	50.43	43.86	63.36
UB2	49.85	41.90	57.89
UB3	49.77	42.38	59.13
UB4	51.10	44.64	66.39
UB5	299.30	237.14	354.14

User Base Hourly Response Times

UB1

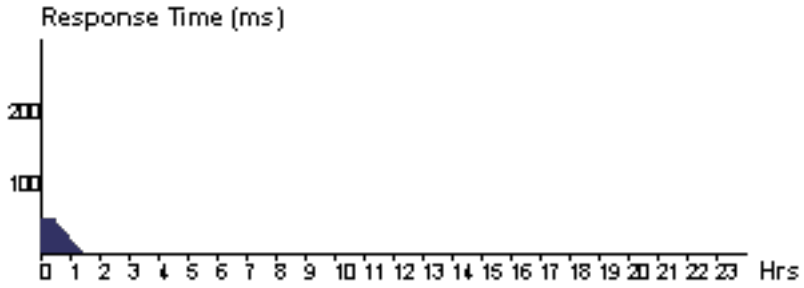


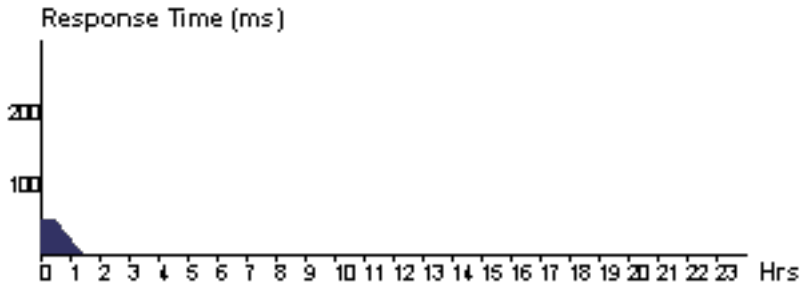
UB2



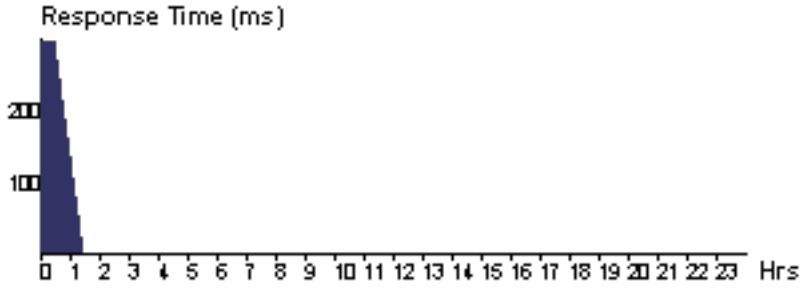
UB3

UB4





UB5



Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.54	0.10	0.86
DC2	0.52	0.14	0.89
DC3	0.45	0.13	0.88
DC4	0.54	0.13	0.88

Data Center Hourly Average Processing Times

DC1

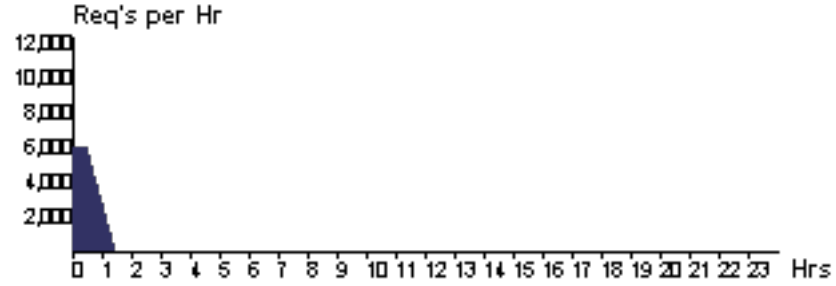
DC2

DC3

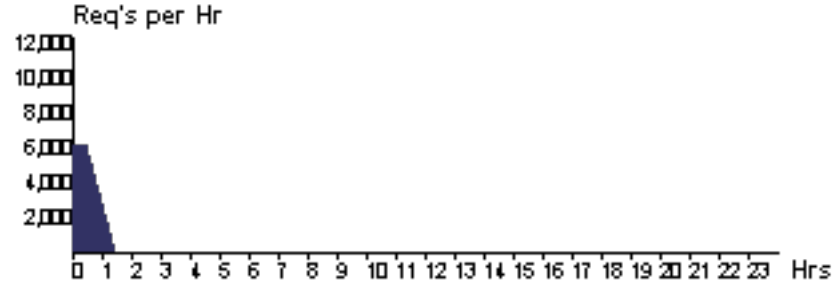
DC4

Data Center Hourly Loading

DC1

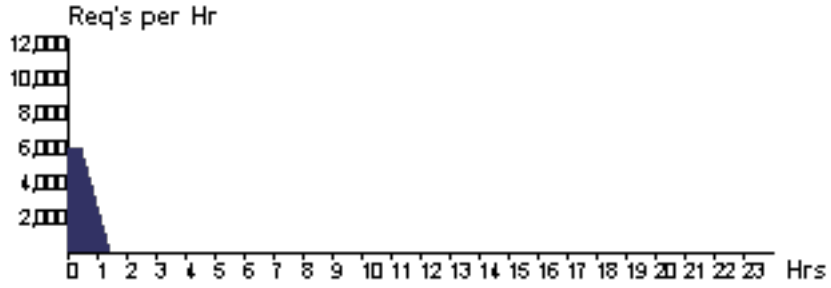


DC2



DC3

DC4

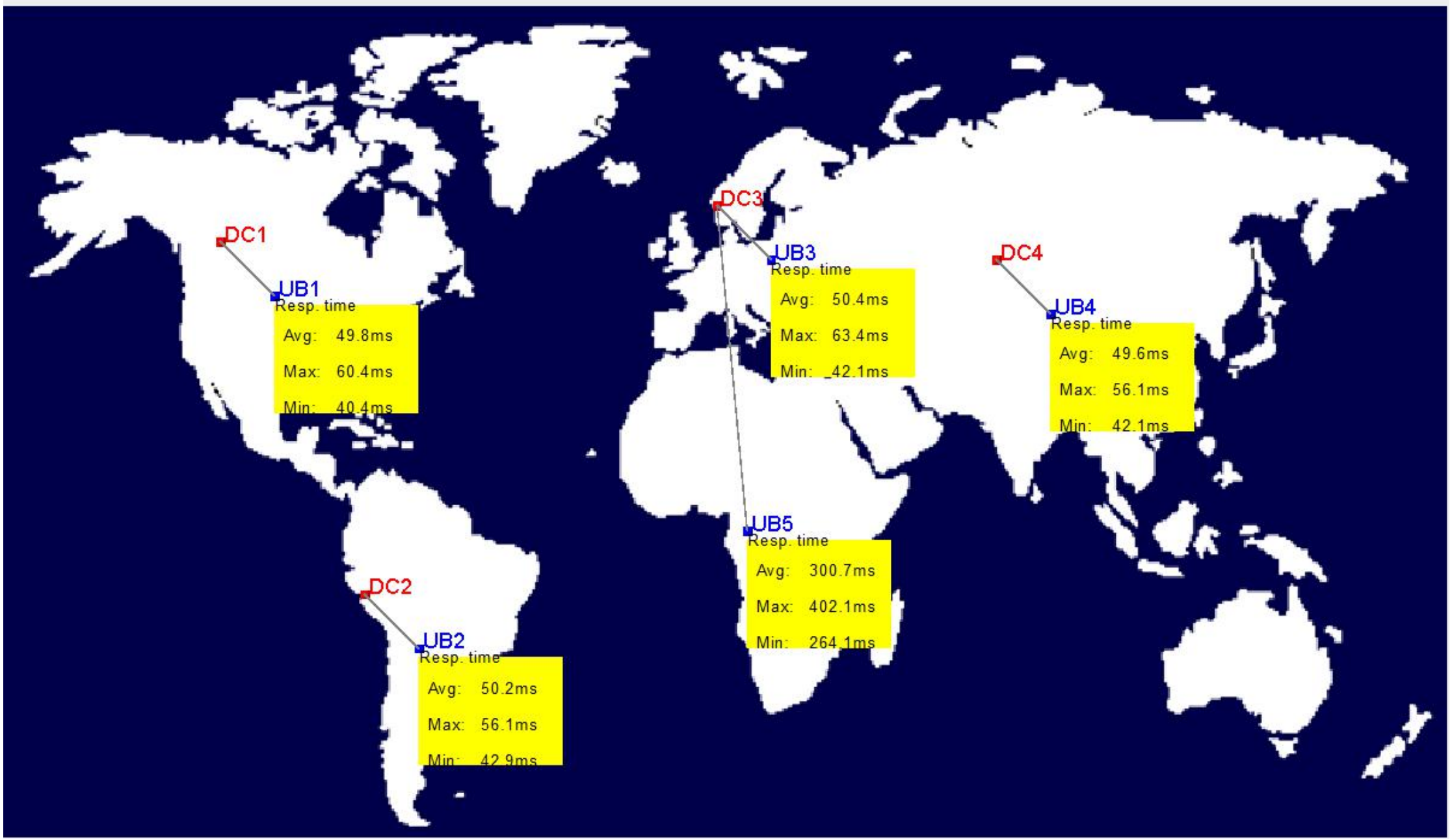


Cost

Total Virtual Machine Cost ($):	2.01
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	2.30

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	0.50	0.06	0.56
DC1	0.50	0.06	0.56
DC4	0.50	0.06	0.56
DC3	0.50	0.12	0.62

8. Throttled - Optimize response time ----t8



Results of the Simulation Completed at: 09/02/2022 09:58:12

Overall Response Time Summary

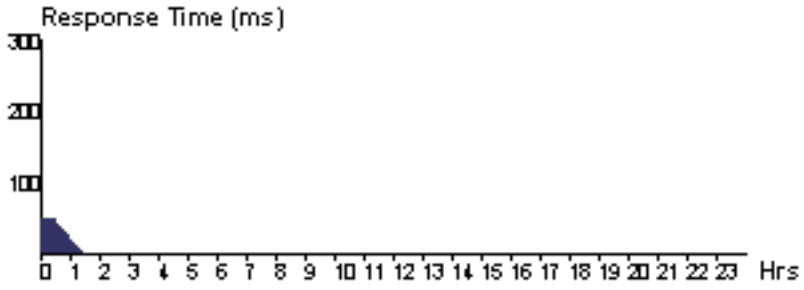
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.41	40.36	402.15
Data Center processing time:	0.47	0.10	0.89

Response Time by Region

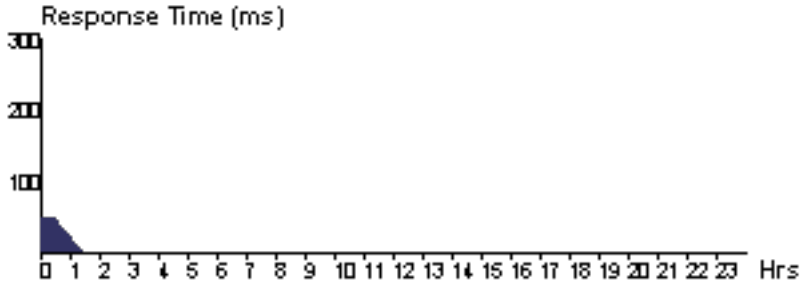
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	49.84	40.36	60.36
UB2	50.15	42.90	56.15
UB3	50.37	42.14	63.38
UB4	49.61	42.14	56.14
UB5	300.75	264.14	402.15

User Base Hourly Response Times

UB1

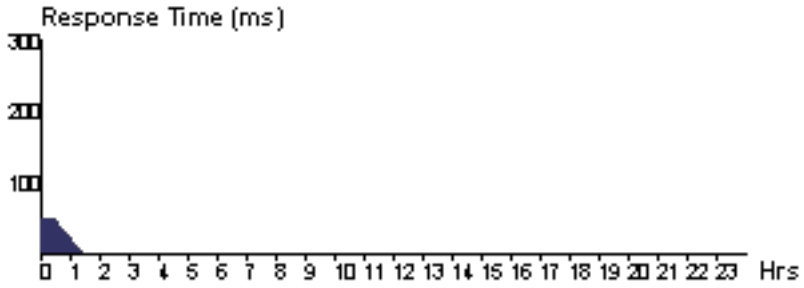


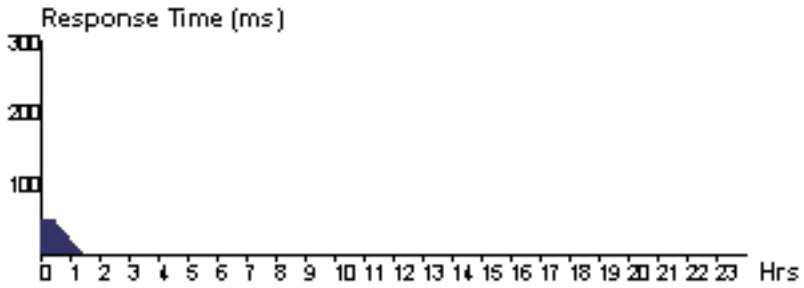
UB2



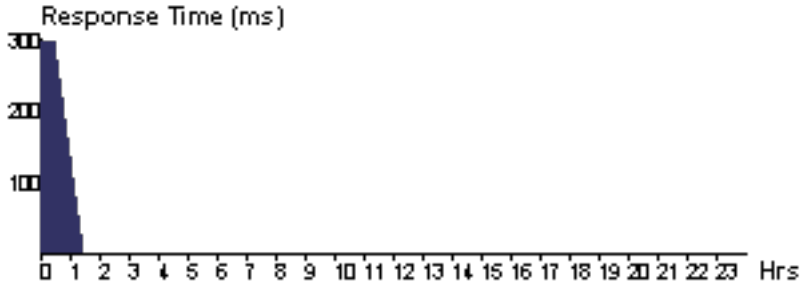
UB3

UB4





UB5



Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.45	0.10	0.86
DC2	0.51	0.14	0.89
DC3	0.44	0.13	0.88
DC4	0.52	0.13	0.88

Data Center Hourly Average Processing Times

DC1

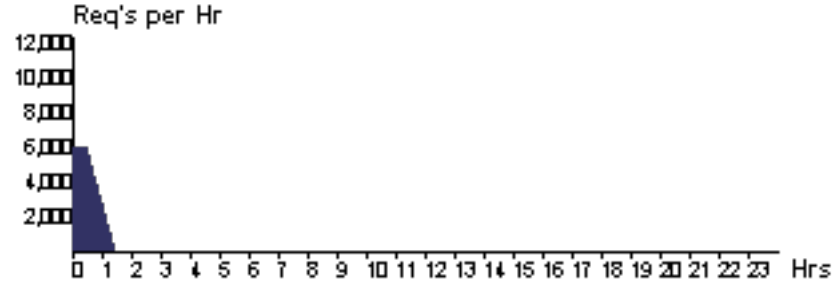
DC2

DC3

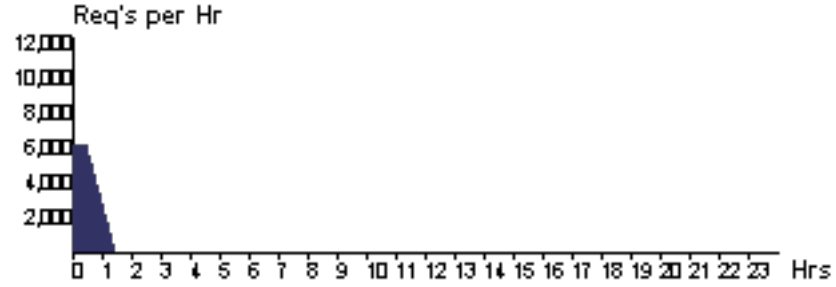
DC4

Data Center Hourly Loading

DC1

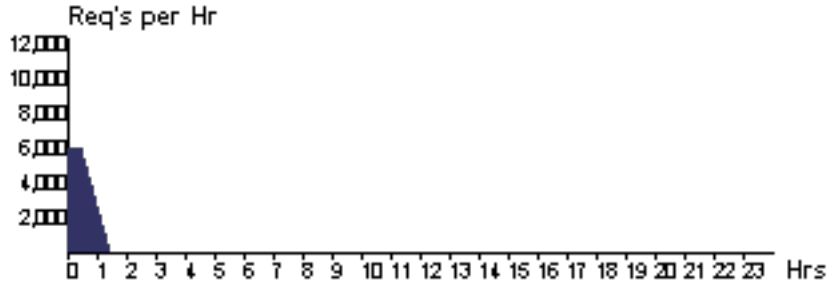


DC2



DC3

DC4

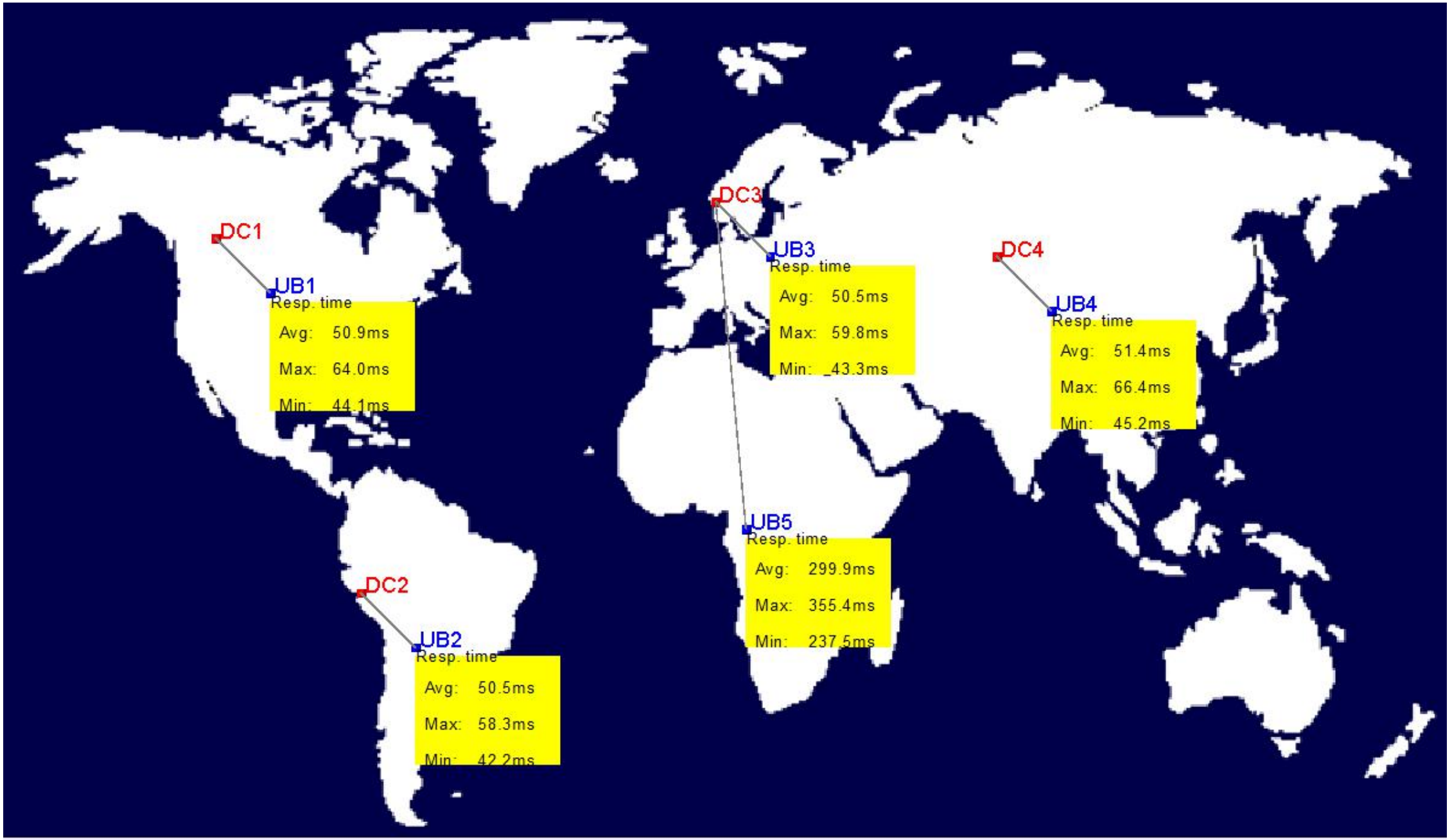


Cost

Total Virtual Machine Cost ($):	2.01
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	2.30

Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	0.50	0.06	0.56
DC1	0.50	0.06	0.56
DC4	0.50	0.06	0.56
DC3	0.50	0.12	0.62

9 **Throttled- Reconfigure dynamically----t** 9



Results of the Simulation Completed at: 09/02/2022 10:00:03

Overall Response Time Summary

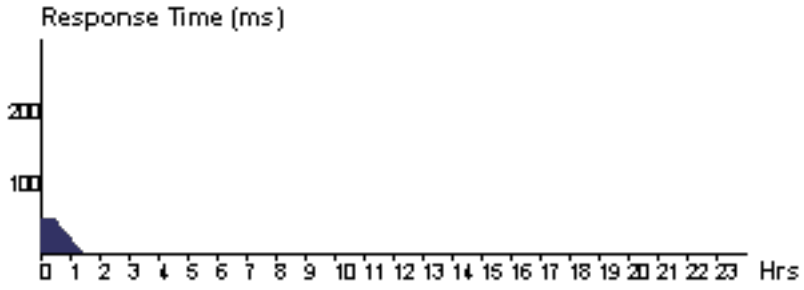
	Avg (ms)	Min (ms)	Max (ms)
Overall response time:	101.91	42.23	355.42
Data Center processing time:	1.07	0.10	2.30

Response Time by Region

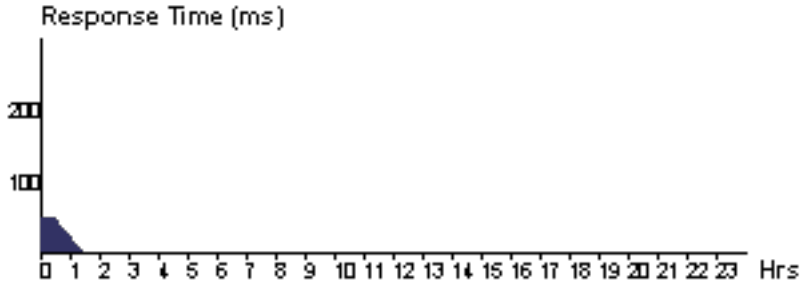
Userbase	Avg (ms)	Min (ms)	Max (ms)
UB1	50.86	44.11	63.98
UB2	50.53	42.23	58.33
UB3	50.53	43.28	59.76
UB4	51.41	45.19	66.39
UB5	299.95	237.47	355.42

User Base Hourly Response Times

UB1

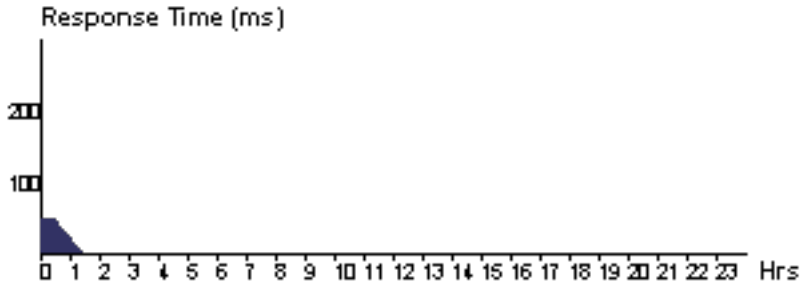


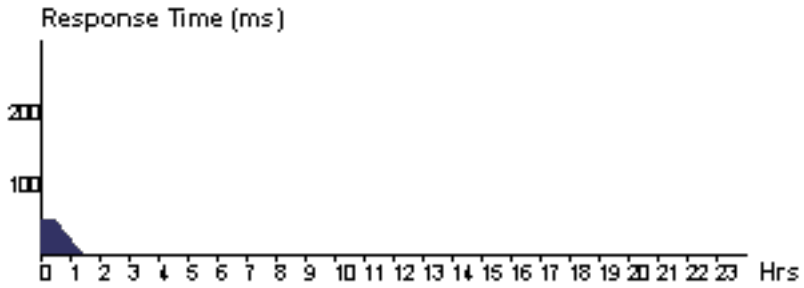
UB2



UB3

UB4





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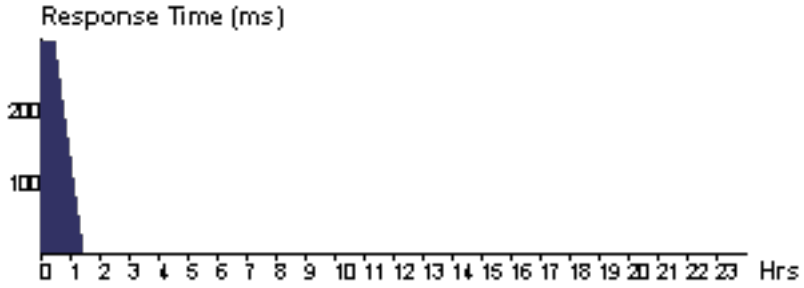


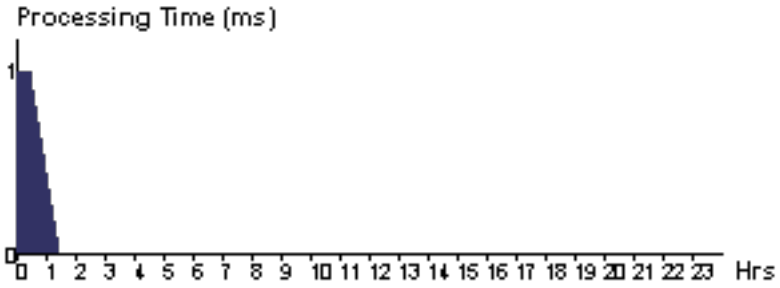
Data Center Request Servicing Times

Data Center	Avg (ms)	Min (ms)	Max (ms)
DC1	0.81	0.10	1.51
DC2	1.15	0.14	2.16
DC3	1.10	0.13	2.30
DC4	1.17	0.13	2.23

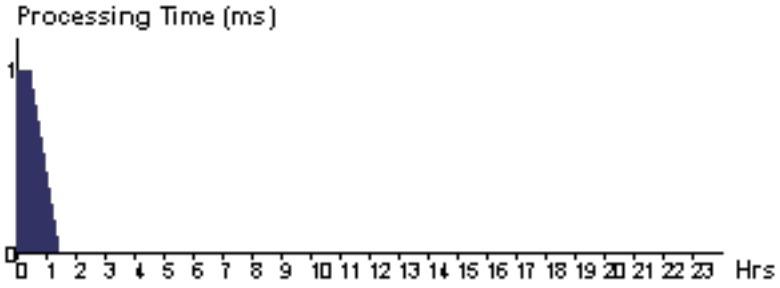
Data Center Hourly Average Processing Times

DC1

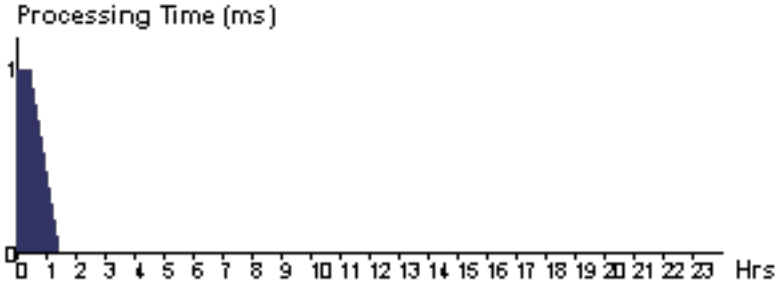
DC2



DC3

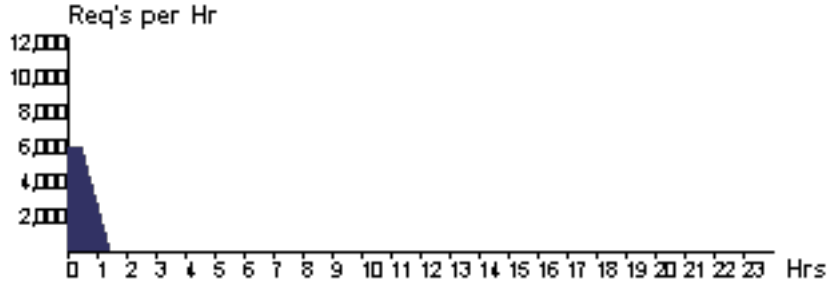


DC4

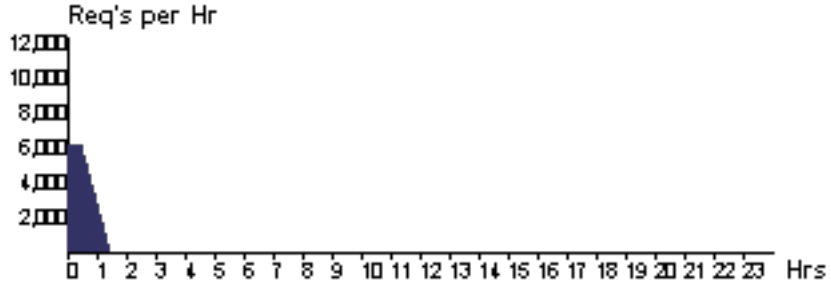


Data Center Hourly Loading

DC1

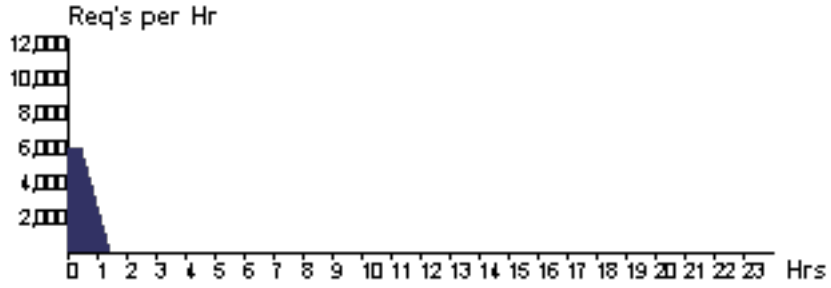


DC2



DC3

DC4



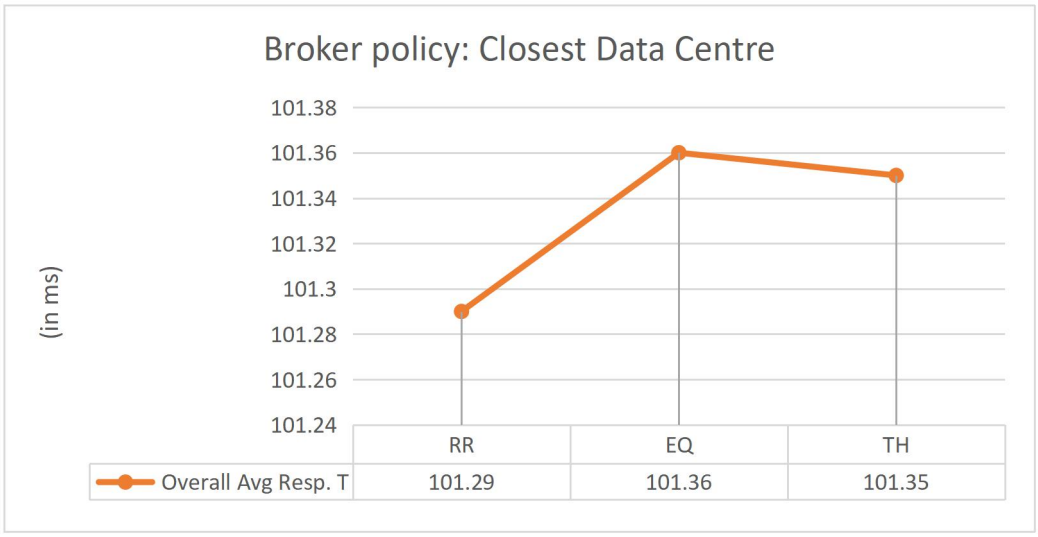
Cost

Total Virtual Machine Cost ($):	12.83
Total Data Transfer Cost ($):	0.29
Grand Total: ($)	13.12

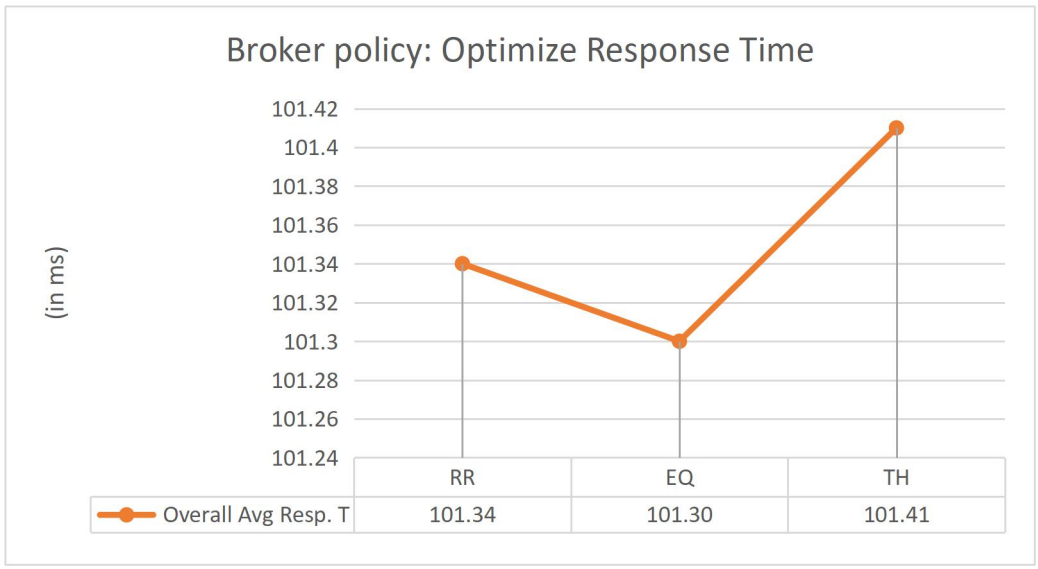
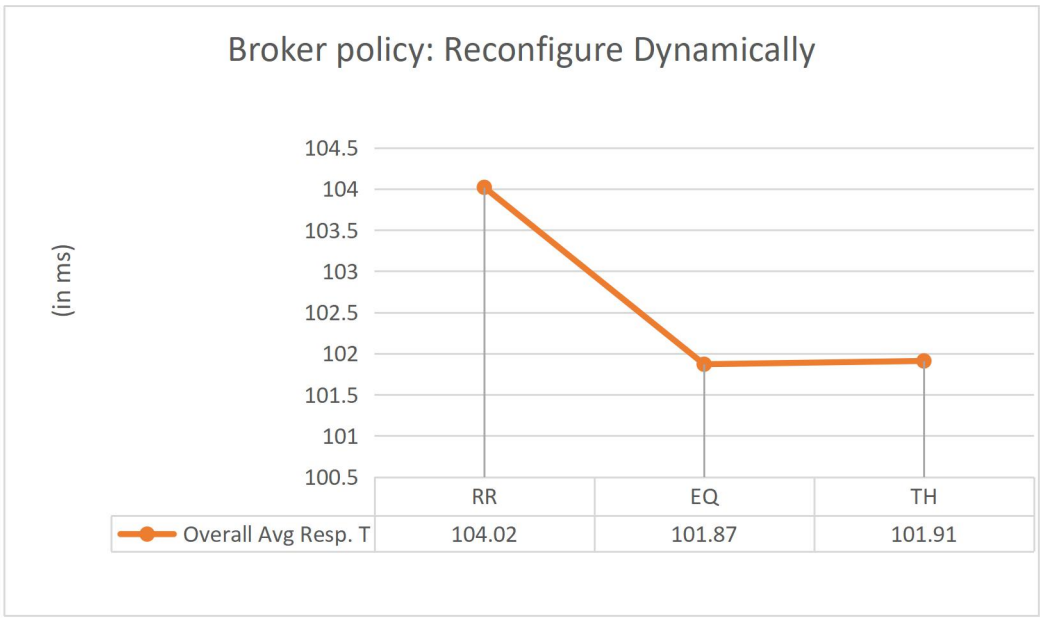
Data Center	**VM Cost $**	**Data Transfer Cost $**	**Total $**
DC2	3.16	0.06	3.22
DC1	3.16	0.06	3.22
DC4	3.25	0.06	3.31
DC3	3.25	0.12	3.37

Under all broker policies: comparison of all load balancing algorithms (Round Robin, Equally spread current execution load and Throttled)

1)



2)



3)