

CS5331: Mobile Data Management and Privacy

Spring 2023

Project #3: A Pull-based Cache Invalidation

Himaja_Madala

Instructions how to run the program:

Download and install GlobalProtect from the raiderlink to access the ttu vpn.

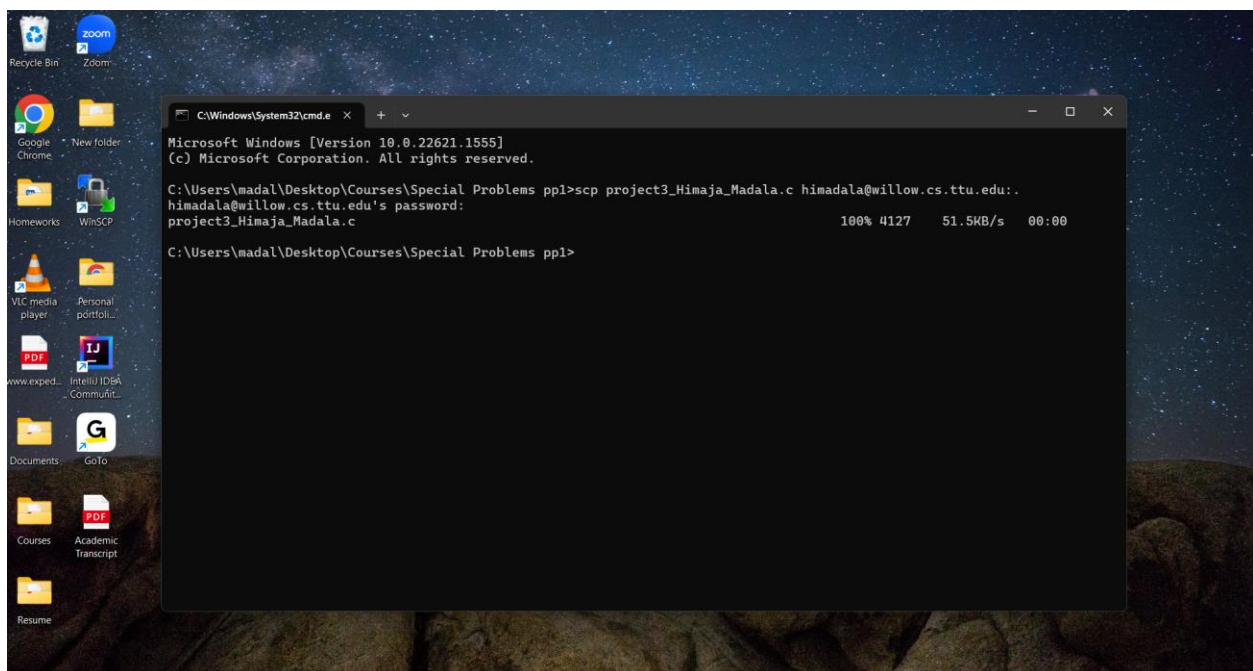
Download and install Winscp to access willow server. Also, download Xming to use PuTTY.

Now create a folder and save the project code with .c extension on desktop.

Open cmd in the path of the folder created on desktop.

Run the following command in cmd:

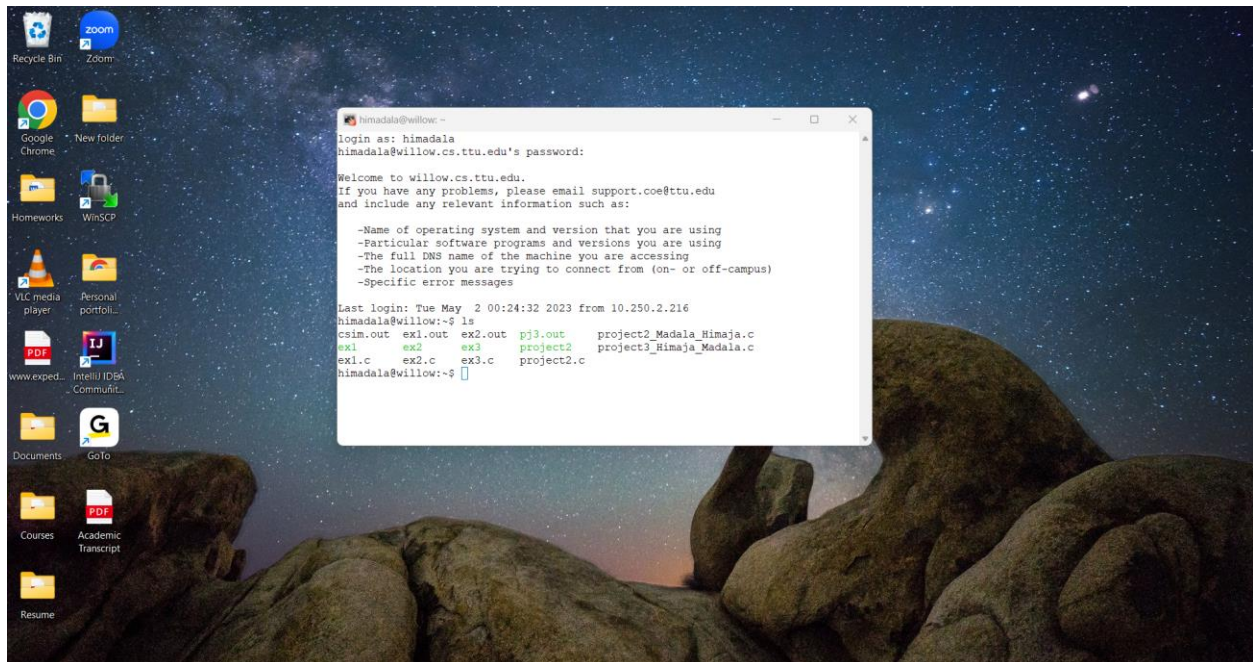
scp project3_Himaja_Madala.c himadala@willow.cs.ttu.edu:



Now, open Xming and run PuTTY.

Login to PuTTY using your credentials.

Enter the command 'ls' to see all the saved files and verify whether you can see the project code folder.

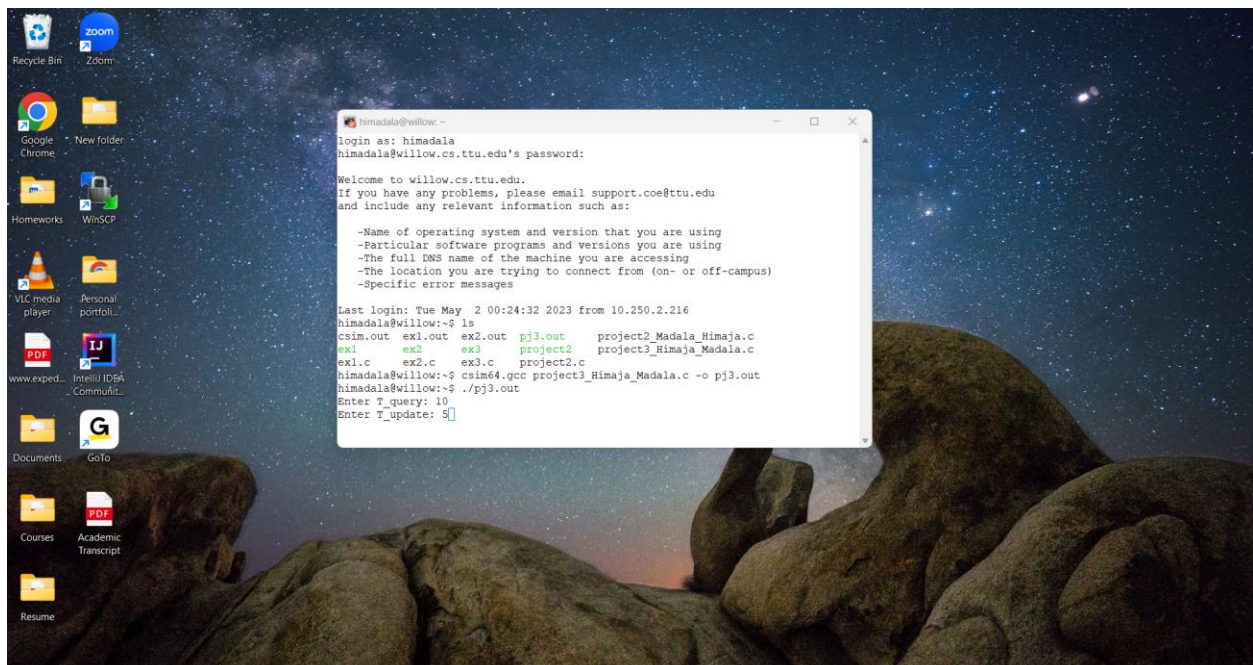


After verifying, enter the following command to compile the code: "csim64.gcc project3_Himaja_Madala.c -o pj3"

The above command also saves the output in 'pj3'

Now, in order to check the output, enter the following command: "./pj3.out"

It will then ask us to enter the T-query value and T_update.

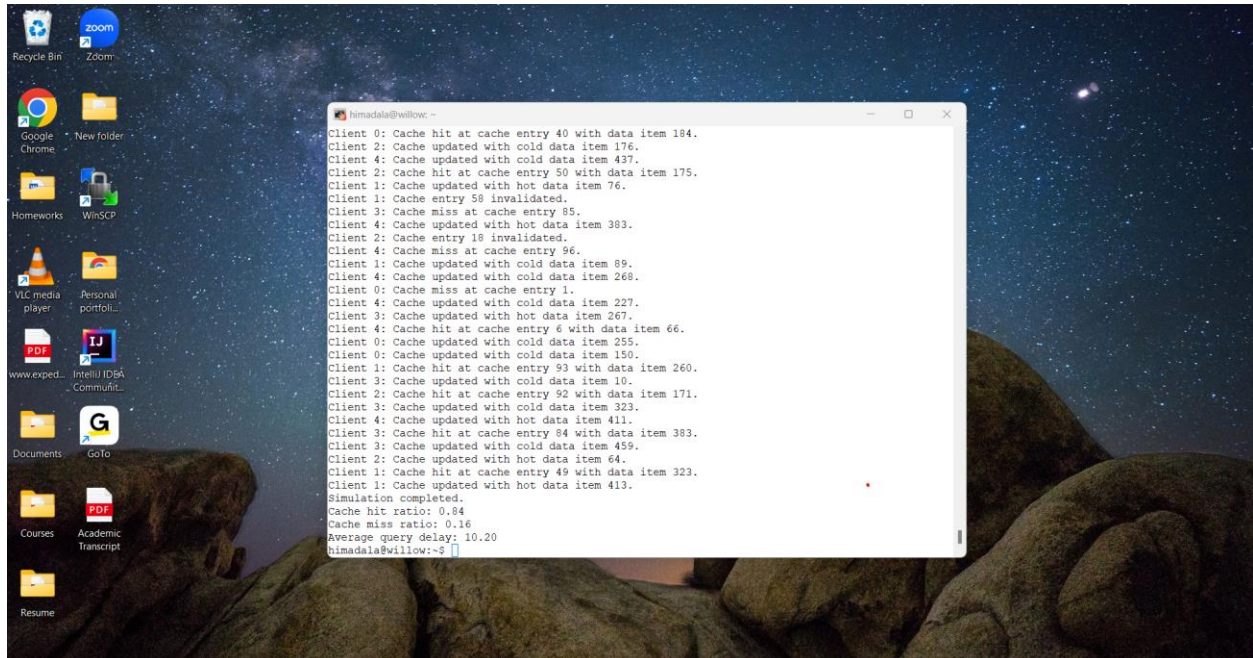


According to the project, we considered the following values for T-update while T_query being 10:

5, 10, 20, 100, 200

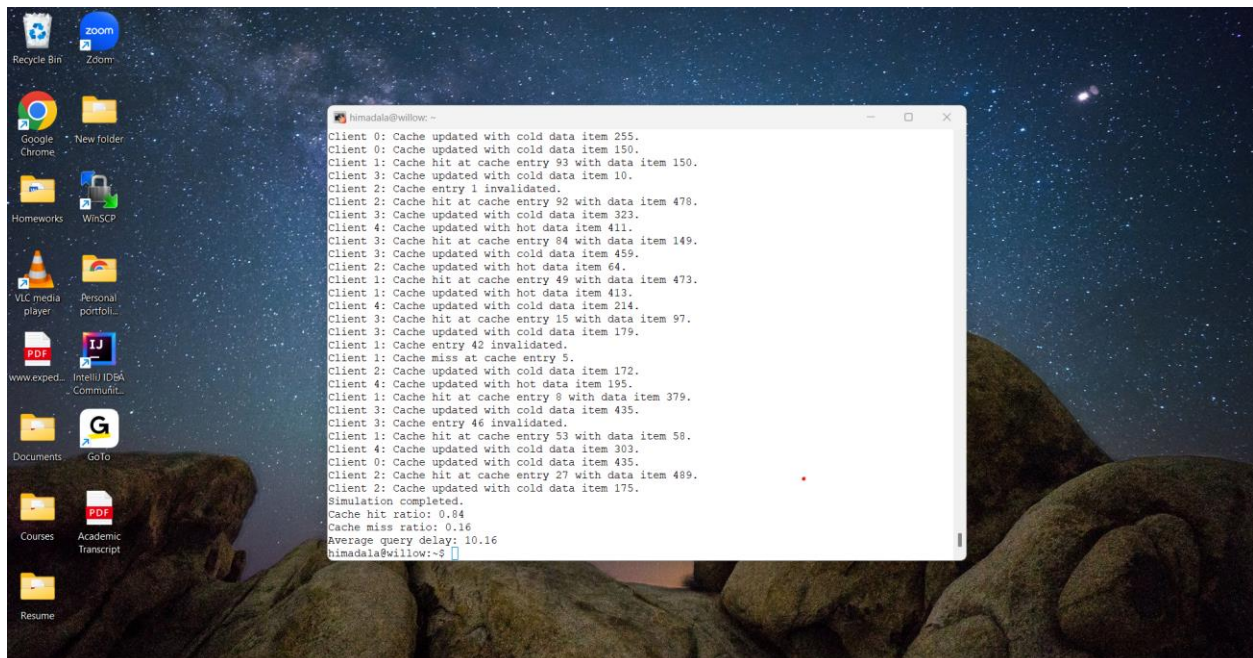
So, we should execute the command “./pj3.out” and enter the above probabilities to get cache hit ratio, cache miss ratio and average query delay.

The following are the outputs for T_query as 10 and T_update as 5.



```
himadala@willow: ~  
Client 0: Cache hit at cache entry 40 with data item 184.  
Client 2: Cache updated with cold data item 176.  
Client 4: Cache updated with cold data item 437.  
Client 2: Cache hit at cache entry 50 with data item 175.  
Client 1: Cache updated with hot data item 76.  
Client 1: Cache entry 58 invalidated.  
Client 3: Cache miss at cache entry 85.  
Client 4: Cache updated with hot data item 383.  
Client 2: Cache entry 18 invalidated.  
Client 4: Cache miss at cache entry 96.  
Client 1: Cache updated with cold data item 89.  
Client 4: Cache updated with cold data item 268.  
Client 0: Cache miss at cache entry 1.  
Client 4: Cache updated with cold data item 227.  
Client 3: Cache updated with hot data item 267.  
Client 4: Cache hit at cache entry 6 with data item 66.  
Client 0: Cache updated with cold data item 255.  
Client 0: Cache updated with cold data item 150.  
Client 1: Cache hit at cache entry 93 with data item 260.  
Client 2: Cache hit at cache entry 92 with data item 10.  
Client 3: Cache updated with cold data item 171.  
Client 4: Cache updated with hot data item 323.  
Client 3: Cache hit at cache entry 84 with data item 383.  
Client 3: Cache updated with cold data item 459.  
Client 2: Cache updated with hot data item 64.  
Client 1: Cache hit at cache entry 49 with data item 323.  
Client 1: Cache updated with hot data item 413.  
Simulation completed.  
Cache hit ratio: 0.84  
Cache miss ratio: 0.16  
Average query delay: 10.20  
himadala@willow:~$
```

The following are the outputs for T_query as 10 and T_update as 10.

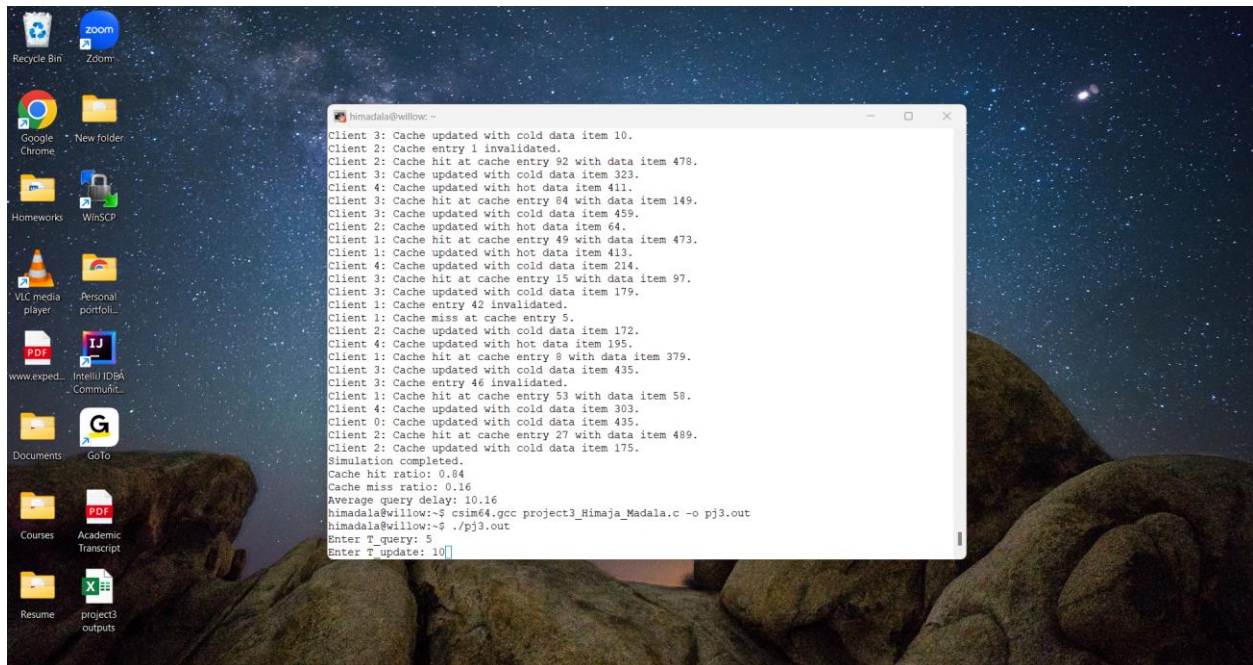


```
himadala@willow: ~  
Client 0: Cache updated with cold data item 255.  
Client 0: Cache updated with cold data item 150.  
Client 1: Cache hit at cache entry 93 with data item 150.  
Client 3: Cache updated with cold data item 10.  
Client 2: Cache entry 1 invalidated.  
Client 2: Cache hit at cache entry 92 with data item 478.  
Client 3: Cache updated with cold data item 323.  
Client 4: Cache updated with hot data item 411.  
Client 3: Cache hit at cache entry 84 with data item 149.  
Client 3: Cache updated with cold data item 459.  
Client 2: Cache updated with hot data item 64.  
Client 1: Cache hit at cache entry 49 with data item 473.  
Client 1: Cache updated with hot data item 413.  
Client 4: Cache updated with cold data item 214.  
Client 3: Cache hit at cache entry 15 with data item 97.  
Client 3: Cache updated with cold data item 179.  
Client 1: Cache entry 42 invalidated.  
Client 1: Cache miss at cache entry 5.  
Client 2: Cache updated with cold data item 172.  
Client 4: Cache updated with hot data item 195.  
Client 1: Cache hit at cache entry 9 with data item 379.  
Client 3: Cache updated with cold data item 435.  
Client 3: Cache entry 46 invalidated.  
Client 1: Cache hit at cache entry 53 with data item 58.  
Client 4: Cache updated with cold data item 303.  
Client 0: Cache updated with cold data item 435.  
Client 2: Cache hit at cache entry 27 with data item 489.  
Client 2: Cache updated with cold data item 175.  
Simulation completed.  
Cache hit ratio: 0.84  
Cache miss ratio: 0.16  
Average query delay: 10.16  
himadala@willow:~$
```


In the same way we should run the code for T_{update} as 10 and changing the values of T_{query} .

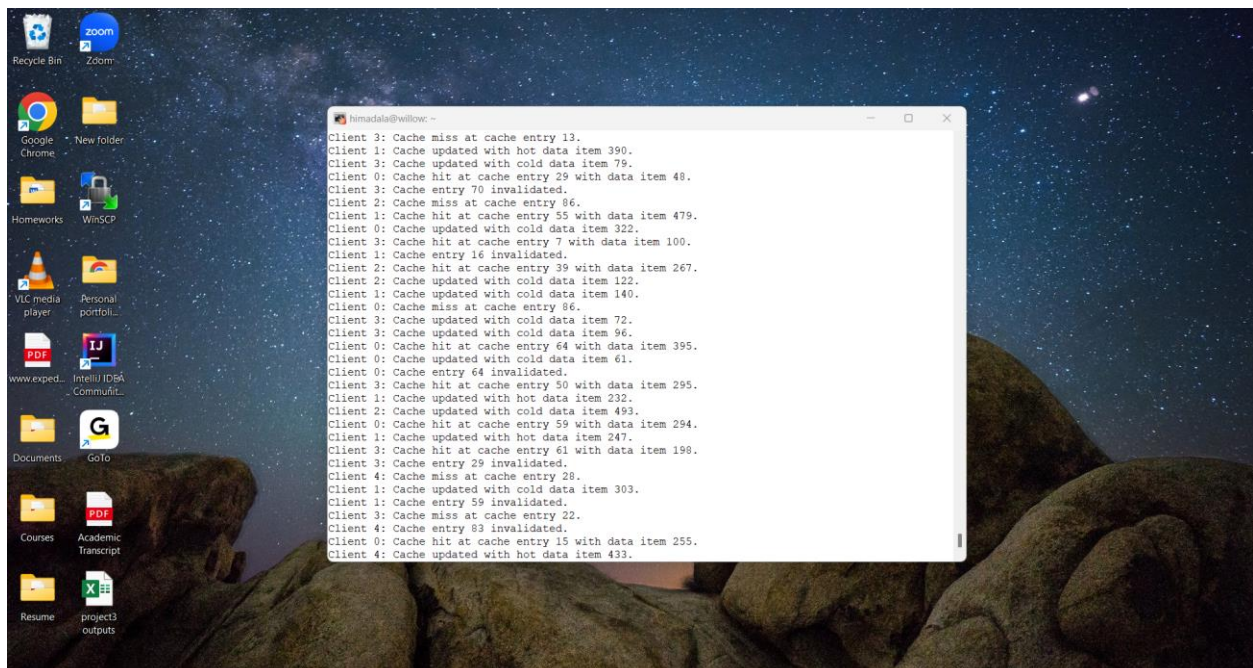
The values of T_{query} according to the project are 5, 10, 25, 50, 100

The following are the outputs for T_{query} as 5 and T_{update} as 10.



```
himadala@willow: ~  
Client 3: Cache updated with cold data item 10.  
Client 2: Cache entry 1 invalidated.  
Client 2: Cache hit at cache entry 92 with data item 478.  
Client 3: Cache updated with cold data item 323.  
Client 4: Cache updated with hot data item 411.  
Client 3: Cache hit at cache entry 84 with data item 149.  
Client 3: Cache updated with cold data item 459.  
Client 2: Cache updated with hot data item 64.  
Client 1: Cache hit at cache entry 49 with data item 473.  
Client 1: Cache updated with hot data item 413.  
Client 4: Cache updated with cold data item 214.  
Client 3: Cache hit at cache entry 15 with data item 97.  
Client 3: Cache updated with cold data item 179.  
Client 1: Cache entry 42 invalidated.  
Client 1: Cache miss at cache entry 5.  
Client 2: Cache updated with cold data item 172.  
Client 4: Cache updated with hot data item 195.  
Client 1: Cache hit at cache entry 9 with data item 379.  
Client 3: Cache updated with cold data item 435.  
Client 3: Cache entry 46 invalidated.  
Client 1: Cache hit at cache entry 53 with data item 58.  
Client 4: Cache updated with cold data item 303.  
Client 0: Cache updated with cold data item 435.  
Client 2: Cache hit at cache entry 27 with data item 489.  
Client 2: Cache updated with cold data item 175.  
Simulation completed.  
Cache hit ratio: 0.84  
Cache miss ratio: 0.16  
Average query delay: 10.16  
himadala@willow:~$ csim64.qcc project3_Himaja_Madala.c -o pj3.out  
himadala@willow:~$ ./pj3.out  
Enter T_query: 5  
Enter T_update: 10
```

The output for the above is as follows:



```
himadala@willow: ~  
Client 3: Cache miss at cache entry 13.  
Client 1: Cache updated with hot data item 390.  
Client 3: Cache updated with cold data item 79.  
Client 0: Cache hit at cache entry 29 with data item 48.  
Client 3: Cache entry 70 invalidated.  
Client 2: Cache miss at cache entry 86.  
Client 1: Cache hit at cache entry 55 with data item 479.  
Client 0: Cache updated with cold data item 322.  
Client 3: Cache hit at cache entry 7 with data item 100.  
Client 1: Cache entry 16 invalidated.  
Client 2: Cache hit at cache entry 39 with data item 267.  
Client 2: Cache updated with cold data item 122.  
Client 1: Cache updated with cold data item 140.  
Client 0: Cache miss at cache entry 86.  
Client 3: Cache updated with cold data item 72.  
Client 3: Cache updated with cold data item 96.  
Client 0: Cache hit at cache entry 64 with data item 395.  
Client 0: Cache updated with cold data item 61.  
Client 0: Cache entry 64 invalidated.  
Client 3: Cache hit at cache entry 50 with data item 295.  
Client 1: Cache updated with hot data item 232.  
Client 2: Cache updated with cold data item 493.  
Client 0: Cache hit at cache entry 59 with data item 294.  
Client 1: Cache updated with hot data item 247.  
Client 3: Cache hit at cache entry 61 with data item 198.  
Client 3: Cache entry 29 invalidated.  
Client 4: Cache miss at cache entry 28.  
Client 1: Cache updated with cold data item 303.  
Client 1: Cache entry 59 invalidated.  
Client 3: Cache miss at cache entry 22.  
Client 4: Cache entry 83 invalidated.  
Client 0: Cache hit at cache entry 15 with data item 255.  
Client 4: Cache updated with hot data item 433.
```

The following are the outputs for T_{query} as 25 and T_{update} as 10.

```

himadala@willow: ~
Client 2: Cache updated with cold data item 140.
Client 0: Cache updated with cold data item 313.
Client 0: Cache hit at cache entry 27 with data item 92.
Client 1: Cache updated with cold data item 122.
Client 2: Cache entry 81 invalidated.
Client 0: Cache hit at cache entry 64 with data item 113.
Client 0: Cache updated with hot data item 390.
Client 1: Cache updated with cold data item 437.
Client 2: Cache hit at cache entry 31 with data item 483.
Client 1: Cache updated with cold data item 445.
Client 0: Cache updated with hot data item 323.
Client 2: Cache hit at cache entry 93 with data item 158.
Client 3: Cache updated with hot data item 195.
Client 0: Cache updated with cold data item 132.
Client 1: Cache hit at cache entry 18 with data item 489.
Client 0: Cache updated with cold data item 227.
Client 2: Cache entry 72 invalidated.
Client 3: Cache hit at cache entry 63 with data item 99.
Client 1: Cache updated with cold data item 40.
Client 0: Cache updated with hot data item 195.
Client 0: Cache hit at cache entry 2 with data item 281.
Client 0: Cache updated with hot data item 368.
Client 0: Cache entry 21 invalidated.
Client 0: Cache hit at cache entry 0 with data item 205.
Client 3: Cache updated with cold data item 252.
Client 2: Cache entry 9 invalidated.
Client 0: Cache hit at cache entry 44 with data item 119.
Client 1: Cache updated with cold data item 201.
Simulation completed.
Cache hit ratio: 0.83
Cache miss ratio: 0.17
Average query delay: 26.82
himadala@willow:~$

```

The following table shows the values for T_{query} as 10 and changing the values for T_{update}

T_{query}	T_{update}	Cache hit ratio	Cache miss ratio	Avg query delay
10	5	0.84	0.16	10.20
10	10	0.84	0.16	10.16
10	20	0.76	0.24	10.28
10	100	0.65	0.35	9.92
10	200	0.66	0.34	9.84

The following table shows the values for T_{update} as 10 and changing the values for T_{query}

T_{query}	T_{update}	Cache hit ratio	Cache miss ratio	Avg query delay
5	10	0.77	0.23	5.10
10	10	0.84	0.16	10.16
25	10	0.83	0.17	26.82
50	10	0.81	0.19	52.86
100	10	0.81	0.19	104.83

The following are the graphs

