1 Load Balancing Output


```
[abhi@localhost src]$ python server.py --is_leader_election False --is_clock_sync False --is_raffle False
cmdargs, is_leader_election False
dispatcher leader election False
Starting server 0 at  127.0.0.1 10000
Starting server 1 at  127.0.0.1 10001
Running Front End HTTP Server
Press CTRL+C to exit
127.0.0.1 - - [04/Apr/2018 00:08:39] "GET /getMedalTally/Gaul HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:39] "GET /getMedalTally/Rome HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:39] "GET /getScore/Luge HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:39] "GET /getScore/Stone%20Curling HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:39] "GET /getScore/Stone%20Skating HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:44] "GET /getMedalTally/Gaul HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:44] "GET /getMedalTally/Rome HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:44] "GET /getScore/Luge HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:44] "GET /getScore/Stone%20Curling HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:08:44] "GET /getScore/Stone%20Skating HTTP/1.1" 200 -
```

Figure 1: Dispatcher and server working


```
[abhi@localhost src]$ python database_server.py --is_leader_election False --is_clock_sync False
Running Database Server HTTP Server
Press CTRL+C to exit
127.0.0.1 - - [04/Apr/2018 00:06:28] "GET /query_medal_tally_by_team/Gaul HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:28] "GET /query_medal_tally_by_team/Rome HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:28] "GET /query_score_by_game/Luge HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:28] "GET /query_score_by_game/Stone%20Curling HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:28] "GET /query_score_by_game/Stone%20Skating HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:30] "GET /query_medal_tally_by_team/Gaul HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:30] "GET /query_medal_tally_by_team/Rome HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:30] "GET /query_score_by_game/Luge HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:30] "GET /query_score_by_game/Stone%20Curling HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:30] "GET /query_score_by_game/Stone%20Skating HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:33] "GET /query_medal_tally_by_team/Gaul HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:33] "GET /query_medal_tally_by_team/Rome HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:33] "GET /query_score_by_game/Luge HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:33] "GET /query_score_by_game/Stone%20Curling HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:33] "GET /query_score_by_game/Stone%20Skating HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:34] "GET /query_medal_tally_by_team/Gaul HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:34] "GET /query_medal_tally_by_team/Rome HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:34] "GET /query_score_by_game/Luge HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:34] "GET /query_score_by_game/Stone%20Curling HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:34] "GET /query_score_by_game/Stone%20Skating HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:38] "GET /query_medal_tally_by_team/Gaul HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:06:38] "GET /query_medal_tally_by_team/Rome HTTP/1.1" 200 -
```

Figure 2: Database server working

```
[abhi@localhost src]$ python client_pull.py --dispatcher_ip_addr 127.0.0.1
Getting Medal Tally for-----------------
 Gaul
Select from following choices:
Getting server

1. getMedalTally
2. getScore
Enter Choice (1 or 2):Server Address obtained http://127.0.0.1:10000
Medals and Timestamps:
Bronze =  0 last updated at Wed Dec 31 19:00:00 1969
Silver =  0 last updated at Wed Dec 31 19:00:00 1969
Gold =  0 last updated at Wed Dec 31 19:00:00 1969
Getting Medal Tally for Rome
Medals and Timestamps:
Bronze =  0 last updated at Wed Dec 31 19:00:00 1969
Silver =  0 last updated at Wed Dec 31 19:00:00 1969
Gold =  0 last updated at Wed Dec 31 19:00:00 1969
```

Figure 3: Client connected to server 0


```
[abhi@localhost src]$ python client_pull.py --dispatcher_ip_addr 127.0.0.
Getting Medal Tally for-----------------
Select from following choices:

1. getMedalTally
 Gaul2. getScore
Enter Choice (1 or 2):
Getting server
Server Address obtained http://127.0.0.1:10001
Medals and Timestamps:
Bronze =  0 last updated at Wed Dec 31 19:00:00 1969
Silver =  0 last updated at Wed Dec 31 19:00:00 1969
Gold =  0 last updated at Wed Dec 31 19:00:00 1969
Getting Medal Tally for Rome
Medals and Timestamps:
Bronze =  0 last updated at Wed Dec 31 19:00:00 1969
Silver =  0 last updated at Wed Dec 31 19:00:00 1969
Gold =  0 last updated at Wed Dec 31 19:00:00 1969
Getting Score for Luge
Score:
Gaul : 0 last updated at Wed Dec 31 19:00:00 1969
Rome : 0 last updated at Wed Dec 31 19:00:00 1969
Getting Score for Stone Curling
```

Figure 4: Client connected to server 1

2 Raffle Winner Working

```
[u'127.0.0.1:10001', u'127.0.0.1:10000']
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastAck/50/0/45/127.0.0.1:6001 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastMsg/51/0/49 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastMsg/52/0/49 HTTP/1.1" 200 -
recevied multicast message at 0recevied multicast message at  491 0  <Thread(Thread-82, started 1
49 0 <Thread(Thread-81, started 139990231152384)>
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /getScore/Stone%20Skating HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastAck/53/0/49/127.0.0.1:6001 HTTP/1.1" 200 -
[u'127.0.0.1:10001', u'127.0.0.1:10000']
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastAck/54/0/49/127.0.0.1:6001 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastMsg/56/0/54 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastMsg/57/0/54 HTTP/1.1" 200 -
recevied multicast message at 1 54 0 <Thread(Thread-90, started 139990197581568)>
recevied multicast message at 0 54 0 <Thread(Thread-91, started 139990214366976)>
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastAck/59/0/54/127.0.0.1:6001 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 23:52:22] "GET /multicastAck/58/0/54/127.0.0.1:6001 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 23:52:23] "GET /chooseRaffleWinner/0.301783 HTTP/1.1" 200 -
Winner of Raffle is (0, 1)
```

Figure 5: Raffle Winner

3   Clock Synchronization

```
[abhi@guest2-011 COMPSCI677]$ python -m lab2.test.clock_sync_test
dispatcher leader election False
Starting server 0 at  127.0.0.1 6000
Enabling Clock Synchronization
Starting server 1 at  127.0.0.1 6001
Enabling Clock Synchronization
get all servers 127.0.0.1:5000
127.0.0.1 - - [03/Apr/2018 22:40:08] "GET /getAllServers/ HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:08] "GET /getClock/8 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:08] "GET /getClock/8 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:08] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6001  =  -8 changing offset with =  -4
127.0.0.1 - - [03/Apr/2018 22:40:08] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6000  =  -12 changing offset with =  -4
127.0.0.1 - - [03/Apr/2018 22:40:08] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:4001  =  -6 changing offset with =  -4
All slaves changed with offset -4
127.0.0.1 - - [03/Apr/2018 22:40:09] "GET /getClock/-12 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:09] "GET /getClock/-12 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:09] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6001  =  11 changing offset with =  3
127.0.0.1 - - [03/Apr/2018 22:40:09] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6000  =  15 changing offset with =  3
127.0.0.1 - - [03/Apr/2018 22:40:09] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:4001  =  9 changing offset with =  3
All slaves changed with offset 3
127.0.0.1 - - [03/Apr/2018 22:40:10] "GET /getClock/15 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:10] "GET /getClock/15 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:10] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6001  =  -15 changing offset with =  -4
127.0.0.1 - - [03/Apr/2018 22:40:10] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6000  =  -19 changing offset with =  -4
127.0.0.1 - - [03/Apr/2018 22:40:10] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:4001  =  -13 changing offset with =  -4
All slaves changed with offset -4
```

Figure 6: Clock Syncronization Start

```
127.0.0.1 - - [03/Apr/2018 22:40:16] "GET /getClock/-33 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:16] "GET /getClock/-33 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:16] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6001  =  32 changing offset with =  3
127.0.0.1 - - [03/Apr/2018 22:40:16] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6000  =  36 changing offset with =  3
127.0.0.1 - - [03/Apr/2018 22:40:16] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:4001  =  30 changing offset with =  3
All slaves changed with offset 3
127.0.0.1 - - [03/Apr/2018 22:40:17] "GET /getClock/36 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:17] "GET /getClock/36 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:17] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6001  =  -36 changing offset with =  -4
127.0.0.1 - - [03/Apr/2018 22:40:17] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6000  =  -40 changing offset with =  -4
127.0.0.1 - - [03/Apr/2018 22:40:17] "GET /setClock/-4 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:4001  =  -34 changing offset with =  -4
All slaves changed with offset -4
127.0.0.1 - - [03/Apr/2018 22:40:18] "GET /getClock/-40 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:18] "GET /getClock/-40 HTTP/1.1" 200 -
127.0.0.1 - - [03/Apr/2018 22:40:18] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6001  =  39 changing offset with =  3
127.0.0.1 - - [03/Apr/2018 22:40:18] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:6000  =  43 changing offset with =  3
127.0.0.1 - - [03/Apr/2018 22:40:18] "GET /setClock/3 HTTP/1.1" 200 -
Setting new time offset of 127.0.0.1:4001  =  37 changing offset with =  3
All slaves changed with offset 3
shutdown server ('', 6000)
shutdown server ('', 6001)
.
----------------------------------------------------------------------
Ran 1 test in 11.290s

OK
```

Figure 7: Clock Synchronization End

4 Leader Election

```
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /getAllServers/ HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /getAllServers/ HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /getLeaderElectionLock HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /getLeaderElectionLock HTTP/1.1" 200 -
start new election  127.0.0.1:10001
newelection next_server 127.0.0.1:10000
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /passElection/127.0.0.1:10001/0 HTTP/1.1" 200
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /getAllServers/ HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /passElection/127.0.0.1:10001/127.0.0.1:10000/
127.0.0.1 - - [04/Apr/2018 00:14:14] "GET /releaseLeaderElectionLock HTTP/1.1" 200 -
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /getLeaderElectionLock HTTP/1.1" 200 -
start new election  127.0.0.1:10000
newelection next_server 127.0.0.1:8000
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /passElection/127.0.0.1:10000/127.0.0.1:8000/0
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /passElection/127.0.0.1:10000/127.0.0.1:8000/1
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /releaseLeaderElectionLock HTTP/1.1" 200 -
I am the leader 127.0.0.1:10000
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /getLeaderElectionLock HTTP/1.1" 200 -
start new election  127.0.0.1:10001
newelection next_server 127.0.0.1:10000
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /passElection/127.0.0.1:10001/0 HTTP/1.1" 200
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /passElection/127.0.0.1:10001/127.0.0.1:10000/
127.0.0.1 - - [04/Apr/2018 00:14:20] "GET /releaseLeaderElectionLock HTTP/1.1" 200 -
```

Figure 8: Leader Election