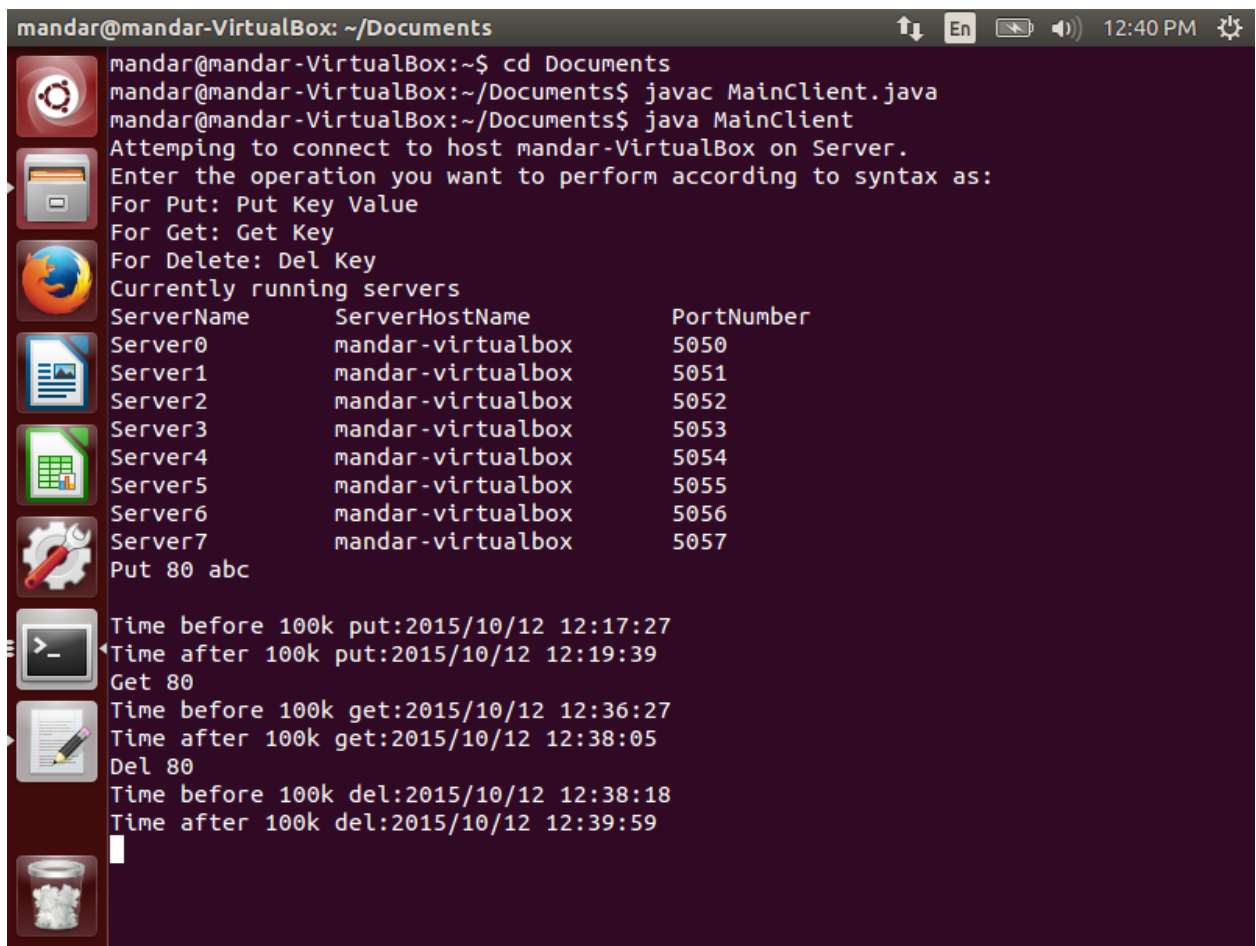


## Evaluation

- In order to evaluate the DHT system, messages of total size 1020 bytes were created (Key of 20 bytes and Value of 1000 bytes).
- Evaluation folder contains all programs modified for carrying out testing.
- To create Values of 1000 bytes a random string builder function was called.
- An array Testkeyarr stored 100k keys and array Testvaluearr stored 100k values.
- For 100k requests coming for each command here 100k times socket connection is created after finding the location of server. Results are based on this implementation.
- Running 1 Client for 100k put, 100kget, 100k del commands:



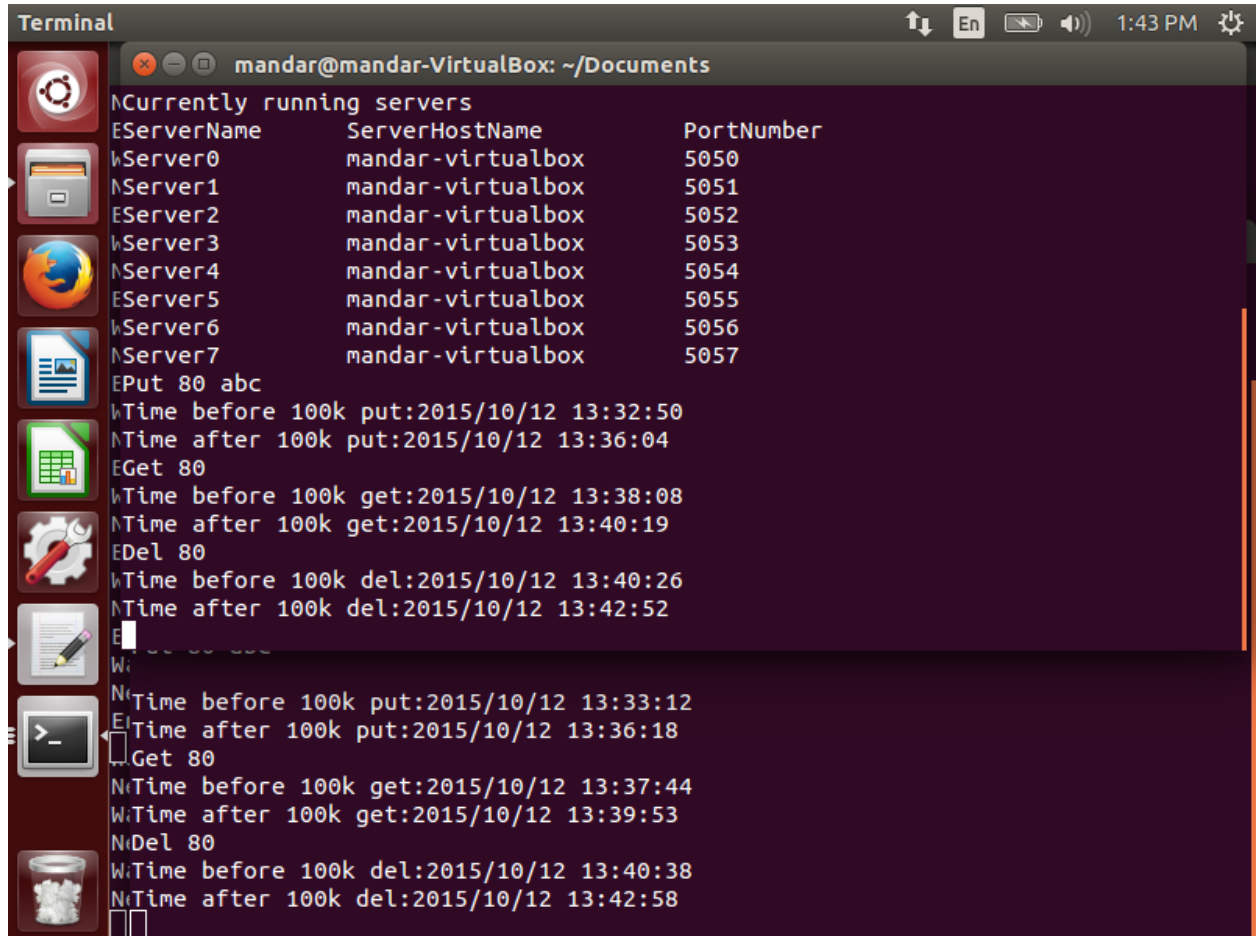
```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox    5050
Server1         mandar-virtualbox    5051
Server2         mandar-virtualbox    5052
Server3         mandar-virtualbox    5053
Server4         mandar-virtualbox    5054
Server5         mandar-virtualbox    5055
Server6         mandar-virtualbox    5056
Server7         mandar-virtualbox    5057
Put 80 abc
Time before 100k put:2015/10/12 12:17:27
Time after 100k put:2015/10/12 12:19:39
Get 80
Time before 100k get:2015/10/12 12:36:27
Time after 100k get:2015/10/12 12:38:05
Del 80
Time before 100k del:2015/10/12 12:38:18
Time after 100k del:2015/10/12 12:39:59
```

Time taken for 100k put messages each of size 1024 bytes = 132 sec.

Time taken for 100k get messages each of size 1024 bytes = 98 sec.

Time taken for 100k del messages each of size 1024 bytes = 101 sec.

- 2 clients running concurrently for 100k put, 100k get and 100k del commands:



The terminal window displays the following output:

```

Currently running servers
EServerName      ServerHostName      PortNumber
WServer0         mandar-virtualbox    5050
NServer1         mandar-virtualbox    5051
EServer2         mandar-virtualbox    5052
WServer3         mandar-virtualbox    5053
NServer4         mandar-virtualbox    5054
EServer5         mandar-virtualbox    5055
WServer6         mandar-virtualbox    5056
NServer7         mandar-virtualbox    5057

EPut 80 abc
WTime before 100k put:2015/10/12 13:32:50
NTime after 100k put:2015/10/12 13:36:04
EGet 80
WTime before 100k get:2015/10/12 13:38:08
NTime after 100k get:2015/10/12 13:40:19
EDel 80
WTime before 100k del:2015/10/12 13:40:26
NTime after 100k del:2015/10/12 13:42:52

E
W
N
WTime before 100k put:2015/10/12 13:33:12
E
NTime after 100k put:2015/10/12 13:36:18
WGet 80
NTime before 100k get:2015/10/12 13:37:44
WTime after 100k get:2015/10/12 13:39:53
NDel 80
WTime before 100k del:2015/10/12 13:40:38
NTime after 100k del:2015/10/12 13:42:58
  
```

For client1:

100k put: 194 sec.

100k get: 131 sec.

100k del: 146 sec.

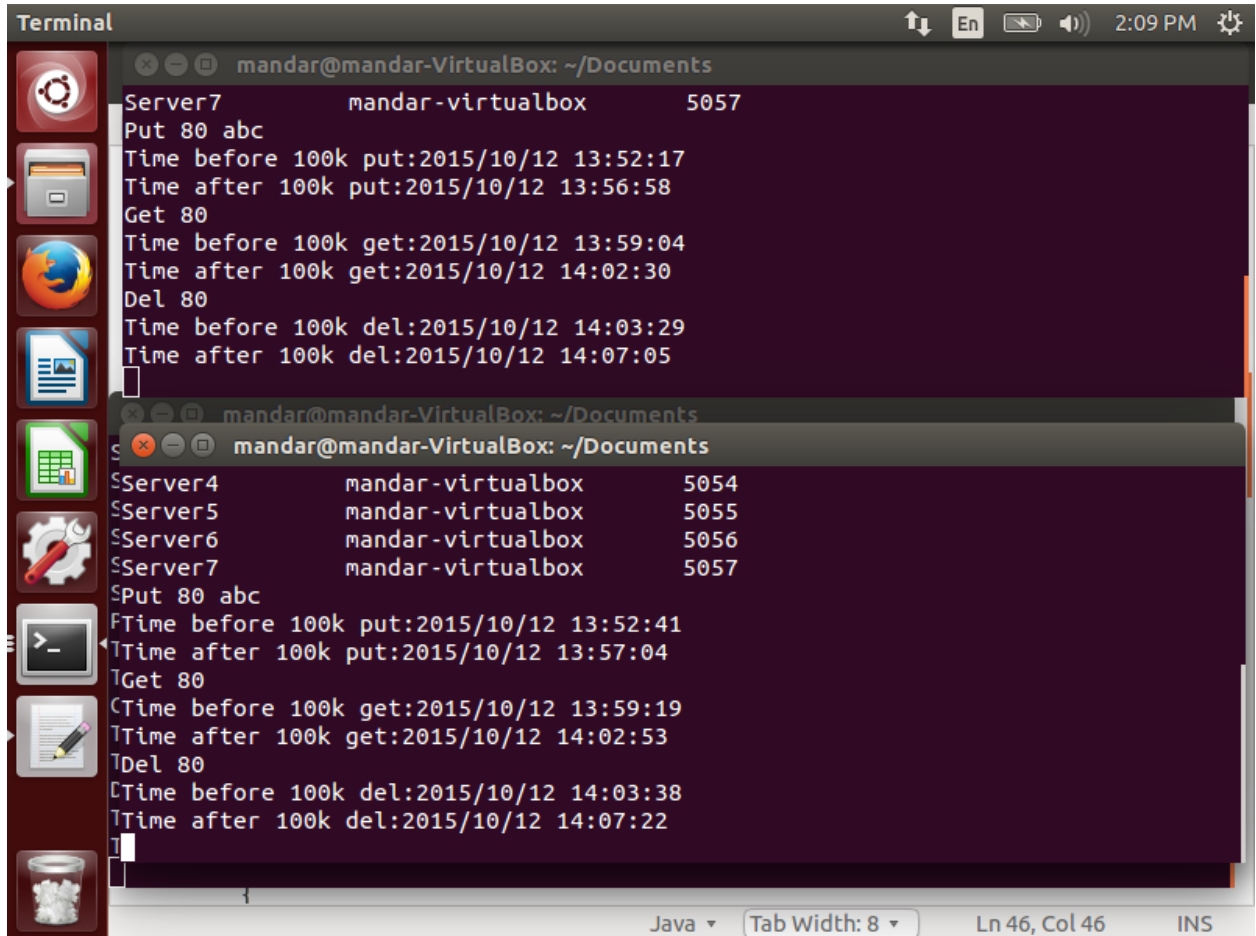
For client2:

100k put: 186 sec.

100k get: 129 sec.

100k del: 137 sec.

- 4 clients running concurrently performing 100k put, 100k get and 100k del:



```
Terminal
mandar@mandar-VirtualBox: ~/Documents
Server7      mandar-virtualbox      5057
Put 80 abc
Time before 100k put:2015/10/12 13:52:17
Time after 100k put:2015/10/12 13:56:58
Get 80
Time before 100k get:2015/10/12 13:59:04
Time after 100k get:2015/10/12 14:02:30
Del 80
Time before 100k del:2015/10/12 14:03:29
Time after 100k del:2015/10/12 14:07:05

S
mandar@mandar-VirtualBox: ~/Documents
Server4      mandar-virtualbox      5054
Server5      mandar-virtualbox      5055
Server6      mandar-virtualbox      5056
Server7      mandar-virtualbox      5057
SPut 80 abc
Time before 100k put:2015/10/12 13:52:41
Time after 100k put:2015/10/12 13:57:04
TGet 80
Time before 100k get:2015/10/12 13:59:19
Time after 100k get:2015/10/12 14:02:53
TDel 80
Time before 100k del:2015/10/12 14:03:38
Time after 100k del:2015/10/12 14:07:22
T
```

Java ▾ Tab Width: 8 ▾ Ln 46, Col 46 INS

```
Terminal
mandar@mandar-VirtualBox: ~/Documents
Server7      mandar-virtualbox      5057
Put 80 abc
Time before 100k put:2015/10/12 13:52:17
Time after 100k put:2015/10/12 13:56:58
Get 80
Time before 100k get:2015/10/12 13:59:04
Time after 100k get:2015/10/12 14:02:30
Del 80
Time before 100k del:2015/10/12 14:03:29
Time after 100k del:2015/10/12 14:07:05

mandar@mandar-VirtualBox: ~/Documents
Server2      mandar-virtualbox      5052
Server3      mandar-virtualbox      5053
Server4      mandar-virtualbox      5054
Server5      mandar-virtualbox      5055
Server6      mandar-virtualbox      5056
Server7      mandar-virtualbox      5057
Put 80 abc
Time before 100k put:2015/10/12 13:51:55
Time after 100k put:2015/10/12 13:56:46
Get 80
Time before 100k get:2015/10/12 13:59:30
Time after 100k get:2015/10/12 14:03:03
Del 80
Time before 100k del:2015/10/12 14:03:47
Time after 100k del:2015/10/12 14:07:32

Java ▾ Tab Width: 8 ▾ Ln 46, Col 46 INS
```

When 4 clients are running concurrently,  
avg response time for 100k put per client = 280 sec.  
avg response time for 100k get per client = 264 sec.  
avg response time for 100k del per client = 225 sec.

- 8 concurrent client for 100k put, 100k get and 100k del each message of size 1024 bytes.

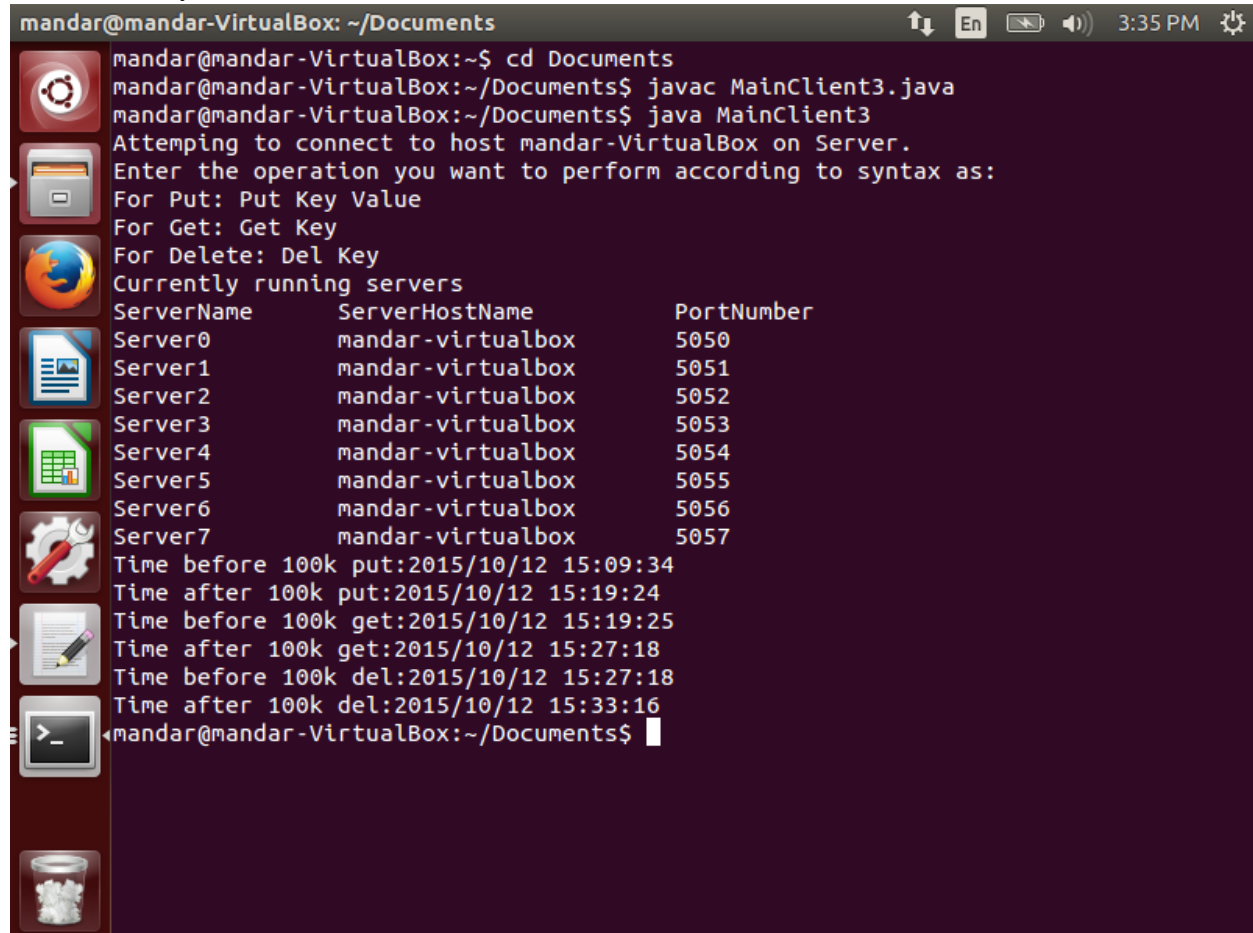
❖ Time taken by client1:

```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient1.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient1
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox    5050
Server1         mandar-virtualbox    5051
Server2         mandar-virtualbox    5052
Server3         mandar-virtualbox    5053
Server4         mandar-virtualbox    5054
Server5         mandar-virtualbox    5055
Server6         mandar-virtualbox    5056
Server7         mandar-virtualbox    5057
Time before 100k put:2015/10/12 15:10:39
Time after 100k put:2015/10/12 15:20:28
Time before 100k get:2015/10/12 15:20:28
Time after 100k get:2015/10/12 15:28:11
Time before 100k del:2015/10/12 15:28:11
Time after 100k del:2015/10/12 15:33:35
mandar@mandar-VirtualBox:~/Documents$
```

❖ Time taken by client2:

```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient2.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient2
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox   5050
Server1         mandar-virtualbox   5051
Server2         mandar-virtualbox   5052
Server3         mandar-virtualbox   5053
Server4         mandar-virtualbox   5054
Server5         mandar-virtualbox   5055
Server6         mandar-virtualbox   5056
Server7         mandar-virtualbox   5057
Time before 100k put:2015/10/12 15:10:08
Time after 100k put:2015/10/12 15:19:58
Time before 100k get:2015/10/12 15:19:58
Time after 100k get:2015/10/12 15:27:46
Time before 100k del:2015/10/12 15:27:46
Time after 100k del:2015/10/12 15:33:27
mandar@mandar-VirtualBox:~/Documents$
```

❖ Time taken by client3:

A terminal window titled 'mandar@mandar-VirtualBox: ~/Documents' with a dark background and light text. The window shows the execution of Java code to connect to a server and perform operations. The output includes a list of running servers and timing information for 100k operations.

```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient3.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient3
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox   5050
Server1         mandar-virtualbox   5051
Server2         mandar-virtualbox   5052
Server3         mandar-virtualbox   5053
Server4         mandar-virtualbox   5054
Server5         mandar-virtualbox   5055
Server6         mandar-virtualbox   5056
Server7         mandar-virtualbox   5057
Time before 100k put:2015/10/12 15:09:34
Time after 100k put:2015/10/12 15:19:24
Time before 100k get:2015/10/12 15:19:25
Time after 100k get:2015/10/12 15:27:18
Time before 100k del:2015/10/12 15:27:18
Time after 100k del:2015/10/12 15:33:16
mandar@mandar-VirtualBox:~/Documents$
```

❖ Time taken by client4:

```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient4.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient4
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox    5050
Server1         mandar-virtualbox    5051
Server2         mandar-virtualbox    5052
Server3         mandar-virtualbox    5053
Server4         mandar-virtualbox    5054
Server5         mandar-virtualbox    5055
Server6         mandar-virtualbox    5056
Server7         mandar-virtualbox    5057
Time before 100k put:2015/10/12 15:08:57
Time after 100k put:2015/10/12 15:18:42
Time before 100k get:2015/10/12 15:18:42
Time after 100k get:2015/10/12 15:26:44
Time before 100k del:2015/10/12 15:26:44
Time after 100k del:2015/10/12 15:33:00
mandar@mandar-VirtualBox:~/Documents$
```



❖ Time taken by client5

```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient5.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient5
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox    5050
Server1         mandar-virtualbox    5051
Server2         mandar-virtualbox    5052
Server3         mandar-virtualbox    5053
Server4         mandar-virtualbox    5054
Server5         mandar-virtualbox    5055
Server6         mandar-virtualbox    5056
Server7         mandar-virtualbox    5057
Time before 100k put:2015/10/12 15:08:17
Time after 100k put:2015/10/12 15:17:43
Time before 100k get:2015/10/12 15:17:43
Time after 100k get:2015/10/12 15:25:54
Time before 100k del:2015/10/12 15:25:54
Time after 100k del:2015/10/12 15:32:31
mandar@mandar-VirtualBox:~/Documents$
```

❖ Time taken by client6:

```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient6.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient6
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox    5050
Server1         mandar-virtualbox    5051
Server2         mandar-virtualbox    5052
Server3         mandar-virtualbox    5053
Server4         mandar-virtualbox    5054
Server5         mandar-virtualbox    5055
Server6         mandar-virtualbox    5056
Server7         mandar-virtualbox    5057
Time before 100k put:2015/10/12 15:07:35
Time after 100k put:2015/10/12 15:15:48
Time before 100k get:2015/10/12 15:15:48
Time after 100k get:2015/10/12 15:24:10
Time before 100k del:2015/10/12 15:24:10
Time after 100k del:2015/10/12 15:31:24
mandar@mandar-VirtualBox:~/Documents$
```

❖ Time taken by client7:

```
mandar@mandar-VirtualBox: ~/Documents
mandar@mandar-VirtualBox:~$ cd Documents
mandar@mandar-VirtualBox:~/Documents$ javac MainClient7.java
mandar@mandar-VirtualBox:~/Documents$ java MainClient7
Attempting to connect to host mandar-VirtualBox on Server.
Enter the operation you want to perform according to syntax as:
For Put: Put Key Value
For Get: Get Key
For Delete: Del Key
Currently running servers
ServerName      ServerHostName      PortNumber
Server0         mandar-virtualbox    5050
Server1         mandar-virtualbox    5051
Server2         mandar-virtualbox    5052
Server3         mandar-virtualbox    5053
Server4         mandar-virtualbox    5054
Server5         mandar-virtualbox    5055
Server6         mandar-virtualbox    5056
Server7         mandar-virtualbox    5057
Time before 100k put:2015/10/12 15:07:07
Time after 100k put:2015/10/12 15:13:14
Time before 100k get:2015/10/12 15:13:14
Time after 100k get:2015/10/12 15:22:17
Time before 100k del:2015/10/12 15:22:17
Time after 100k del:2015/10/12 15:29:49
mandar@mandar-VirtualBox:~/Documents$
```

When 8 clients are running concurrently,  
Avg response time for 100k put per client = 547 sec.  
Avg response time for 100k get per client = 541 sec.  
Avg response time for 100k del per client = 432 sec.

**NOTE:** On running 8 servers and 8 clients each in new terminal caused the system to slow down.

