Lab-2 Report

Group Members:

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Question 1:

We are using 2 laptops. 1 Lenovo laptop having Ubuntu 15.04 x86_64 architecture, 8GB RAM. The 2nd one, a DELL laptop having Ubuntu 15.04 x86_64 architecture, 4GB RAM. Our setup has both these laptops connected to a LAN.
(i) Maximum read bandwidth of the disk is 40 MB/s. This is approximately 20 requests/s.
(ii) Maximum network bandwidth is 93.3 Mbps i.e 11.67 MBps.

Question 2:

./multi-client 10.7.160.48 5000 1 120 0 random

Throughput: 5.586777 req/s
Average Response Time: 0.178994 sec

./multi-client 10.7.160.48 5000 2 120 0 random

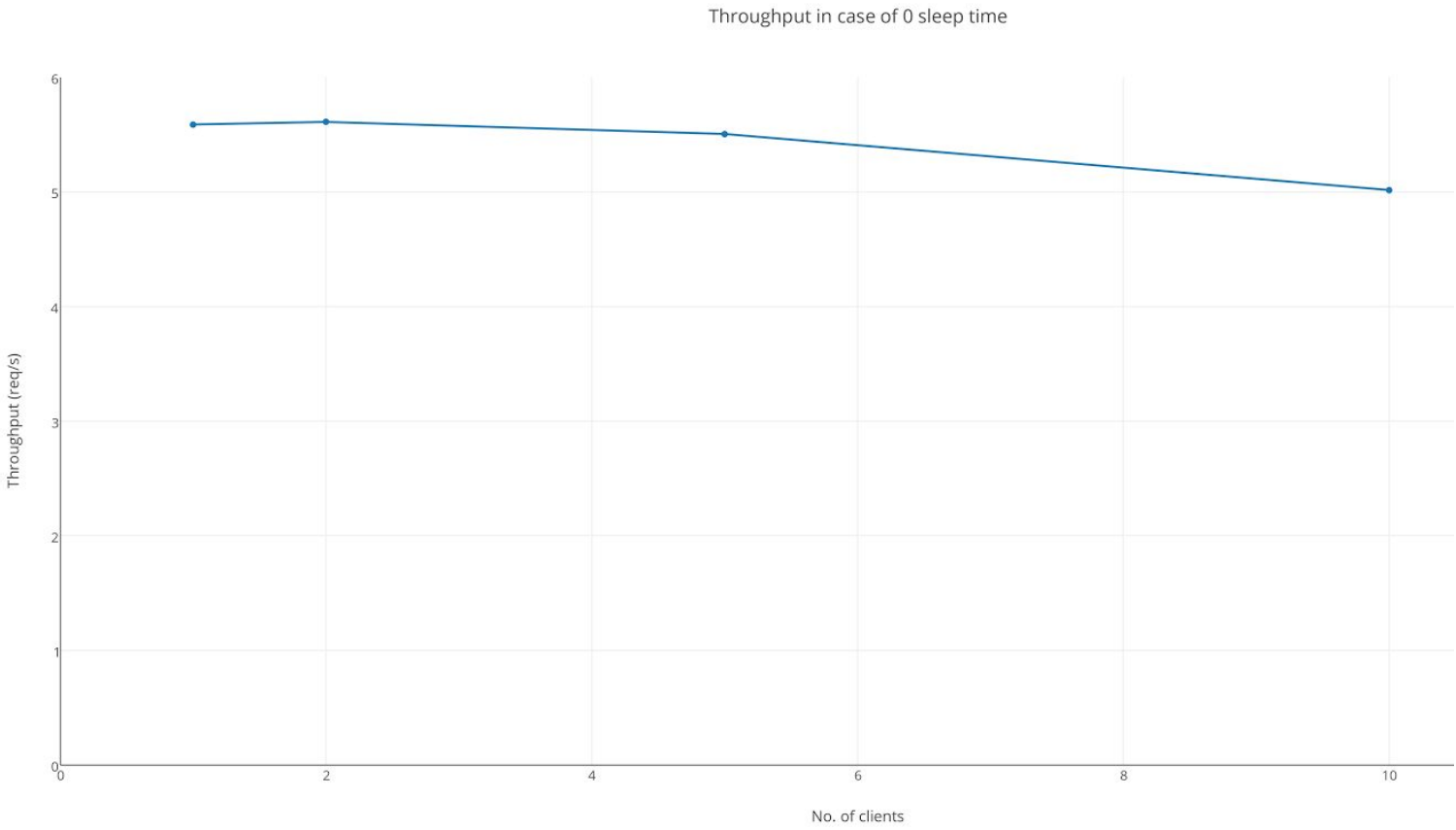
Throughput: 5.611570 req/s
Average Response Time: 0.356406 sec

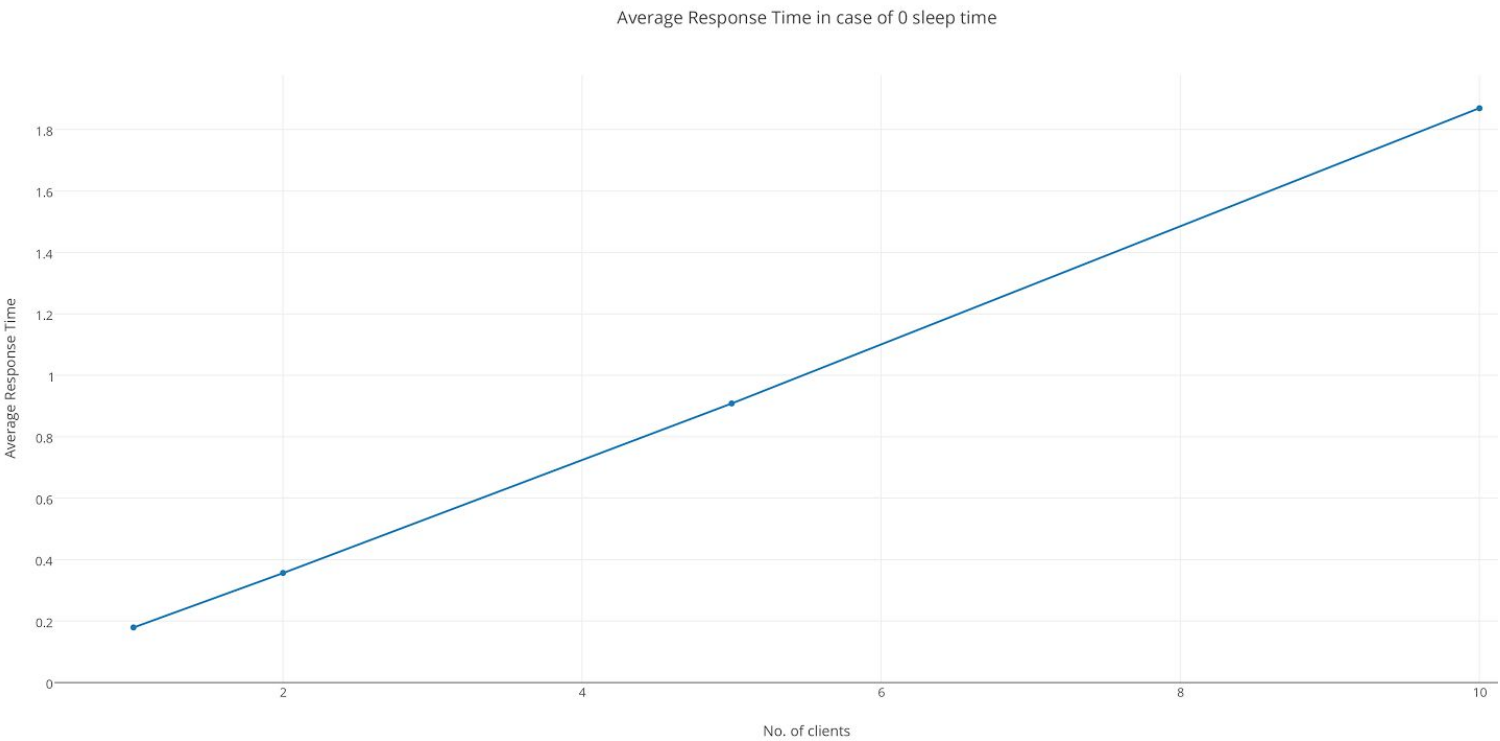
./multi-client 10.7.160.48 5000 5 120 0 random

Throughput: 5.504132 req/s
Average Response Time: 0.908408 sec

./multi-client 10.7.160.48 5000 10 120 0 random

Throughput: 5.015038 req/s
Average Response Time: 1.869565 sec


Throughput in case of 0 sleep time
Throughput (req/s)
0
1
2
3
4
5
6
0
2
4
6
8
10
No. of clients


Average Response Time in case of 0 sleep time
Average Response Time
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
4
6
8
10
No. of clients

(a) Optimal value of N is 2.
(b) The throughput is less for values of N lower or higher than the optimal value. The response time for lower N is lesser and for greater N is higher than the optimal value.
(c) The bottleneck when the server is operating at saturation is the network. At this stage, neither the server nor the client process saturates the CPU and memory. And the the throughput when multiplied by the file size gives a value which is almost equal to the bandwidth. Thus we can deduce that the bottleneck is the network.
(d) At saturation the throughput is 5.611570 req/s. When multiplied by the size of request i.e. 2MB, we get it to be 11.22314 MB/s which is roughly the same as bandwidth i.e. 11.67MB/s

Question 3:

./multi-client 10.7.160.48 5000 1 120 1 random

Throughput: 0.859504 req/s
Average Response Time: 0.173077 sec

./multi-client 10.7.160.48 5000 2 120 1 random

Throughput: 1.672131 req/s
Average Response Time: 0.200980 sec

./multi-client 10.7.160.48 5000 5 120 1 random

Throughput: 4.180328 req/s
Average Response Time: 0.198039 sec

./multi-client 10.7.160.48 5000 10 120 1 random

Throughput: 5.483607 req/s
Average Response Time: 0.831091 sec

./multi-client 10.7.160.48 5000 15 120 1 random

Throughput: 4.704545 req/s
Average Response Time: 2.109501 sec

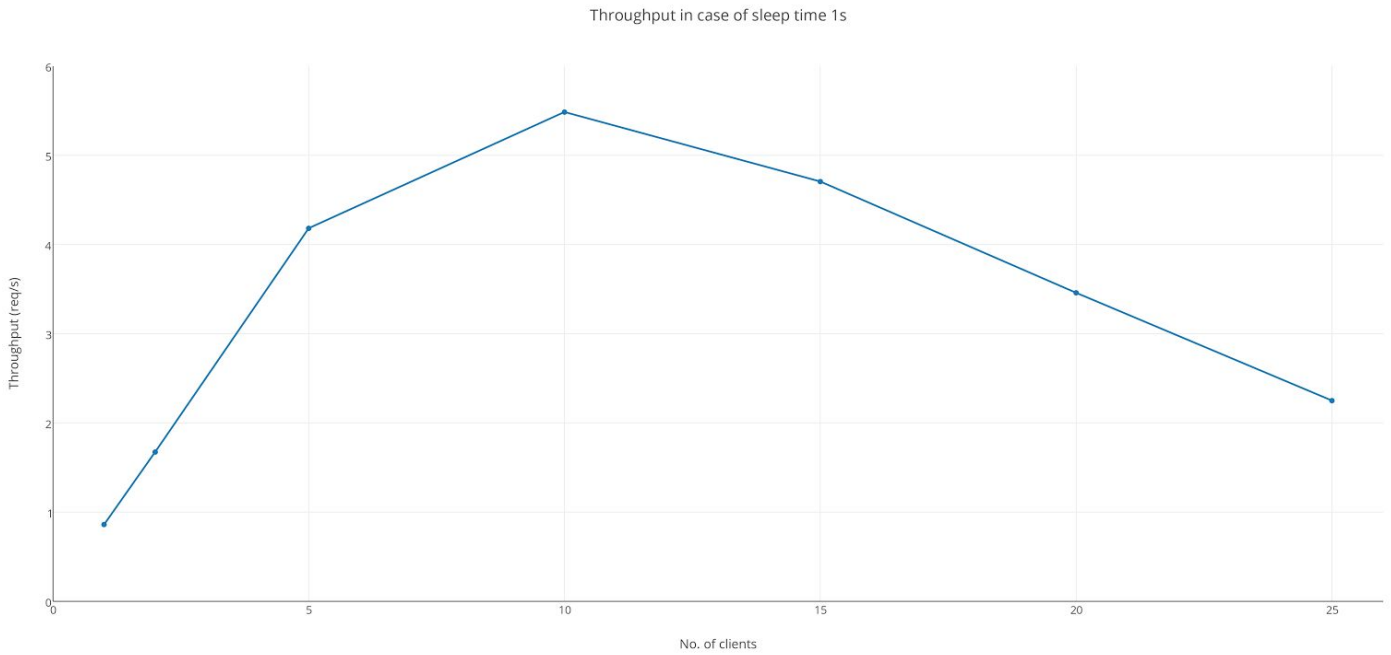
./multi-client 10.7.160.48 5000 20 120 1 random

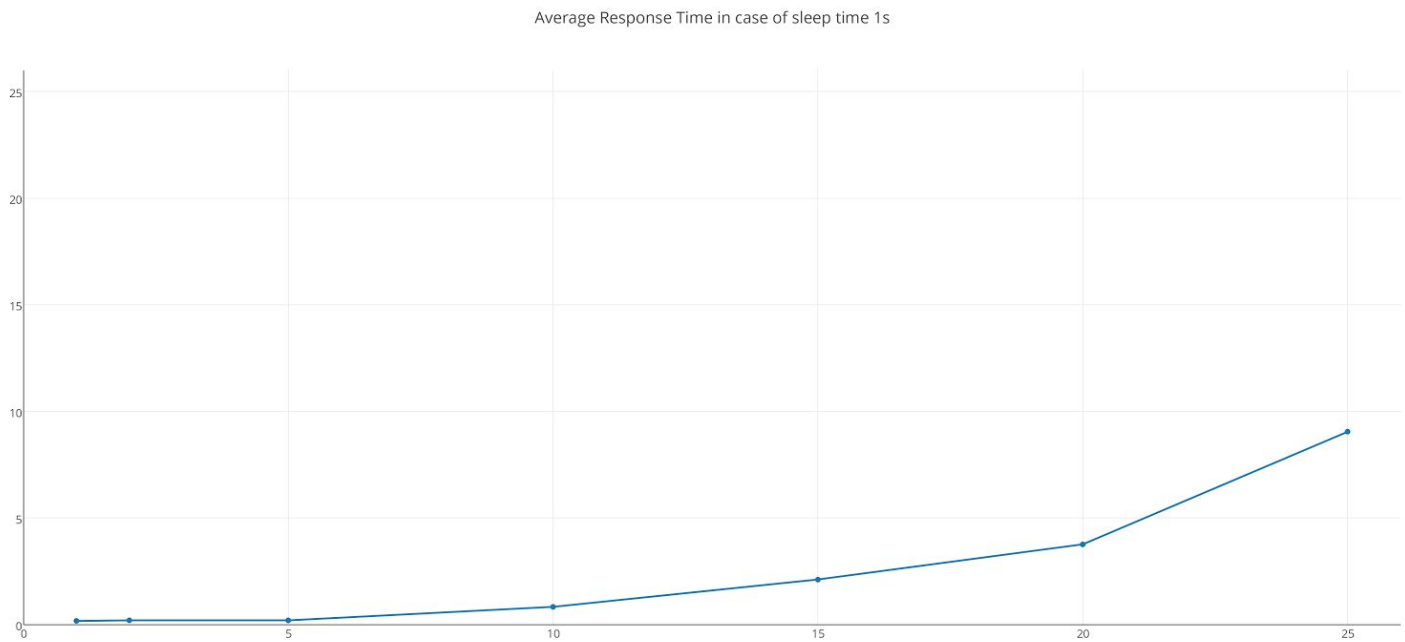
Throughput: 3.457516 req/s
Average Response Time: 3.761815 sec

./multi-client 10.7.160.48 5000 25 120 1 random

Throughput: 2.248366 req/s
Average Response Time: 9.049419 sec

(a) Optimal value of N is 10.
(b) The throughput is less for values of N lower or higher than the optimal value. The response time for lower N is lesser and for greater N is higher than the optimal value.
(c) The bottleneck when the server is operating at saturation is the network. At this stage, neither the server nor the client process saturates the CPU and memory. And the the throughput when multiplied by the file size gives a value which is almost equal to the bandwidth. Thus we can deduce that the bottleneck is the network.
(d) At saturation the throughput is 5.483607 req/s. When multiplied by the size of request i.e. 2MB, we get it to be 10.967214 MB/s which is roughly the same as bandwidth i.e. 11.67 MB/s





Question 4:

./multi-client 10.7.160.48 5000 1 120 0 fixed

Throughput: 5.677686 req/s
Average Response Time: 0.176128 sec

./multi-client 10.7.160.48 5000 2 120 0 fixed

Throughput: 5.710744 req/s
Average Response Time: 0.350217 sec

./multi-client 10.7.160.48 5000 5 120 0 fixed

Throughput: 5.727273 req/s
Average Response Time: 0.873016 sec

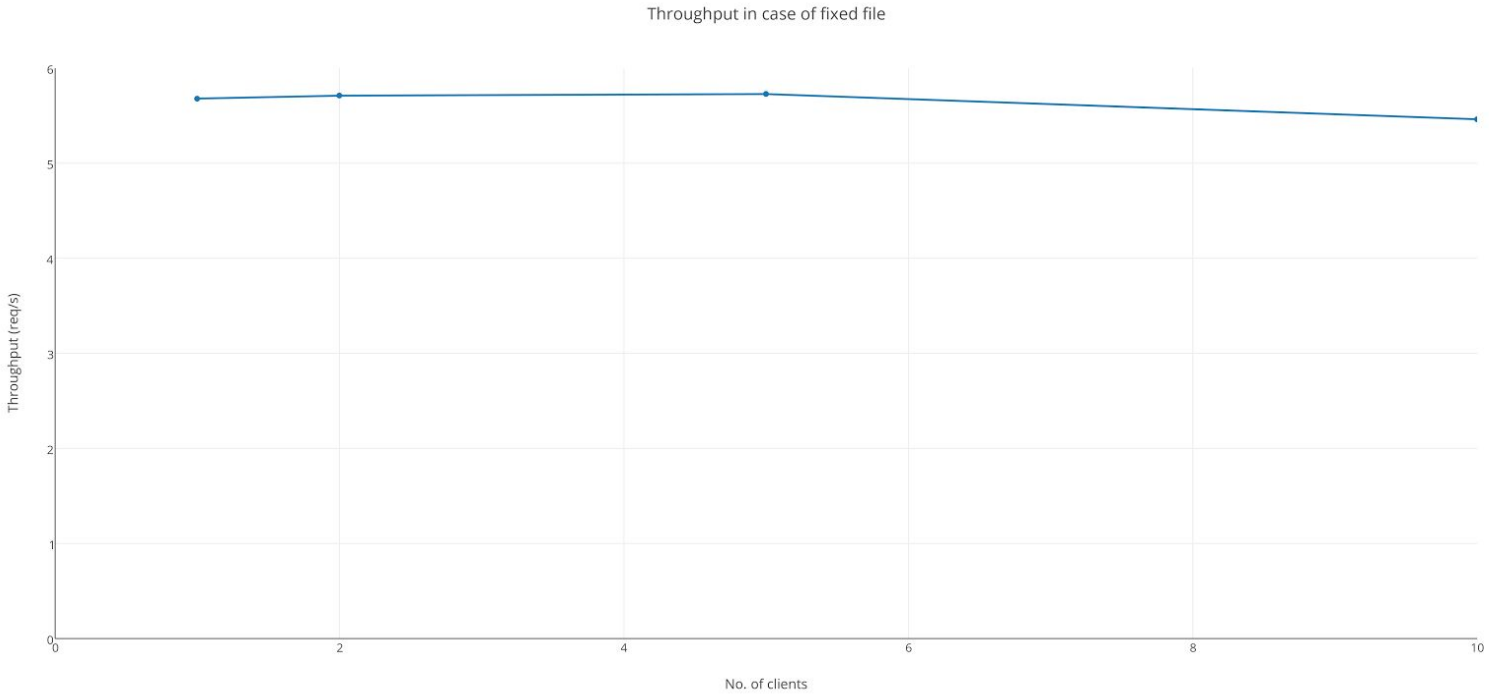
./multi-client 10.7.160.48 5000 10 120 0 fixed

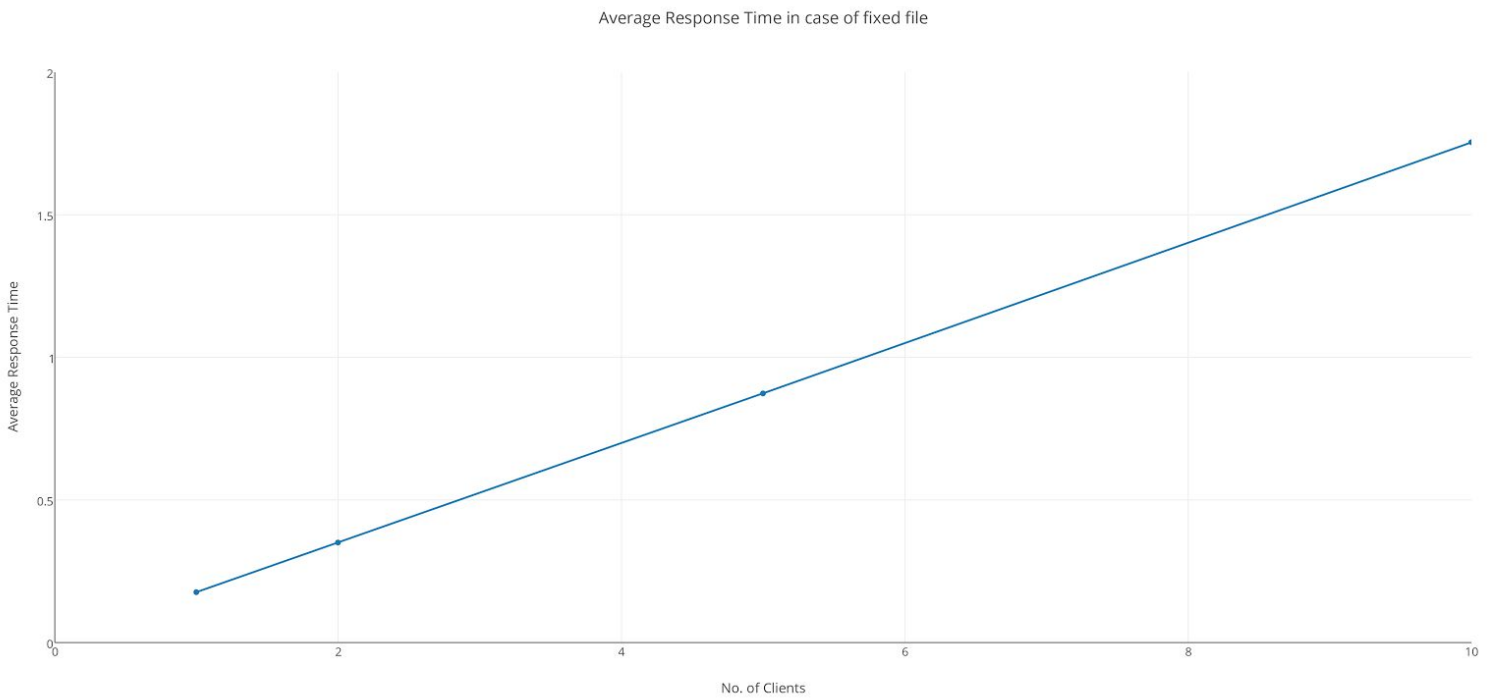
Throughput: 5.460938 req/s
Average Response Time: 1.753934 sec

(For file size ~10kB):
./multi-client 10.7.160.48 5000 1 120 0 fixed

Throughput: 89.661157 req/s
Average Response Time: 0.011153 sec

(a) Optimal value of N is 5.
(b) The throughput is less for values of N lower or higher than the optimal value. The response time for lower N is lesser and for greater N is higher than the optimal value.
(c) The bottleneck when the server is operating at saturation is the network. At this stage, neither the server nor the client process saturates the CPU and memory. And the the throughput when multiplied by the file size gives a value which is almost equal to the bandwidth. Thus we can deduce that the bottleneck is the network.
(d) At saturation the throughput is 5.727273 req/s. When multiplied by the size of request i.e. 2MB, we get it to be 11.454546 MB/s which is roughly the same as bandwidth i.e. 11.67 MB/s


Throughput in case of fixed file
Throughput (req/s)
0
1
2
3
4
5
6
0
2
4
6
8
10
No. of clients


Average Response Time in case of fixed file
Average Response Time
0
0.5
1
1.5
2
0
2
4
6
8
10
No. of Clients