

14) Download iperf in laptop/phone and make sure they are in same network. Try different iperf commands with tcp, udp, bidirectional, reverse, multicast, parallel options and analyze the bandwidth and rate of transmission, delay, jitter etc.

Using windows where I run the server and client from the same machine :

TCP:

CLIENT :

```
C:\Users\pavan\Downloads\iperf3.18_64\iperf3.18_64>iperf3 -c 127.0.0.1
Connecting to host 127.0.0.1, port 5201
[ 5] local 127.0.0.1 port 59738 connected to 127.0.0.1 port 5201
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-1.01      sec   3.97 GBytes  33.7 Gbits/sec
[ 5]  1.01-2.01      sec   3.90 GBytes  33.5 Gbits/sec
[ 5]  2.01-3.01      sec   3.95 GBytes  33.9 Gbits/sec
[ 5]  3.01-4.00      sec   3.90 GBytes  33.9 Gbits/sec
[ 5]  4.00-5.00      sec   4.15 GBytes  35.7 Gbits/sec
[ 5]  5.00-6.01      sec   3.91 GBytes  33.4 Gbits/sec
[ 5]  6.01-7.01      sec   4.21 GBytes  35.9 Gbits/sec
[ 5]  7.01-8.00      sec   4.32 GBytes  37.5 Gbits/sec
[ 5]  8.00-9.01      sec   3.41 GBytes  29.0 Gbits/sec
[ 5]  9.01-10.01     sec   3.45 GBytes  29.7 Gbits/sec
-----
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-10.01     sec   39.2 GBytes  33.6 Gbits/sec
[ 5]  0.00-10.01     sec   39.2 GBytes  33.6 Gbits/sec
iperf Done.
```

Server :

```
C:\Users\pavan\Downloads\iperf3.18_64\iperf3.18_64>iperf3 -s
-----
Server listening on 5201 (test #1)
-----
Accepted connection from 127.0.0.1, port 59737
[ 5] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59738
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-1.01      sec   3.97 GBytes  33.7 Gbits/sec
[ 5]  1.01-2.01      sec   3.90 GBytes  33.5 Gbits/sec
[ 5]  2.01-3.01      sec   3.95 GBytes  33.9 Gbits/sec
[ 5]  3.01-4.00      sec   3.90 GBytes  33.9 Gbits/sec
[ 5]  4.00-5.00      sec   4.15 GBytes  35.7 Gbits/sec
[ 5]  5.00-6.01      sec   3.91 GBytes  33.4 Gbits/sec
[ 5]  6.01-7.01      sec   4.21 GBytes  35.9 Gbits/sec
[ 5]  7.01-8.00      sec   4.32 GBytes  37.5 Gbits/sec
[ 5]  8.00-9.01      sec   3.41 GBytes  29.0 Gbits/sec
[ 5]  9.01-10.01     sec   3.45 GBytes  29.7 Gbits/sec
[ 5] 10.01-10.01     sec    128 KBytes  3.31 Gbits/sec
-----
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-10.01     sec   39.2 GBytes  33.6 Gbits/sec
receiver
```

UDP :

```
C:\Users\pavan\Downloads\iperf3.18_64\iperf3.18_64>iperf3 -c 127.0.0.1 -u -b 100M
Connecting to host 127.0.0.1, port 5201
[ 5] local 127.0.0.1 port 62105 connected to 127.0.0.1 port 5201
[ ID] Interval      Transfer    Bitrate      Total Datagrams
[ 5] 0.00-1.00 sec  11.8 MBytes 98.8 Mbits/sec 190
[ 5] 1.00-2.00 sec  11.9 MBytes 99.7 Mbits/sec 190
[ 5] 2.00-3.01 sec  12.1 MBytes 100 Mbits/sec 193
[ 5] 3.01-4.01 sec  11.9 MBytes 99.7 Mbits/sec 190
[ 5] 4.01-5.01 sec  12.1 MBytes 102 Mbits/sec 193
[ 5] 5.01-6.01 sec  11.8 MBytes 98.3 Mbits/sec 190
[ 5] 6.01-7.01 sec  11.9 MBytes 99.9 Mbits/sec 190
[ 5] 7.01-8.00 sec  11.9 MBytes 100 Mbits/sec 190
[ 5] 8.00-9.01 sec  12.1 MBytes 99.9 Mbits/sec 193
[ 5] 9.01-10.02 sec 12.0 MBytes 100 Mbits/sec 191
-----
[ ID] Interval      Transfer    Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.02 sec 119 MBytes 99.9 Mbits/sec 0.000 ms 0/1910 (0%) sender
[ 5] 0.00-10.02 sec 110 MBytes 92.2 Mbits/sec 0.154 ms 147/1910 (7.7%) receiver

iperf Done.
```

```
-----
Server listening on 5201 (test #2)
-----
Accepted connection from 127.0.0.1, port 59753
[ 5] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 62105
[ ID] Interval      Transfer    Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-1.00 sec  10.6 MBytes 88.3 Mbits/sec 0.120 ms 20/189 (11%)
[ 5] 1.00-2.00 sec  10.8 MBytes 90.8 Mbits/sec 0.139 ms 16/189 (8.5%)
[ 5] 2.00-3.01 sec  11.4 MBytes 95.1 Mbits/sec 0.058 ms 14/197 (7.1%)
[ 5] 3.01-4.01 sec  11.1 MBytes 92.9 Mbits/sec 0.135 ms 10/187 (5.3%)
[ 5] 4.01-5.01 sec  11.4 MBytes 96.1 Mbits/sec 0.100 ms 10/193 (5.2%)
[ 5] 5.01-6.01 sec  10.4 MBytes 86.9 Mbits/sec 0.136 ms 22/189 (12%)
[ 5] 6.01-7.01 sec  10.7 MBytes 90.4 Mbits/sec 0.123 ms 19/191 (9.9%)
[ 5] 7.01-8.00 sec  10.9 MBytes 91.8 Mbits/sec 0.138 ms 15/189 (7.9%)
[ 5] 8.00-9.01 sec  11.4 MBytes 94.2 Mbits/sec 0.125 ms 12/194 (6.2%)
[ 5] 9.01-10.02 sec 11.4 MBytes 95.3 Mbits/sec 0.151 ms 9/191 (4.7%)
[ 5] 10.02-10.02 sec 64.0 KBytes 523 Mbits/sec 0.154 ms 0/1 (0%)
-----
[ ID] Interval      Transfer    Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.02 sec 110 MBytes 92.2 Mbits/sec 0.154 ms 147/1910 (7.7%) receiver
```

Uses **UDP** instead of TCP.

Sends data at **100 Mbps**.

Useful for checking **packet loss** and **jitter**.

Bidirectional :

```
C:\Users\pavan\Downloads\iperf3.18_64\iperf3.18_64>iperf3 -c 127.0.0.1 --bidir
Connecting to host 127.0.0.1, port 5201
[ 5] local 127.0.0.1 port 59797 connected to 127.0.0.1 port 5201
[ 7] local 127.0.0.1 port 59798 connected to 127.0.0.1 port 5201
[ ID][Role] Interval          Transfer          Bitrate
[ 5][TX-C]  0.00-1.00    sec  4.19 GBytes  36.0 Gbits/sec
[ 7][RX-C]  0.00-1.00    sec  2.75 GBytes  23.6 Gbits/sec
[ 5][TX-C]  1.00-2.01    sec  4.16 GBytes  35.4 Gbits/sec
[ 7][RX-C]  1.00-2.01    sec  2.87 GBytes  24.4 Gbits/sec
[ 5][TX-C]  2.01-3.01    sec  4.18 GBytes  36.1 Gbits/sec
[ 7][RX-C]  2.01-3.01    sec  2.82 GBytes  24.4 Gbits/sec
[ 5][TX-C]  3.01-4.00    sec  4.24 GBytes  36.5 Gbits/sec
[ 7][RX-C]  3.01-4.00    sec  2.72 GBytes  23.4 Gbits/sec
[ 5][TX-C]  4.00-5.00    sec  4.21 GBytes  36.3 Gbits/sec
[ 7][RX-C]  4.00-5.00    sec  2.74 GBytes  23.6 Gbits/sec
[ 5][TX-C]  5.00-6.00    sec  4.13 GBytes  35.4 Gbits/sec
[ 7][RX-C]  5.00-6.00    sec  2.80 GBytes  24.0 Gbits/sec
[ 5][TX-C]  6.00-7.01    sec  4.07 GBytes  34.8 Gbits/sec
[ 7][RX-C]  6.00-7.01    sec  2.85 GBytes  24.4 Gbits/sec
[ 5][TX-C]  7.01-8.01    sec  4.11 GBytes  35.0 Gbits/sec
[ 7][RX-C]  7.01-8.01    sec  2.91 GBytes  24.8 Gbits/sec
[ 5][TX-C]  8.01-9.00    sec  2.87 GBytes  24.9 Gbits/sec
[ 7][RX-C]  8.01-9.00    sec  2.44 GBytes  21.2 Gbits/sec
[ 5][TX-C]  9.00-10.01   sec  2.94 GBytes  25.0 Gbits/sec
[ 7][RX-C]  9.00-10.01   sec  2.92 GBytes  24.8 Gbits/sec
-----
[ ID][Role] Interval          Transfer          Bitrate
[ 5][TX-C]  0.00-10.01   sec  39.1 GBytes  33.5 Gbits/sec
[ 5][TX-C]  0.00-10.01   sec  39.1 GBytes  33.5 Gbits/sec
[ 7][RX-C]  0.00-10.01   sec  27.8 GBytes  23.9 Gbits/sec
sender
receiver
sender
```

```
-----
Accepted connection from 127.0.0.1, port 59796
[ 5] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59797
[ 8] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59798
[ ID][Role] Interval          Transfer          Bitrate
[ 5][RX-S]  0.00-1.00    sec  4.19 GBytes  36.0 Gbits/sec
[ 8][TX-S]  0.00-1.00    sec  2.75 GBytes  23.6 Gbits/sec
[ 5][RX-S]  1.00-2.01    sec  4.16 GBytes  35.4 Gbits/sec
[ 8][TX-S]  1.00-2.01    sec  2.87 GBytes  24.4 Gbits/sec
[ 5][RX-S]  2.01-3.01    sec  4.18 GBytes  36.1 Gbits/sec
[ 8][TX-S]  2.01-3.01    sec  2.82 GBytes  24.4 Gbits/sec
[ 5][RX-S]  3.01-4.00    sec  4.24 GBytes  36.5 Gbits/sec
[ 8][TX-S]  3.01-4.00    sec  2.72 GBytes  23.4 Gbits/sec
[ 5][RX-S]  4.00-5.00    sec  4.21 GBytes  36.3 Gbits/sec
[ 8][TX-S]  4.00-5.00    sec  2.74 GBytes  23.6 Gbits/sec
[ 5][RX-S]  5.00-6.00    sec  4.13 GBytes  35.4 Gbits/sec
[ 8][TX-S]  5.00-6.00    sec  2.80 GBytes  24.0 Gbits/sec
[ 5][RX-S]  6.00-7.01    sec  4.07 GBytes  34.8 Gbits/sec
[ 8][TX-S]  6.00-7.01    sec  2.85 GBytes  24.4 Gbits/sec
[ 5][RX-S]  7.01-8.01    sec  4.11 GBytes  35.0 Gbits/sec
[ 8][TX-S]  7.01-8.01    sec  2.91 GBytes  24.8 Gbits/sec
[ 5][RX-S]  8.01-9.00    sec  2.87 GBytes  24.9 Gbits/sec
[ 8][TX-S]  8.01-9.00    sec  2.44 GBytes  21.2 Gbits/sec
[ 5][RX-S]  9.00-10.01   sec  2.94 GBytes  25.0 Gbits/sec
[ 8][TX-S]  9.00-10.01   sec  2.92 GBytes  24.8 Gbits/sec
[ 5][RX-S]  10.01-10.01   sec   256 KBytes  3.76 Gbits/sec
[ 8][TX-S]  10.01-10.01   sec   1.00 MBytes  15.1 Gbits/sec
-----
[ ID][Role] Interval          Transfer          Bitrate
[ 5][RX-S]  0.00-10.01   sec  39.1 GBytes  33.5 Gbits/sec
receiver
```

REVERSE MODE :

```
C:\Users\pavan\Downloads\iperf3.18_64\iperf3.18_64>iperf3 -c 127.0.0.1 -R
Connecting to host 127.0.0.1, port 5201
Reverse mode, remote host 127.0.0.1 is sending
[ 5] local 127.0.0.1 port 59834 connected to 127.0.0.1 port 5201
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-1.00      sec   4.03 GBytes   34.6 Gbits/sec
[ 5]  1.00-2.00      sec   4.07 GBytes   35.0 Gbits/sec
[ 5]  2.00-3.00      sec   4.12 GBytes   35.4 Gbits/sec
[ 5]  3.00-4.00      sec   3.92 GBytes   33.7 Gbits/sec
[ 5]  4.00-5.00      sec   4.06 GBytes   34.8 Gbits/sec
[ 5]  5.00-6.00      sec   4.00 GBytes   34.4 Gbits/sec
[ 5]  6.00-7.00      sec   3.88 GBytes   33.3 Gbits/sec
[ 5]  7.00-8.00      sec   4.10 GBytes   35.3 Gbits/sec
[ 5]  8.00-9.00      sec   2.79 GBytes   24.0 Gbits/sec
[ 5]  9.00-10.00     sec   2.96 GBytes   25.4 Gbits/sec
- - - - -
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-10.00     sec   37.9 GBytes   32.6 Gbits/sec      sender
[ 5]  0.00-10.00     sec   37.9 GBytes   32.6 Gbits/sec      receiver
```

```
C:\Users\pavan\Downloads\iperf3.18_64\iperf3.18_64>iperf3 -c 127.0.0.1 -R
Connecting to host 127.0.0.1, port 5201
Reverse mode, remote host 127.0.0.1 is sending
[ 5] local 127.0.0.1 port 59834 connected to 127.0.0.1 port 5201
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-1.00      sec   4.03 GBytes   34.6 Gbits/sec
[ 5]  1.00-2.00      sec   4.07 GBytes   35.0 Gbits/sec
[ 5]  2.00-3.00      sec   4.12 GBytes   35.4 Gbits/sec
[ 5]  3.00-4.00      sec   3.92 GBytes   33.7 Gbits/sec
[ 5]  4.00-5.00      sec   4.06 GBytes   34.8 Gbits/sec
[ 5]  5.00-6.00      sec   4.00 GBytes   34.4 Gbits/sec
[ 5]  6.00-7.00      sec   3.88 GBytes   33.3 Gbits/sec
[ 5]  7.00-8.00      sec   4.10 GBytes   35.3 Gbits/sec
[ 5]  8.00-9.00      sec   2.79 GBytes   24.0 Gbits/sec
[ 5]  9.00-10.00     sec   2.96 GBytes   25.4 Gbits/sec
- - - - -
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-10.00     sec   37.9 GBytes   32.6 Gbits/sec      sender
[ 5]  0.00-10.00     sec   37.9 GBytes   32.6 Gbits/sec      receiver
```

MULTIPLE PARALLEL STREAMS :

```
C:\Users\pavan\Downloads\iperf3.18_64\iperf3.18_64>iperf3 -c 127.0.0.1 -P 5
Connecting to host 127.0.0.1, port 5201
[ 5] local 127.0.0.1 port 59843 connected to 127.0.0.1 port 5201
[ 7] local 127.0.0.1 port 59844 connected to 127.0.0.1 port 5201
[ 9] local 127.0.0.1 port 59845 connected to 127.0.0.1 port 5201
[11] local 127.0.0.1 port 59846 connected to 127.0.0.1 port 5201
[13] local 127.0.0.1 port 59847 connected to 127.0.0.1 port 5201
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-1.00      sec   2.85 GBytes   24.4 Gbits/sec
[ 7]  0.00-1.00      sec   2.93 GBytes   25.0 Gbits/sec
[ 9]  0.00-1.00      sec   2.66 GBytes   22.8 Gbits/sec
[11]  0.00-1.00      sec   2.77 GBytes   23.7 Gbits/sec
[13]  0.00-1.00      sec   2.80 GBytes   23.9 Gbits/sec
[SUM] 0.00-1.00      sec  14.0 GBytes   120 Gbits/sec
-- -- -- -- --
[ 5]  1.00-2.00      sec   2.59 GBytes   22.3 Gbits/sec
[ 7]  1.00-2.00      sec   2.57 GBytes   22.1 Gbits/sec
[ 9]  1.00-2.00      sec   2.51 GBytes   21.6 Gbits/sec
[11]  1.00-2.00      sec   2.52 GBytes   21.7 Gbits/sec
[13]  1.00-2.00      sec   2.63 GBytes   22.6 Gbits/sec
[SUM] 1.00-2.00      sec  12.8 GBytes   110 Gbits/sec
-- -- -- -- --
[ 5]  2.00-3.00      sec   2.56 GBytes   21.9 Gbits/sec
[ 7]  2.00-3.00      sec   2.66 GBytes   22.8 Gbits/sec
[ 9]  2.00-3.00      sec   2.60 GBytes   22.3 Gbits/sec
[11]  2.00-3.00      sec   2.35 GBytes   20.2 Gbits/sec
[13]  2.00-3.00      sec   2.68 GBytes   23.0 Gbits/sec
[SUM] 2.00-3.00      sec  12.8 GBytes   110 Gbits/sec
-- -- -- -- --
[ 5]  3.00-4.00      sec   2.49 GBytes   21.4 Gbits/sec
[ 7]  3.00-4.00      sec   2.42 GBytes   20.8 Gbits/sec
[ 9]  3.00-4.00      sec   2.82 GBytes   24.2 Gbits/sec
[11]  3.00-4.00      sec   2.48 GBytes   21.3 Gbits/sec
[13]  3.00-4.00      sec   2.54 GBytes   21.8 Gbits/sec
[SUM] 3.00-4.00      sec  12.7 GBytes   109 Gbits/sec
-- -- -- -- --
[ 5]  4.00-5.00      sec   2.60 GBytes   22.3 Gbits/sec
[ 7]  4.00-5.00      sec   2.63 GBytes   22.6 Gbits/sec
[ 9]  4.00-5.00      sec   2.49 GBytes   21.4 Gbits/sec
[11]  4.00-5.00      sec   2.37 GBytes   20.3 Gbits/sec
```

```
-- -- -- -- --
[ ID] Interval           Transfer     Bitrate
[ 5]  0.00-10.00      sec  25.6 GBytes   21.9 Gbits/sec      sender
[ 5]  0.00-10.00      sec  25.6 GBytes   21.9 Gbits/sec      receiver
[ 7]  0.00-10.00      sec  25.5 GBytes   21.9 Gbits/sec      sender
[ 7]  0.00-10.00      sec  25.5 GBytes   21.9 Gbits/sec      receiver
[ 9]  0.00-10.00      sec  25.7 GBytes   22.1 Gbits/sec      sender
[ 9]  0.00-10.00      sec  25.7 GBytes   22.1 Gbits/sec      receiver
[11]  0.00-10.00      sec  24.9 GBytes   21.3 Gbits/sec      sender
[11]  0.00-10.00      sec  24.9 GBytes   21.3 Gbits/sec      receiver
[13]  0.00-10.00      sec  25.3 GBytes   21.8 Gbits/sec      sender
[13]  0.00-10.00      sec  25.3 GBytes   21.8 Gbits/sec      receiver
[SUM] 0.00-10.00      sec  127 GBytes   109 Gbits/sec      sender
[SUM] 0.00-10.00      sec  127 GBytes   109 Gbits/sec      receiver
```

```

Accepted connection from 127.0.0.1, port 59842
[ 5] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59843
[ 8] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59844
[10] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59845
[12] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59846
[14] local 127.0.0.1 port 5201 connected to 127.0.0.1 port 59847
[ ID] Interval      Transfer      Bitrate
[ 5]   0.00-1.00    sec  2.85 GBytes  24.4 Gbits/sec
[ 8]   0.00-1.00    sec  2.93 GBytes  25.0 Gbits/sec
[10]   0.00-1.00    sec  2.66 GBytes  22.8 Gbits/sec
[12]   0.00-1.00    sec  2.77 GBytes  23.7 Gbits/sec
[14]   0.00-1.00    sec  2.80 GBytes  23.9 Gbits/sec
[SUM] 0.00-1.00    sec  14.0 GBytes  120 Gbits/sec
- - - - -
[ 5]   1.00-2.00    sec  2.59 GBytes  22.3 Gbits/sec
[ 8]   1.00-2.00    sec  2.57 GBytes  22.1 Gbits/sec
[10]   1.00-2.00    sec  2.51 GBytes  21.6 Gbits/sec
[12]   1.00-2.00    sec  2.52 GBytes  21.7 Gbits/sec
[14]   1.00-2.00    sec  2.63 GBytes  22.6 Gbits/sec
[SUM] 1.00-2.00    sec  12.8 GBytes  110 Gbits/sec
- - - - -
[ 5]   2.00-3.00    sec  2.56 GBytes  21.9 Gbits/sec
[ 8]   2.00-3.00    sec  2.66 GBytes  22.8 Gbits/sec
[10]   2.00-3.00    sec  2.60 GBytes  22.3 Gbits/sec
[12]   2.00-3.00    sec  2.35 GBytes  20.2 Gbits/sec
[14]   2.00-3.00    sec  2.68 GBytes  23.0 Gbits/sec
[SUM] 2.00-3.00    sec  12.8 GBytes  110 Gbits/sec
- - - - -
[ 5]   3.00-4.00    sec  2.49 GBytes  21.4 Gbits/sec
[ 8]   3.00-4.00    sec  2.42 GBytes  20.8 Gbits/sec
[10]   3.00-4.00    sec  2.82 GBytes  24.2 Gbits/sec
[12]   3.00-4.00    sec  2.48 GBytes  21.3 Gbits/sec
[14]   3.00-4.00    sec  2.54 GBytes  21.8 Gbits/sec
[SUM] 3.00-4.00    sec  12.7 GBytes  109 Gbits/sec
- - - - -
[ 5]   4.00-5.00    sec  2.60 GBytes  22.3 Gbits/sec
[ 8]   4.00-5.00    sec  2.63 GBytes  22.6 Gbits/sec

```