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

```
-------------------------------------------------------------
Server listening on 5201 (test #7)
-------------------------------------------------------------
Accepted connection from 192.168.149.50, port 52896
[  5] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52897
[  8] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52898
[ 10] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52899
[ 12] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52900
[ 14] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52901
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-1.01   sec   378 MBytes  3.13 Gbits/sec
[  8]   0.00-1.01   sec   373 MBytes  3.09 Gbits/sec
[ 10]   0.00-1.01   sec   384 MBytes  3.18 Gbits/sec
[ 12]   0.00-1.01   sec   370 MBytes  3.06 Gbits/sec
[ 14]   0.00-1.01   sec   377 MBytes  3.12 Gbits/sec
[SUM]   0.00-1.01   sec  1.84 GBytes  15.6 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   1.01-2.01   sec   348 MBytes  2.91 Gbits/sec
[  8]   1.01-2.01   sec   364 MBytes  3.05 Gbits/sec
[ 10]   1.01-2.01   sec   339 MBytes  2.84 Gbits/sec
[ 12]   1.01-2.01   sec   337 MBytes  2.82 Gbits/sec
[ 14]   1.01-2.01   sec   354 MBytes  2.97 Gbits/sec
[SUM]   1.01-2.01   sec  1.70 GBytes  14.6 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   2.01-3.01   sec   358 MBytes  3.01 Gbits/sec
[  8]   2.01-3.01   sec   362 MBytes  3.04 Gbits/sec
[ 10]   2.01-3.01   sec   362 MBytes  3.04 Gbits/sec
[ 12]   2.01-3.01   sec   364 MBytes  3.06 Gbits/sec
[ 14]   2.01-3.01   sec   346 MBytes  2.91 Gbits/sec
[SUM]   2.01-3.01   sec  1.75 GBytes  15.1 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   3.01-4.01   sec   329 MBytes  2.76 Gbits/sec
[  8]   3.01-4.01   sec   336 MBytes  2.82 Gbits/sec
[ 10]   3.01-4.01   sec   350 MBytes  2.94 Gbits/sec
[ 12]   3.01-4.01   sec   338 MBytes  2.83 Gbits/sec
[ 14]   3.01-4.01   sec   362 MBytes  3.04 Gbits/sec
[SUM]   3.01-4.01   sec  1.67 GBytes  14.4 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   4.01-5.01   sec   349 MBytes  2.93 Gbits/sec
[  8]   4.01-5.01   sec   389 MBytes  3.26 Gbits/sec
[ 10]   4.01-5.01   sec   380 MBytes  3.18 Gbits/sec
```

Basic TCP Test (Default Mode)

UDP Test (Measure Jitter, Loss, and Latency)

```
C:\Users\sakthi kumar\Downloads\iperf3.17_64\iperf3.17_64>iperf3 -c 192.168.149.50
Connecting to host 192.168.149.50, port 5201
[  5] local 192.168.149.50 port 52854 connected to 192.168.149.50 port 5201
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-1.02   sec   166 MBytes  1.37 Gbits/sec
[  5]   1.02-2.02   sec  90.1 MBytes   755 Mbits/sec
[  5]   2.02-3.00   sec  89.0 MBytes   759 Mbits/sec
[  5]   3.00-4.00   sec  70.9 MBytes   594 Mbits/sec
[  5]   4.00-5.00   sec  87.4 MBytes   732 Mbits/sec
[  5]   5.00-6.00   sec  90.8 MBytes   760 Mbits/sec
[  5]   6.00-7.01   sec  74.2 MBytes   622 Mbits/sec
[  5]   7.01-8.01   sec  92.5 MBytes   776 Mbits/sec
[  5]   8.01-9.01   sec  87.4 MBytes   732 Mbits/sec
[  5]   9.01-10.01  sec   128 MBytes  1.08 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-10.01  sec   976 MBytes   818 Mbits/sec                  sender
[  5]   0.00-10.01  sec   976 MBytes   818 Mbits/sec                  receiver

iperf Done.

C:\Users\sakthi kumar\Downloads\iperf3.17_64\iperf3.17_64>iperf3.exe -c 192.168.149.50 -u -b 10M
Connecting to host 192.168.149.50, port 5201
[  5] local 192.168.149.50 port 49950 connected to 192.168.149.50 port 5201
[ ID] Interval           Transfer     Bitrate         Total Datagrams
[  5]   0.00-1.01   sec  1.19 MBytes  9.90 Mbits/sec  19
[  5]   1.01-2.00   sec  1.19 MBytes  9.98 Mbits/sec  20
[  5]   2.00-3.00   sec  1.19 MBytes  9.97 Mbits/sec  18
[  5]   3.00-4.01   sec  1.25 MBytes  10.3 Mbits/sec  20
[  5]   4.01-5.00   sec  1.19 MBytes  10.1 Mbits/sec  19
[  5]   5.00-6.00   sec  1.19 MBytes  9.98 Mbits/sec  19
[  5]   6.00-7.00   sec  1.19 MBytes  9.97 Mbits/sec  19
[  5]   7.00-8.01   sec  1.19 MBytes  9.82 Mbits/sec  19
[  5]   8.01-9.01   sec  1.19 MBytes  9.97 Mbits/sec  20
[  5]   9.01-10.02  sec  1.19 MBytes  9.93 Mbits/sec  18
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate         Jitter    Lost/Total Datagrams
[  5]   0.00-10.02  sec  11.9 MBytes  9.99 Mbits/sec  0.000 ms  0/191 (0%)  sender
[  5]   0.00-10.02  sec  11.9 MBytes  9.99 Mbits/sec  0.061 ms  0/191 (0%)  receiver

iperf Done.
```

Bidirectional Test

```
C:\Users\sakthi kumar\Downloads\iperf3.17_64\iperf3.17_64>iperf3.exe -c 192.168.149.50 --bidir
Connecting to host 192.168.149.50, port 5201
[  5] local 192.168.149.50 port 52877 connected to 192.168.149.50 port 5201
[  7] local 192.168.149.50 port 52878 connected to 192.168.149.50 port 5201
[ ID][Role] Interval           Transfer     Bitrate
[  5][TX-C]   0.00-1.01   sec   143 MBytes  1.19 Gbits/sec
[  7][RX-C]   0.00-1.01   sec   131 MBytes  1.09 Gbits/sec
[  5][TX-C]   1.01-2.01   sec   134 MBytes  1.12 Gbits/sec
[  7][RX-C]   1.01-2.01   sec   193 MBytes  1.61 Gbits/sec
[  5][TX-C]   2.01-3.00   sec   191 MBytes  1.62 Gbits/sec
[  7][RX-C]   2.01-3.00   sec   397 MBytes  3.37 Gbits/sec
[  5][TX-C]   3.00-4.01   sec   173 MBytes  1.44 Gbits/sec
[  7][RX-C]   3.00-4.01   sec   237 MBytes  1.97 Gbits/sec
[  5][TX-C]   4.01-5.00   sec   144 MBytes  1.22 Gbits/sec
[  7][RX-C]   4.01-5.00   sec   228 MBytes  1.92 Gbits/sec
[  5][TX-C]   5.00-6.01   sec   179 MBytes  1.49 Gbits/sec
[  7][RX-C]   5.00-6.01   sec   261 MBytes  2.17 Gbits/sec
[  5][TX-C]   6.01-7.00   sec   177 MBytes  1.50 Gbits/sec
[  7][RX-C]   6.01-7.00   sec   300 MBytes  2.54 Gbits/sec
[  5][TX-C]   7.00-8.01   sec   149 MBytes  1.24 Gbits/sec
[  7][RX-C]   7.00-8.01   sec   215 MBytes  1.79 Gbits/sec
[  5][TX-C]   8.01-9.01   sec   185 MBytes  1.55 Gbits/sec
[  7][RX-C]   8.01-9.01   sec   197 MBytes  1.64 Gbits/sec
[  5][TX-C]   9.01-10.00  sec   284 MBytes  2.41 Gbits/sec
[  7][RX-C]   9.01-10.00  sec   243 MBytes  2.06 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - -
[ ID][Role] Interval           Transfer     Bitrate
[  5][TX-C]   0.00-10.00  sec  1.72 GBytes  1.47 Gbits/sec                  sender
[  5][TX-C]   0.00-10.00  sec  1.72 GBytes  1.47 Gbits/sec                  receiver
[  7][RX-C]   0.00-10.00  sec  2.35 GBytes  2.01 Gbits/sec                  sender
[  7][RX-C]   0.00-10.00  sec  2.35 GBytes  2.01 Gbits/sec                  receiver

iperf Done.
```

Reverse Test (Client Sends, Server Receives)

Parallel Streams (Multiple Connections)

```
C:\Users\sakthi kumar\Downloads\iperf3.17_64\iperf3.17_64>iperf3.exe -c 192.168.149.50 -R
Connecting to host 192.168.149.50, port 5201
Reverse mode, remote host 192.168.149.50 is sending
[  5] local 192.168.149.50 port 52882 connected to 192.168.149.50 port 5201
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-1.01   sec  99.5 MBytes   829 Mbits/sec
[  5]   1.01-2.01   sec  95.0 MBytes   794 Mbits/sec
[  5]   2.01-3.01   sec   101 MBytes   851 Mbits/sec
[  5]   3.01-4.01   sec   109 MBytes   917 Mbits/sec
[  5]   4.01-5.00   sec  85.9 MBytes   723 Mbits/sec
[  5]   5.00-6.00   sec  81.8 MBytes   684 Mbits/sec
[  5]   6.00-7.00   sec  94.1 MBytes   792 Mbits/sec
[  5]   7.00-8.01   sec   119 MBytes   984 Mbits/sec
[  5]   8.01-9.01   sec   141 MBytes  1.18 Gbits/sec
[  5]   9.01-10.01  sec   116 MBytes   977 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-10.01  sec  1.02 GBytes   874 Mbits/sec                  sender
[  5]   0.00-10.01  sec  1.02 GBytes   873 Mbits/sec                  receiver

iperf Done.

C:\Users\sakthi kumar\Downloads\iperf3.17_64\iperf3.17_64>iperf3.exe -c 192.168.149.50 -P 5
Connecting to host 192.168.149.50, port 5201
[  5] local 192.168.149.50 port 52897 connected to 192.168.149.50 port 5201
[  7] local 192.168.149.50 port 52898 connected to 192.168.149.50 port 5201
[  9] local 192.168.149.50 port 52899 connected to 192.168.149.50 port 5201
[ 11] local 192.168.149.50 port 52900 connected to 192.168.149.50 port 5201
[ 13] local 192.168.149.50 port 52901 connected to 192.168.149.50 port 5201
[ ID] Interval           Transfer     Bitrate
[  5]   0.00-1.01   sec   378 MBytes  3.14 Gbits/sec
[  7]   0.00-1.01   sec   373 MBytes  3.09 Gbits/sec
[  9]   0.00-1.01   sec   385 MBytes  3.19 Gbits/sec
[ 11]   0.00-1.01   sec   370 MBytes  3.07 Gbits/sec
[ 13]   0.00-1.01   sec   377 MBytes  3.12 Gbits/sec
[SUM]   0.00-1.01   sec  1.84 GBytes  15.6 Gbits/sec
- - - - - - - - - - - - - - - - - - - - - - -
[  5]   1.01-2.01   sec   348 MBytes  2.91 Gbits/sec
[  7]   1.01-2.01   sec   364 MBytes  3.05 Gbits/sec
[  9]   1.01-2.01   sec   339 MBytes  2.84 Gbits/sec
[ 11]   1.01-2.01   sec   336 MBytes  2.82 Gbits/sec
```
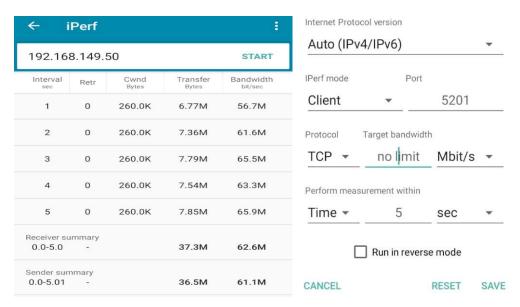
On Mobile:

Interval sec	Retr	Cwnd Bytes	Transfer Bytes	Bandwidth bit/sec
1	0	260.0K	6.77M	56.7M
2	0	260.0K	7.36M	61.6M
3	0	260.0K	7.79M	65.5M
4	0	260.0K	7.54M	63.3M
5	0	260.0K	7.85M	65.9M
Receiver summary 0.0-5.0	-		37.3M	62.6M
Sender summary 0.0-5.01	-		36.5M	61.1M

Internet Protocol version
Auto (IPv4/IPv6)

IPerf mode	Port
Client	5201

Protocol	Target bandwidth	
TCP	no limit	Mbit/s

Perform measurement within

Time	5	sec

☐ Run in reverse mode

CANCEL   RESET   SAVE

On the client side (Mobile) using the settings mentioned one can change and observe the network performance under various metrics.