Q15)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.

iperf3 –s) TCP Test

```
C:\Users\visha\Downloads\iperf3.1.3_64>iperf3 -s
-----------------------------------------------------------
Server listening on 5201
-----------------------------------------------------------
Accepted connection from 192.168.0.108, port 61384
[  5] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 61385
[  7] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 61386
[  9] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 61387
[ 11] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 61388
[ 13] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 61389
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-1.00   sec  2.50 MBytes  20.9 Mbits/sec
[  7]   0.00-1.00   sec  2.25 MBytes  18.8 Mbits/sec
[  9]   0.00-1.00   sec  2.12 MBytes  17.8 Mbits/sec
[ 11]   0.00-1.00   sec  2.12 MBytes  17.8 Mbits/sec
[ 13]   0.00-1.00   sec  2.12 MBytes  17.8 Mbits/sec
[SUM]   0.00-1.00   sec  11.1 MBytes  93.2 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   1.00-2.00   sec  2.25 MBytes  18.9 Mbits/sec
[  7]   1.00-2.00   sec  2.25 MBytes  18.9 Mbits/sec
[  9]   1.00-2.00   sec  2.12 MBytes  17.8 Mbits/sec
[ 11]   1.00-2.00   sec  2.12 MBytes  17.8 Mbits/sec
[ 13]   1.00-2.00   sec  2.12 MBytes  17.8 Mbits/sec
[SUM]   1.00-2.00   sec  10.9 MBytes  91.3 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   2.00-3.00   sec  2.62 MBytes  22.0 Mbits/sec
[  7]   2.00-3.00   sec  2.62 MBytes  22.0 Mbits/sec
[  9]   2.00-3.00   sec  2.50 MBytes  20.9 Mbits/sec
[ 11]   2.00-3.00   sec  2.50 MBytes  20.9 Mbits/sec
[ 13]   2.00-3.00   sec  2.25 MBytes  18.8 Mbits/sec
[SUM]   2.00-3.00   sec  12.5 MBytes   105 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   3.00-4.00   sec  1.25 MBytes  10.5 Mbits/sec
[  7]   3.00-4.00   sec  1.25 MBytes  10.5 Mbits/sec
[  9]   3.00-4.00   sec  1.25 MBytes  10.5 Mbits/sec
[ 11]   3.00-4.00   sec  1.25 MBytes  10.5 Mbits/sec
[ 13]   3.00-4.00   sec  1.25 MBytes  10.5 Mbits/sec
[SUM]   3.00-4.00   sec  6.25 MBytes  52.5 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - - - -
[  5]   4.00-5.00   sec   768 KBytes  6.29 Mbits/sec
[  7]   4.00-5.00   sec   768 KBytes  6.29 Mbits/sec
[  9]   4.00-5.00   sec   896 KBytes  7.33 Mbits/sec
[ 11]   4.00-5.00   sec   768 KBytes  6.29 Mbits/sec
[ 13]   4.00-5.00   sec   768 KBytes  6.29 Mbits/sec
[SUM]   4.00-5.00   sec  3.88 MBytes  32.5 Mbits/sec
```

UDP Test

```
C:\Users\visha\Downloads\iperf3.1.3_64>iperf3 -s
------------------------------------------------------------
Server listening on 5201
------------------------------------------------------------
Accepted connection from 192.168.0.108, port 61442
[  5] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 51564
[ ID] Interval           Transfer     Bandwidth       Jitter    Lost/Total Datagrams
[  5]   0.00-1.00   sec   128 KBytes  1.05 Mbits/sec  348379523.427 ms  0/90 (0%)
[  5]   1.00-2.00   sec   128 KBytes  1.05 Mbits/sec  1045846.080 ms  0/90 (0%)
[  5]   2.00-3.00   sec   127 KBytes  1.04 Mbits/sec  3349.345 ms  0/89 (0%)
[  5]   3.00-4.00   sec   128 KBytes  1.05 Mbits/sec  10.512 ms   0/90 (0%)
[  5]   4.00-5.00   sec   128 KBytes  1.05 Mbits/sec  0.443 ms   0/90 (0%)
[  5]   5.00-6.00   sec   128 KBytes  1.05 Mbits/sec  2.588 ms   0/90 (0%)
[  5]   6.00-7.00   sec   128 KBytes  1.05 Mbits/sec  0.325 ms   0/90 (0%)
[  5]   7.00-8.00   sec   127 KBytes  1.04 Mbits/sec  0.657 ms   0/89 (0%)
[  5]   8.00-8.00   sec  0.00 Bytes   0.00 bits/sec  0.657 ms   0/0 (0%)
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth       Jitter    Lost/Total Datagrams
[  5]   0.00-8.00   sec  0.00 Bytes   0.00 bits/sec  0.657 ms   0/718 (0%)
------------------------------------------------------------
Server listening on 5201
------------------------------------------------------------
```

Birdirectional test

```
Server listening on 5201
------------------------------------------------------------
Accepted connection from 192.168.0.108, port 61443
[  5] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 61444
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-1.00   sec  9.78 MBytes  82.0 Mbits/sec
[  5]   1.00-2.00   sec  11.8 MBytes  98.9 Mbits/sec
[  5]   2.00-3.00   sec  11.5 MBytes  96.7 Mbits/sec
[  5]   3.00-4.00   sec  9.24 MBytes  77.5 Mbits/sec
[  5]   4.00-5.00   sec  8.44 MBytes  70.9 Mbits/sec
[  5]   5.00-6.00   sec  8.78 MBytes  73.7 Mbits/sec
[  5]   6.00-7.00   sec  9.36 MBytes  78.5 Mbits/sec
[  5]   7.00-8.00   sec  10.0 MBytes  83.9 Mbits/sec
[  5]   8.00-9.00   sec  8.80 MBytes  73.8 Mbits/sec
[  5]   9.00-10.00  sec  7.72 MBytes  64.7 Mbits/sec
[  5]  10.00-10.02  sec   237 KBytes  84.4 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-10.02  sec  0.00 Bytes   0.00 bits/sec                  sender
[  5]   0.00-10.02  sec  95.7 MBytes  80.1 Mbits/sec                  receiver
------------------------------------------------------------
Server listening on 5201
------------------------------------------------------------
```

Reverse test

```
Server listening on 5201
-----------------------------------------------------------
Accepted connection from 192.168.0.108, port 61445
[  5] local 192.168.0.107 port 5201 connected to 192.168.0.108 port 61446
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-1.00   sec  6.88 MBytes  57.5 Mbits/sec
[  5]   1.00-2.00   sec  4.75 MBytes  39.9 Mbits/sec
[  5]   2.00-3.00   sec  5.38 MBytes  45.1 Mbits/sec
[  5]   3.00-4.00   sec  5.62 MBytes  47.2 Mbits/sec
[  5]   4.00-5.00   sec  5.75 MBytes  48.2 Mbits/sec
[  5]   5.00-6.00   sec  5.00 MBytes  42.0 Mbits/sec
[  5]   6.00-7.00   sec  5.75 MBytes  48.2 Mbits/sec
[  5]   7.00-8.00   sec  6.00 MBytes  50.4 Mbits/sec
[  5]   8.00-9.00   sec  6.12 MBytes  51.4 Mbits/sec
[  5]   9.00-10.00  sec  5.62 MBytes  47.1 Mbits/sec
[  5]  10.00-10.01  sec   128 KBytes   161 Mbits/sec
- - - - - - - - - - - - - - - - - - - - - - - - -
[ ID] Interval           Transfer     Bandwidth
[  5]   0.00-10.01  sec  57.0 MBytes  47.8 Mbits/sec                    sender
[  5]   0.00-10.01  sec  0.00 Bytes   0.00 bits/sec                     receiver
-----------------------------------------------------------
Server listening on 5201
-----------------------------------------------------------
```

- **Bandwidth** → Speed in Mbps/Gbps.
- **Jitter** → Delay variation in ms (important for VoIP, gaming).
- **Packet Loss** → Lost packets in UDP tests.
- **Retransmissions** → Shows TCP reliability.