

## LINUX NETWORKING MODULE 7 AND 8 ASSESSMENT SOLUTION

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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.

```
C:\Windows\System32\cmd.exe X Windows PowerShell X + v
Microsoft Windows [Version 10.0.26100.3476]
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C:\Users\sakthi kumar\Downloads\iperf3.17.64\iperf3.17.64>iperf3.exe -s

Server listening on 5201 (test #1)
-----
Accepted connection from 192.168.149.125, port 41300
[ 5] local 192.168.149.50 port 5201 connected to 192.168.149.125 port 41302
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-1.00 sec  5.25 MBytes  43.9 Mbits/sec
[ 5] 1.00-2.01 sec  6.62 MBytes  55.4 Mbits/sec
[ 5] 2.01-3.01 sec  7.12 MBytes  59.7 Mbits/sec
[ 5] 3.01-4.01 sec  7.00 MBytes  58.6 Mbits/sec
[ 5] 4.01-5.01 sec  7.00 MBytes  58.8 Mbits/sec
-----
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-5.01 sec  33.0 MBytes  55.3 Mbits/sec
receiver

Server listening on 5201 (test #2)
-----
Accepted connection from 192.168.149.125, port 41324
[ 5] local 192.168.149.50 port 5201 connected to 192.168.149.125 port 41326
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-1.01 sec  6.00 MBytes  49.8 Mbits/sec
[ 5] 1.01-2.01 sec  7.38 MBytes  61.9 Mbits/sec
[ 5] 2.01-3.01 sec  7.62 MBytes  63.9 Mbits/sec
[ 5] 3.01-4.01 sec  7.75 MBytes  65.0 Mbits/sec
[ 5] 4.01-5.01 sec  7.75 MBytes  65.2 Mbits/sec
-----
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-5.01 sec  36.5 MBytes  61.1 Mbits/sec
receiver

Server listening on 5201 (test #3)
-----
Accepted connection from 192.168.149.50, port 52853
[ 5] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52854
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-1.00 sec  164 MBytes  1.37 Gbits/sec
[ 5] 1.00-2.00 sec  91.4 MBytes  766 Mbits/sec
[ 5] 2.00-3.00 sec  89.8 MBytes  752 Mbits/sec
[ 5] 3.00-4.00 sec  78.9 MBytes  594 Mbits/sec
[ 5] 4.00-5.01 sec  87.4 MBytes  732 Mbits/sec
[ 5] 5.01-6.01 sec  90.8 MBytes  760 Mbits/sec
[ 5] 6.01-7.01 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
[ 5] 10.01-10.01 sec 256 MBytes  2.56 Gbits/sec
-----
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-10.01 sec  976 MBytes  818 Mbits/sec
receiver

Server listening on 5201 (test #4)
-----
Accepted connection from 192.168.149.50, port 52866
[ 5] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 49950
[ ID] Interval      Transfer    Bitrate    Jitter  Lost/Total Datagrams
[ 5] 0.00-1.01 sec  1.19 MBytes  9.86 Mbits/sec  0.028 ms  0/19 (0%)
[ 5] 1.01-2.01 sec  1.19 MBytes  9.98 Mbits/sec  0.033 ms  0/19 (0%)
[ 5] 2.01-3.00 sec  1.19 MBytes  9.97 Mbits/sec  0.054 ms  0/19 (0%)
[ 5] 3.00-4.00 sec  1.25 MBytes  10.5 Mbits/sec  0.059 ms  0/20 (0%)
[ 5] 4.00-5.01 sec  1.19 MBytes  9.91 Mbits/sec  0.143 ms  0/19 (0%)
[ 5] 5.01-6.00 sec  1.19 MBytes  9.98 Mbits/sec  0.088 ms  0/19 (0%)
[ 5] 6.00-7.00 sec  1.19 MBytes  9.97 Mbits/sec  0.084 ms  0/19 (0%)
[ 5] 7.00-8.00 sec  1.19 MBytes  9.97 Mbits/sec  0.071 ms  0/19 (0%)
[ 5] 8.00-9.00 sec  1.19 MBytes  9.97 Mbits/sec  0.053 ms  0/19 (0%)
[ 5] 9.00-10.00 sec  1.19 MBytes  9.94 Mbits/sec  0.061 ms  0/19 (0%)
-----
[ ID] Interval      Transfer    Bitrate    Jitter  Lost/Total Datagrams
[ 5] 0.00-10.02 sec  11.9 MBytes  9.99 Mbits/sec  0.061 ms  0/191 (0%) receiver

Server listening on 5201 (test #5)
-----
Accepted connection from 192.168.149.50, port 52876
[ 5] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52877
[ 8] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52878
[ ID][Role] Interval      Transfer    Bitrate
[ 5][RX-S] 0.00-1.01 sec  143 MBytes  1.19 Gbits/sec
[ 8][TX-S] 0.00-1.01 sec  131 MBytes  1.09 Gbits/sec
[ 5][RX-S] 1.01-2.01 sec  134 MBytes  1.12 Gbits/sec
[ 8][TX-S] 1.01-2.01 sec  193 MBytes  1.61 Gbits/sec
[ 5][RX-S] 2.01-3.00 sec  191 MBytes  1.62 Gbits/sec
[ 8][TX-S] 2.01-3.00 sec  397 MBytes  3.37 Gbits/sec
[ 5][RX-S] 3.00-4.01 sec  172 MBytes  1.44 Gbits/sec
[ 8][TX-S] 3.00-4.01 sec  227 MBytes  1.97 Gbits/sec
[ 5][RX-S] 4.01-5.01 sec  144 MBytes  1.22 Gbits/sec
[ 8][TX-S] 4.01-5.01 sec  228 MBytes  1.92 Gbits/sec
[ 5][RX-S] 5.01-6.01 sec  179 MBytes  1.49 Gbits/sec
[ 8][TX-S] 5.01-6.01 sec  261 MBytes  2.17 Gbits/sec
[ 5][RX-S] 6.01-7.00 sec  177 MBytes  1.50 Gbits/sec
[ 8][TX-S] 6.01-7.00 sec  300 MBytes  2.54 Gbits/sec
[ 5][RX-S] 7.00-8.01 sec  149 MBytes  1.24 Gbits/sec
[ 8][TX-S] 7.00-8.01 sec  215 MBytes  1.79 Gbits/sec
[ 5][RX-S] 8.01-9.01 sec  188 MBytes  1.55 Gbits/sec
[ 8][TX-S] 8.01-9.01 sec  197 MBytes  1.64 Gbits/sec
[ 5][RX-S] 9.01-10.00 sec  284 MBytes  2.41 Gbits/sec
[ 8][TX-S] 9.01-10.00 sec  243 MBytes  2.07 Gbits/sec
[ 5][RX-S] 10.00-10.00 sec  384 MBytes  1.62 Gbits/sec
[ 8][TX-S] 10.00-10.00 sec  384 MBytes  1.62 Gbits/sec
-----
[ ID][Role] Interval      Transfer    Bitrate
[ 5][RX-S] 0.00-10.00 sec  1.72 GBytes  1.47 Gbits/sec
[ 8][TX-S] 0.00-10.00 sec  2.35 GBytes  2.01 Gbits/sec
receiver
sender

Server listening on 5201 (test #6)
-----
Accepted connection from 192.168.149.50, port 52881
[ 5] local 192.168.149.50 port 5201 connected to 192.168.149.50 port 52882
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-1.01 sec  99.8 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] 5.00-6.01 sec  81.8 MBytes  684 Mbits/sec
[ 5] 6.01-7.00 sec  94.1 MBytes  792 Mbits/sec
[ 5] 7.00-8.02 sec  119 MBytes  984 Mbits/sec
[ 5] 8.02-9.02 sec  141 MBytes  1.19 Gbits/sec
[ 5] 9.02-10.01 sec  116 MBytes  977 Mbits/sec
[ 5] 10.01-10.01 sec  384 MBytes  3.24 Gbits/sec
-----
[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-10.01 sec  1.02 GBytes  874 Mbits/sec
sender
```

```

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 Mb/s/sec
[ 5] 2.02-3.00 sec    89.0 MBytes    759 Mb/s/sec
[ 5] 3.00-4.00 sec    70.9 MBytes    594 Mb/s/sec
[ 5] 4.00-5.00 sec    87.4 MBytes    732 Mb/s/sec
[ 5] 5.00-6.00 sec    90.8 MBytes    760 Mb/s/sec
[ 5] 6.00-7.01 sec    74.2 MBytes    622 Mb/s/sec
[ 5] 7.01-8.01 sec    92.5 MBytes    776 Mb/s/sec
[ 5] 8.01-9.01 sec    87.4 MBytes    732 Mb/s/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 Mb/s/sec
[ 5] 0.00-10.01 sec   976 MBytes    818 Mb/s/sec
sender
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 Mb/s/sec    19
[ 5] 1.01-2.00 sec    1.19 MBytes    9.98 Mb/s/sec    20
[ 5] 2.00-3.00 sec    1.19 MBytes    9.97 Mb/s/sec    18
[ 5] 3.00-4.01 sec    1.25 MBytes    10.3 Mb/s/sec    20
[ 5] 4.01-5.00 sec    1.19 MBytes    10.1 Mb/s/sec    19
[ 5] 5.00-6.00 sec    1.19 MBytes    9.98 Mb/s/sec    19
[ 5] 6.00-7.00 sec    1.19 MBytes    9.97 Mb/s/sec    19
[ 5] 7.00-8.01 sec    1.19 MBytes    9.82 Mb/s/sec    19
[ 5] 8.01-9.01 sec    1.19 MBytes    9.97 Mb/s/sec    20
[ 5] 9.01-10.02 sec   1.19 MBytes    9.93 Mb/s/sec    18
-----
[ ID] Interval      Transfer      Bitrate      Jitter      Lost/Total Datagrams
[ 5] 0.00-10.02 sec   11.9 MBytes    9.99 Mb/s/sec    0.000 ms    0/191 (0%) sender
[ 5] 0.00-10.02 sec   11.9 MBytes    9.99 Mb/s/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 Mb/s
[ 5] 1.01-2.01   sec    95.0 MBytes    794 Mb/s
[ 5] 2.01-3.01   sec    101 MBytes    851 Mb/s
[ 5] 3.01-4.01   sec    109 MBytes    917 Mb/s
[ 5] 4.01-5.00   sec    85.9 MBytes    723 Mb/s
[ 5] 5.00-6.00   sec    81.8 MBytes    684 Mb/s
[ 5] 6.00-7.00   sec    94.1 MBytes    792 Mb/s
[ 5] 7.00-8.01   sec    119 MBytes    984 Mb/s
[ 5] 8.01-9.01   sec    141 MBytes    1.18 Gb/s
[ 5] 9.01-10.01  sec    116 MBytes    977 Mb/s
-----
[ ID] Interval          Transfer        Bitrate
[ 5] 0.00-10.01  sec    1.02 GBytes    874 Mb/s      sender
[ 5] 0.00-10.01  sec    1.02 GBytes    873 Mb/s      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 Gb/s
[ 7] 0.00-1.01   sec    373 MBytes    3.09 Gb/s
[ 9] 0.00-1.01   sec    385 MBytes    3.19 Gb/s
[11] 0.00-1.01   sec    370 MBytes    3.07 Gb/s
[13] 0.00-1.01   sec    377 MBytes    3.12 Gb/s
[SUM] 0.00-1.01   sec    1.84 GBytes    15.6 Gb/s
-----
[ 5] 1.01-2.01   sec    348 MBytes    2.91 Gb/s
[ 7] 1.01-2.01   sec    364 MBytes    3.05 Gb/s
[ 9] 1.01-2.01   sec    339 MBytes    2.84 Gb/s
[11] 1.01-2.01   sec    336 MBytes    2.82 Gb/s
```

On Mobile:

←

iPerf

⋮

192.168.149.50

START

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

Client ▼

Port

5201

Protocol

TCP ▼

Target bandwidth

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.