

Linux: TC - bandwidth limitation, transmission error induction and delays

programmes used to take measurements:

- <https://man7.org/linux/man-pages/man8/tc.8.html>
- <https://github.com/tum-lkn/tcgui>

Connection diagram

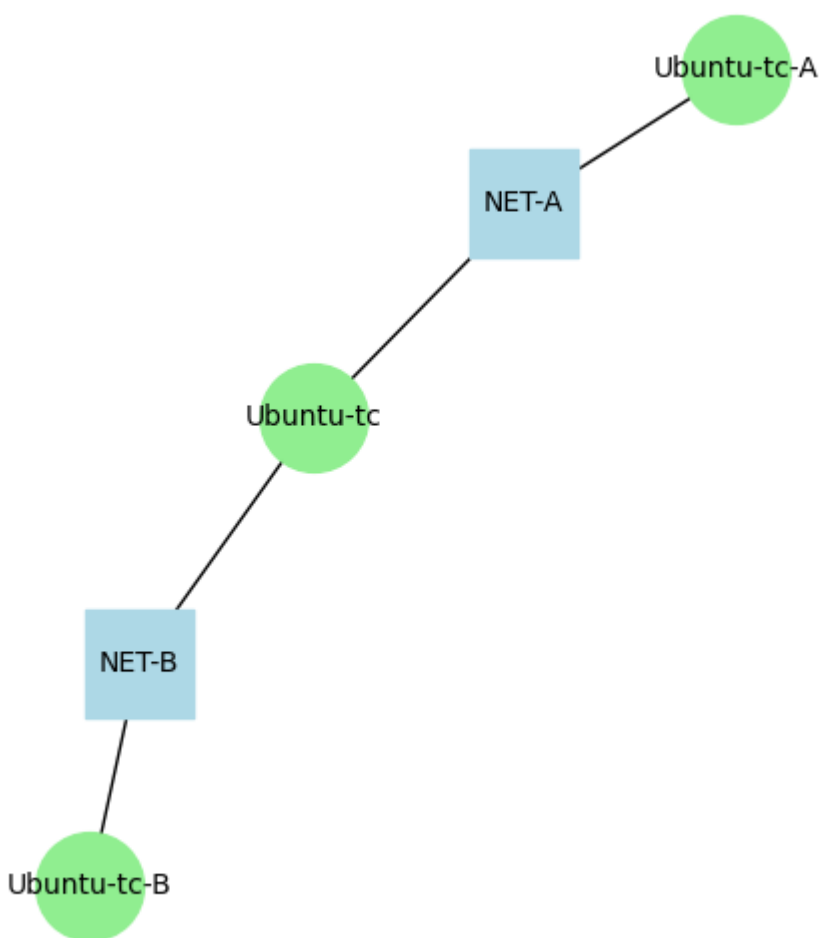


Diagram generated using [my script](#)

Machine name	Network card	ip address	gateway	Virtual switch
ubuntu-tc	eth0	192.168.1.1/24	X	NET-A
	eth1	192.168.2.1/24	X	NET-B
ubuntu-tc-A	eth0	192.168.1.10/24	192.168.1.1/24	NET-A
ubuntu-tc-B	eth0	192.168.2.10/24	192.168.2.1/24	NET-B

Settings on the "Ubuntu-tc" machine

- enable forwarding for ipv4

```
echo "net.ipv4.ip_forward=1" | sudo tee -a /etc/sysctl.conf
```

- restart the network interfaces
- copy tc-gui to machine and run

```
sudo apt install git
git clone https://github.com/tum-lkn/tcgui
cd tcgui
sudo python3 main.py --ip 127.0.0.1
```

- open firefox browser to address 127.0.0.1:5000

TCGUI - 4 Available Interfaces

eth0 (192.168.1.1)
eth1 (192.168.2.1)
eth2 (172.30.16.210)
lo (127.0.0.1)

eth0 (192.168.1.1)

Name	Current Value	New Value	Variance / Correlation	New Value
Rate	None	<input type="text"/> mbit		
Delay	None	<input type="text"/> ms	±None	± <input type="text"/> ms
Loss	None	<input type="text"/> %	None	<input type="text"/> %
Duplicate	None	<input type="text"/> %		
Reorder	None	<input type="text"/> %	None	<input type="text"/> %
Corrupt	None	<input type="text"/> %		
Limit	None	<input type="text"/>		

Settings on the rest of the machines

```
sudo apt-get update
sudo apt-get install iperf3
```

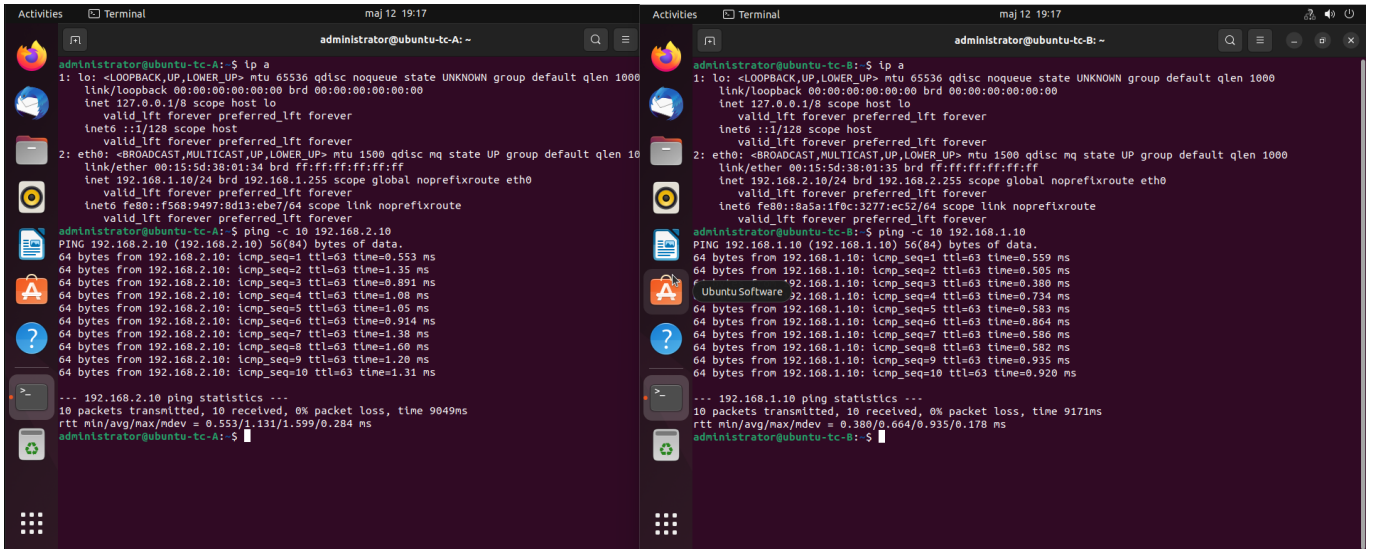
We still need to address them statically via the GUI or by using netplan

Test results table

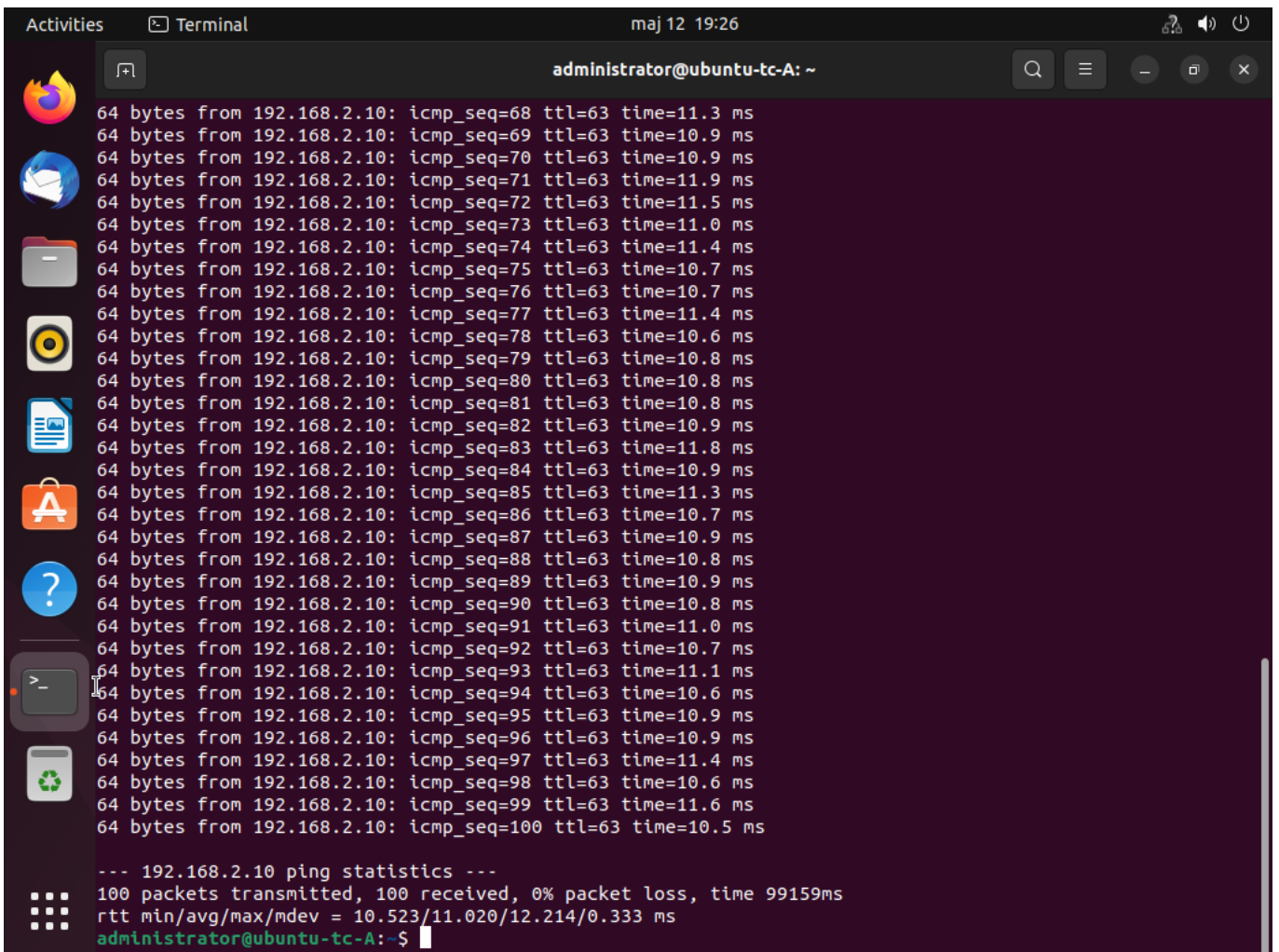
Test description	protocol	loss	bandwidth	delay [ms]
Delay tests				
Test without added delay	icmp	0%	—	1,131
Test with added 10ms delay result from 100 measurements	icmp	0%	—	11,020
test with added 100ms delay result from 100 measurements	icmp	0%	—	101,071
test with added 1000ms delay result from 100 measurements	icmp	0%	—	1000,911
UDP bandwidth tests				
	protocol	Lost/Sent	bandwidth	delay [ms]
Unlimited 30s test (UDP 1Gbps iperf)	UDP	—	998 Mbps	—
300Mbps 30s bandwidth limitation (UDP iperf)	UDP	72%	282 Mbps	—
Bandwidth limitation to 100Mbps 30s (UDP iperf)	UDP	91%	94.3 Mbps	—
10Mbps 30s bandwidth limitation (UDP iperf)	UDP	99%	9.72 Mbps	—
Bandwidth limitation to 1Mbps 30s (UDP iperf)	UDP	1e+02%	972 kbps	—
TCP bandwidth tests				
	protocol	retransmissions	bandwidth	delay [ms]
Unlimited 30s test (TCP iperf)	TCP	2	10.3 Gbps	—
Bandwidth limitation to 300Mbps 30s (TCP iperf)	TCP	0	282 Mbps	—
Bandwidth limitation to 100Mbps 30s (TCP iperf)	TCP	0	94.3 Mbps	—
Bandwidth limitation to 10Mbps 30s (TCP iperf)	TCP	152	9.72 Mbps	—
Bandwidth limitation to 1Mbps 30s (TCP iperf)	TCP	0	972 kbps	—
Other Tests				
Round trip link test 10Mbps, latency 2000ms, urata 3%, corrupted 10% (ping 100 measurements)	ICMP	24%	—	4001,69
10Mbps round trip link test, latency 600ms, loss 3%, corrupted 10% (TCP iperf)	TCP	23	82 kbps	—
10Mbps round trip link test, latency 600ms, loss 3%, faulty 10% (UDP iperf)	UDP	99%	7.79 kbps	—
60Mbps round trip link test, 600ms latency, 5% loss (UDP iperf)	UDP	98%	14.7 Mbps	—

Delay tests

Test without added delay

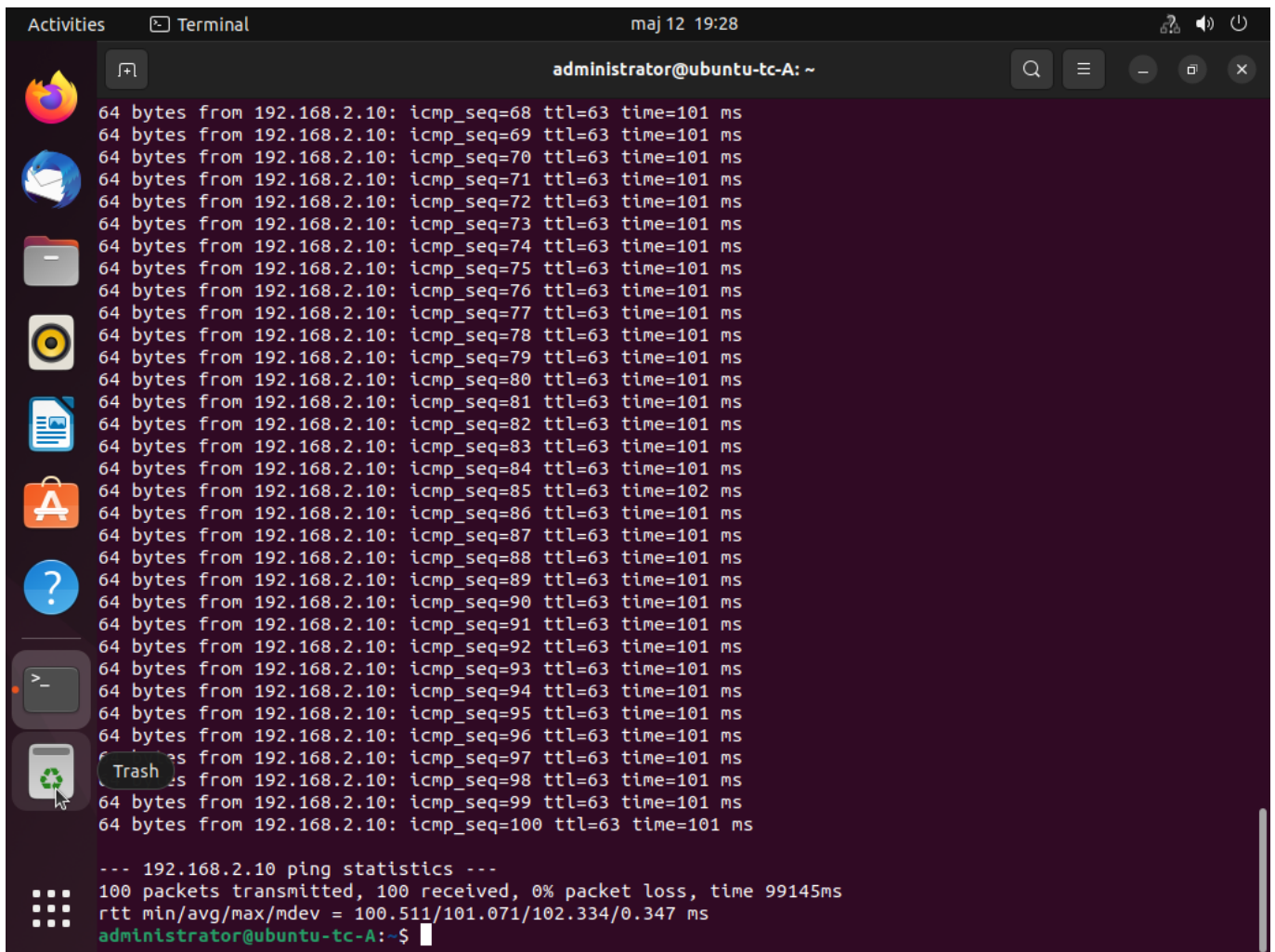


Test with added delay 10ms result from 100 measurements

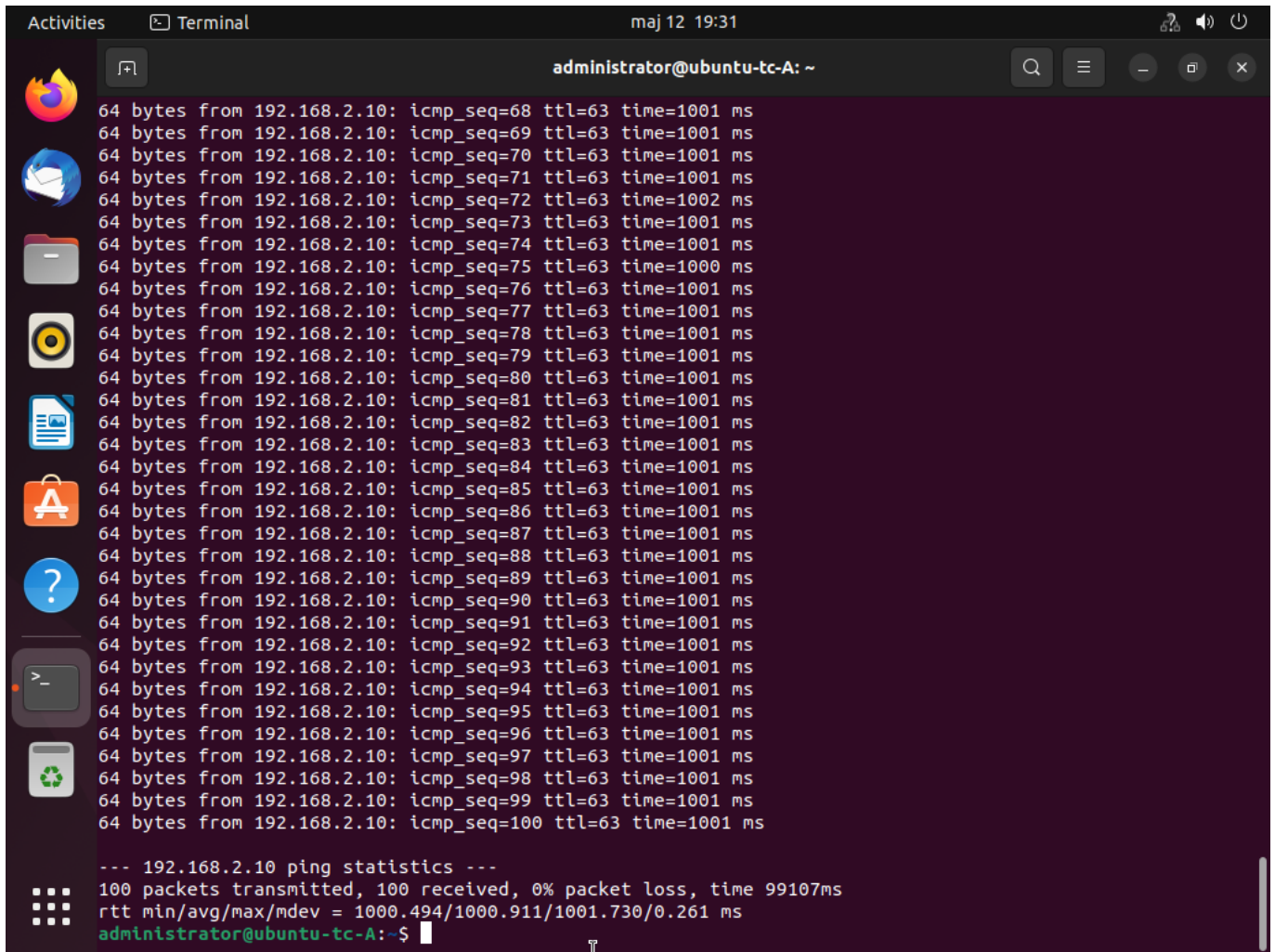


test with an added delay of 100ms result from 100

measurements



test with an added delay of 1000ms result from 100 measurements



```
64 bytes from 192.168.2.10: icmp_seq=68 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=69 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=70 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=71 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=72 ttl=63 time=1002 ms
64 bytes from 192.168.2.10: icmp_seq=73 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=74 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=75 ttl=63 time=1000 ms
64 bytes from 192.168.2.10: icmp_seq=76 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=77 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=78 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=79 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=80 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=81 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=82 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=83 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=84 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=85 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=86 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=87 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=88 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=89 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=90 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=91 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=92 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=93 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=94 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=95 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=96 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=97 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=98 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=99 ttl=63 time=1001 ms
64 bytes from 192.168.2.10: icmp_seq=100 ttl=63 time=1001 ms

--- 192.168.2.10 ping statistics ---
100 packets transmitted, 100 received, 0% packet loss, time 99107ms
rtt min/avg/max/mdev = 1000.494/1000.911/1001.730/0.261 ms
administrator@ubuntu-tc-A:~$
```

test with added delay of 5000ms result from 100 measurements

Bandwidth limitation test

Unlimited 30s test (UDP 1Gbps iperf)

```

[ ID ] Interval      Transfer      Btrate      Total Datagrams
[ 5 ] 0.00-1.00 sec  119 MBytes  999 Mb/s/sec  86279
[ 5 ] 1.00-2.00 sec  119 MBytes  1000 Mb/s/sec  86325
[ 5 ] 2.00-3.00 sec  119 MBytes  1000 Mb/s/sec  86322
[ 5 ] 3.00-4.00 sec  119 MBytes  1000 Mb/s/sec  86323
[ 5 ] 4.00-5.00 sec  119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 5.00-6.00 sec  119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 6.00-7.00 sec  119 MBytes  1000 Mb/s/sec  86329
[ 5 ] 7.00-8.00 sec  119 MBytes  1000 Mb/s/sec  86323
[ 5 ] 8.00-9.00 sec  119 MBytes  1.00 Gb/s/sec  86328
[ 5 ] 9.00-10.00 sec 119 MBytes  1000 Mb/s/sec  86326
[ 5 ] 10.00-11.00 sec 119 MBytes  1000 Mb/s/sec  86324
[ 5 ] 11.00-12.00 sec 119 MBytes  1.00 Gb/s/sec  86333
[ 5 ] 12.00-13.00 sec 119 MBytes  1.00 Gb/s/sec  86331
[ 5 ] 13.00-14.00 sec 119 MBytes  1000 Mb/s/sec  86319
[ 5 ] 14.00-15.00 sec 119 MBytes  1000 Mb/s/sec  86324
[ 5 ] 15.00-16.00 sec 119 MBytes  1.00 Gb/s/sec  86330
[ 5 ] 16.00-17.00 sec 119 MBytes  1000 Mb/s/sec  86321
[ 5 ] 17.00-18.00 sec 119 MBytes  1000 Mb/s/sec  86313
[ 5 ] 18.00-19.00 sec 119 MBytes  1.00 Gb/s/sec  86339
[ 5 ] 19.00-20.00 sec 119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 20.00-21.00 sec 119 MBytes  1000 Mb/s/sec  86321
[ 5 ] 21.00-22.00 sec 119 MBytes  1.00 Gb/s/sec  86329
[ 5 ] 22.00-23.00 sec 119 MBytes  1.00 Gb/s/sec  86331
[ 5 ] 23.00-24.00 sec 119 MBytes  1000 Mb/s/sec  86328
[ 5 ] 24.00-25.00 sec 119 MBytes  1000 Mb/s/sec  86326
[ 5 ] 25.00-26.00 sec 119 MBytes  1.00 Gb/s/sec  86328
[ 5 ] 26.00-27.00 sec 119 MBytes  1.00 Gb/s/sec  86326
[ 5 ] 27.00-28.00 sec 119 MBytes  1000 Mb/s/sec  86325
[ 5 ] 28.00-29.00 sec 119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 29.00-30.00 sec 119 MBytes  1000 Mb/s/sec  86325

[ ID ] Interval      Transfer      Btrate      Jitter      Lost/Total Datagrams
[ 5 ] 0.00-30.00 sec  3.49 GBytes  998 Mb/s/sec  0.002 ms    4048/2589728 (0.10%) sender
[ 5 ] 0.00-30.00 sec  3.49 GBytes  998 Mb/s/sec  0.002 ms    4048/2589728 (0.10%) receiver

iperf Done.
adminstrator@ubuntu-tc-A: ~$
  
```

Bandwidth limited to 300Mbps 30s (UDP iperf)

```

[ ID ] Interval      Transfer      Btrate      Total Datagrams
[ 5 ] 0.00-1.00 sec  119 MBytes  999 Mb/s/sec  86200
[ 5 ] 1.00-2.00 sec  119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 2.00-3.00 sec  119 MBytes  1000 Mb/s/sec  86324
[ 5 ] 3.00-4.00 sec  119 MBytes  1.00 Gb/s/sec  86328
[ 5 ] 4.00-5.00 sec  119 MBytes  1000 Mb/s/sec  86324
[ 5 ] 5.00-6.00 sec  119 MBytes  1000 Mb/s/sec  86325
[ 5 ] 6.00-7.00 sec  119 MBytes  1.00 Gb/s/sec  86341
[ 5 ] 7.00-8.00 sec  119 MBytes  1000 Mb/s/sec  86316
[ 5 ] 8.00-9.00 sec  119 MBytes  1.00 Gb/s/sec  86328
[ 5 ] 9.00-10.00 sec 119 MBytes  1000 Mb/s/sec  86321
[ 5 ] 10.00-11.00 sec 119 MBytes  1.00 Gb/s/sec  86332
[ 5 ] 11.00-12.00 sec 119 MBytes  1000 Mb/s/sec  86320
[ 5 ] 12.00-13.00 sec 119 MBytes  1.00 Gb/s/sec  86331
[ 5 ] 13.00-14.00 sec 119 MBytes  1000 Mb/s/sec  86322
[ 5 ] 14.00-15.00 sec 119 MBytes  1000 Mb/s/sec  86327
[ 5 ] 15.00-16.00 sec 119 MBytes  1000 Mb/s/sec  86325
[ 5 ] 16.00-17.00 sec 119 MBytes  1.00 Gb/s/sec  86330
[ 5 ] 17.00-18.00 sec 119 MBytes  1000 Mb/s/sec  86321
[ 5 ] 18.00-19.00 sec 119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 19.00-20.00 sec 119 MBytes  1000 Mb/s/sec  86322
[ 5 ] 20.00-21.00 sec 119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 21.00-22.00 sec 119 MBytes  1.00 Gb/s/sec  86327
[ 5 ] 22.00-23.00 sec 119 MBytes  1000 Mb/s/sec  86322
[ 5 ] 23.00-24.00 sec 119 MBytes  1.00 Gb/s/sec  86332
[ 5 ] 24.00-25.00 sec 119 MBytes  1.00 Gb/s/sec  86330
[ 5 ] 25.00-26.00 sec 119 MBytes  1000 Mb/s/sec  86304
[ 5 ] 26.00-27.00 sec 119 MBytes  1000 Mb/s/sec  86321
[ 5 ] 27.00-28.00 sec 119 MBytes  1.00 Gb/s/sec  86337
[ 5 ] 28.00-29.00 sec 119 MBytes  1000 Mb/s/sec  86312
[ 5 ] 29.00-30.00 sec 119 MBytes  1.00 Gb/s/sec  86331

[ ID ] Interval      Transfer      Btrate      Jitter      Lost/Total Datagrams
[ 5 ] 0.00-30.00 sec  3.49 GBytes  998 Mb/s/sec  0.000 ms    0/2589717 (0%) sender
[ 5 ] 0.00-30.04 sec  1010 MBytes  282 Mb/s/sec  0.048 ms    1858455/2589708 (72%) receiver

iperf Done.
adminstrator@ubuntu-tc-A: ~$
  
```

Bandwidth limitation to 100Mbps 30s (UDP iperf)

```
Interval Transfer Btrate Total Datagrams
[ 5] 0.00-1.00 sec 119 MBytes 1000 Mbits/sec 86324
[ 5] 1.00-2.00 sec 119 MBytes 999 Mbits/sec 86271
[ 5] 2.00-3.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 3.00-4.00 sec 119 MBytes 1.00 Gbts/sec 86326
[ 5] 4.00-5.00 sec 119 MBytes 1000 Mbits/sec 86322
[ 5] 5.00-6.00 sec 119 MBytes 1.00 Gbts/sec 86330
[ 5] 6.00-7.00 sec 119 MBytes 1.00 Gbts/sec 86333
[ 5] 7.00-8.00 sec 119 MBytes 1000 Mbits/sec 86316
[ 5] 8.00-9.00 sec 119 MBytes 1.00 Gbts/sec 86351
[ 5] 9.00-10.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 10.00-11.00 sec 119 MBytes 1000 Mbits/sec 86309
[ 5] 11.00-12.00 sec 119 MBytes 1.00 Gbts/sec 86338
[ 5] 12.00-13.00 sec 119 MBytes 1000 Mbits/sec 86322
[ 5] 13.00-14.00 sec 119 MBytes 1.00 Gbts/sec 86333
[ 5] 14.00-15.00 sec 119 MBytes 1000 Mbits/sec 86312
[ 5] 15.00-16.00 sec 119 MBytes 1.00 Gbts/sec 86334
[ 5] 16.00-17.00 sec 119 MBytes 1000 Mbits/sec 86322
[ 5] 17.00-18.00 sec 119 MBytes 1.00 Gbts/sec 86328
[ 5] 18.00-19.00 sec 119 MBytes 1000 Mbits/sec 86324
[ 5] 19.00-20.00 sec 119 MBytes 1000 Mbits/sec 86325
[ 5] 20.00-21.00 sec 119 MBytes 1000 Mbits/sec 86323
[ 5] 21.00-22.00 sec 119 MBytes 1.00 Gbts/sec 86331
[ 5] 22.00-23.00 sec 119 MBytes 1000 Mbits/sec 86323
[ 5] 23.00-24.00 sec 119 MBytes 1.00 Gbts/sec 86330
[ 5] 24.00-25.00 sec 119 MBytes 1.00 Gbts/sec 86330
[ 5] 25.00-26.00 sec 119 MBytes 1.00 Gbts/sec 86326
[ 5] 26.00-27.00 sec 119 MBytes 1000 Mbits/sec 86318
[ 5] 27.00-28.00 sec 119 MBytes 1.00 Gbts/sec 86342
[ 5] 28.00-29.00 sec 119 MBytes 1000 Mbits/sec 86308
[ 5] 29.00-30.00 sec 119 MBytes 1.00 Gbts/sec 86331

[ ID] Interval Transfer Btrate Jitter Lost/Total Datagrams
[ 5] 0.00-30.00 sec 3.49 GBytes 1000 Mbits/sec 0.000 ms 0/2589717 (0%) sender
[ 5] 0.00-30.12 sec 338 MBytes 94.3 Mbits/sec 0.171 ms 2344557/2589638 (91%)

iperf Done.
administrator@ubuntu-tc-A: $
```

```
Interval Transfer Btrate Jitter Lost/Total Datagrams
[ 5] 0.00-1.00 sec 11.6 MBytes 97.1 Mbits/sec 0.201 ms 67613/75998 (89%)
[ 5] 1.00-2.00 sec 11.6 MBytes 97.2 Mbits/sec 0.184 ms 77946/86335 (90%)
[ 5] 2.00-3.00 sec 11.6 MBytes 97.2 Mbits/sec 0.197 ms 77916/86306 (90%)
[ 5] 3.00-4.00 sec 11.6 MBytes 97.2 Mbits/sec 0.185 ms 77937/86326 (90%)
[ 5] 4.00-5.00 sec 11.6 MBytes 97.2 Mbits/sec 0.188 ms 77941/86331 (90%)
[ 5] 5.00-6.00 sec 11.6 MBytes 97.2 Mbits/sec 0.206 ms 77935/86324 (90%)
[ 5] 6.00-7.00 sec 11.6 MBytes 97.2 Mbits/sec 0.197 ms 77934/86324 (90%)
[ 5] 7.00-8.00 sec 11.6 MBytes 97.2 Mbits/sec 0.193 ms 77944/86333 (90%)
[ 5] 8.00-9.00 sec 2.74 MBytes 23.0 Mbits/sec 0.167 ms 18415/20401 (90%)
[ 5] 9.00-10.00 sec 9.94 MBytes 83.5 Mbits/sec 0.186 ms 145062/152261 (90%)
[ 5] 10.00-11.00 sec 11.6 MBytes 97.2 Mbits/sec 0.198 ms 77921/86311 (90%)
[ 5] 11.00-12.00 sec 11.6 MBytes 97.2 Mbits/sec 0.209 ms 77938/86327 (90%)
[ 5] 12.00-13.00 sec 11.6 MBytes 97.2 Mbits/sec 0.191 ms 77939/86329 (90%)
[ 5] 13.00-14.00 sec 11.6 MBytes 97.2 Mbits/sec 0.196 ms 77936/86325 (90%)
[ 5] 14.00-15.00 sec 11.6 MBytes 97.2 Mbits/sec 0.188 ms 77944/86334 (90%)
[ 5] 15.00-16.00 sec 11.6 MBytes 97.2 Mbits/sec 0.192 ms 77923/86312 (90%)
[ 5] 16.00-17.00 sec 11.6 MBytes 97.2 Mbits/sec 0.204 ms 77938/86328 (90%)
[ 5] 17.00-18.00 sec 11.6 MBytes 97.2 Mbits/sec 0.200 ms 77940/86335 (90%)
[ 5] 18.00-19.00 sec 11.6 MBytes 97.2 Mbits/sec 0.198 ms 77929/86318 (90%)
[ 5] 19.00-20.00 sec 11.6 MBytes 97.2 Mbits/sec 0.200 ms 77934/86324 (90%)
[ 5] 20.00-21.00 sec 11.6 MBytes 97.2 Mbits/sec 0.204 ms 77941/86330 (90%)
[ 5] 21.00-22.00 sec 11.6 MBytes 97.2 Mbits/sec 0.191 ms 77940/86330 (90%)
[ 5] 22.00-23.00 sec 11.6 MBytes 97.2 Mbits/sec 0.196 ms 77931/86320 (90%)
[ 5] 23.00-24.00 sec 11.6 MBytes 97.2 Mbits/sec 0.194 ms 77933/86323 (90%)
[ 5] 24.00-25.00 sec 11.6 MBytes 97.2 Mbits/sec 0.162 ms 77954/86343 (90%)
[ 5] 25.00-26.00 sec 11.6 MBytes 97.2 Mbits/sec 0.200 ms 77924/86314 (90%)
[ 5] 26.00-27.00 sec 11.6 MBytes 97.2 Mbits/sec 0.192 ms 77943/86332 (90%)
[ 5] 27.00-28.00 sec 11.6 MBytes 97.2 Mbits/sec 0.196 ms 77936/86326 (90%)
[ 5] 28.00-29.00 sec 11.6 MBytes 97.2 Mbits/sec 0.192 ms 77932/86321 (90%)
[ 5] 29.00-30.00 sec 11.6 MBytes 97.2 Mbits/sec 0.193 ms 77934/86324 (90%)
[ 5] 30.00-30.12 sec 1.37 MBytes 97.1 Mbits/sec 0.171 ms 9198/10193 (90%)

Server listening on 5201
Show Applications
```

Bandwidth limitation to 10Mbps 30s (UDP iperf)

```
Interval Transfer Btrate Total Datagrams
[ 5] 0.00-1.00 sec 119 MBytes 1000 Mbits/sec 86273
[ 5] 1.00-2.00 sec 119 MBytes 1000 Mbits/sec 86319
[ 5] 2.00-3.00 sec 119 MBytes 1.00 Gbts/sec 86335
[ 5] 3.00-4.00 sec 119 MBytes 1.00 Gbts/sec 86333
[ 5] 4.00-5.00 sec 119 MBytes 1000 Mbits/sec 86307
[ 5] 5.00-6.00 sec 119 MBytes 1.00 Gbts/sec 86344
[ 5] 6.00-7.00 sec 119 MBytes 1000 Mbits/sec 86318
[ 5] 7.00-8.00 sec 119 MBytes 1.00 Gbts/sec 86337
[ 5] 8.00-9.00 sec 119 MBytes 1000 Mbits/sec 86314
[ 5] 9.00-10.00 sec 119 MBytes 1.00 Gbts/sec 86366
[ 5] 10.00-11.00 sec 119 MBytes 1000 Mbits/sec 86296
[ 5] 11.00-12.00 sec 119 MBytes 1.00 Gbts/sec 86329
[ 5] 12.00-13.00 sec 119 MBytes 1000 Mbits/sec 86310
[ 5] 13.00-14.00 sec 119 MBytes 1000 Mbits/sec 86323
[ 5] 14.00-15.00 sec 119 MBytes 1000 Mbits/sec 86322
[ 5] 15.00-16.00 sec 119 MBytes 1.00 Gbts/sec 86332
[ 5] 16.00-17.00 sec 119 MBytes 1.00 Gbts/sec 86334
[ 5] 17.00-18.00 sec 119 MBytes 1.00 Gbts/sec 86342
[ 5] 18.00-19.00 sec 119 MBytes 1000 Mbits/sec 86319
[ 5] 19.00-20.00 sec 119 MBytes 1.00 Gbts/sec 86336
[ 5] 20.00-21.00 sec 119 MBytes 1000 Mbits/sec 86323
[ 5] 21.00-22.00 sec 119 MBytes 1000 Mbits/sec 86324
[ 5] 22.00-23.00 sec 119 MBytes 1.00 Gbts/sec 86335
[ 5] 23.00-24.00 sec 119 MBytes 1.00 Gbts/sec 86335
[ 5] 24.00-25.00 sec 119 MBytes 1000 Mbits/sec 86330
[ 5] 25.00-26.00 sec 119 MBytes 1.00 Gbts/sec 86338
[ 5] 26.00-27.00 sec 119 MBytes 1000 Mbits/sec 86328
[ 5] 27.00-28.00 sec 119 MBytes 1.00 Gbts/sec 86341
[ 5] 28.00-29.00 sec 119 MBytes 1.00 Gbts/sec 86341
[ 5] 29.00-30.00 sec 119 MBytes 1000 Mbits/sec 86304

[ ID] Interval Transfer Btrate Jitter Lost/Total Datagrams
[ 5] 0.00-30.00 sec 3.49 GBytes 1000 Mbits/sec 0.000 ms 0/2589717 (0%) sender
[ 5] 0.00-31.19 sec 36.1 MBytes 9.72 Mbits/sec 0.289 ms 2563457/2589624 (99%) receiver

iperf Done.
administrator@ubuntu-tc-A: $
```

```
Interval Transfer Btrate Jitter Lost/Total Datagrams
[ 5] 1.00-2.00 sec 1.16 MBytes 9.72 Mbits/sec 0.237 ms 67932/68771 (99%)
[ 5] 2.00-3.00 sec 1.16 MBytes 9.72 Mbits/sec 0.227 ms 85488/86327 (99%)
[ 5] 3.00-4.00 sec 1.16 MBytes 9.72 Mbits/sec 0.257 ms 85369/86408 (99%)
[ 5] 4.00-5.00 sec 1.16 MBytes 9.72 Mbits/sec 0.317 ms 85472/86311 (99%)
[ 5] 5.00-6.00 sec 1.16 MBytes 9.72 Mbits/sec 0.289 ms 85511/86352 (99%)
[ 5] 6.00-7.00 sec 1.16 MBytes 9.72 Mbits/sec 0.289 ms 85486/86325 (99%)
[ 5] 7.00-8.00 sec 1.16 MBytes 9.72 Mbits/sec 0.262 ms 85488/86327 (99%)
[ 5] 8.00-9.00 sec 1.16 MBytes 9.72 Mbits/sec 0.368 ms 85486/86319 (99%)
[ 5] 9.00-10.00 sec 1.16 MBytes 9.72 Mbits/sec 0.231 ms 140337/141175 (99%)
[ 5] 10.00-11.00 sec 1.16 MBytes 9.72 Mbits/sec 0.326 ms 30558/31397 (97%)
[ 5] 11.00-12.00 sec 1.16 MBytes 9.72 Mbits/sec 0.281 ms 85495/86334 (99%)
[ 5] 12.00-13.00 sec 1.16 MBytes 9.72 Mbits/sec 0.259 ms 85481/86320 (99%)
[ 5] 13.00-14.00 sec 1.16 MBytes 9.72 Mbits/sec 0.273 ms 85486/86325 (99%)
[ 5] 14.00-15.00 sec 1.16 MBytes 9.72 Mbits/sec 0.231 ms 85486/86325 (99%)
[ 5] 15.00-16.00 sec 1.16 MBytes 9.72 Mbits/sec 0.265 ms 85485/86324 (99%)
[ 5] 16.00-17.00 sec 1.16 MBytes 9.72 Mbits/sec 0.275 ms 85474/86313 (99%)
[ 5] 17.00-18.00 sec 1.16 MBytes 9.72 Mbits/sec 0.278 ms 85529/86368 (99%)
[ 5] 18.00-19.00 sec 1.16 MBytes 9.72 Mbits/sec 0.260 ms 85495/86334 (99%)
[ 5] 19.00-20.00 sec 1.16 MBytes 9.72 Mbits/sec 0.306 ms 85532/86371 (99%)
[ 5] 20.00-21.00 sec 1.16 MBytes 9.72 Mbits/sec 0.309 ms 85492/86331 (99%)
[ 5] 21.00-22.00 sec 1.16 MBytes 9.72 Mbits/sec 0.278 ms 85485/86324 (99%)
[ 5] 22.00-23.00 sec 1.16 MBytes 9.72 Mbits/sec 0.248 ms 85492/86331 (99%)
[ 5] 23.00-24.00 sec 1.16 MBytes 9.72 Mbits/sec 0.252 ms 85470/86309 (99%)
[ 5] 24.00-25.00 sec 1.16 MBytes 9.72 Mbits/sec 0.254 ms 85501/86340 (99%)
[ 5] 25.00-26.00 sec 1.16 MBytes 9.71 Mbits/sec 0.259 ms 85393/86231 (99%)
[ 5] 26.00-27.00 sec 1.16 MBytes 9.72 Mbits/sec 0.322 ms 85481/86320 (99%)
[ 5] 27.00-28.00 sec 1.16 MBytes 9.72 Mbits/sec 0.260 ms 85503/86342 (99%)
[ 5] 28.00-29.00 sec 1.16 MBytes 9.72 Mbits/sec 0.271 ms 85488/86327 (99%)
[ 5] 29.00-30.00 sec 1.16 MBytes 9.72 Mbits/sec 0.324 ms 85466/86305 (99%)
[ 5] 30.00-31.00 sec 1.16 MBytes 9.72 Mbits/sec 0.272 ms 85509/86348 (99%)
[ 5] 31.00-31.19 sec 228 KBytes 9.75 Mbits/sec 0.289 ms 16391/16552 (99%)

Server listening on 5201
```

Bandwidth limitation to 1Mbps 30s (UDP iperf)

```

[ 5] Interval      Transfer      Bitrate      Total  Datagrams
[ 5] 0.00-1.00    sec  119 MBytes    999 Mb/s/sec  86272
[ 5] 1.00-2.00    sec  119 MBytes    1.00 Gb/s/sec  86345
[ 5] 2.00-3.00    sec  119 MBytes    1000 Mb/s/sec  86309
[ 5] 3.00-4.00    sec  119 MBytes    1000 Mb/s/sec  86314
[ 5] 4.00-5.00    sec  119 MBytes    1.00 Gb/s/sec  86338
[ 5] 5.00-6.00    sec  119 MBytes    1.00 Gb/s/sec  86346
[ 5] 6.00-7.00    sec  119 MBytes    1000 Mb/s/sec  86305
[ 5] 7.00-8.00    sec  119 MBytes    1.00 Gb/s/sec  86336
[ 5] 8.00-9.00    sec  119 MBytes    1000 Mb/s/sec  86322
[ 5] 9.00-10.00   sec  119 MBytes    1000 Mb/s/sec  86321
[ 5] 10.00-11.00  sec  119 MBytes    1.00 Gb/s/sec  86335
[ 5] 11.00-12.00  sec  119 MBytes    1000 Mb/s/sec  86316
[ 5] 12.00-13.00  sec  119 MBytes    1000 Mb/s/sec  86326
[ 5] 13.00-14.00  sec  119 MBytes    1.00 Gb/s/sec  86326
[ 5] 14.00-15.00  sec  119 MBytes    1.00 Gb/s/sec  86327
[ 5] 15.00-16.00  sec  119 MBytes    1000 Mb/s/sec  86326
[ 5] 16.00-17.00  sec  119 MBytes    1.00 Gb/s/sec  86361
[ 5] 17.00-18.00  sec  119 MBytes    1.00 Gb/s/sec  86336
[ 5] 18.00-19.00  sec  119 MBytes    1000 Mb/s/sec  86289
[ 5] 19.00-20.00  sec  119 MBytes    1000 Mb/s/sec  86325
[ 5] 20.00-21.00  sec  119 MBytes    1.00 Gb/s/sec  86317
[ 5] 21.00-22.00  sec  119 MBytes    1.00 Gb/s/sec  86328
[ 5] 22.00-23.00  sec  119 MBytes    1000 Mb/s/sec  86323
[ 5] 23.00-24.00  sec  119 MBytes    1.00 Gb/s/sec  86328
[ 5] 24.00-25.00  sec  119 MBytes    1.00 Gb/s/sec  86336
[ 5] 25.00-26.00  sec  119 MBytes    1000 Mb/s/sec  86320
[ 5] 26.00-27.00  sec  119 MBytes    1000 Mb/s/sec  86301
[ 5] 27.00-28.00  sec  119 MBytes    1.00 Gb/s/sec  86368
[ 5] 28.00-29.00  sec  119 MBytes    1000 Mb/s/sec  86302
[ 5] 29.00-30.00  sec  119 MBytes    1.00 Gb/s/sec  86340
-----
[ 5] ID Interval      Transfer      Bitrate      Jitter  Lost/Total Datagrams
[ 5] 0.00-30.00   sec  3.49 GBytes  1000 Mb/s/sec  0.000 ms  0/2589738 (0%) sender
[ 5] 0.00-41.92   sec  4.86 MBytes  972 kb/s/sec   0.147 ms 2585788/2589304 (1e+02%) receiver

iperf Done.
administrator@ubuntu-tc-A:~$

```

```

[ 5] Interval      Transfer      Bitrate      Jitter  Lost/Total Datagrams
[ 5] 0.00-1.00    sec  119 KBytes    973 kb/s/sec  0.180 ms  86341/86425 (1e+02%)
[ 5] 1.00-2.00    sec  119 KBytes    973 kb/s/sec  0.327 ms  86323/86407 (1e+02%)
[ 5] 2.00-3.00    sec  119 KBytes    973 kb/s/sec  0.225 ms  86370/86454 (1e+02%)
[ 5] 3.00-4.00    sec  119 KBytes    973 kb/s/sec  0.225 ms  86361/86445 (1e+02%)
[ 5] 4.00-5.00    sec  119 KBytes    973 kb/s/sec  0.255 ms  86323/86407 (1e+02%)
[ 5] 5.00-6.00    sec  117 KBytes    961 kb/s/sec  0.257 ms  85299/85382 (1e+02%)
[ 5] 6.00-7.00    sec  119 KBytes    973 kb/s/sec  0.201 ms  86371/86455 (1e+02%)
[ 5] 7.00-8.00    sec  119 KBytes    973 kb/s/sec  0.197 ms  86380/86464 (1e+02%)
[ 5] 8.00-9.00    sec  119 KBytes    973 kb/s/sec  15.365 ms 1028905/1028989 (1e+02%)
[ 5] 9.00-10.00   sec  119 KBytes    973 kb/s/sec  11.929 ms  0/84 (0%)
[ 5] 10.00-11.00  sec  119 KBytes    973 kb/s/sec  11.918 ms  0/84 (0%)
[ 5] 11.00-12.00  sec  119 KBytes    973 kb/s/sec  11.923 ms  0/84 (0%)
[ 5] 12.00-13.00  sec  117 KBytes    961 kb/s/sec  11.922 ms  0/83 (0%)
[ 5] 13.00-14.00  sec  119 KBytes    973 kb/s/sec  11.911 ms  0/84 (0%)
[ 5] 14.00-15.00  sec  119 KBytes    973 kb/s/sec  11.905 ms  0/84 (0%)
[ 5] 15.00-16.00  sec  119 KBytes    973 kb/s/sec  0.267 ms  86331/86445 (1e+02%)
[ 5] 16.00-17.00  sec  119 KBytes    973 kb/s/sec  0.183 ms  85295/85378 (1e+02%)
[ 5] 17.00-18.00  sec  119 KBytes    973 kb/s/sec  0.140 ms  86411/86495 (1e+02%)
[ 5] 18.00-19.00  sec  119 KBytes    973 kb/s/sec  0.175 ms  86330/86414 (1e+02%)
[ 5] 19.00-20.00  sec  119 KBytes    973 kb/s/sec  0.312 ms  86322/86406 (1e+02%)
[ 5] 20.00-21.00  sec  119 KBytes    973 kb/s/sec  0.353 ms  86351/86435 (1e+02%)
[ 5] 21.00-22.00  sec  119 KBytes    973 kb/s/sec  0.159 ms  86388/86472 (1e+02%)
[ 5] 22.00-23.00  sec  119 KBytes    973 kb/s/sec  0.164 ms  86338/86422 (1e+02%)
[ 5] 23.00-24.00  sec  119 KBytes    973 kb/s/sec  0.214 ms  86307/86391 (1e+02%)
[ 5] 24.00-25.00  sec  109 KBytes    974 kb/s/sec  0.147 ms  79199/79276 (1e+02%)
-----
[ 5] ID Interval      Transfer      Bitrate      Jitter  Lost/Total Datagrams
[ 5] 0.00-41.92   sec  4.86 MBytes  972 kb/s/sec   0.147 ms 2585788/2589304 (1e+02%) receiver

Server Listening on 5201

```

Unlimited test 30s (TCP iperf)

```

[ 5] Interval      Transfer      Bitrate      Retr  Cwnd
[ 5] 0.00-1.00    sec  1.17 GBytes  10.8 Gb/s/sec  0  3.16 MBytes
[ 5] 1.00-2.00    sec  1.25 GBytes  10.8 Gb/s/sec  0  3.16 MBytes
[ 5] 2.00-3.00    sec  1.29 GBytes  11.1 Gb/s/sec  0  3.16 MBytes
[ 5] 3.00-4.00    sec  1.27 GBytes  10.9 Gb/s/sec  0  3.16 MBytes
[ 5] 4.00-5.00    sec  1.26 GBytes  10.9 Gb/s/sec  0  3.16 MBytes
[ 5] 5.00-6.00    sec  1.26 GBytes  10.8 Gb/s/sec  0  3.16 MBytes
[ 5] 6.00-7.00    sec  1.27 GBytes  10.9 Gb/s/sec  0  3.16 MBytes
[ 5] 7.00-8.00    sec  1.25 GBytes  10.7 Gb/s/sec  0  3.16 MBytes
[ 5] 8.00-9.00    sec  1.24 GBytes  10.7 Gb/s/sec  0  3.16 MBytes
[ 5] 9.00-10.00   sec  1.26 GBytes  10.8 Gb/s/sec  0  3.16 MBytes
[ 5] 10.00-11.00  sec  1.23 GBytes  10.5 Gb/s/sec  0  3.16 MBytes
[ 5] 11.00-12.00  sec  1.22 GBytes  10.4 Gb/s/sec  0  3.16 MBytes
[ 5] 12.00-13.00  sec  1.25 GBytes  10.7 Gb/s/sec  0  3.16 MBytes
[ 5] 13.00-14.00  sec  1.20 GBytes  10.3 Gb/s/sec  0  3.16 MBytes
[ 5] 14.00-15.00  sec  1.05 GBytes  9.01 Gb/s/sec  0  3.16 MBytes
[ 5] 15.00-16.00  sec  1.17 GBytes  10.0 Gb/s/sec  0  3.16 MBytes
[ 5] 16.00-17.00  sec  1.19 GBytes  10.2 Gb/s/sec  0  3.16 MBytes
[ 5] 17.00-18.00  sec  1.18 GBytes  10.1 Gb/s/sec  0  3.16 MBytes
[ 5] 18.00-19.00  sec  1.18 GBytes  10.1 Gb/s/sec  0  3.16 MBytes
[ 5] 19.00-20.00  sec  1.18 GBytes  10.1 Gb/s/sec  0  3.16 MBytes
[ 5] 20.00-21.00  sec  1.18 GBytes  10.1 Gb/s/sec  0  3.16 MBytes
[ 5] 21.00-22.00  sec  1.21 GBytes  10.4 Gb/s/sec  0  3.16 MBytes
[ 5] 22.00-23.00  sec  1.13 GBytes  9.73 Gb/s/sec  1  3.16 MBytes
[ 5] 23.00-24.00  sec  1.13 GBytes  9.60 Gb/s/sec  0  3.16 MBytes
[ 5] 24.00-25.00  sec  1.06 GBytes  9.08 Gb/s/sec  1  3.16 MBytes
[ 5] 25.00-26.00  sec  1.25 GBytes  10.7 Gb/s/sec  0  3.16 MBytes
[ 5] 26.00-27.00  sec  1.19 GBytes  10.2 Gb/s/sec  0  3.16 MBytes
[ 5] 27.00-28.00  sec  1.17 GBytes  10.1 Gb/s/sec  0  3.16 MBytes
[ 5] 28.00-29.00  sec  1.21 GBytes  10.4 Gb/s/sec  0  3.16 MBytes
[ 5] 29.00-30.00  sec  1.24 GBytes  10.6 Gb/s/sec  0  3.16 MBytes
-----
[ 5] ID Interval      Transfer      Bitrate      Retr  sender
[ 5] 0.00-30.00   sec  36.1 GBytes  10.3 Gb/s/sec  2      sender
[ 5] 0.00-30.00   sec  36.1 GBytes  10.3 Gb/s/sec

iperf Done.
administrator@ubuntu-tc-A:~$

```

```

[ 5] Interval      Transfer      Bitrate
[ 5] 0.00-1.00    sec  1.17 GBytes  10.8 Gb/s/sec
[ 5] 1.00-2.00    sec  1.25 GBytes  10.8 Gb/s/sec
[ 5] 2.00-3.00    sec  1.29 GBytes  11.1 Gb/s/sec
[ 5] 3.00-4.00    sec  1.27 GBytes  10.9 Gb/s/sec
[ 5] 4.00-5.00    sec  1.26 GBytes  10.9 Gb/s/sec
[ 5] 5.00-6.00    sec  1.26 GBytes  10.8 Gb/s/sec
[ 5] 6.00-7.00    sec  1.27 GBytes  10.9 Gb/s/sec
[ 5] 7.00-8.00    sec  1.25 GBytes  10.7 Gb/s/sec
[ 5] 8.00-9.00    sec  1.24 GBytes  10.7 Gb/s/sec
[ 5] 9.00-10.00   sec  1.26 GBytes  10.8 Gb/s/sec
[ 5] 10.00-11.00  sec  1.23 GBytes  10.5 Gb/s/sec
[ 5] 11.00-12.00  sec  1.22 GBytes  10.4 Gb/s/sec
[ 5] 12.00-13.00  sec  1.25 GBytes  10.7 Gb/s/sec
[ 5] 13.00-14.00  sec  1.20 GBytes  10.3 Gb/s/sec
[ 5] 14.00-15.00  sec  1.05 GBytes  9.01 Gb/s/sec
[ 5] 15.00-16.00  sec  1.17 GBytes  10.0 Gb/s/sec
[ 5] 16.00-17.00  sec  1.19 GBytes  10.2 Gb/s/sec
[ 5] 17.00-18.00  sec  1.17 GBytes  10.1 Gb/s/sec
[ 5] 18.00-19.00  sec  1.18 GBytes  10.1 Gb/s/sec
[ 5] 19.00-20.00  sec  1.18 GBytes  10.1 Gb/s/sec
[ 5] 20.00-21.00  sec  1.18 GBytes  10.1 Gb/s/sec
[ 5] 21.00-22.00  sec  1.21 GBytes  10.4 Gb/s/sec
[ 5] 22.00-23.00  sec  1.13 GBytes  9.73 Gb/s/sec
[ 5] 23.00-24.00  sec  1.13 GBytes  9.60 Gb/s/sec
[ 5] 24.00-25.00  sec  1.06 GBytes  9.08 Gb/s/sec
[ 5] 25.00-26.00  sec  1.25 GBytes  10.7 Gb/s/sec
[ 5] 26.00-27.00  sec  1.19 GBytes  10.2 Gb/s/sec
[ 5] 27.00-28.00  sec  1.17 GBytes  10.1 Gb/s/sec
[ 5] 28.00-29.00  sec  1.21 GBytes  10.4 Gb/s/sec
[ 5] 29.00-30.00  sec  1.24 GBytes  10.6 Gb/s/sec
-----
[ 5] ID Interval      Transfer      Bitrate
[ 5] 0.00-30.00   sec  36.1 GBytes  10.3 Gb/s/sec

Server Listening on 5201

```

Bandwidth restriction up to 300Mbps 30s (TCP iperf)

```

administrator@ubuntu-tc-A:~$ iperf
[ ID] Interval      Transfer      Bitrate      Retr  Cwnd
[  5] 0.00-1.00    sec 36.9 MBytes  389 Mbits/sec  0    1.78 MBytes
[  5] 1.00-2.00    sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 2.00-3.00    sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 3.00-4.00    sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 4.00-5.00    sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 5.00-6.00    sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 6.00-7.00    sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 7.00-8.00    sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 8.00-9.00    sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 9.00-10.00   sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 10.00-11.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 11.00-12.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 12.00-13.00  sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 13.00-14.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 14.00-15.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 15.00-16.00  sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 16.00-17.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 17.00-18.00  sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 18.00-19.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 19.00-20.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 20.00-21.00  sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 21.00-22.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 22.00-23.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 23.00-24.00  sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 24.00-25.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 25.00-26.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 26.00-27.00  sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 27.00-28.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
[  5] 28.00-29.00  sec 35.0 MBytes  294 Mbits/sec  0    3.15 MBytes
[  5] 29.00-30.00  sec 33.8 MBytes  283 Mbits/sec  0    3.15 MBytes
-----
[ ID] Interval      Transfer      Bitrate      Retr  sender receiver
[  5] 0.00-30.00   sec 1.01 GBytes 288 Mbits/sec  0
[  5] 0.00-30.00   sec 1.00 GBytes 287 Mbits/sec

iperf Done.
administrator@ubuntu-tc-A:~$

[  5] 0.00-1.00    sec 34.1 MBytes  286 Mbits/sec
[  5] 1.00-2.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 2.00-3.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 3.00-4.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 4.00-5.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 5.00-6.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 6.00-7.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 7.00-8.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 8.00-9.00    sec 34.2 MBytes  287 Mbits/sec
[  5] 9.00-10.00   sec 34.2 MBytes  287 Mbits/sec
[  5] 10.00-11.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 11.00-12.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 12.00-13.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 13.00-14.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 14.00-15.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 15.00-16.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 16.00-17.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 17.00-18.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 18.00-19.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 19.00-20.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 20.00-21.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 21.00-22.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 22.00-23.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 23.00-24.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 24.00-25.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 25.00-26.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 26.00-27.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 27.00-28.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 28.00-29.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 29.00-30.00  sec 34.2 MBytes  287 Mbits/sec
[  5] 30.00-30.00  sec 2.96 MBytes  287 Mbits/sec
-----
[ ID] Interval      Transfer      Bitrate      Retr  sender receiver
[  5] 0.00-30.00   sec 1.00 GBytes 287 Mbits/sec

Server listening on 5201

```

Bandwidth limitation to 100Mbps 30s (TCP iperf)

```

administrator@ubuntu-tc-A:~$ iperf
[ ID] Interval      Transfer      Bitrate      Retr  Cwnd
[  5] 0.00-1.00    sec 14.7 MBytes  123 Mbits/sec  0    619 KBytes
[  5] 1.00-2.00    sec 11.2 MBytes  94.4 Mbits/sec  0    1.75 MBytes
[  5] 2.00-3.00    sec 11.2 MBytes  94.4 Mbits/sec  0    2.33 MBytes
[  5] 3.00-4.00    sec 11.2 MBytes  94.4 Mbits/sec  0    2.86 MBytes
[  5] 4.00-5.00    sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 5.00-6.00    sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 6.00-7.00    sec 12.5 MBytes  105 Mbits/sec  0    3.00 MBytes
[  5] 7.00-8.00    sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 8.00-9.00    sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 9.00-10.00   sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 10.00-11.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 11.00-12.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 12.00-13.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 13.00-14.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 14.00-15.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 15.00-16.00  sec 12.5 MBytes  105 Mbits/sec  0    3.00 MBytes
[  5] 16.00-17.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 17.00-18.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 18.00-19.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 19.00-20.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 20.00-21.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 21.00-22.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 22.00-23.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 23.00-24.00  sec 12.5 MBytes  105 Mbits/sec  0    3.00 MBytes
[  5] 24.00-25.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 25.00-26.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 26.00-27.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 27.00-28.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 28.00-29.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
[  5] 29.00-30.00  sec 11.2 MBytes  94.4 Mbits/sec  0    3.00 MBytes
-----
[ ID] Interval      Transfer      Bitrate      Retr  sender receiver
[  5] 0.00-30.00   sec 345 MBytes 96.4 Mbits/sec  0
[  5] 0.00-30.00   sec 345 MBytes 95.6 Mbits/sec

iperf Done.
administrator@ubuntu-tc-A:~$

[  5] 0.00-1.00    sec 11.4 MBytes  95.5 Mbits/sec
[  5] 1.00-2.00    sec 11.4 MBytes  95.6 Mbits/sec
[  5] 2.00-3.00    sec 11.4 MBytes  95.6 Mbits/sec
[  5] 3.00-4.00    sec 11.4 MBytes  95.6 Mbits/sec
[  5] 4.00-5.00    sec 11.4 MBytes  95.7 Mbits/sec
[  5] 5.00-6.00    sec 11.4 MBytes  95.6 Mbits/sec
[  5] 6.00-7.00    sec 11.4 MBytes  95.6 Mbits/sec
[  5] 7.00-8.00    sec 11.4 MBytes  95.6 Mbits/sec
[  5] 8.00-9.00    sec 11.4 MBytes  95.7 Mbits/sec
[  5] 9.00-10.00   sec 11.4 MBytes  95.6 Mbits/sec
[  5] 10.00-11.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 11.00-12.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 12.00-13.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 13.00-14.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 14.00-15.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 15.00-16.00  sec 11.4 MBytes  95.7 Mbits/sec
[  5] 16.00-17.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 17.00-18.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 18.00-19.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 19.00-20.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 20.00-21.00  sec 11.4 MBytes  95.7 Mbits/sec
[  5] 21.00-22.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 22.00-23.00  sec 11.4 MBytes  95.5 Mbits/sec
[  5] 23.00-24.00  sec 11.4 MBytes  95.7 Mbits/sec
[  5] 24.00-25.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 25.00-26.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 26.00-27.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 27.00-28.00  sec 11.4 MBytes  95.8 Mbits/sec
[  5] 28.00-29.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 29.00-30.00  sec 11.4 MBytes  95.6 Mbits/sec
[  5] 30.00-30.23  sec 2.68 MBytes  95.6 Mbits/sec
-----
[ ID] Interval      Transfer      Bitrate      Retr  sender receiver
[  5] 0.00-30.23   sec 345 MBytes 95.6 Mbits/sec

Server listening on 5201

```

Bandwidth limitation to 10Mbps 30s (TCP iperf)

```

[ 5] 0.00-1.00 sec 2.26 MBytes 18.9 Mbits/sec 0 394 KBytes
[ 5] 1.00-2.00 sec 1.25 MBytes 10.5 Mbits/sec 0 352 KBytes
[ 5] 2.00-3.00 sec 1.48 MBytes 12.5 Mbits/sec 0 410 KBytes
[ 5] 3.00-4.00 sec 1.72 MBytes 14.4 Mbits/sec 0 468 KBytes
[ 5] 4.00-5.00 sec 1.01 MBytes 8.40 Mbits/sec 0 527 KBytes
[ 5] 5.00-6.00 sec 2.26 MBytes 18.9 Mbits/sec 0 585 KBytes
[ 5] 6.00-7.00 sec 1.25 MBytes 10.5 Mbits/sec 0 643 KBytes
[ 5] 7.00-8.00 sec 1.25 MBytes 10.5 Mbits/sec 0 703 KBytes
[ 5] 8.00-9.00 sec 1.25 MBytes 10.5 Mbits/sec 0 761 KBytes
[ 5] 9.00-10.00 sec 1.25 MBytes 10.5 Mbits/sec 0 819 KBytes
[ 5] 10.00-11.00 sec 0.00 Bytes 0.00 bits/sec 0 882 KBytes
[ 5] 11.00-12.00 sec 1.25 MBytes 10.5 Mbits/sec 0 1.00 MBytes
[ 5] 12.00-13.00 sec 1.25 MBytes 10.5 Mbits/sec 0 1.19 MBytes
[ 5] 13.00-14.00 sec 1.25 MBytes 10.5 Mbits/sec 0 1.42 MBytes
[ 5] 14.00-15.00 sec 1.25 MBytes 10.5 Mbits/sec 0 1.68 MBytes
[ 5] 15.00-16.00 sec 1.25 MBytes 10.5 Mbits/sec 0 1.97 MBytes
[ 5] 16.00-17.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.28 MBytes
[ 5] 17.00-18.00 sec 0.00 Bytes 0.00 bits/sec 0 2.66 MBytes
[ 5] 18.00-19.00 sec 1.25 MBytes 10.5 Mbits/sec 0 3.04 MBytes
[ 5] 19.00-20.00 sec 1.25 MBytes 10.5 Mbits/sec 0 3.10 MBytes
[ 5] 20.00-21.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.44 MBytes
[ 5] 21.00-22.00 sec 0.00 Bytes 0.00 bits/sec 144 1.08 MBytes
[ 5] 22.00-23.00 sec 2.50 MBytes 21.0 Mbits/sec 0 2.17 MBytes
[ 5] 23.00-24.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.22 MBytes
[ 5] 24.00-25.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.33 MBytes
[ 5] 25.00-26.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.46 MBytes
[ 5] 26.00-27.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.58 MBytes
[ 5] 27.00-28.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.69 MBytes
[ 5] 28.00-29.00 sec 0.00 Bytes 0.00 bits/sec 0 2.79 MBytes
[ 5] 29.00-30.00 sec 1.25 MBytes 10.5 Mbits/sec 0 2.86 MBytes
[ ID] Interval Transfer Bitrate Retr Cwnd
[ 5] 0.00-30.00 sec 36.2 MBytes 10.1 Mbits/sec 152 sender
[ 5] 0.00-31.70 sec 35.9 MBytes 9.49 Mbits/sec receiver
iperf Done.
administrator@ubuntu-tc-A:~$
  
```

```

[ 5] 1.00-2.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 2.00-3.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 3.00-4.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 4.00-5.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 5.00-6.00 sec 1.14 MBytes 9.57 Mbits/sec
[ 5] 6.00-7.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 7.00-8.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 8.00-9.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 9.00-10.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 10.00-11.00 sec 1.14 MBytes 9.55 Mbits/sec
[ 5] 11.00-12.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 12.00-13.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 13.00-14.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 14.00-15.00 sec 1.14 MBytes 9.55 Mbits/sec
[ 5] 15.00-16.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 16.00-17.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 17.00-18.00 sec 1.14 MBytes 9.55 Mbits/sec
[ 5] 18.00-19.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 19.00-20.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 20.00-21.00 sec 837 KBytes 6.86 Mbits/sec
[ 5] 21.00-22.00 sec 0.00 Bytes 0.00 bits/sec
[ 5] 22.00-23.00 sec 2.60 MBytes 21.9 Mbits/sec
[ 5] 23.00-24.00 sec 1.14 MBytes 9.53 Mbits/sec
[ 5] 24.00-25.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 25.00-26.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 26.00-27.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 27.00-28.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 28.00-29.00 sec 1.14 MBytes 9.58 Mbits/sec
[ 5] 29.00-30.00 sec 1.14 MBytes 9.56 Mbits/sec
[ 5] 30.00-31.00 sec 1.14 MBytes 9.57 Mbits/sec
[ 5] 31.00-31.70 sec 537 KBytes 6.33 Mbits/sec
[ ID] Interval Transfer Bitrate
[ 5] 0.00-31.70 sec 35.9 MBytes 9.49 Mbits/sec receiver
Server listening on 5201
  
```

Bandwidth limitation to 1Mbps 30s (TCP iperf)

```

[ 5] 0.00-1.00 sec 379 KBytes 3.10 Mbits/sec 0 56.6 KBytes
[ 5] 1.00-2.00 sec 146 KBytes 1.19 Mbits/sec 0 62.2 KBytes
[ 5] 2.00-3.00 sec 182 KBytes 1.49 Mbits/sec 0 67.9 KBytes
[ 5] 3.00-4.00 sec 182 KBytes 1.49 Mbits/sec 0 74.9 KBytes
[ 5] 4.00-5.00 sec 243 KBytes 1.99 Mbits/sec 0 91.9 KBytes
[ 5] 5.00-6.00 sec 0.00 Bytes 0.00 bits/sec 0 123 KBytes
[ 5] 6.00-7.00 sec 304 KBytes 2.49 Mbits/sec 0 164 KBytes
[ 5] 7.00-8.00 sec 365 KBytes 2.99 Mbits/sec 0 222 KBytes
[ 5] 8.00-9.00 sec 406 KBytes 3.39 Mbits/sec 0 280 KBytes
[ 5] 9.00-10.00 sec 609 KBytes 5.48 Mbits/sec 0 339 KBytes
[ 5] 10.00-11.00 sec 0.00 Bytes 0.00 bits/sec 0 397 KBytes
[ 5] 11.00-12.00 sec 912 KBytes 7.48 Mbits/sec 0 455 KBytes
[ 5] 12.00-13.00 sec 0.00 Bytes 0.00 bits/sec 0 515 KBytes
[ 5] 13.00-14.00 sec 0.00 Bytes 0.00 bits/sec 0 573 KBytes
[ 5] 14.00-15.00 sec 1.19 MBytes 9.97 Mbits/sec 0 631 KBytes
[ 5] 15.00-16.00 sec 0.00 Bytes 0.00 bits/sec 0 689 KBytes
[ 5] 16.00-17.00 sec 0.00 Bytes 0.00 bits/sec 0 748 KBytes
[ 5] 17.00-18.00 sec 0.00 Bytes 0.00 bits/sec 0 806 KBytes
[ 5] 18.00-19.00 sec 0.00 Bytes 0.00 bits/sec 0 864 KBytes
[ 5] 19.00-20.00 sec 0.00 Bytes 0.00 bits/sec 0 922 KBytes
[ 5] 20.00-21.00 sec 0.00 Bytes 0.00 bits/sec 0 980 KBytes
[ 5] 21.00-22.00 sec 0.00 Bytes 0.00 bits/sec 0 1.01 MBytes
[ 5] 22.00-23.00 sec 0.00 Bytes 0.00 bits/sec 0 1.07 MBytes
[ 5] 23.00-24.00 sec 0.00 Bytes 0.00 bits/sec 0 1.13 MBytes
[ 5] 24.00-25.00 sec 0.00 Bytes 0.00 bits/sec 0 1.19 MBytes
[ 5] 25.00-26.00 sec 1.25 MBytes 10.5 Mbits/sec 0 1.24 MBytes
[ 5] 26.00-27.00 sec 0.00 Bytes 0.00 bits/sec 0 1.30 MBytes
[ 5] 27.00-28.00 sec 0.00 Bytes 0.00 bits/sec 0 1.36 MBytes
[ 5] 28.00-29.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 MBytes
[ 5] 29.00-30.00 sec 0.00 Bytes 0.00 bits/sec 0 1.46 MBytes
[ ID] Interval Transfer Bitrate Retr
[ 5] 0.00-30.00 sec 6.22 MBytes 1.74 Mbits/sec 0 sender
[ 5] 0.00-42.59 sec 4.86 MBytes 956 Kbits/sec receiver
iperf Done.
administrator@ubuntu-tc-A:~$
  
```

```

[ 5] 12.00-13.00 sec 119 KBytes 973 kbits/sec
[ 5] 13.00-14.00 sec 116 KBytes 950 kbits/sec
[ 5] 14.00-15.00 sec 116 KBytes 950 kbits/sec
[ 5] 15.00-16.00 sec 116 KBytes 950 kbits/sec
[ 5] 16.00-17.00 sec 119 KBytes 973 kbits/sec
[ 5] 17.00-18.00 sec 115 KBytes 938 kbits/sec
[ 5] 18.00-19.00 sec 119 KBytes 973 kbits/sec
[ 5] 19.00-20.00 sec 116 KBytes 950 kbits/sec
[ 5] 20.00-21.00 sec 116 KBytes 950 kbits/sec
[ 5] 21.00-22.00 sec 119 KBytes 973 kbits/sec
[ 5] 22.00-23.00 sec 116 KBytes 950 kbits/sec
[ 5] 23.00-24.00 sec 116 KBytes 950 kbits/sec
[ 5] 24.00-25.00 sec 116 KBytes 950 kbits/sec
[ 5] 25.00-26.00 sec 119 KBytes 973 kbits/sec
[ 5] 26.00-27.00 sec 116 KBytes 950 kbits/sec
[ 5] 27.00-28.00 sec 116 KBytes 950 kbits/sec
[ 5] 28.00-29.00 sec 119 KBytes 973 kbits/sec
[ 5] 29.00-30.00 sec 115 KBytes 938 kbits/sec
[ 5] 30.00-31.00 sec 119 KBytes 973 kbits/sec
[ 5] 31.00-32.00 sec 116 KBytes 950 kbits/sec
[ 5] 32.00-33.00 sec 116 KBytes 950 kbits/sec
[ 5] 33.00-34.00 sec 119 KBytes 973 kbits/sec
[ 5] 34.00-35.00 sec 116 KBytes 950 kbits/sec
[ 5] 35.00-36.00 sec 116 KBytes 950 kbits/sec
[ 5] 36.00-37.00 sec 116 KBytes 950 kbits/sec
[ 5] 37.00-38.00 sec 119 KBytes 973 kbits/sec
[ 5] 38.00-39.00 sec 116 KBytes 950 kbits/sec
[ 5] 39.00-40.00 sec 116 KBytes 950 kbits/sec
[ 5] 40.00-41.00 sec 116 KBytes 950 kbits/sec
[ 5] 41.00-42.00 sec 119 KBytes 973 kbits/sec
[ 5] 42.00-42.59 sec 69.3 KBytes 964 kbits/sec
[ ID] Interval Transfer Bitrate
[ 5] 0.00-42.59 sec 4.86 MBytes 956 Kbits/sec receiver
Server listening on 5201
  
```

Round trip link test 10Mbps, latency 2000ms, urata 3%, faulty 10% (ping 100 measurements)

```

Activities Terminal maj 12 20:04 administrator@ubuntu-tc-A: ~
64 bytes from 192.168.2.10: icmp_seq=57 ttl=63 time=4002 ms
64 bytes from 192.168.2.10: icmp_seq=58 ttl=63 time=4002 ms
64 bytes from 192.168.2.10: icmp_seq=59 ttl=63 time=4003 ms
64 bytes from 192.168.2.10: icmp_seq=60 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=61 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=62 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=64 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=65 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=66 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=67 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=68 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=70 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=71 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=72 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=73 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=74 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=76 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=78 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=82 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=84 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=85 ttl=63 time=4002 ms
64 bytes from 192.168.2.10: icmp_seq=86 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=87 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=88 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=89 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=90 ttl=63 time=4002 ms
64 bytes from 192.168.2.10: icmp_seq=91 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=93 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=94 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=97 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=98 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=99 ttl=63 time=4001 ms
64 bytes from 192.168.2.10: icmp_seq=100 ttl=63 time=4001 ms

--- 192.168.2.10 ping statistics ---
100 packets transmitted, 76 received, 24% packet loss, time 99542ms
rtt min/avg/max/mdev = 4000.690/4001.120/4002.574/0.383 ms, pipe 5
administrator@ubuntu-tc-A:~$

```

10Mbps round trip link test, latency 600ms, loss 3%, corrupted 10% (TCP iperf)

```

Activities Terminal maj 12 20:06 administrator@ubuntu-tc-A: ~
[ ID] Interval      Transfer    Bitrate      Retr  Cwnd
[ 5] 0.00-1.20    sec 102 KBytes  695 Kbits/sec  1 14.1 KBytes
[ 5] 1.20-2.00    sec 0.00 Bytes  0.00 bbits/sec  0 28.3 KBytes
[ 5] 2.00-3.00    sec 93.3 KBytes 706 Kbits/sec  0 28.3 KBytes
[ 5] 3.00-4.00    sec 0.00 Bytes  0.00 bbits/sec  3 32.5 KBytes
[ 5] 4.00-5.00    sec 0.00 Bytes  0.00 bbits/sec  1 22.6 KBytes
[ 5] 5.00-6.00    sec 0.00 Bytes  0.00 bbits/sec  0 22.6 KBytes
[ 5] 6.00-7.00    sec 0.00 Bytes  0.00 bbits/sec  1 28.3 KBytes
[ 5] 7.00-8.00    sec 0.00 Bytes  0.00 bbits/sec  2 21.2 KBytes
[ 5] 8.00-9.00    sec 90.5 KBytes 742 Kbits/sec  1 17.0 KBytes
[ 5] 9.00-10.00   sec 0.00 Bytes  0.00 bbits/sec  0 15.6 KBytes
[ 5] 10.00-11.00  sec 0.00 Bytes  0.00 bbits/sec  1 12.7 KBytes
[ 5] 11.00-12.00  sec 0.00 Bytes  0.00 bbits/sec  0 12.7 KBytes
[ 5] 12.00-13.00  sec 0.00 Bytes  0.00 bbits/sec  3 9.90 KBytes
[ 5] 13.00-14.00  sec 122 KBytes 997 Kbits/sec  1 8.48 KBytes
[ 5] 14.00-15.00  sec 0.00 Bytes  0.00 bbits/sec  0 5.66 KBytes
[ 5] 15.00-16.00  sec 0.00 Bytes  0.00 bbits/sec  0 7.07 KBytes
[ 5] 16.00-17.00  sec 0.00 Bytes  0.00 bbits/sec  0 11.3 KBytes
[ 5] 17.00-18.00  sec 0.00 Bytes  0.00 bbits/sec  0 11.3 KBytes
[ 5] 18.00-19.00  sec 0.00 Bytes  0.00 bbits/sec  0 17.0 KBytes
[ 5] 19.00-20.00  sec 0.00 Bytes  0.00 bbits/sec  2 12.7 KBytes
[ 5] 20.00-21.00  sec 0.00 Bytes  0.00 bbits/sec  0 14.1 KBytes
[ 5] 21.00-22.00  sec 0.00 Bytes  0.00 bbits/sec  0 18.4 KBytes
[ 5] 22.00-23.00  sec 0.00 Bytes  0.00 bbits/sec  1 12.7 KBytes
[ 5] 23.00-24.00  sec 0.00 Bytes  0.00 bbits/sec  0 12.7 KBytes
[ 5] 24.00-25.00  sec 0.00 Bytes  0.00 bbits/sec  1 7.07 KBytes
[ 5] 25.00-26.00  sec 0.00 Bytes  0.00 bbits/sec  3 7.07 KBytes
[ 5] 26.00-27.00  sec 0.00 Bytes  0.00 bbits/sec  1 5.66 KBytes
[ 5] 27.00-28.00  sec 122 KBytes 996 Kbits/sec  0 12.7 KBytes
[ 5] 28.00-29.00  sec 0.00 Bytes  0.00 bbits/sec  1 8.48 KBytes
[ 5] 29.00-30.00  sec 0.00 Bytes  0.00 bbits/sec  0 8.48 KBytes

[ ID] Interval      Transfer    Bitrate      Retr  sender receiver
[ 5] 0.00-30.00   sec 529 KBytes 144 Kbits/sec  23
[ 5] 0.00-31.20   sec 313 KBytes 82.0 Kbits/sec

iperf Done.
administrator@ubuntu-tc-A:~$

Activities Terminal maj 12 20:06 administrator@ubuntu-tc-B: ~
[ 5] 1.00-2.00    sec 0.00 Bytes  0.00 bbits/sec
[ 5] 2.00-3.00    sec 14.1 KBytes 116 Kbits/sec
[ 5] 3.00-4.00    sec 11.3 KBytes 92.7 Kbits/sec
[ 5] 4.00-5.00    sec 2.83 KBytes 23.2 Kbits/sec
[ 5] 5.00-6.00    sec 0.00 Bytes  0.00 bbits/sec
[ 5] 6.00-7.00    sec 56.6 KBytes 463 Kbits/sec
[ 5] 7.00-8.00    sec 1.41 KBytes 11.6 Kbits/sec
[ 5] 8.00-9.00    sec 33.9 KBytes 278 Kbits/sec
[ 5] 9.00-10.00   sec 32.5 KBytes 267 Kbits/sec
[ 5] 10.00-11.00  sec 7.07 KBytes 57.9 Kbits/sec
[ 5] 11.00-12.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 12.00-13.00  sec 4.24 KBytes 34.8 Kbits/sec
[ 5] 13.00-14.00  sec 14.1 KBytes 116 Kbits/sec
[ 5] 14.00-15.00  sec 12.7 KBytes 104 Kbits/sec
[ 5] 15.00-16.00  sec 5.66 KBytes 46.4 Kbits/sec
[ 5] 16.00-17.00  sec 7.07 KBytes 57.9 Kbits/sec
[ 5] 17.00-18.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 18.00-19.00  sec 11.3 KBytes 92.7 Kbits/sec
[ 5] 19.00-20.00  sec 2.83 KBytes 23.2 Kbits/sec
[ 5] 20.00-21.00  sec 24.0 KBytes 197 Kbits/sec
[ 5] 21.00-22.00  sec 14.1 KBytes 116 Kbits/sec
[ 5] 22.00-23.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 23.00-24.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 24.00-25.00  sec 18.4 KBytes 151 Kbits/sec
[ 5] 25.00-26.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 26.00-27.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 27.00-28.00  sec 18.4 KBytes 151 Kbits/sec
[ 5] 28.00-29.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 29.00-30.00  sec 0.00 Bytes  0.00 bbits/sec
[ 5] 30.00-31.00  sec 19.8 KBytes 162 Kbits/sec
[ 5] 31.00-31.20  sec 0.00 Bytes  0.00 bbits/sec

[ ID] Interval      Transfer    Bitrate
[ 5] 0.00-31.20   sec 313 KBytes 82.0 Kbits/sec

Server listening on 5201

```

10Mbps round trip link test, 600ms latency, 3% loss, 10% corrupted (UDP iperf)

```

[ 5] 0.00-1.20 sec 1.44 MBytes 9.65 Mbits/sec 1 172598
[ 5] 1.20-2.00 sec 238 MBytes 2.50 Gbits/sec 86329
[ 5] 2.00-3.00 sec 119 MBytes 1.00 Gbits/sec 86319
[ 5] 3.00-4.00 sec 119 MBytes 1000 Mbits/sec 86319
[ 5] 4.00-5.00 sec 119 MBytes 1.00 Gbits/sec 86351
[ 5] 5.00-6.00 sec 119 MBytes 1000 Mbits/sec 86297
[ 5] 6.00-7.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 7.00-8.00 sec 119 MBytes 1.00 Gbits/sec 86328
[ 5] 8.00-9.00 sec 119 MBytes 1.00 Gbits/sec 86337
[ 5] 9.00-10.00 sec 119 MBytes 1000 Mbits/sec 86324
[ 5] 10.00-11.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 11.00-12.00 sec 119 MBytes 1.00 Gbits/sec 86343
[ 5] 12.00-13.00 sec 119 MBytes 1000 Mbits/sec 86310
[ 5] 13.00-14.00 sec 119 MBytes 1.00 Gbits/sec 86328
[ 5] 14.00-15.00 sec 119 MBytes 1.00 Gbits/sec 86328
[ 5] 15.00-16.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 16.00-17.00 sec 119 MBytes 1.00 Gbits/sec 86331
[ 5] 17.00-18.00 sec 119 MBytes 1.00 Gbits/sec 86331
[ 5] 18.00-19.00 sec 119 MBytes 1000 Mbits/sec 86324
[ 5] 19.00-20.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 20.00-21.00 sec 119 MBytes 1000 Mbits/sec 86322
[ 5] 21.00-22.00 sec 119 MBytes 1.00 Gbits/sec 86329
[ 5] 22.00-23.00 sec 119 MBytes 1.00 Gbits/sec 86326
[ 5] 23.00-24.00 sec 119 MBytes 1.00 Gbits/sec 86334
[ 5] 24.00-25.00 sec 119 MBytes 1000 Mbits/sec 86323
[ 5] 25.00-26.00 sec 119 MBytes 1.00 Gbits/sec 86333
[ 5] 26.00-27.00 sec 119 MBytes 1000 Mbits/sec 86306
[ 5] 27.00-28.00 sec 119 MBytes 1.00 Gbits/sec 86342
[ 5] 28.00-29.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 29.00-30.00 sec 119 MBytes 1000 Mbits/sec 86325

[ ID] Interval      Transfer      Bitrate      Jitter    Lost/Total Datagrams
[ 5] 0.00-30.00 sec 3.49 GBytes 1000 Mbits/sec 0.000 ms 0/2589724 (0%) sender
[ 5] 0.00-31.79 sec 29.5 MBytes 7.79 Mbits/sec 0.240 ms 2568223/2589618 (99%) receiver

iperf Done.
administrator@ubuntu-tc-A: ~$

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[ 5] 1.00-2.00 sec 0.00 Bytes 0.00 bits/sec 0.000 ms 0/0 (0%)
[ 5] 2.00-3.00 sec 635 KBytes 5.21 Mbits/sec 1.320 ms 69/518 (13%)
[ 5] 3.00-4.00 sec 1.04 MBytes 8.73 Mbits/sec 0.262 ms 189195/189949 (1e+02%)
[ 5] 4.00-5.00 sec 1.05 MBytes 8.80 Mbits/sec 0.249 ms 85598/86350 (99%)
[ 5] 5.00-6.00 sec 1.04 MBytes 8.72 Mbits/sec 0.249 ms 85598/86351 (99%)
[ 5] 6.00-7.00 sec 1.05 MBytes 8.87 Mbits/sec 0.301 ms 85575/86341 (99%)
[ 5] 7.00-8.00 sec 1.05 MBytes 8.82 Mbits/sec 0.274 ms 85428/86189 (99%)
[ 5] 8.00-9.00 sec 1.05 MBytes 8.78 Mbits/sec 0.247 ms 85583/86341 (99%)
[ 5] 9.00-10.00 sec 1.02 MBytes 8.56 Mbits/sec 0.314 ms 85617/86356 (99%)
[ 5] 10.00-11.00 sec 1.04 MBytes 8.74 Mbits/sec 0.248 ms 85572/86326 (99%)
[ 5] 11.00-12.00 sec 1.04 MBytes 8.70 Mbits/sec 0.336 ms 85580/86331 (99%)
[ 5] 12.00-13.00 sec 1.03 MBytes 8.68 Mbits/sec 0.368 ms 85578/86327 (99%)
[ 5] 13.00-14.00 sec 1.04 MBytes 8.70 Mbits/sec 0.272 ms 85571/86322 (99%)
[ 5] 14.00-15.00 sec 1.04 MBytes 8.71 Mbits/sec 0.301 ms 85579/86332 (99%)
[ 5] 15.00-16.00 sec 1.05 MBytes 8.82 Mbits/sec 0.294 ms 85558/86319 (99%)
[ 5] 16.00-17.00 sec 1.03 MBytes 8.64 Mbits/sec 0.287 ms 85591/86337 (99%)
[ 5] 17.00-18.00 sec 1.04 MBytes 8.70 Mbits/sec 0.291 ms 85545/86296 (99%)
[ 5] 18.00-19.00 sec 1.04 MBytes 8.76 Mbits/sec 0.266 ms 85577/86333 (99%)
[ 5] 19.00-20.00 sec 1.06 MBytes 8.86 Mbits/sec 0.243 ms 85577/86342 (99%)
[ 5] 20.00-21.00 sec 1.01 MBytes 8.44 Mbits/sec 0.277 ms 85578/86307 (99%)
[ 5] 21.00-22.00 sec 1.05 MBytes 8.77 Mbits/sec 0.265 ms 85598/86355 (99%)
[ 5] 22.00-23.00 sec 1.05 MBytes 8.78 Mbits/sec 0.275 ms 85548/86306 (99%)
[ 5] 23.00-24.00 sec 1.04 MBytes 8.70 Mbits/sec 0.267 ms 85640/86391 (99%)
[ 5] 24.00-25.00 sec 1.07 MBytes 8.94 Mbits/sec 0.265 ms 85579/86353 (99%)
[ 5] 25.00-26.00 sec 332 KBytes 2.72 Mbits/sec 0.246 ms 25828/26063 (99%)
[ 5] 26.00-27.00 sec 693 KBytes 5.68 Mbits/sec 1.258 ms 140268/140758 (1e+02%)
[ 5] 27.00-28.00 sec 1.05 MBytes 8.55 Mbits/sec 0.265 ms 91338/92074 (99%)
[ 5] 28.00-29.00 sec 1.05 MBytes 8.77 Mbits/sec 0.256 ms 85565/86322 (99%)
[ 5] 29.00-30.00 sec 1.05 MBytes 8.84 Mbits/sec 0.280 ms 85565/86328 (99%)
[ 5] 30.00-31.00 sec 1.05 MBytes 8.78 Mbits/sec 0.279 ms 85573/86331 (99%)
[ 5] 31.00-31.79 sec 853 KBytes 8.83 Mbits/sec 0.240 ms 67730/68333 (99%)

Server Listening on 5201

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60Mbps round trip link test, 600ms latency, 5% loss (UDP iperf)

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[ 5] 0.00-1.00 sec 119 MBytes 999 Mbits/sec 86263
[ 5] 1.00-2.00 sec 119 MBytes 1.00 Gbits/sec 86329
[ 5] 2.00-3.00 sec 119 MBytes 1000 Mbits/sec 86321
[ 5] 3.00-4.00 sec 119 MBytes 1.00 Gbits/sec 86338
[ 5] 4.00-5.00 sec 119 MBytes 1000 Mbits/sec 86314
[ 5] 5.00-6.00 sec 119 MBytes 1.00 Gbits/sec 86334
[ 5] 6.00-7.00 sec 119 MBytes 1000 Mbits/sec 86326
[ 5] 7.00-8.00 sec 119 MBytes 1000 Mbits/sec 86318
[ 5] 8.00-9.00 sec 119 MBytes 1.00 Gbits/sec 86337
[ 5] 9.00-10.00 sec 119 MBytes 1.00 Gbits/sec 86328
[ 5] 10.00-11.00 sec 119 MBytes 1000 Mbits/sec 86310
[ 5] 11.00-12.00 sec 119 MBytes 1.00 Gbits/sec 86342
[ 5] 12.00-13.00 sec 119 MBytes 1.00 Gbits/sec 86332
[ 5] 13.00-14.00 sec 119 MBytes 1000 Mbits/sec 86313
[ 5] 14.00-15.00 sec 119 MBytes 1.00 Gbits/sec 86327
[ 5] 15.00-16.00 sec 119 MBytes 1.00 Gbits/sec 86334
[ 5] 16.00-17.00 sec 119 MBytes 1000 Mbits/sec 86314
[ 5] 17.00-18.00 sec 119 MBytes 1.00 Gbits/sec 86327
[ 5] 18.00-19.00 sec 119 MBytes 1000 Mbits/sec 86323
[ 5] 19.00-20.00 sec 119 MBytes 1.00 Gbits/sec 86312
[ 5] 20.00-21.00 sec 119 MBytes 1.00 Gbits/sec 86341
[ 5] 21.00-22.00 sec 119 MBytes 1.00 Gbits/sec 86326
[ 5] 22.00-23.00 sec 119 MBytes 1000 Mbits/sec 86319
[ 5] 23.00-24.00 sec 119 MBytes 1.00 Gbits/sec 86331
[ 5] 24.00-25.00 sec 119 MBytes 1.00 Gbits/sec 86326
[ 5] 25.00-26.00 sec 119 MBytes 1000 Mbits/sec 86316
[ 5] 26.00-27.00 sec 119 MBytes 1.00 Gbits/sec 86377
[ 5] 27.00-28.00 sec 119 MBytes 1000 Mbits/sec 86304
[ 5] 28.00-29.00 sec 119 MBytes 1000 Mbits/sec 86294
[ 5] 29.00-30.00 sec 119 MBytes 1.00 Gbits/sec 86334

[ ID] Interval      Transfer      Bitrate      Jitter    Lost/Total Datagrams
[ 5] 0.00-30.00 sec 3.49 GBytes 1000 Mbits/sec 0.008 ms 0/2589728 (0%) sender
[ 5] 0.00-37.81 sec 66.3 MBytes 14.7 Mbits/sec 0.266 ms 2515137/2563136 (98%) receiver

iperf Done.
administrator@ubuntu-tc-A: ~$

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[ 6] 7.00-8.00 sec 1.68 MBytes 14.1 Mbits/sec 0.281 ms 54372/55591 (98%)
[ 6] 8.00-9.00 sec 1.38 MBytes 11.6 Mbits/sec 0.232 ms 50959/51950 (98%)
[ 6] 9.00-10.00 sec 785 KBytes 6.43 Mbits/sec 0.188 ms 141965/142520 (1e+02%)
[ 6] 10.00-11.00 sec 2.08 MBytes 16.7 Mbits/sec 0.250 ms 66953/68398 (98%)
[ 6] 11.00-12.00 sec 2.76 MBytes 23.2 Mbits/sec 0.290 ms 101843/103842 (98%)
[ 6] 12.00-13.00 sec 2.11 MBytes 17.7 Mbits/sec 0.273 ms 94130/95658 (98%)
[ 6] 13.00-14.00 sec 2.03 MBytes 17.0 Mbits/sec 0.278 ms 58569/60041 (98%)
[ 6] 14.00-15.00 sec 2.76 MBytes 23.2 Mbits/sec 0.252 ms 101795/103795 (98%)
[ 6] 15.00-16.00 sec 2.07 MBytes 17.4 Mbits/sec 0.292 ms 93639/95140 (98%)
[ 6] 16.00-17.00 sec 2.07 MBytes 17.4 Mbits/sec 0.294 ms 59015/60514 (98%)
[ 6] 17.00-18.00 sec 2.76 MBytes 23.2 Mbits/sec 0.285 ms 101766/103766 (98%)
[ 6] 18.00-19.00 sec 2.04 MBytes 17.1 Mbits/sec 0.307 ms 93224/94699 (98%)
[ 6] 19.00-20.00 sec 2.11 MBytes 17.7 Mbits/sec 0.309 ms 59507/61032 (98%)
[ 6] 20.00-21.00 sec 2.76 MBytes 23.2 Mbits/sec 0.270 ms 101764/103764 (98%)
[ 6] 21.00-22.00 sec 2.08 MBytes 16.8 Mbits/sec 0.270 ms 92737/94186 (98%)
[ 6] 22.00-23.00 sec 2.14 MBytes 18.0 Mbits/sec 0.260 ms 59964/61515 (97%)
[ 6] 23.00-24.00 sec 2.76 MBytes 23.2 Mbits/sec 0.272 ms 101792/103792 (98%)
[ 6] 24.00-25.00 sec 1.97 MBytes 16.5 Mbits/sec 0.292 ms 92242/93665 (98%)
[ 6] 25.00-26.00 sec 2.18 MBytes 18.3 Mbits/sec 0.284 ms 60409/61986 (97%)
[ 6] 26.00-27.00 sec 2.76 MBytes 23.2 Mbits/sec 0.290 ms 101755/103755 (98%)
[ 6] 27.00-28.00 sec 1.93 MBytes 16.2 Mbits/sec 0.265 ms 91839/93236 (99%)
[ 6] 28.00-29.00 sec 2.21 MBytes 18.6 Mbits/sec 0.301 ms 60817/62420 (97%)
[ 6] 29.00-30.00 sec 2.76 MBytes 23.2 Mbits/sec 0.285 ms 101754/103754 (98%)
[ 6] 30.00-31.00 sec 1.98 MBytes 15.9 Mbits/sec 0.283 ms 91431/92084 (98%)
[ 6] 31.00-32.00 sec 2.25 MBytes 18.8 Mbits/sec 0.268 ms 61223/62850 (97%)
[ 6] 32.00-33.00 sec 2.76 MBytes 23.2 Mbits/sec 0.282 ms 101762/103762 (98%)
[ 6] 33.00-34.00 sec 1.88 MBytes 15.6 Mbits/sec 0.294 ms 91027/92373 (99%)
[ 6] 34.00-35.00 sec 2.28 MBytes 19.2 Mbits/sec 0.266 ms 61620/63274 (97%)
[ 6] 35.00-36.00 sec 0.00 Bytes 0.00 bits/sec 0.266 ms 0/0 (0%)
[ 6] 36.00-37.00 sec 0.00 Bytes 0.00 bits/sec 0.266 ms 0/0 (0%)
[ 6] 37.00-37.81 sec 0.00 Bytes 0.00 bits/sec 0.266 ms 0/0 (0%)

Server Listening on 5201

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