

Joel Trainer
Assignment 2:

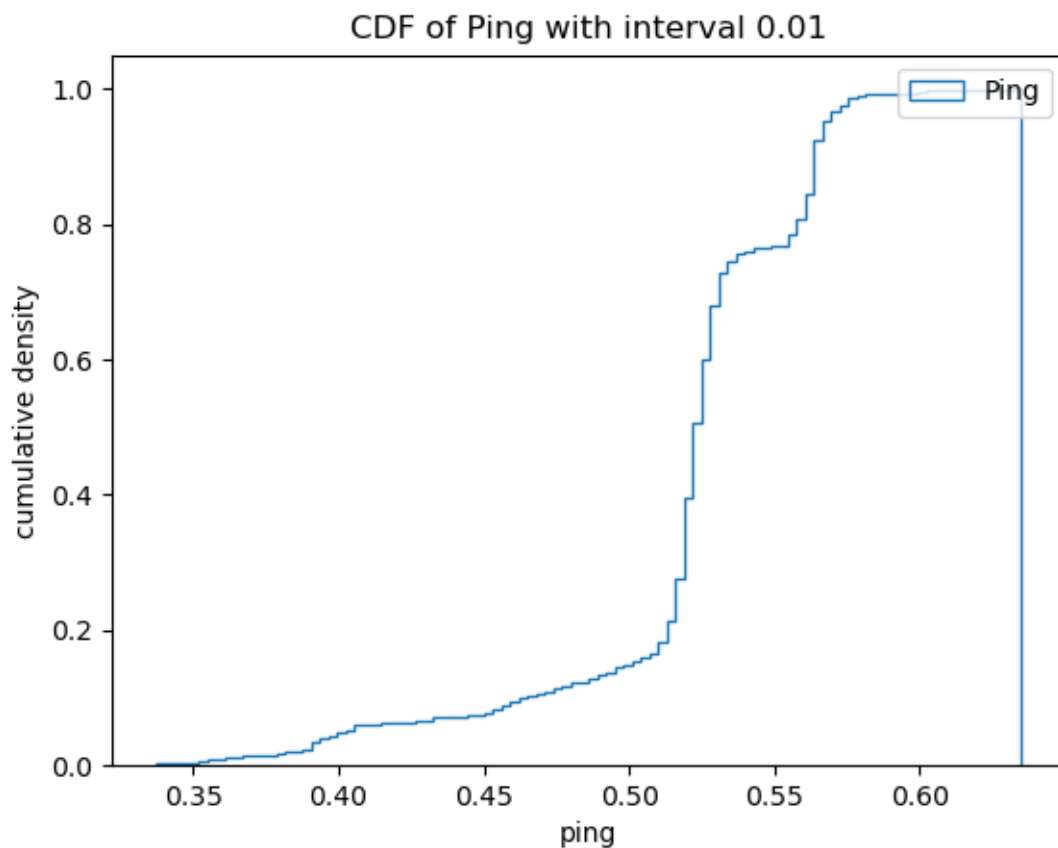
Ping

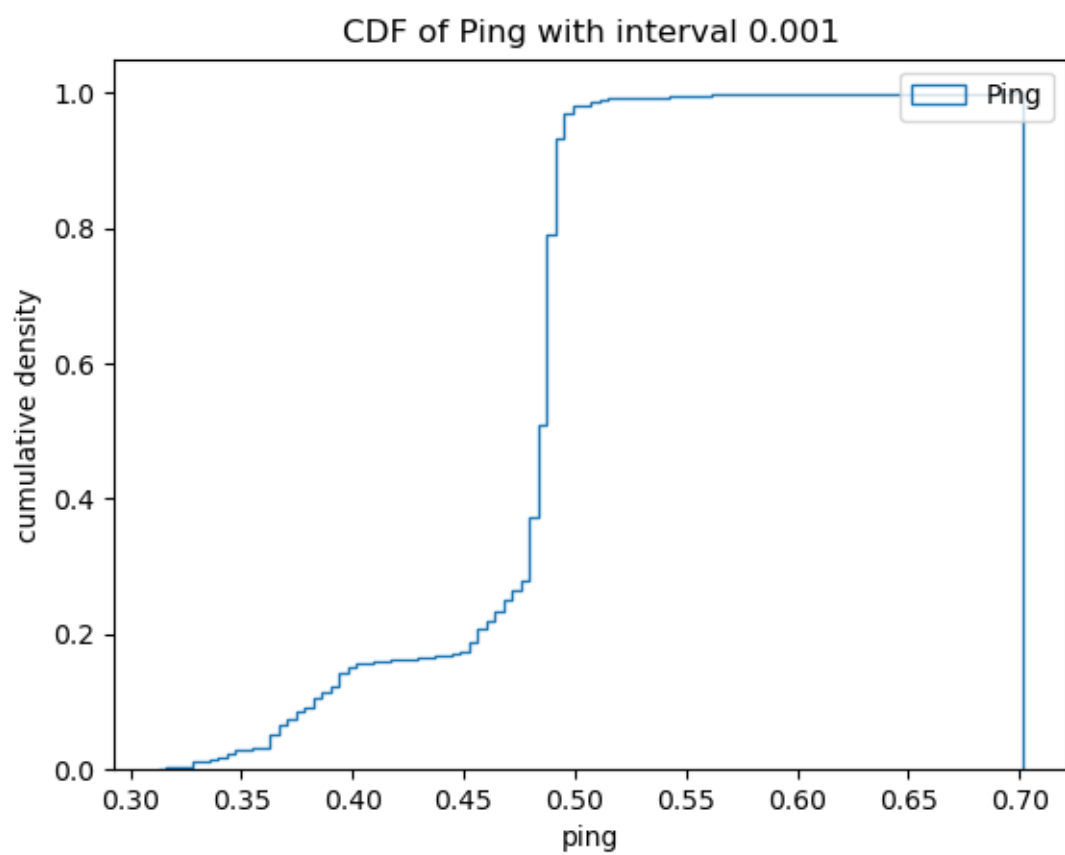
Ping from lab machine to raspberry pi 10 times, interval 0.2 seconds.
10 packets transmitted, 10 received, 0% packet loss, time 1834ms
rtt min/avg/max/mdev = 0.390/0.478/0.541/0.038 ms

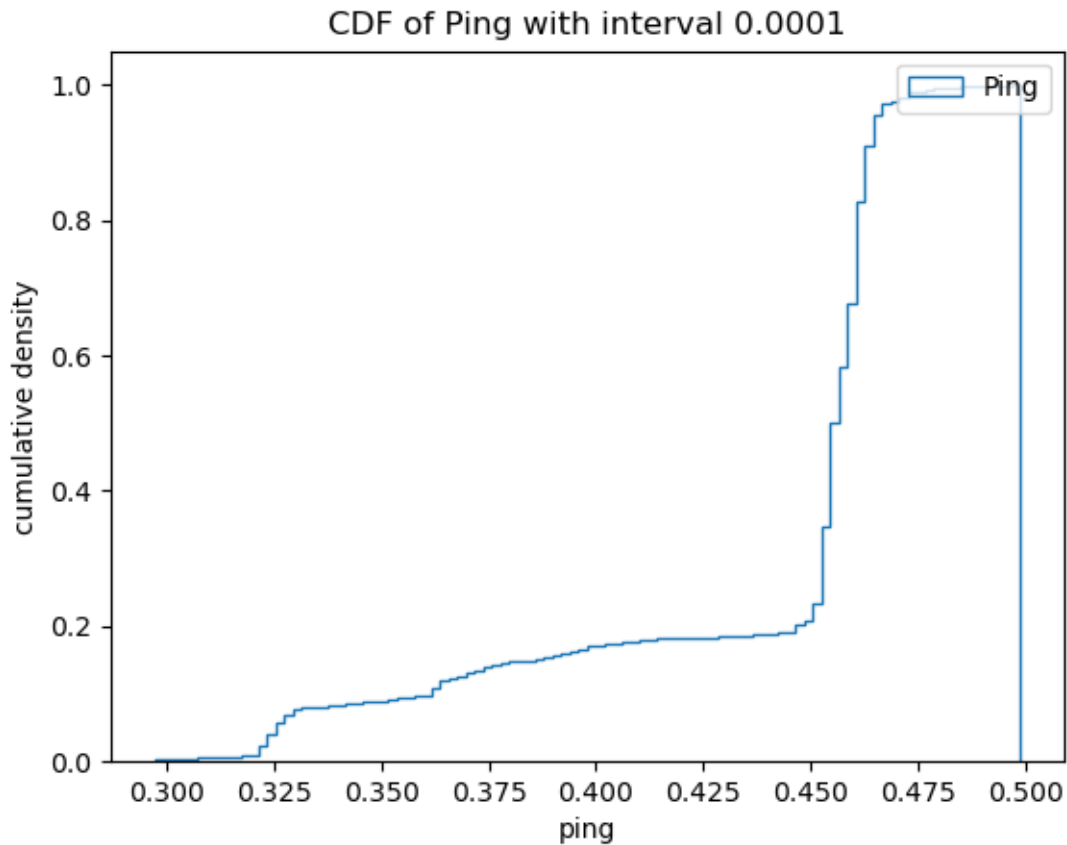
Ping from raspberry pi to lab machine 10 times, interval 0.2 seconds.
10 packets transmitted, 10 received, 0% packet loss, time 1844ms
rtt min/avg/max/mdev = 0.358/0.513/0.579/0.082 ms

Ping from raspberry pi to lab machine 100 times, interval 0.001 seconds.
100 packets transmitted, 100 received, 0% packet loss, time 99ms
rtt min/avg/max/mdev = 0.191/0.337/0.474/0.030 ms

Ping from raspberry pi to lab machine 10000 times using flooding
10000 packets transmitted, 10000 received, 0% packet loss, time 3310ms
rtt min/avg/max/mdev = 0.180/0.291/0.521/0.011 ms, ipg/ewma 0.331/0.296 ms







Can you speculate why different intervals lead to different round trip results?

I think that different intervals lead to different round trip results because for longer intervals, the computer will start doing other tasks which will lead to delays so the ping comes back lower for the shorter interval tests.

What do you estimate is the most accurate measured parameter that can be used to estimate propagation time between the two machines?

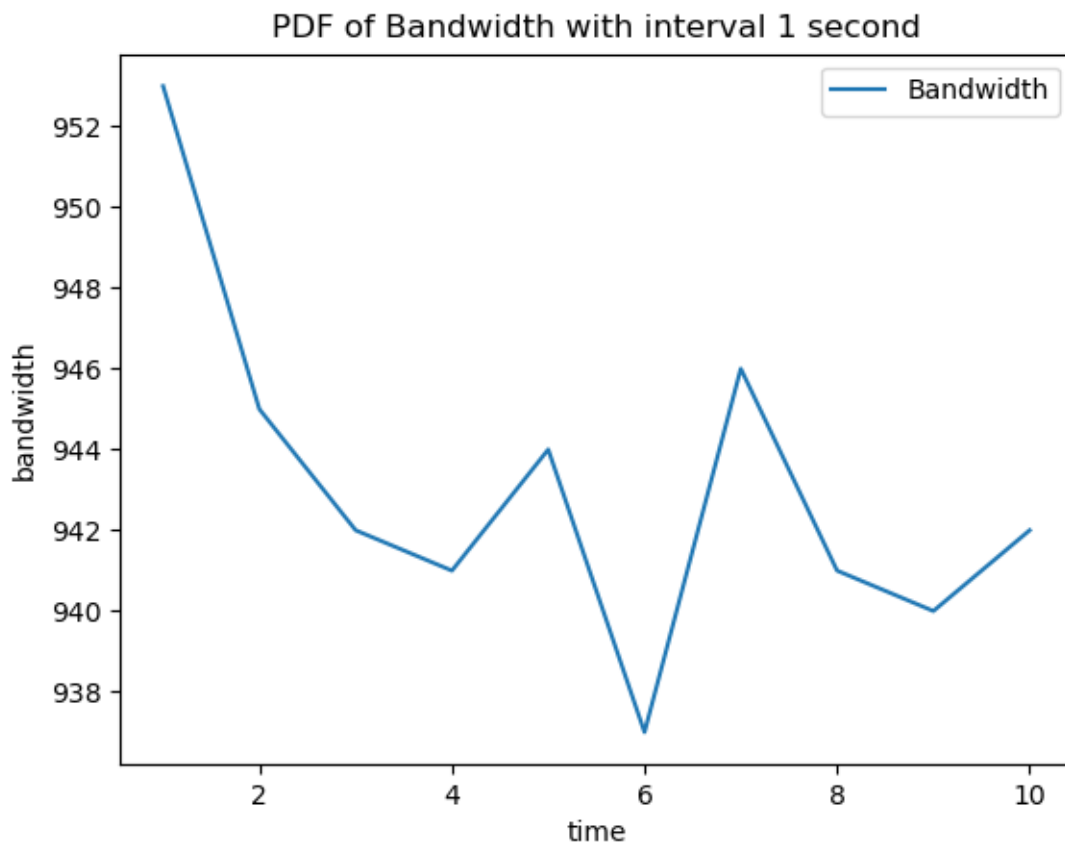
Although the min gives a theoretical best propagation time, the mean gives a better result for an estimate of the propagation time.

Iperf

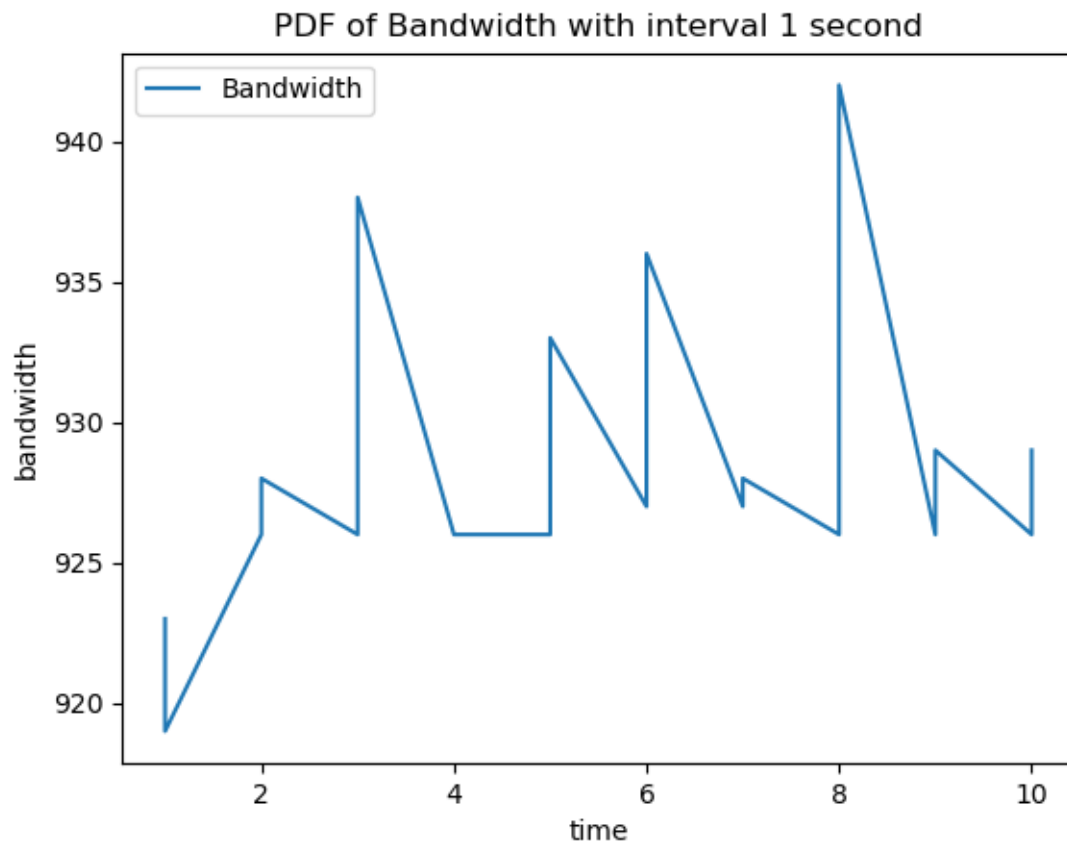
Lab machine as iperf server. Raspberry pi as client. Using TCP 10 seconds.

[ID]	Interval	Transfer	Bandwidth
[3]	0.0000-1.0000 sec	113 MBytes	951 Mbits/sec
[3]	1.0000-2.0000 sec	112 MBytes	941 Mbits/sec
[3]	2.0000-3.0000 sec	113 MBytes	945 Mbits/sec
[3]	3.0000-4.0000 sec	112 MBytes	935 Mbits/sec
[3]	4.0000-5.0000 sec	112 MBytes	941 Mbits/sec
[3]	5.0000-6.0000 sec	112 MBytes	943 Mbits/sec
[3]	6.0000-7.0000 sec	112 MBytes	944 Mbits/sec
[3]	7.0000-8.0000 sec	111 MBytes	934 Mbits/sec
[3]	8.0000-9.0000 sec	114 MBytes	952 Mbits/sec
[3]	9.0000-10.0000 sec	112 MBytes	935 Mbits/sec
[3]	10.0000-10.0024 sec	256 KBytes	877 Mbits/sec
[3]	0.0000-10.0024 sec	1.10 GBytes	942 Mbits/sec

Raspberry Pi as iperf server, lab machine as client. TCP 10 seconds, units Mbits/s.



Raspberry Pi as iperf server, lab machine as client. TCP 10 seconds, bi directional, units Mbits/s.



UDP sending 100Kbps for 5 seconds

```
ubuntu@ubuntu:~/CWM-ProgNets/assignment2$ sudo iperf -c 192.168.10.2 -i 1 -t 5 -b 100k -u
-----
Client connecting to 192.168.10.2, UDP port 5001
Sending 1470 byte datagrams, IPG target: 117600.00 us (kalman adjust)
UDP buffer size: 208 KByte (default)
-----
[ 1] local 192.168.10.1 port 35807 connected with 192.168.10.2 port 5001
[ ID] Interval          Transfer      Bandwidth
[ 1] 0.0000-1.0000 sec  14.4 KBytes  118 Kbits/sec
[ 1] 1.0000-2.0000 sec  12.9 KBytes  106 Kbits/sec
[ 1] 2.0000-3.0000 sec  11.5 KBytes  94.1 Kbits/sec
[ 1] 3.0000-4.0000 sec  12.9 KBytes  106 Kbits/sec
[ 1] 4.0000-5.0000 sec  11.5 KBytes  94.1 Kbits/sec
[ 1] 0.0000-5.1748 sec  66.0 KBytes  105 Kbits/sec
[ 1] Sent 47 datagrams
[ 1] Server Report:
[ ID] Interval          Transfer      Bandwidth      Jitter    Lost/Total Datagrams
[ 1] 0.0000-5.1745 sec  66.0 KBytes  105 Kbits/sec  0.004 ms  0/46 (0%)
```

No packet loss across 5 seconds.

UDP sending 1Mbps for 5 seconds

```
ubuntu@ubuntu:~/CWM-ProgNets/assignment2$ sudo iperf -c 192.168.10.2 -i 1 -t 5 -b 1m -u
-----
Client connecting to 192.168.10.2, UDP port 5001
Sending 1470 byte datagrams, IPG target: 11760.00 us (kalman adjust)
UDP buffer size: 208 KByte (default)
-----
[ 1] local 192.168.10.1 port 47379 connected with 192.168.10.2 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 1] 0.0000-1.0000 sec   125 KBytes  1.02 Mbits/sec
[ 1] 1.0000-2.0000 sec   122 KBytes  1000 Kbits/sec
[ 1] 2.0000-3.0000 sec   122 KBytes  1000 Kbits/sec
[ 1] 3.0000-4.0000 sec   122 KBytes  1000 Kbits/sec
[ 1] 4.0000-5.0000 sec   122 KBytes  1000 Kbits/sec
[ 1] 0.0000-5.0218 sec   616 KBytes  1.00 Mbits/sec
[ 1] Sent 430 datagrams
[ 1] Server Report:
[ ID] Interval      Transfer    Bandwidth      Jitter    Lost/Total Datagrams
[ 1] 0.0000-5.0216 sec   616 KBytes  1.00 Mbits/sec  0.002 ms  0/429 (0%)
```

No packet loss for 5 seconds

UDP sending 100Mbps for 5 seconds

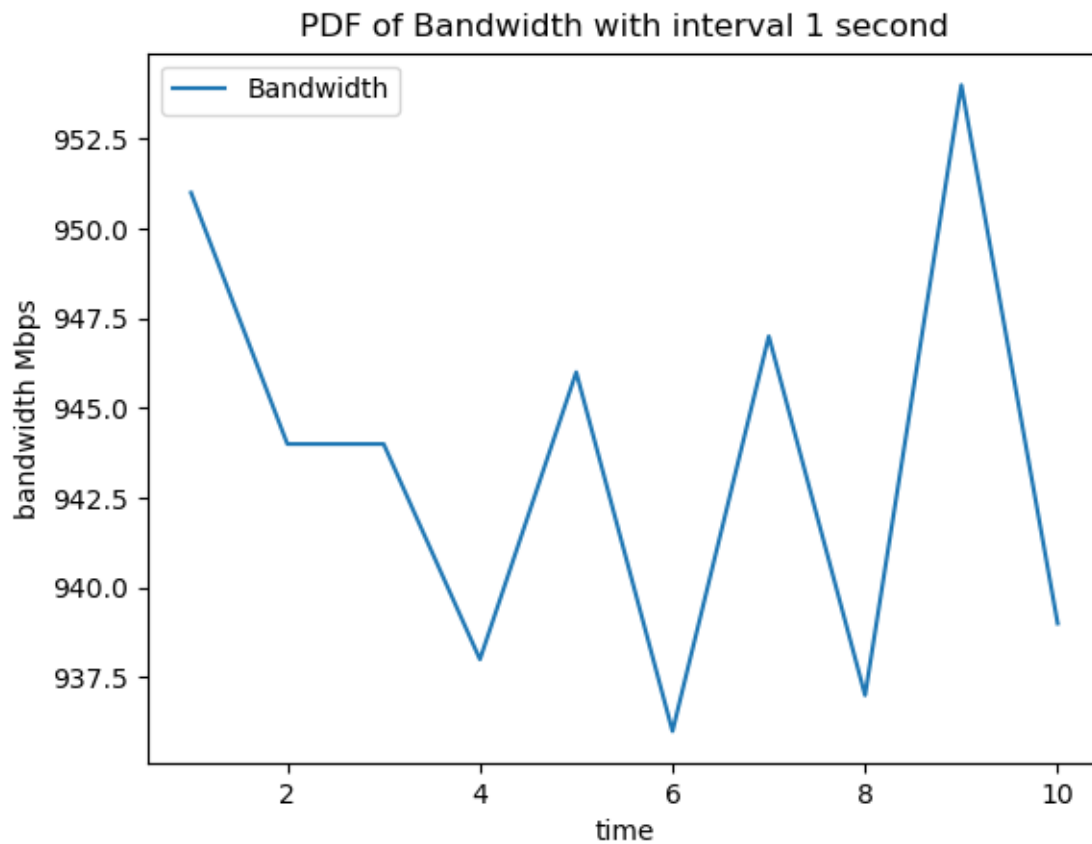
```
ubuntu@ubuntu:~/CWM-ProgNets/assignment2$ sudo iperf -c 192.168.10.2 -i 1 -t 5 -b 100m -u
-----
Client connecting to 192.168.10.2, UDP port 5001
Sending 1470 byte datagrams, IPG target: 117.60 us (kalman adjust)
UDP buffer size: 208 KByte (default)
-----
[ 1] local 192.168.10.1 port 51501 connected with 192.168.10.2 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 1] 0.0000-1.0000 sec  11.9 MBytes  100 Mbits/sec
[ 1] 1.0000-2.0000 sec  11.9 MBytes  100 Mbits/sec
[ 1] 2.0000-3.0000 sec  11.9 MBytes  100 Mbits/sec
[ 1] 3.0000-4.0000 sec  11.9 MBytes  100 Mbits/sec
[ 1] 4.0000-5.0000 sec  11.9 MBytes  100 Mbits/sec
[ 1] 0.0000-5.0001 sec  59.6 MBytes  100 Mbits/sec
[ 1] Sent 42521 datagrams
[ 1] Server Report:
[ ID] Interval      Transfer    Bandwidth      Jitter    Lost/Total Datagrams
[ 1] 0.0000-4.9997 sec  59.6 MBytes  100 Mbits/sec  0.007 ms  0/42520 (0%)
```

No packet loss for 5 seconds

There was no packet loss at any of the speeds of sending data.

Iperf 3

Raspberry pi as iperf3 server, lab machine as client. Bandwidth between the 2 for 10 seconds.



Raspberry pi as server, lab machine as client. 5 seconds

100Kbps

```
ubuntu@ubuntu:~/CWM-ProgNets/assignment2$ iperf3 -c 192.168.10.2 -t 5 -b 100k -u
Connecting to host 192.168.10.2, port 5201
[ 5] local 192.168.10.1 port 49825 connected to 192.168.10.2 port 5201
[ ID] Interval           Transfer     Bitrate     Total Datagrams
[ 5]  0.00-1.00   sec    12.7 KBytes    104 Kbits/sec      9
[ 5]  1.00-2.00   sec    12.7 KBytes    104 Kbits/sec      9
[ 5]  2.00-3.00   sec    11.3 KBytes    92.7 Kbits/sec      8
[ 5]  3.00-4.00   sec    12.7 KBytes    104 Kbits/sec      9
[ 5]  4.00-5.00   sec    12.7 KBytes    104 Kbits/sec      9
-----
[ ID] Interval           Transfer     Bitrate     Jitter      Lost/Total Datag
rams
[ 5]  0.00-5.00   sec    62.2 KBytes    102 Kbits/sec  0.000 ms    0/44 (0%) sende
r
[ 5]  0.00-5.04   sec    62.2 KBytes    101 Kbits/sec  0.006 ms    0/44 (0%) recei
ver
iperf Done.
```

No packet loss.

1Mbps

```
ubuntu@ubuntu:~/CWM-ProgNets/assignment2$ iperf3 -c 192.168.10.2 -t 5 -b 1m -u
Connecting to host 192.168.10.2, port 5201
[ 5] local 192.168.10.1 port 39823 connected to 192.168.10.2 port 5201
[ ID] Interval           Transfer     Bitrate         Total Datagrams
[ 5]  0.00-1.00    sec    123 KBytes    1.01 Mbits/sec    87
[ 5]  1.00-2.00    sec    122 KBytes    996 Kbits/sec     86
[ 5]  2.00-3.00    sec    122 KBytes    996 Kbits/sec     86
[ 5]  3.00-4.00    sec    123 KBytes    1.01 Mbits/sec    87
[ 5]  4.00-5.00    sec    122 KBytes    996 Kbits/sec     86
- - - - -
[ ID] Interval           Transfer     Bitrate         Jitter    Lost/Total Datagrams
[ 5]  0.00-5.00    sec    611 KBytes    1.00 Mbits/sec    0.000 ms    0/432 (0%) sender
[ 5]  0.00-5.04    sec    611 KBytes    993 Kbits/sec    0.002 ms    0/432 (0%) receiver

iperf Done.
```

No packet loss

100Mbps

```
ubuntu@ubuntu:~/CWM-ProgNets/assignment2$ iperf3 -c 192.168.10.2 -t 5 -b 100m -u
Connecting to host 192.168.10.2, port 5201
[ 5] local 192.168.10.1 port 38750 connected to 192.168.10.2 port 5201
[ ID] Interval           Transfer     Bitrate         Total Datagrams
[ 5]  0.00-1.00    sec    11.9 MBytes    99.9 Mbits/sec   8627
[ 5]  1.00-2.00    sec    11.9 MBytes    100 Mbits/sec   8632
[ 5]  2.00-3.00    sec    11.9 MBytes    100 Mbits/sec   8633
[ 5]  3.00-4.00    sec    11.9 MBytes    100 Mbits/sec   8633
[ 5]  4.00-5.00    sec    11.9 MBytes    100 Mbits/sec   8632
- - - - -
[ ID] Interval           Transfer     Bitrate         Jitter    Lost/Total Datagrams
[ 5]  0.00-5.00    sec    59.6 MBytes    100 Mbits/sec    0.000 ms    0/43157 (0%) sender
[ 5]  0.00-5.04    sec    59.6 MBytes    99.2 Mbits/sec    0.013 ms    0/43157 (0%) receiver

iperf Done.
```

No packet loss

Difference I observed:

iperf would sometimes go for times up to 5.1 seconds, whereas iperf3 kept it much closer to the 5 seconds intended with a consistent 5.04s.