**Data size: 1005 bytes**

**Number of packets to send: 252**

**Without adding anything**

tc qdisc show  dev lo - to show current

sudo tc qdisc del dev lo root - to delete ans reset

Loss = 3 Retransmit = 6

real  0m0.885s

user  0m0.904s

sys 0m0.099s

**PACKET DELAY**

1)
Adding delay by 100 ms

sudo tc qdisc add dev lo root netem delay 100ms

Loss = 432 Retransmit = 864

real  0m26.395s

user  0m2.298s

sys 0m0.413s

2)

Real wide area networks show variability so it is possible to add random variation.

sudo tc qdisc add dev lo root netem delay 100ms 10ms

Loss = 434 Retransmit = 866

real  0m26.413s

user  0m2.430s

sys 0m0.313s

3)

sudo tc qdisc add dev lo root netem delay 100ms 10ms 25%

Loss = 416 Retransmit = 831

real  0m26.270s

user  0m2.405s

sys 0m0.430s

**PACKET LOSS**

1)

Adding 10% packet loss with Some simulation in our program

sudo tc qdisc add dev lo root netem loss 10%

Loss = 33 Retransmit = 66

real  0m1.901s

user  0m1.029s

sys 0m0.157s

2)

Adding 90% packet loss with Some simulation in our program

sudo tc qdisc add dev lo root netem loss 90%

Loss = 8996 Retransmit = 17992

real  4m36.190s

user  0m6.795s

sys 0m2.069s

**PACKET DUPLICATION**

1)

1% duplication

sudo tc qdisc add dev lo root netem duplicate 1%

Loss = 5 Retransmit = 10

real  0m0.886s

user  0m0.884s

sys 0m0.088s

2)

50% duplication

sudo tc qdisc add dev lo root netem duplicate 100%

Loss = 1 Retransmit = 2

real  0m1.041s

user  0m1.250s

sys 0m0.142s

**PACKET CORRUPTION**

1)

Adding 10% packet corruption

sudo tc qdisc add dev lo root netem corrupt 10%

Loss = 30 Retransmit = 60


real  0m1.772s

user  0m1.051s

sys 0m0.111s




## PACKET RE-ORDERING

1)

In this example, 25% of packets (with a correlation of 50%) will get sent immediately, others will be delayed by 10ms.


sudo tc qdisc add dev lo root netem delay 10ms reorder 25% 50%


Loss = 10 Retransmit = 20


real  0m3.745s

user  0m1.235s

sys 0m0.136s

2)

If the first packet gets a random delay of 100ms (100ms base - 0ms jitter) and the second packet is sent 1ms later and gets a delay of 50ms (100ms base - 50ms jitter); the second packet will be sent first. This is because the queue discipline tfifo inside netem, keeps packets in order by time to send.

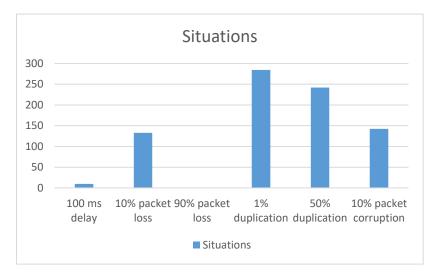sudo tc qdisc add dev lo root netem delay 100ms 75ms

Loss = 400 Retransmit = 800

real  0m24.534s

user  0m2.167s

sys 0m0.373s

Throughput vs Different situations

Throughput