NETEM TEST REPORT FOR RUDP

Test Specifications:

WINDOW SIZE = 1000
Each test ran for 60 seconds
Reliability test passed in each of the cases

Throughput vs Network Delay

- Network delay: **300ms**
  Packet loss: 0
  Packet corruption: 0
  Bandwidth limit: no limit


```
TERMINAL                                                          1: python3, python3  ∨  +  ⬚  🗑  ∧  ×

karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc    karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
qdisc add dev lo root netem delay 300ms                                     performance_test.py
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3     mode (1 - sender, 2 - receiver): 1
performance_test.py                                                         sent: 13186560 Bytes - buffer: (902))
mode (1 - sender, 2 - receiver): 2                                          test finished
bandwidth: 179416.078 B/s - buffer: (1)))                                   []
test finished
```

- Network delay: **400ms**
  Packet loss: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc     mode (1 - sender, 2 - receiver): 1
qdisc add dev lo root netem delay 400ms                                     sent: 12550080 Bytes - buffer: (902))
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3     test finished
performance_test.py                                                         []
mode (1 - sender, 2 - receiver): 2
bandwidth: 178111.823 B/s - buffer: (1)))
test finished
```

- Network delay: **500ms**
  Packet loss: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem delay 500ms
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 153619.966 B/s - buffer: (1)))
test finished
```

```
mode (1 - sender, 2 - receiver): 1
sent: 11481600 Bytes - buffer: (909))
test finished
```

- Network delay: **600ms**
  Packet loss: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem delay 600ms
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 124624.822 B/s - buffer: (1)))
test finished
```

```
mode (1 - sender, 2 - receiver): 1
sent: 9902400 Bytes - buffer: (944))
test finished
```
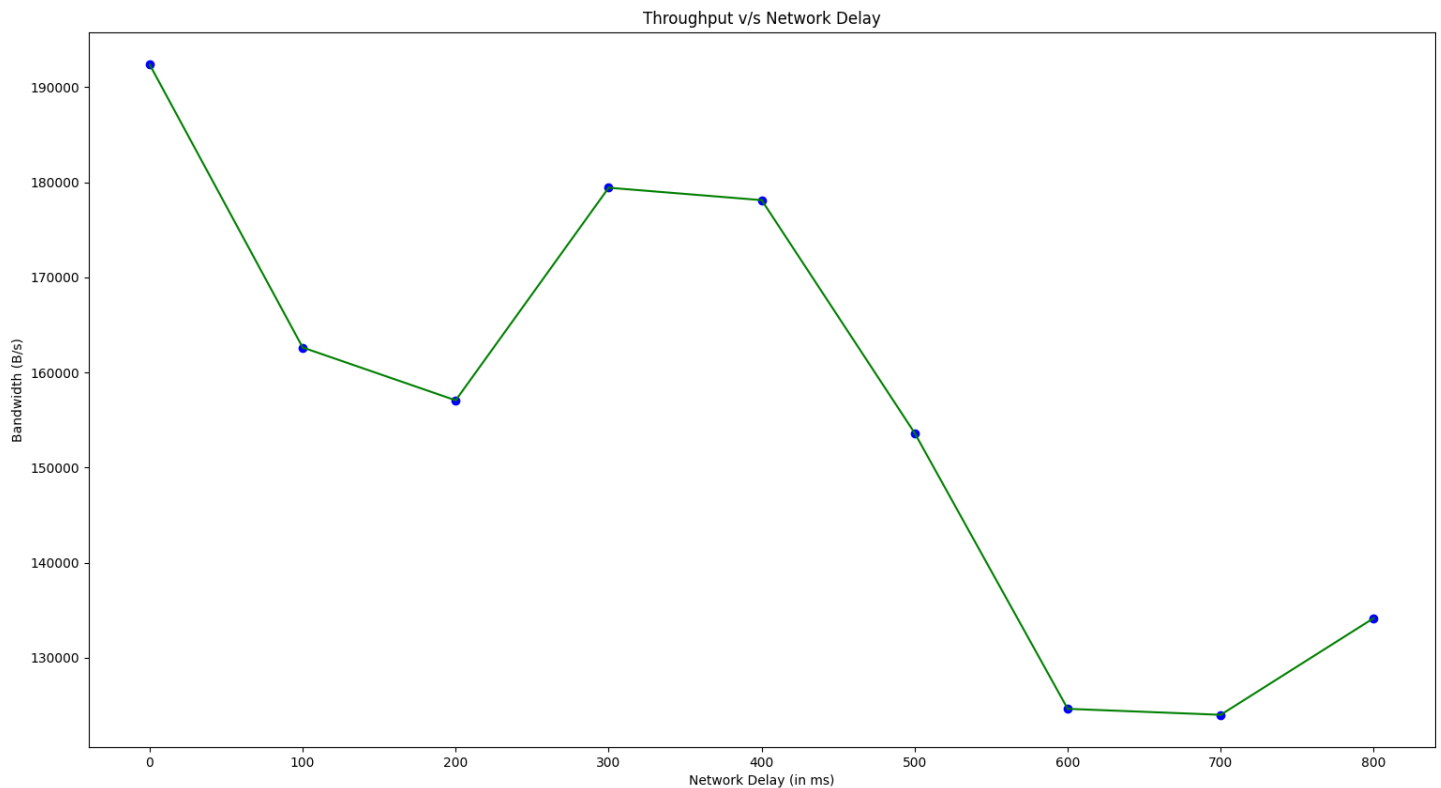
- Network delay: **700ms**
  Packet loss: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem delay 700ms
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 123994.204 B/s - buffer: (1)))
test finished
```

```
mode (1 - sender, 2 - receiver): 1
sent: 8786880 Bytes - buffer: (943))
test finished
```

- Network delay: **800ms**
Packet loss: 0
Packet corruption: 0
Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem delay 800ms
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 134158.864 B/s - buffer: (1)))
test finished
```

```
mode (1 - sender, 2 - receiver): 1
sent: 10322880 Bytes - buffer: (915))
test finished
```

Final Plot:

Throughput vs Packet Loss

- Packet loss: 10%
  Network delay: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem loss 10%
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 161824.531 B/s - buffer: (1)))
test finished
```

```
mode (1 - sender, 2 - receiver): 1
sent: 11778240 Bytes - buffer: (802))
test finished
```

- Packet loss: 15%
  Network delay: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
TERMINAL                                                              1: python3, python3

karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem loss 15%
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 136756.324 B/s - buffer: (1)))
test finished
```

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 1
sent: 10262400 Bytes - buffer: (810))
test finished
```

- Packet loss: 50%
  Network delay: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem loss 50%
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 68129.9185 B/s - buffer: (1)))
test finished
```
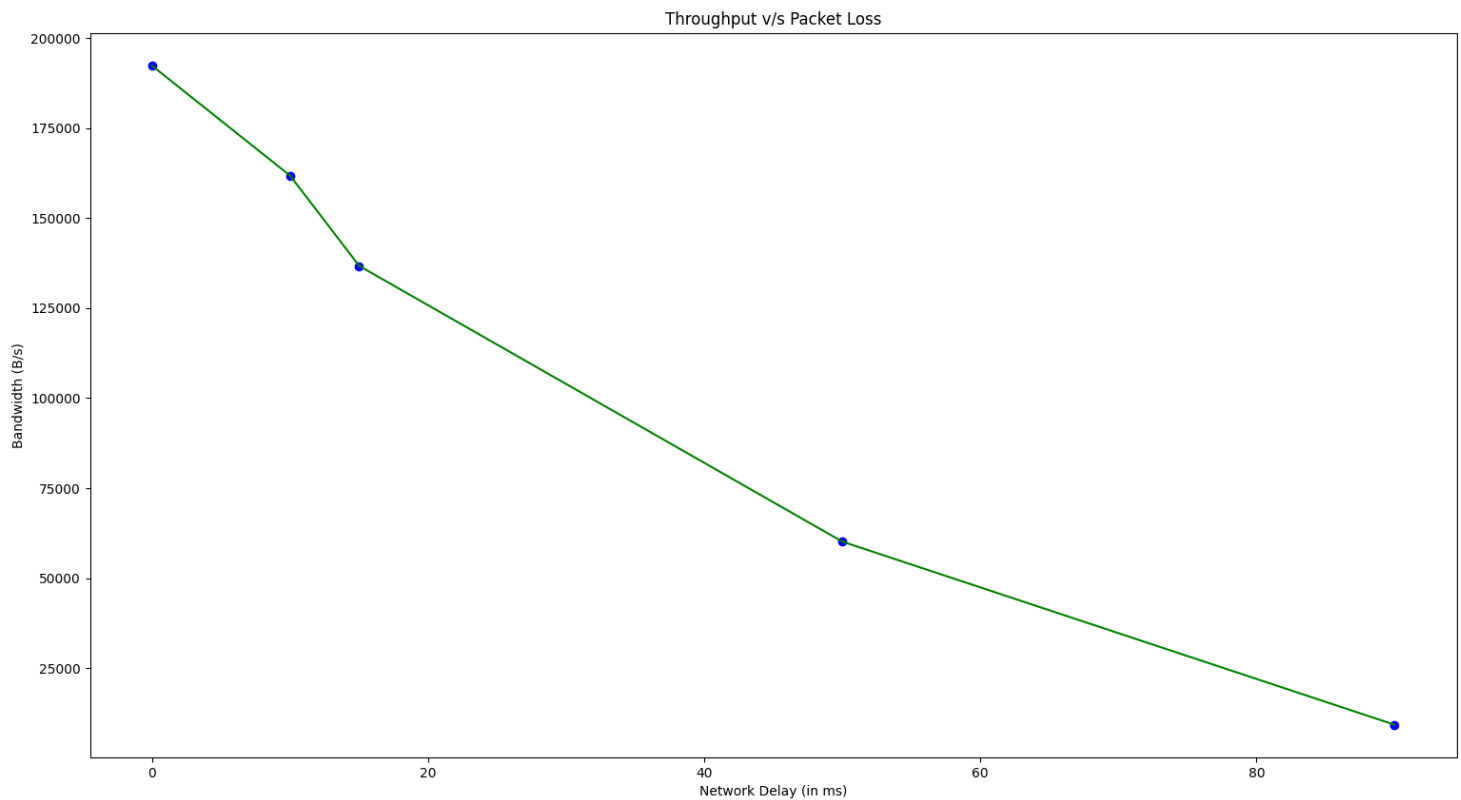
```
mode (1 - sender, 2 - receiver): 1
sent: 5520000 Bytes - buffer: (902))
test finished
```

- Packet loss: 90%
  Network delay: 0
  Packet corruption: 0
  Bandwidth limit: no limit

```
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ sudo tc
qdisc add dev lo root netem loss 90%
karthikshetty03@karthikshetty03:~/Computer Networks Assignment2$ python3
performance_test.py
mode (1 - sender, 2 - receiver): 2
bandwidth: 9249.08674 B/s - buffer: (1)))
test finished
```

```
mode (1 - sender, 2 - receiver): 1
sent: 1328640 Bytes - buffer: (906))
test finished
```

Final Plot:

Throughput vs Packet Loss

- Packet corruption: 5%
  Network delay: 0
  Packet loss: 0
  Bandwidth limit: no limit

  Sent: 14429760 Bytes
  Bandwidth: 209300.501 B/s

- Packet corruption: 10 %
  Packet loss: 0
  Network delay: 0
  Bandwidth limit: no limit

  Sent: 12472320 Bytes
  Bandwidth: 178223.894 B/s

- Packet corruption: 15 %
  Packet loss: 0
  Network delay: 0
  Bandwidth limit: no limit

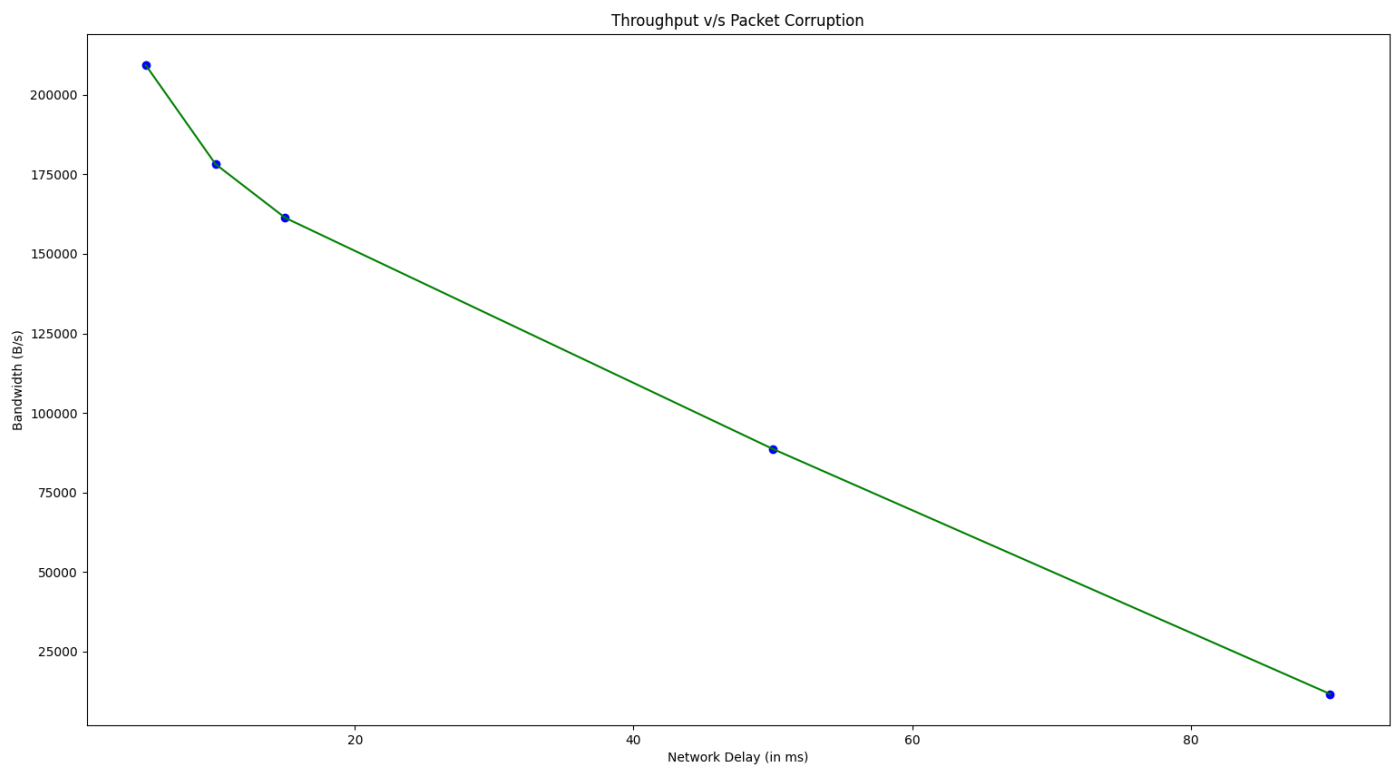 Sent: 11274240 Bytes
  Bandwidth: 161345.688 B/s

- Packet corruption: 50 %
  Packet loss: 0
  Network delay: 0
  Bandwidth limit: no limit

  Sent: 6362860 Bytes
  Bandwidth: 88673.7321 B/s

- Packet corruption: 90 %
  Network delay: 0
  Packet loss: 0
  Bandwidth limit: no limit

  Sent: 1294380 Bytes
  Bandwidth: 11628.2286 B/s

Final Plot:

Throughput v/s Packet Corruption

Additional Tests:

sudo tc qdisc add dev lo root tbf rate 1mbit burst 32kbit latency 400ms

tbf: use the token buffer filter to manipulate traffic rates
rate: sustained maximum rate
burst: maximum allowed burst
latency: packets with higher latency get dropped
<this is bandwidth limiting test>

Useful Commands:

To check all active rules: tc qdisc show dev lo
To delete all active rules: tc qdisc del dev lo root
Add packet loss: tc qdisc add dev lo root netem loss 10%
Add packet delay: tc qdisc add dev lo root netem delay 200ms
Add packet corrupt: sudo tc qdisc add dev lo root netem corrupt 20%