

## **CN Assignment 2**

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### **Graphs obtained after testing**

Netem - Network emulator was used to test our UDP protocol.

#### **What is Netem?**

Netem is an enhancement of the Linux traffic control facilities that allow to add delay, packet loss, duplication and more other characteristics to packets outgoing from a selected network interface.

We used Netem to add delay packet corruption and packet loss to a transfer of 10MB file from server to client to check the working of our protocol and these were the results obtained.

Here we have obtained the graphs for time resulted in receiving the complete file as well as the throughput with the Netem features added to test our protocol.

The following parameters were set:

File Size: 10615705 bytes

Number of packets: 1598 packets

Buffer Size: 300

Window Size: 800

Global timer: 0.5 seconds

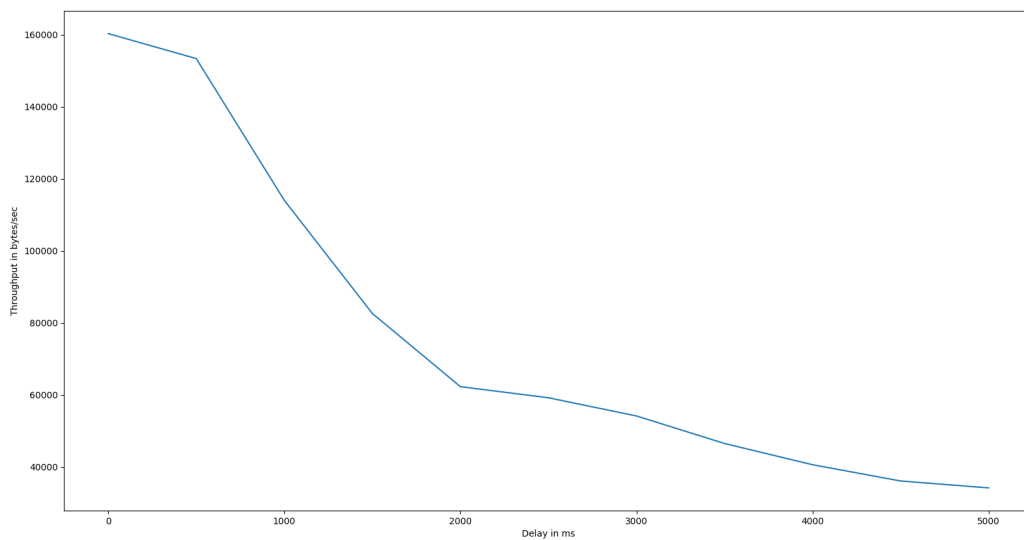
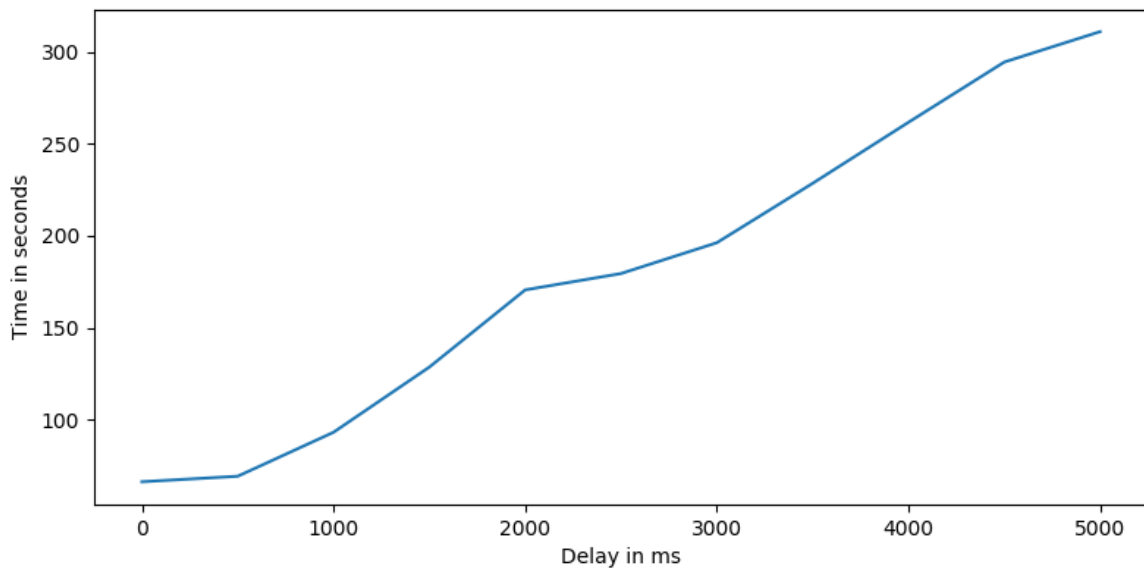
Retransmission Count: was kept variable and was changed according to the conditions to see which was the best one.

In each division, the first graphs are of Time vs Feature added and seconds graphs are of Throughput vs Feature Added.

## Packet Delay

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

This command causes a delay of 100ms in the packet coming and we have taken the values of 0, 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000ms and obtained the following delay in getting the file from the server

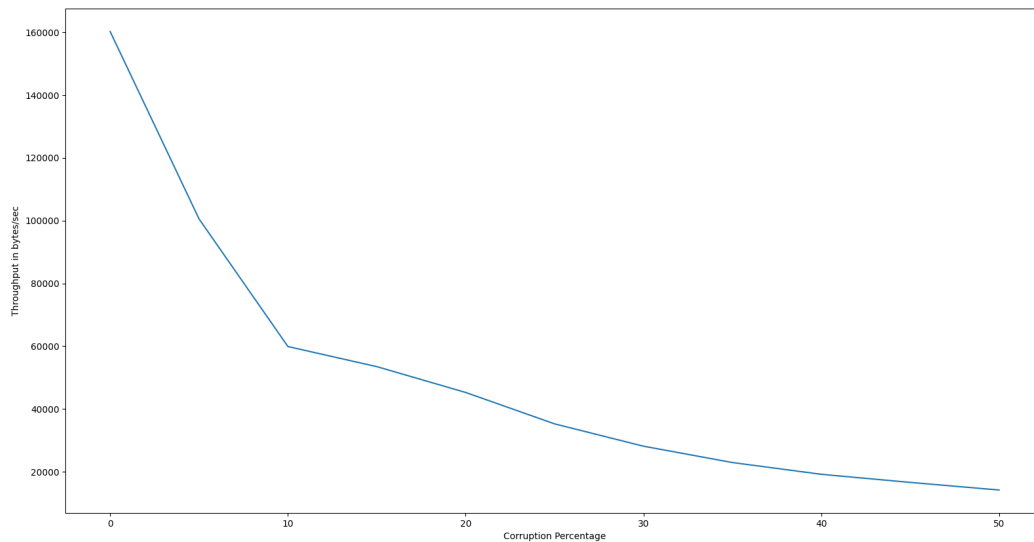
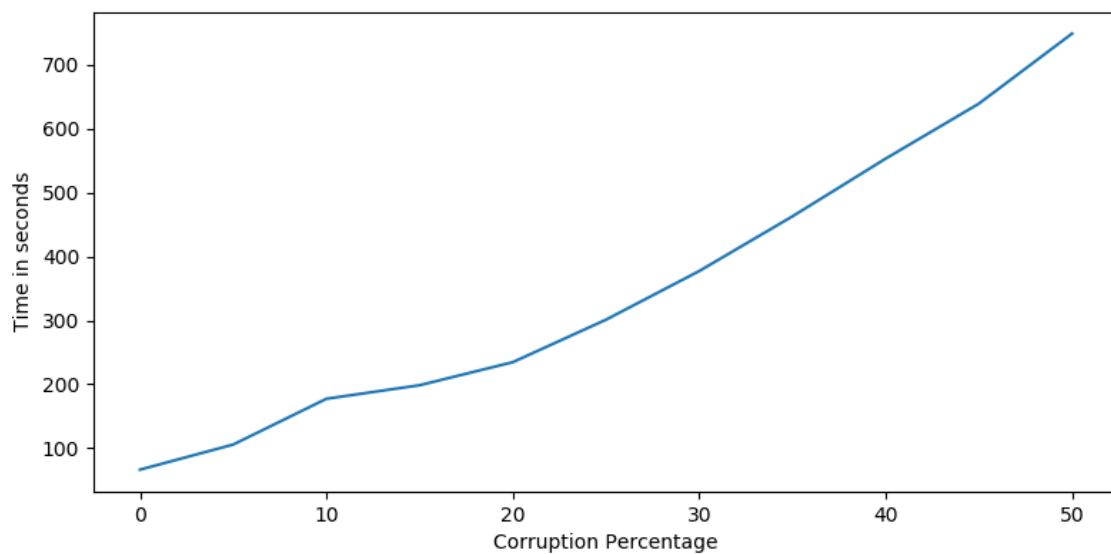


## Packet Corruption

```
sudo tc qdisc add dev lo root netem corrupt 0.1%
```

This ensures that 0.1 percent of the packets coming get corrupted and thus we can see that our designed protocol can handle corruption in our packets or not.

We applied 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 percent packet corruption values and obtained this amount of time for our file to be delivered

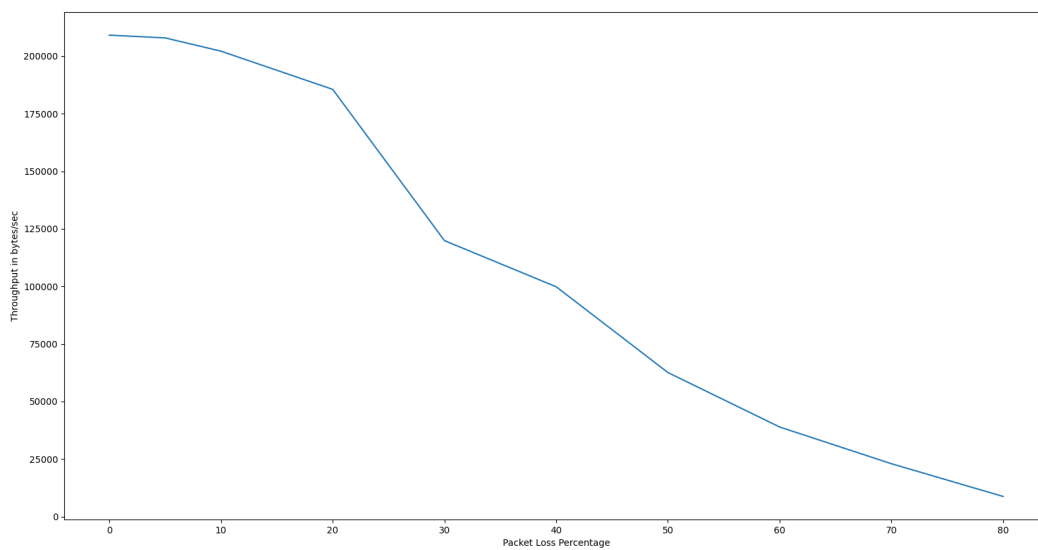
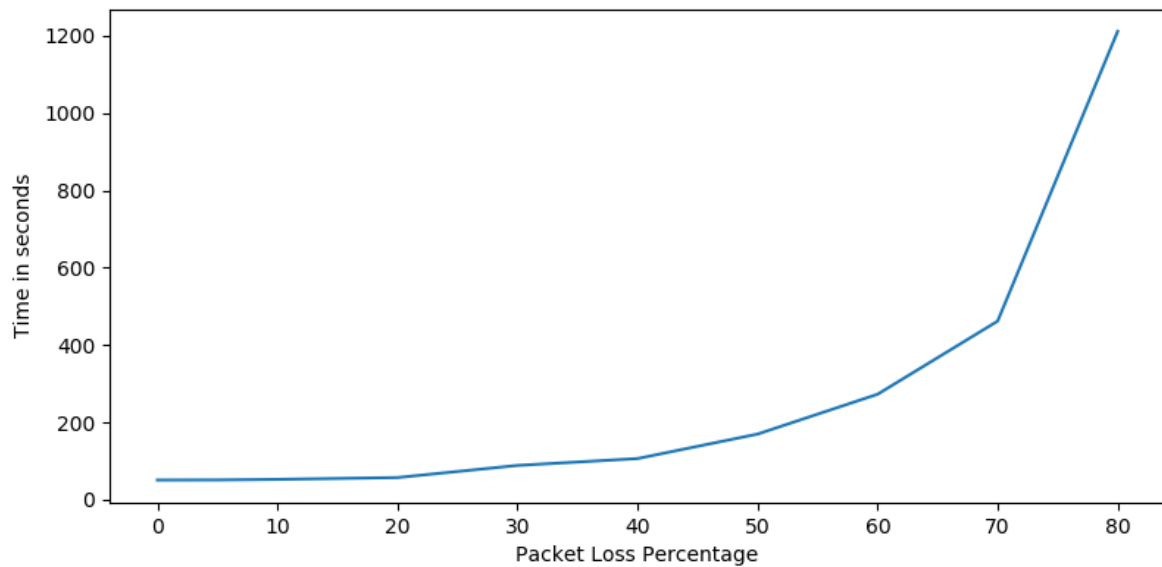


## Packet Loss

```
sudo tc qdisc add dev lo root netem loss 0.1%
```

This command helps us to get packet loss of 0.1 percent and check if our protocol can handle packet loss too.

We applied packet loss of 5, 10, 20, 30, 40, 50, 60, 70, 80 percentage and obtained this graph of how much time it took to get our file.



## Removing these characteristics

```
sudo tc qdisc del dev lo root
```

Using this command we can remove these additional features we added to make it go back to normal

Using all these commands in Netem we observed that our file received by the client from the server had no differences from the file sent by the server meaning the protocol was able to handle the difficult situations and the file was not damaged at all. We got to know this using the command in linux.

```
diff 'receivedFile' 'sentFile'
```