CSC 8220: Advanced Computer Networks
TOPIC: A NACK- only reliable transmission control Protocol(NTCP)
Dhruv Gupta and Lakshmi Nemala

1. Design and Protocol

In this project we have implemented three network devices:

- Sender
- Router
- Reciever / Server

The sender sends the data to the router in n packets. The router uses store and forward, and hence does not send the packets to the final destination till it has received all the packets.

In the scenario described, the router will send a NAK for every missing packet from the sender instead of sending an ACK for every packet that has been received, the router stores the rest of the packets till all the packets have been received, proceeding to send the entire message to the sender in a pipelined fashion. The router does through the received packet and creates a NAK message if a missing sequence number is found, it will insert the missing packet before requesting the next missing packet.

On receiving a NAK the sender retransmits to the router. The sender is constantly listening for a NAK till the connection close request is received. The connection to the router is closed when the router successfully forwards the message to the receiver.

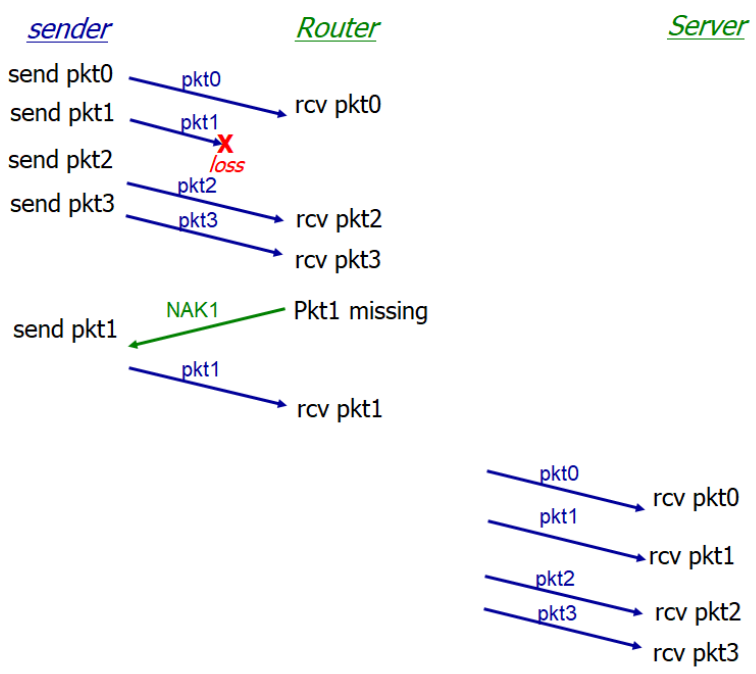


Figure 1 Illustration of packet transmission process implementing Selective Repeat w/ NAK

2. Plot - Successful Transmissions

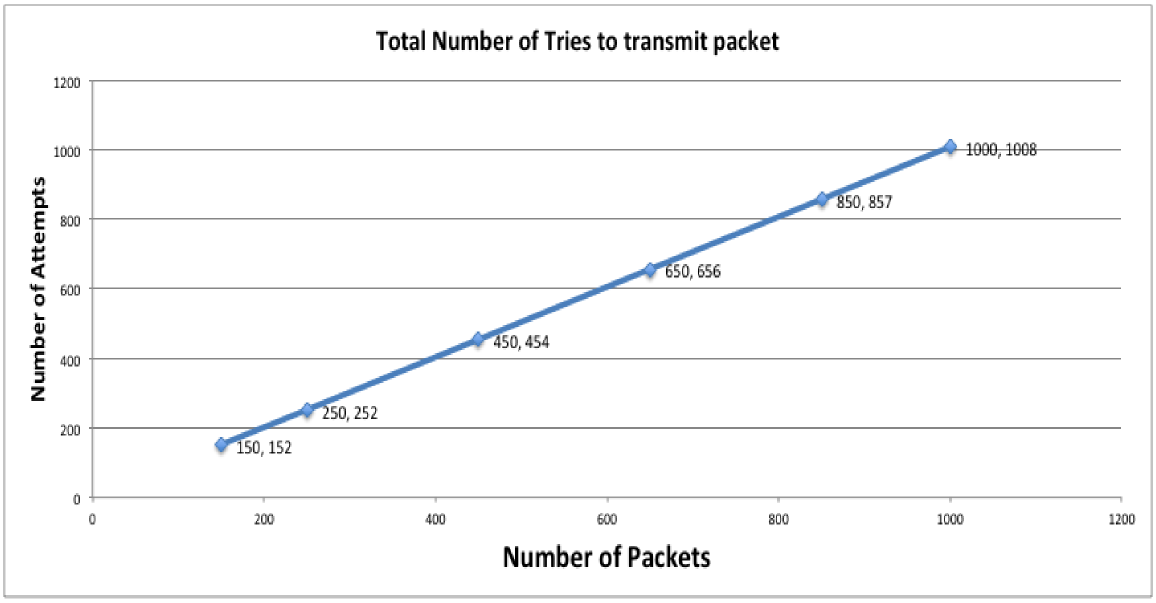
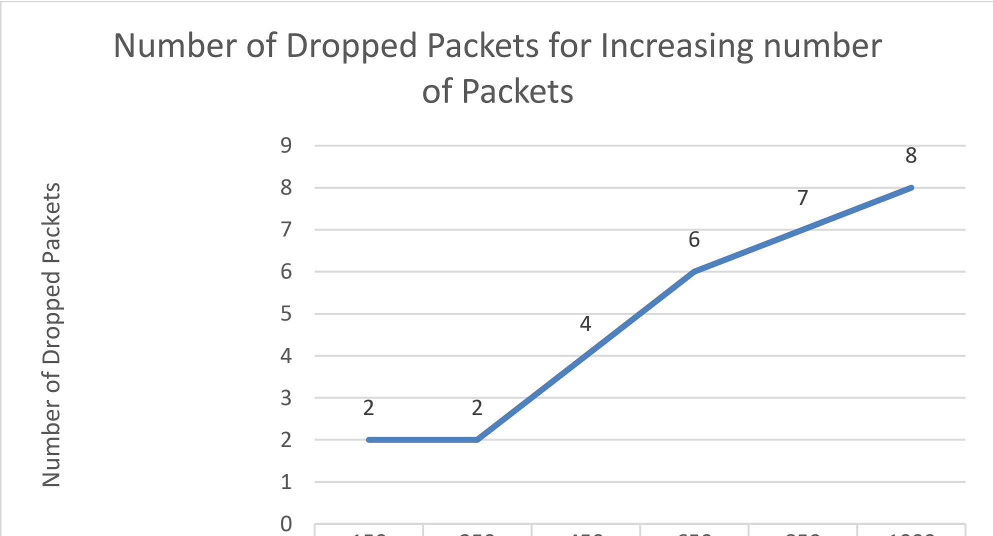


Figure 2: Graph showing the increase in dropped packets with increase in number of packets



	150	250	450	650	850	1000
Number of Dropped Packets	2	2	4	6	7	8

3. Max Throughput

Number of Packets	Number of Dropped Packets	Attempts	Throughput
150	2	152	148 / 150
250	2	252	248 / 250
450	4	454	446 / 450
650	6	656	644 / 650
850	7	857	843 / 850
1000	8	1008	992 / 1000

Table 1: Packet drop data collected from system implementation

4. Throughput Discussion

Throughput is the amount of data that can be transferred between end systems. The instantaneous throughput at any instant is the rate at which a host is receiving the file in bits/sec. Average throughput is the scenarios where F bits being transferred take T seconds, the average throughput is said to be F/T bits per second.

Throughput depends on the following factors:

- Transmission Delay
- Propagation Delay
- Nodal Processing Delay
- Queuing Delay

Propagation delay can be minimized by accessing hosts in close proximity. Eg. Accessing Google servers in the US instead of accessing the google servers in India.

Transmission delay can be reduced if network equipment with larger bandwidth is used.

Queuing delay is a factor of increased network traffic as well as a router low bandwidth or unreliable medium. Ideally if a router with larger bandwidth is deployed, and a reliable medium which doesn’t drop packets is used, the queuing delay can be minimized.

5. Output

```
dhruvs-MBP:homework 1 dhruvgupta$ python3 pingTest.py
data sent
'{"NAK": 6}'
{'data': 'a', 'sno': 6}
'{"NAK": 131}'
{'data': 'a', 'sno': 131}
'{"fin": 0}'
dhruvs-MBP:homework 1 dhruvgupta$
```

Figure 3: Sender showing the NAKs received from dropped packets when sending 150 packets

```
dhruvs-MBP:homework 1 dhruvgupta$ python3 pingTest.py
data sent
'{"NAK": 6}'
{'data': 'a', 'sno': 6}
'{"NAK": 131}'
{'data': 'a', 'sno': 131}
'{"fin": 0}'
```

Figure 4: Sender receiving NAKs when transmitting 250 packets

```
dhruvs-MBP:homework 1 dhruvgupta$ python3 pingTest.py
data sent
'{"NAK": 6}'
{'data': 'a', 'sno': 6}
'{"NAK": 131}'
{'data': 'a', 'sno': 131}
'{"NAK": 256}'
{'data': 'a', 'sno': 256}
'{"NAK": 381}'
{'data': 'a', 'sno': 381}
'{"fin": 0}'
```

Figure 5: Sender receiving NAKs when transmitting 450 packets

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```
dhruvs-MBP:homework 1 dhruvgupta$ python3 pingTest.py
data sent
'{"NAK": 6}'
{'data': 'a', 'sno': 6}
'{"NAK": 131}'
{'data': 'a', 'sno': 131}
'{"NAK": 256}'
{'data': 'a', 'sno': 256}
'{"NAK": 381}'
{'data': 'a', 'sno': 381}
'{"NAK": 506}'
{'data': 'a', 'sno': 506}
'{"NAK": 631}'
{'data': 'a', 'sno': 631}
'{"fin": 0}'
```

Figure 6: Sender receiving NAKs when transmitting 650 packets

```
dhruvs-MBP:homework 1 dhruvgupta$ python3 pingTest.py
data sent
'{"NAK": 6}'
{'data': 'a', 'sno': 6}
'{"NAK": 131}'
{'data': 'a', 'sno': 131}
'{"NAK": 256}'
{'data': 'a', 'sno': 256}
'{"NAK": 381}'
{'data': 'a', 'sno': 381}
'{"NAK": 506}'
{'data': 'a', 'sno': 506}
'{"NAK": 631}'
{'data': 'a', 'sno': 631}
'{"NAK": 756}'
{'data': 'a', 'sno': 756}
'{"fin": 0}'
```

Figure 7: Sender receiving NAKs when transmitting 850 packets

```
dhruvs-MBP:homework 1 dhruvgupta$ python3 pingTest.py
data sent
'{"NAK": 6}'
{'data': 'a', 'sno': 6}
'{"NAK": 131}'
{'data': 'a', 'sno': 131}
'{"NAK": 256}'
{'data': 'a', 'sno': 256}
'{"NAK": 381}'
{'data': 'a', 'sno': 381}
'{"NAK": 506}'
{'data': 'a', 'sno': 506}
'{"NAK": 631}'
{'data': 'a', 'sno': 631}
'{"NAK": 756}'
{'data': 'a', 'sno': 756}
'{"fin": 0}'
```

Figure 8: Sender receiving NAKs when transmitting 1000 packets