LAB 3: Analyzing congestion policy, RTT of TCP using NetSim and wireshark.

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IT304 Computer Networks

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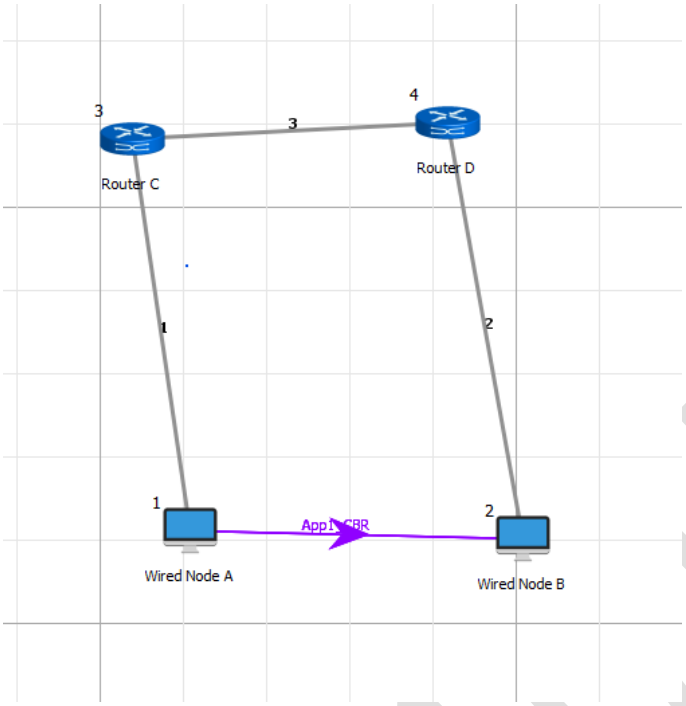
Exercise:

1.2:



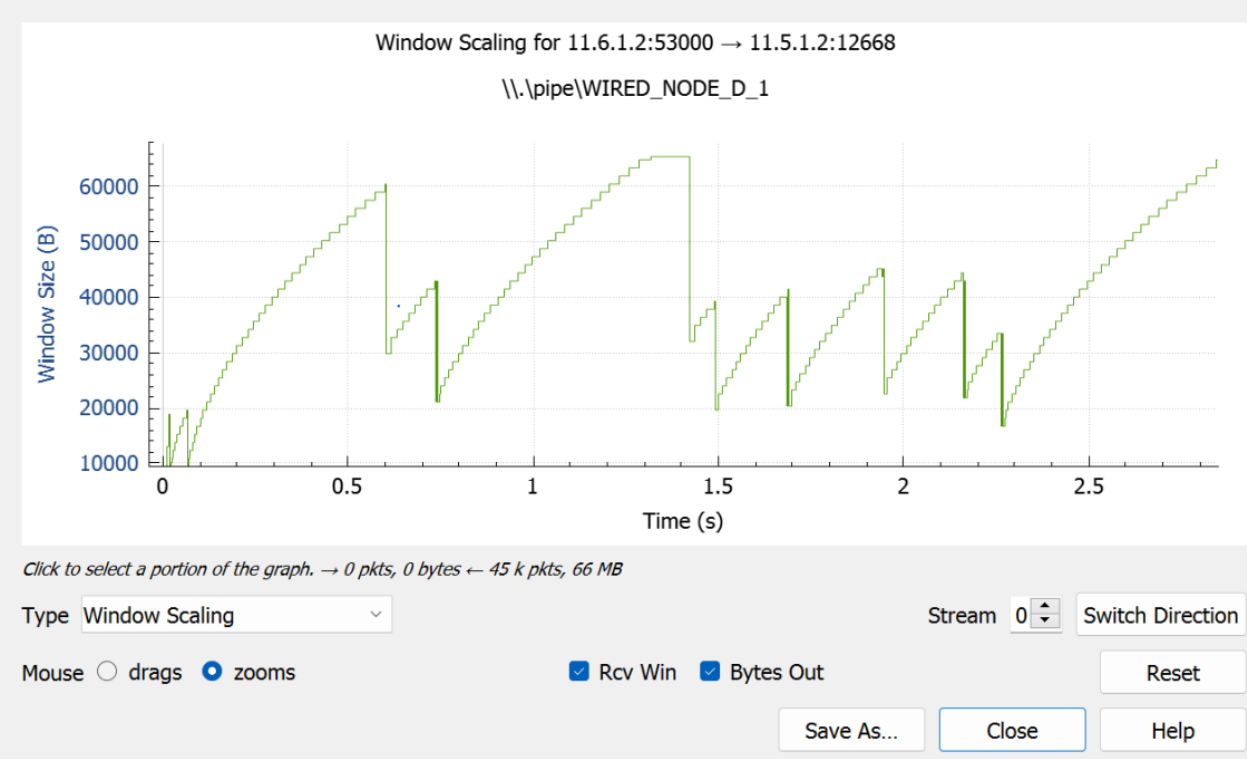
Tahoe:

The slope and the slow start is show by red and blue lines.

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	0.0.0.0	0.0.0.0	IPv4	20	
2	0.020169	11.1.1.2	11.2.1.2	TCP	44	82 → 36934 [SYN] Seq=0 Win=65535 Len=0 MSS=1460
3	0.020169	11.2.1.2	11.2.1.1	TCP	44	36934 → 82 [SYN, ACK] Seq=0 Ack=1 Win=4380 Len=0 MSS=1460
4	0.020505	11.1.1.2	11.2.1.2	TCP	40	82 → 36934 [ACK] Seq=1 Ack=1 Win=4380 Len=0
5	0.021817	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=1 Win=4380 Len=1460
6	0.021817	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=1461 Win=4381 Len=0
7	0.041450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=1461 Win=5840 Len=1460
8	0.041450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=2921 Win=4381 Len=0
9	0.061450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=2921 Win=7300 Len=1460
10	0.061450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=4381 Win=4381 Len=0
11	0.081450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=4381 Win=8760 Len=1460
12	0.081450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=5841 Win=4381 Len=0
13	0.101450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=5841 Win=10220 Len=1460
14	0.101450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=7301 Win=4381 Len=0
15	0.121450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=7301 Win=11680 Len=1460
16	0.121450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=8761 Win=4381 Len=0
17	0.141450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=8761 Win=13140 Len=1460
18	0.141450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=10221 Win=4381 Len=0
19	0.161450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=10221 Win=14600 Len=1460
20	0.161450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=11681 Win=4381 Len=0
21	0.181450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=11681 Win=16060 Len=1460
22	0.181450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=13141 Win=4381 Len=0
23	0.201450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=13141 Win=17520 Len=1460
24	0.201450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=14601 Win=4381 Len=0
25	0.221450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=14601 Win=18980 Len=1460
26	0.221450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=16061 Win=4381 Len=0
27	0.241450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=16061 Win=20440 Len=1460
28	0.241450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=17521 Win=4381 Len=0
29	0.261450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=17521 Win=21900 Len=1460
30	0.261450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=18981 Win=4381 Len=0
31	0.281450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=18981 Win=23360 Len=1460
32	0.281450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=20441 Win=4381 Len=0
33	0.301450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=20441 Win=24820 Len=1460
34	0.301450	11.2.1.2	11.2.1.1	TCP	40	36934 → 82 [ACK] Seq=1 Ack=21901 Win=4381 Len=0
35	0.321450	11.1.1.2	11.2.1.2	TCP	1500	82 → 36934 [<None>] Seq=21901 Win=26280 Len=1460

```
> Frame 9: 1500 bytes on wire (12000 bits), 1500 bytes captured (12000 bits) on interface \\.\pipe\WIRED_NODE_B_1, id 0
  Raw packet data
> Internet Protocol Version 4, Src: 11.1.1.2, Dst: 11.2.1.2
> Transmission Control Protocol, Src Port: 82, Dst Port: 36934, Seq: 2921, Len: 1460
> Data (1460 bytes)
  [Community ID: 1:mF161awsu5c/cWnUO7pVYpDUgnM=]
```

Reno:



Here the slow start clearly seen and the slope also

1. For both the variant, analyze graph of congestion window, answer the following by marking in the graph.

This all is present in the screenshot attached here, below is the thorough output observed from the points that we have on the graph.

(a) Identify the event of TCP slow start.

Tahoe: 0 - 0.048 sec

Reno: 0.01 - 0.06 sec

(b) Identify the event of packet loss and time out.

Tahoe: ([0.762 - 0.789][2.556 - 2.688][2.928 - 2.9629],[3.142 - 3.165]) sec

Reno: ([0.615 - 0.626],[0.740 - 0.761],[1.439 - 1.465],[1.697 - 1.798],

[2.263 - 2.274])sec

(c) Identify the intervals of time when TCP congestion avoidance is operating.

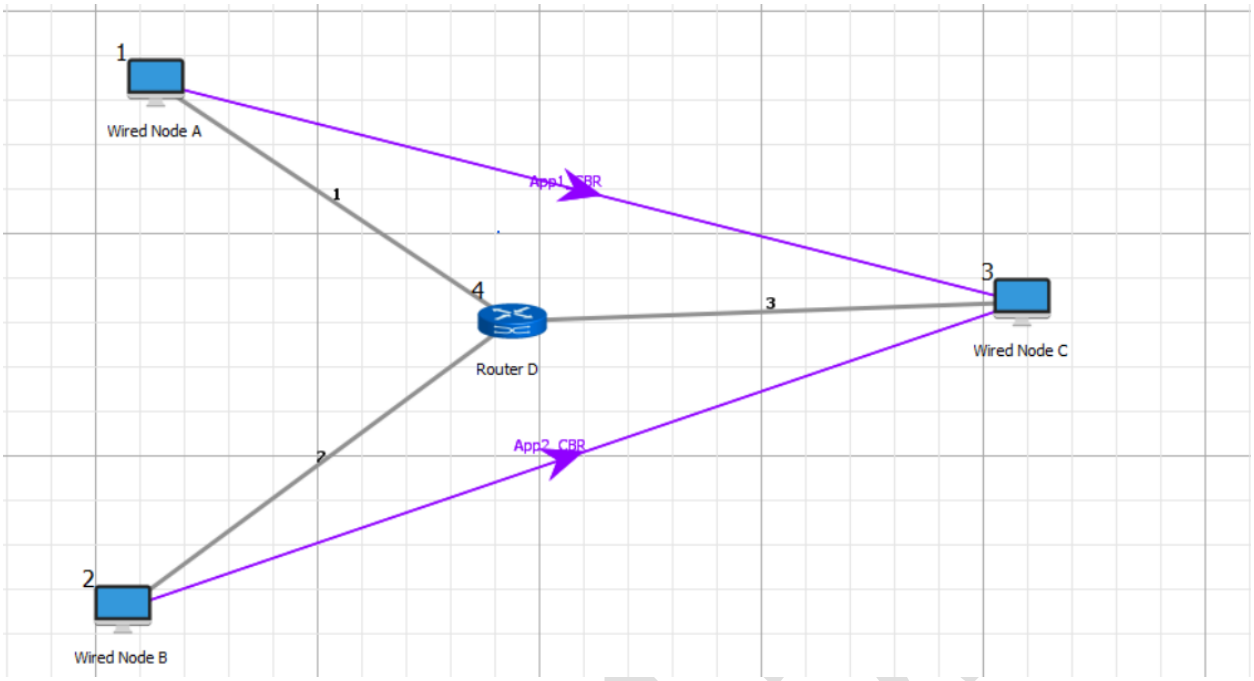
Tahoe: ([0.892 - 2.749],[2.786 - 2.927],[2.956 - 3.143],[3.193 - 3.757]) sec

Reno: ([0.085 - 0.600], [0.852 - 1.454], [1.467 - 1.772], [1.799 - 1.950]) sec

2. What is the difference in congestion control policy of Tahoe and Reno, with respect to congestion avoidance and two events of congestion avoidance phase. Explain briefly in your log book.

In both Tahoe and Reno there is timeout and packet-loss but the difference noticed is that the packet loss in Tahoe is a slow start while in the Reno it starts from the threshold itself to avoid congestion.

2.1:



1.Take 3 wired nodes and one router, configure 2 identical CBR applications with default app specification between them as shown in the figure4. And check throughput for both the applications and write down your observation.

Queue_Metrics_Table

Queue_Metrics — Detailed View

Device_id	Port_id	Queued_packet	Dequeued_packet	Dropped_packet
3	1	5000	5000	0
3	2	5053	5053	0
4	1	5001	5001	0
4	2	5052	5052	0
7	1	5002	5002	0
7	2	5062	5062	0
8	1	5010	5010	0
8	2	5054	5054	0

Application_Metrics_Table

Application_metrics — Detailed View

Application Id	Application Name	Packet transmitted	Packet received	Throughput (Mbps)	Delay(microsec)
1	APP1_CBR	4999	4999	0.583883	4161.386853
2	APP2_CBR	4999	4999	0.583883	23945.284979

Network_Metrics_Table

Network_Metrics — Detailed View

Link_id	Link_throughput_plot	Packet_transmi...		Packet_errored		Packet_collided	
		Data	Control	Data	Control	Data	Control
All	NA	30028	30227	18	3	0	0
1	NA	5001	5002	2	0	0	0
2	NA	4999	5002	0	0	0	0
3	NA	4999	5106	0	0	0	0
4	NA	5013	5004	5	2	0	0
5	NA	5008	5005	6	1	0	0
6	NA	5008	5108	5	0	0	0

TCP_Metrics_Table

TCP_Metrics — Detailed View

Source	Destination	Segment Sent	Segment Received	Ack Sent	Ack Received	Duplicate ack received
WIRED NODE A	ANY_DEVICE	0	0	0	0	0
WIRED NODE B	ANY_DEVICE	0	0	0	0	0
ROUTER C	ANY_DEVICE	0	0	0	0	0
ROUTER D	ANY_DEVICE	0	0	0	0	0
WIRED NODE E	ANY_DEVICE	0	0	0	0	0
WIRED NODE F	ANY_DEVICE	0	0	0	0	0
ROUTER G	ANY_DEVICE	0	0	0	0	0
ROUTER H	ANY_DEVICE	0	0	0	0	0
WIRED NODE A	WIRED NODE B	4999	0	1	4999	0
WIRED NODE E	WIRED NODE F	4999	0	1	4999	0
WIRED NODE B	WIRED NODE A	0	4999	4999	1	0
WIRED NODE F	WIRED NODE E	0	4999	5002	1	0

The Output obtain that is the Throughput obtain is 0.583883 Mbps for both the application 1 and 2.

3.2

1. Consider the TCP segment containing the HTTP POST as the first segment in the TCP connection. What are the sequence numbers of the first six segments in the TCP connection (including the segment containing the HTTP POST)? At what time was each segment sent? When was the ACK for each segment received? Given the difference between when each TCP segment was sent, and when its acknowledgement was received, what is the RTT value for each of the six segments? What is the EstimatedRTT value after the receipt of each ACK?

Seq no of 1st segment: 1

Sending Time: 0.0364

Ack Time: 0.0634

RTT: 0.0284

Expected RTT time: 0.0284

Seq no of 2nd segment: 2026

Sending Time: 0.0568

Ack Time: 0.0831

RTT: 0.0302

Expected RTT time: 0.0296

Seq no of 3rd segment: 3486

Sending Time: 0.1264

Ack Time: 0.1534

RTT: 0.0771

Expected RTT time: 0.0329

Seq no of 4th segment: 4946

Sending Time: 0.1364

Ack Time: 0.1783

RTT: 0.1152

Expected RTT time: 0.0535

Seq no of 5th segment: 6406

Sending Time: 0.0952

Ack Time: 0.1941

RTT: 0.1389

Expected RTT time 0.0558

Seq no of 6th segment: 7866

Sending Time: 0.0974

Ack Time: 0.2025

RTT: 0.1897

Expected RTT time: 0.0725

2. What is the length of each of the first six TCP segments?

The length of 1st segment: 686

The length of 2nd segment: 1460

The length of 3rd segment: 1460

The length of 4th segment: 1460

The length of 5th segment: 1460

The length of 6th segment: 1460
Which after the first is same.

3. What is the minimum amount of available buffer space advertised at the received for the entire trace? Does the lack of receiver buffer space ever throttle the sender?

Minimum window size (Buffer Space) is 5840 bytes. Whereas it can be maximum upto 65535 bytes. Approx. 64kb.

Maximum Segment size: 1460 bytes.

4. Are there any retransmitted segments in the trace file? What did you check for (in the trace) in order to answer this question?

No retransmitted signal is found with any such label.

5. How much data does the receiver typically acknowledge in an ACK? Can you identify cases where the receiver is ACKing every other received segment.

In segment the data is acknowledge of 1460 bytes is acknowledge in ACK. Yes

receiver is ACKing every other segment.

6. What is the throughput (bytes transferred per unit time) for the TCP connection? Explain how you calculated this value.

Throughput = Bytes Transferred/Total Time

161466/5.1s = 31.66 kbps approx..