HW4 (6 points)

Tools:

- iperf: https://iperf.fr/iperf-doc.php
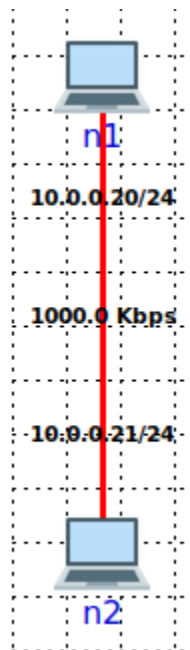
Setup:

1) Setup a CORE scenario as shown below

Part 1: Analyzing impact of delay on TCP (3 points)

1) Set the delay of the link from n1 to n2 to 100ms as shown below

Link Configuration

n1:eth0 to n2:eth0

>>

Symmetric Link Effects

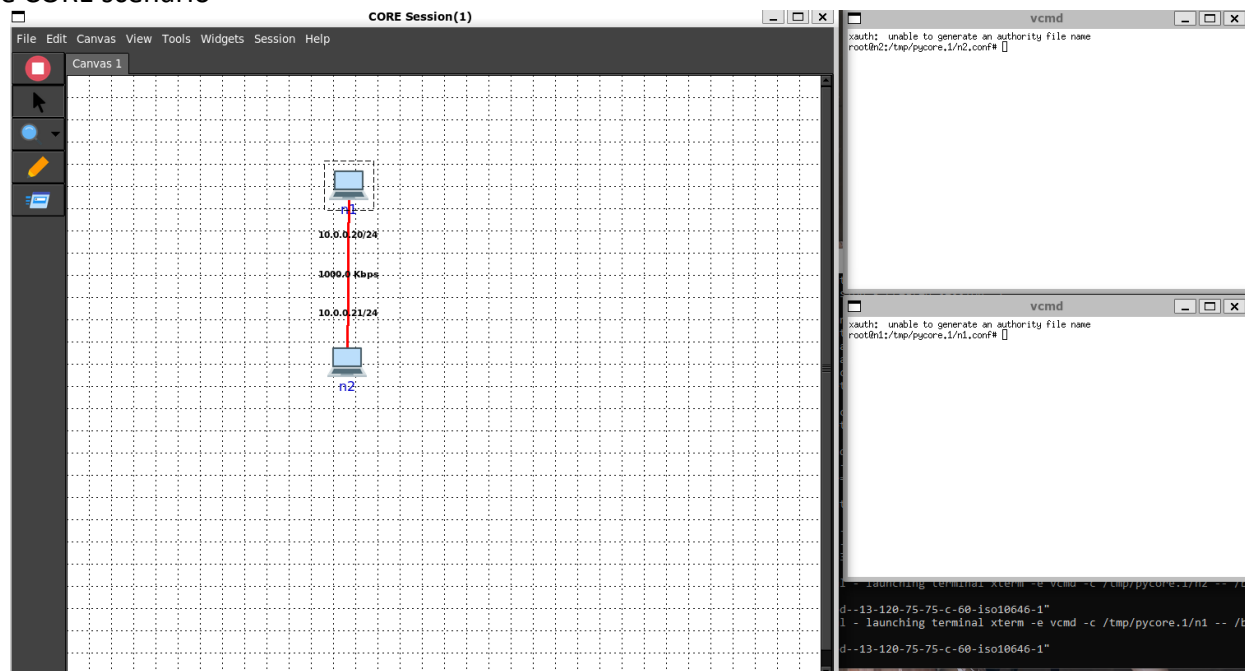|	
Bandwidth (bps)	1000000
Delay (us)	100000
Jitter (us)	0
Loss (%)	0.0
Duplicate (%)	0
Buffer (Packets)	0
Color	#ff0000
Width	3.0

Apply   Cancel

2) Run the CORE scenario

a.

3) Use iperf to run a TCP server on port 8080 on n2
   a. Iperf -s -p 8080
4) Use iperf to run a TCP client connecting to n1. Use bandwidth of 1Mbps
   a. Iperf -c 10.0.0.21 -p 8080 -b 1000000
5) Report the bandwidth you got as reported at the server
   a. 944 Kbits/sec

6) Repeat 4-5 for link delay values 200ms, 400ms, 800ms, 1600ms
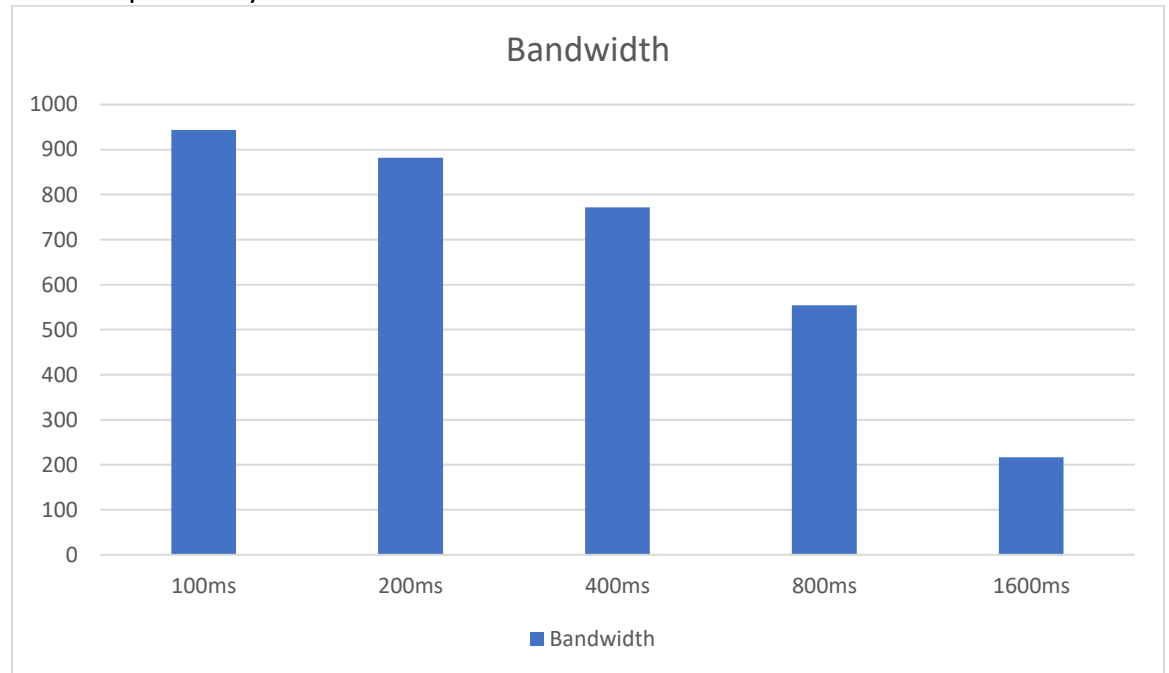   a. 200
        i. 822
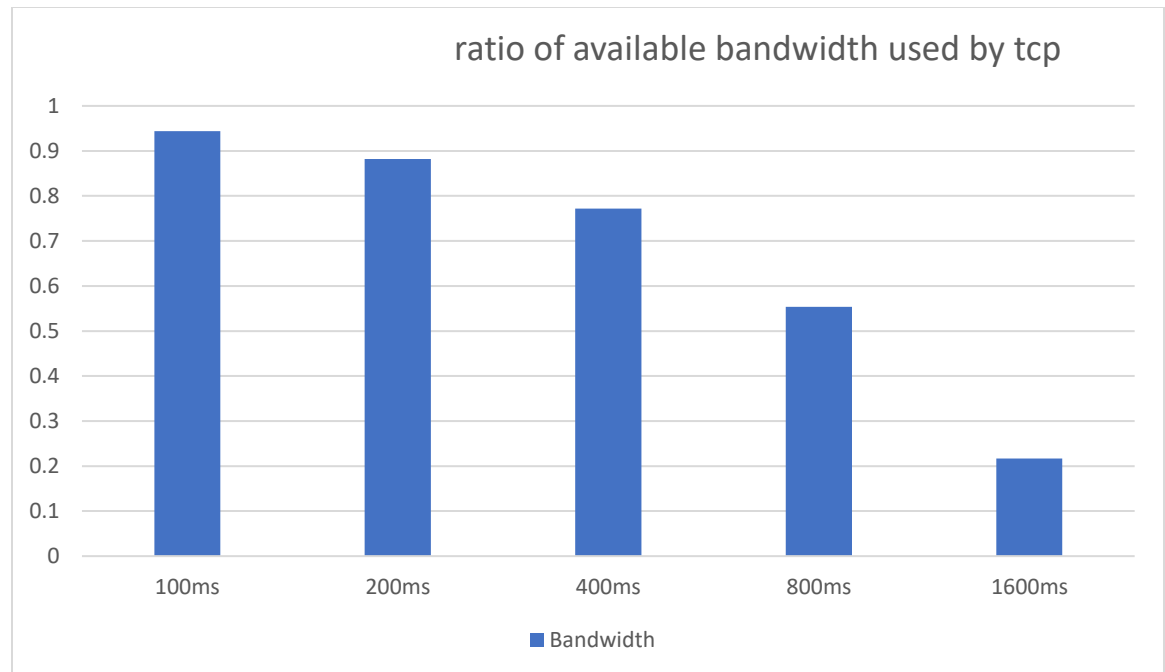   b. 400
        i. 772
    c. 800
        i. 554
    d. 1600
        i. 283
7) Create a bar chart that has delay value in x-axis starting at (100ms to 1600ms) and bandwidth in Kbps in the y-axis

Bandwidth

Delay	Bandwidth
100ms	~945
200ms	~885
400ms	~775
800ms	~555
1600ms	~215

    a.
8) Create another bar chart that has delay value in x-axis starting at (100ms to 1600ms) and ratio of available bandwidth used by TCP in the y-axis
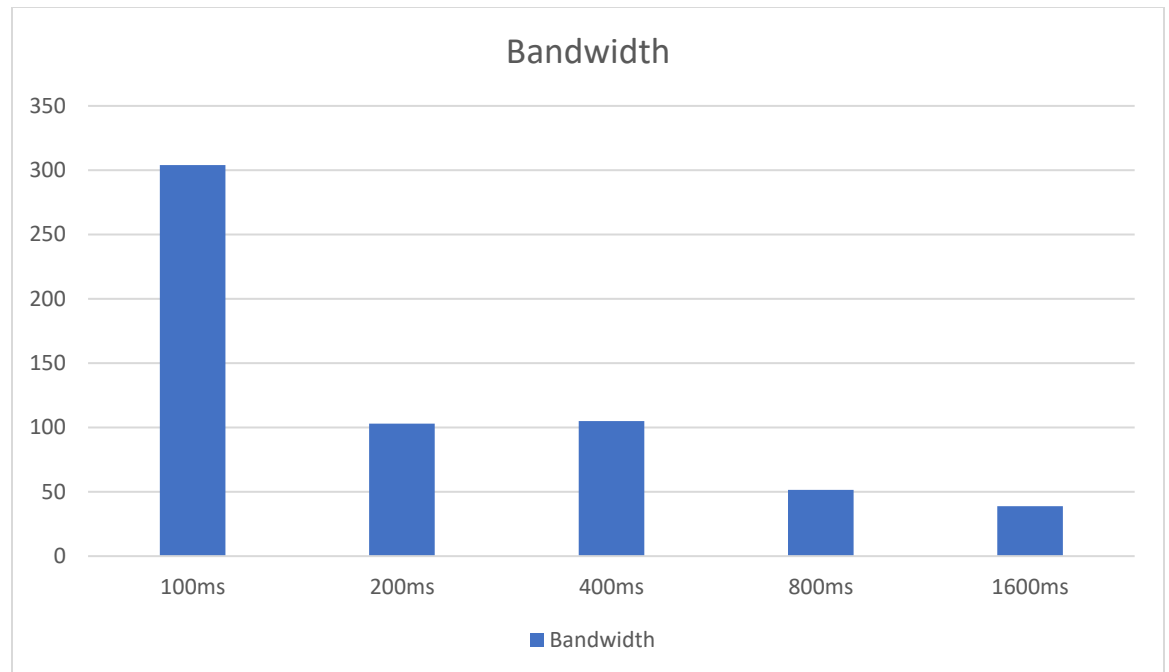
ratio of available bandwidth used by tcp

a.

9) Comment on the effect of delay on TCP performance. Explain how TCP is affected by increase in delay.
   a. Higher delay causes lower ratio of bandwidth used by TCP.
   b. The higher delay is, the lower TCP performs. And there's a significant drop of ratio between 400ms and 800ms.

## Part 2: Analyzing impact of delay and loss on TCP (3 points)

Repeat part 1 but add a 10% loss to the link for all delay values
1) Repeat 4-5 for link delay values 100ms, 200ms, 400ms, 800ms, 1600ms
   a. 100
      i. 304
   b. 200
      i. 103
   c. 400
      i. 105
   d. 800
      i. 51.4
   e. 1600
2) Create a bar chart that has delay value in x-axis starting at (100ms to 1600ms) and bandwidth in Kbps in the y-axis

Bandwidth

a.

3) Create another bar chart that has delay value in x-axis starting at (100ms to 1600ms)
and ratio of available bandwidth used by TCP in the y-axis

ratio of available bandwidth used by tcp
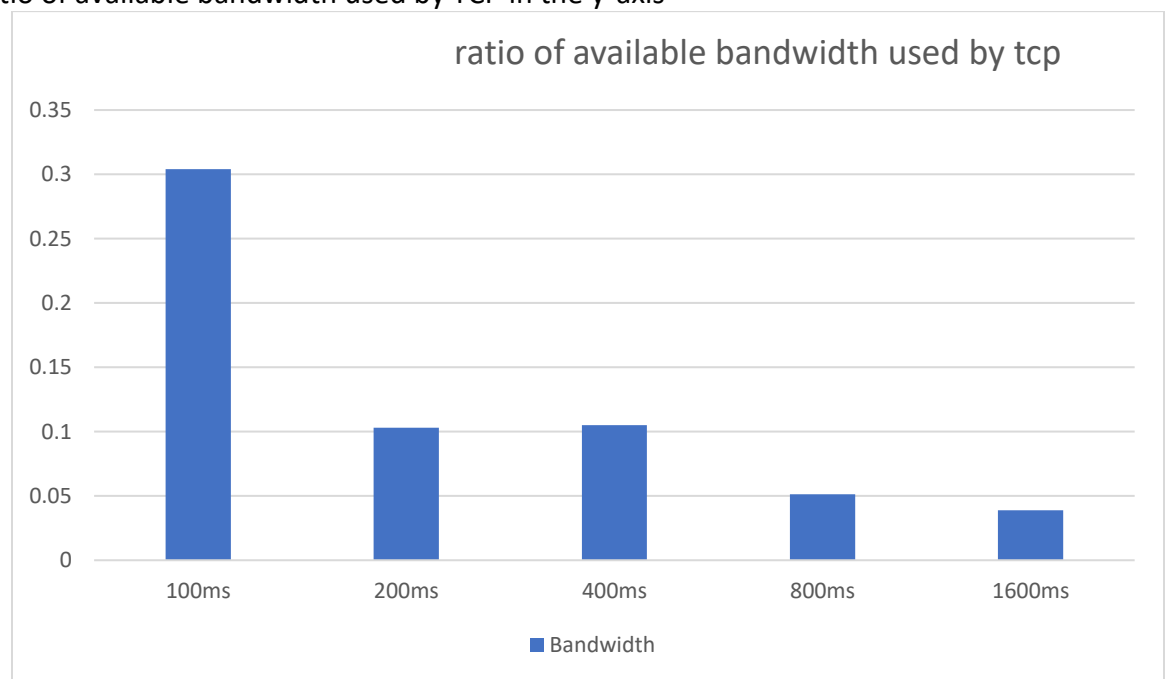
a.

4) Comment on the effect of delay on TCP performance. Explain how TCP is affected by
increase in delay.
   a. Introduction of loss causes worse performance of TCP
   b. This should be the case of congestion control. When loss occurs, the congestion
   control in TCP drops it's rate by half. So in a high loss rate environment, the TCP
   tend to have a bad performance due to it's default congestion control policy