Lab 2

Q1)a)The Control packets sent in the simulation are:-

1. TCP_ACK
2. TCP_FIN
3. TCP_SYN
4. TCP_SYNACK

Control packets provides data for delivering the payload (source and destination addresses, protocol details etc). They are typically sent before data is exchanged across the particular network/link and at the end of the session.

b) HD-Video Application typically requires a higher exchange rate for data due to its high frame rate. Thus a higher amount of packets are exchanged on this account.
The only thing constantly varying is the source and destination for the same packet in each instance.The packets are first being sent by the host to the switch. The switch in turn is forwarding it to the Receiver. This happens on a recurring basis as seen in the picture below.

L2 Switch K	Wired Node B	HD_VIDEO-1	SUCCESS	34043.77
L2 Switch K	Wired Node B	HD_VIDEO-1	SUCCESS	33946.81
Wired Node A	L2 Switch K	HD_VIDEO-1	SUCCESS	33917.65
L2 Switch K	Wired Node B	HD_VIDEO-1	SUCCESS	33824.73
Wired Node A	L2 Switch K	HD_VIDEO-1	SUCCESS	33820.69
L2 Switch K	Wired Node B	HD_VIDEO-1	SUCCESS	33702.65
Wired Node A	L2 Switch K	HD_VIDEO-1	SUCCESS	33698.61
L2 Switch K	Wired Node B	HD_VIDEO-1	SUCCESS	33580.57
Wired Node A	L2 Switch K	HD_VIDEO-1	SUCCESS	33576.53
Wired Node A	L2 Switch K	HD_VIDEO-1	SUCCESS	33454.45

c) Gmail and HTTP packets are not sent frequently because of the following reasons:
1. The applications are designed in such a way that they send out a mail or an HTTP request every 2s. In contrast Video Applications have a design aspect of 30 frames/s. Hence the disparity.
2. Also with respect to a real life model mails and HTTP requests are less frequent with respect to the data packets exchanged while streaming a video.
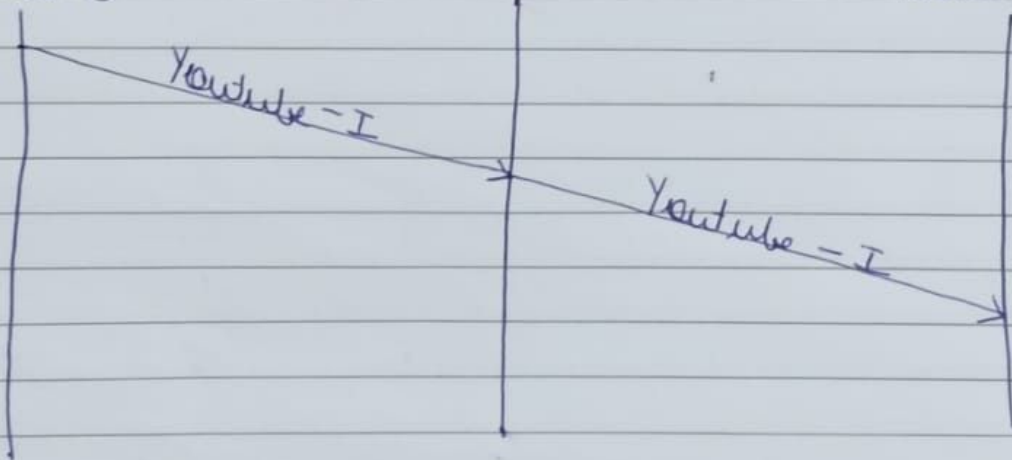
Database ⟶

wired
Node
J

Switch

Wired
Node
k

TCP-SYN

TCP-SYN

TCP-SYNACK

TCP-SYNACK

TCP-ACK

TCP-ACK

APP-DATABASE
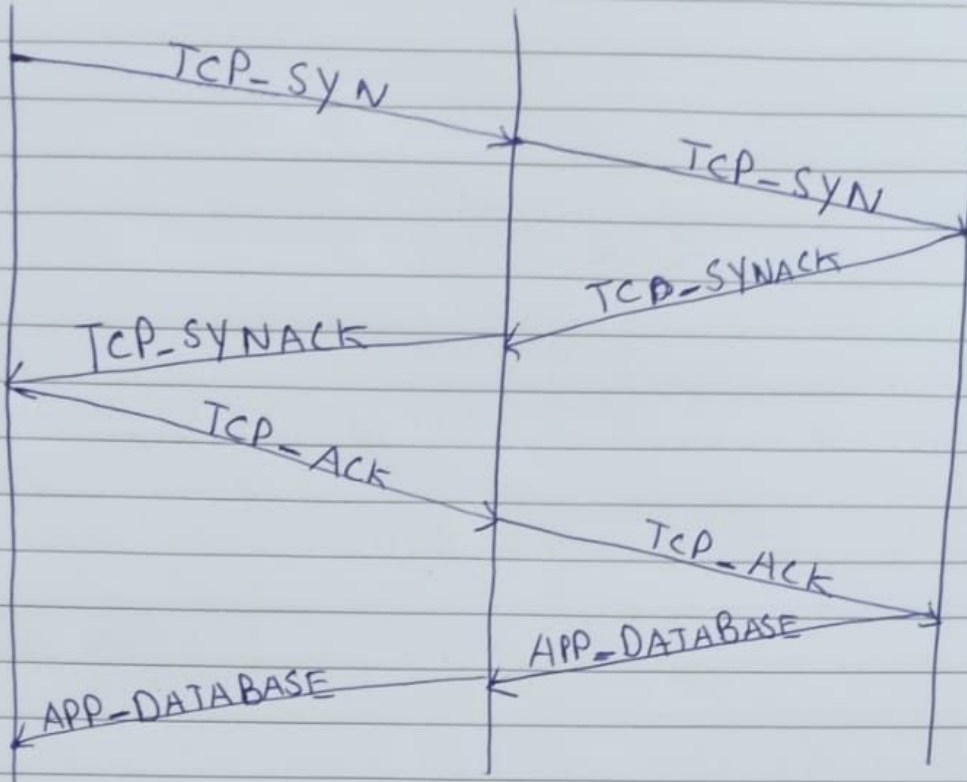
APP-DATABASE

Youtube ⟶

wired
Node D

Switch

Wired
Node E

Youtube-I

Youtube-I

Message sequence are drawn w.r.t animation.

2)a) Average Throughput

NAME OF APPLICATION	AVERAGE THROUGHPUT(Mbps)
HD	1.520862
YOUTUBE	0.099151
GMAIL	0.108000
BROWSING	1.37798
DATABASE	0.008237

b)Average Delay

Name of software	Average Delay (Microseconds)
HD	526.538692
YOUTUBE	118.792727
GMAIL	880.930101
BROWSING	996.115555
DATABASE	85.8400000

c) Packet Delivery Ratio= (packets received/packets transmitted)

Name Of software	Ratio
HD	0.993844
Youtube	1
Gmail	1
Browsing	1
Database	0.99278

3) overhead ratio= (Number of control packets/ Number of data packet)

Link_id	Overhead Ratio
1 (HD)	0
2 (HD)	0
3 (YouTube)	0
4 (YouTube)	0
5 (Gmail)	1.03
6 (Gmail)	1.03
7 (Browsing)	1.25
8 (Browsing)	1.25
9 (Database)	1.988
10 (Database)	1.988

4)

Count of CONTROL_PACKET_TYPE/APP_NAME	Column Labels								
Row Labels	NODE-10	NODE-2	NODE-4	NODE-5	NODE-6	NODE-7	NODE-8	NODE-9	Grand Total
NODE-1		2888							2888
NODE-10								1974	1974
NODE-3			398						398
NODE-5					342				342
NODE-6				342					342
NODE-7							472		472
NODE-8						464			464
NODE-9	2178								2178
Grand Total	2178	2888	398	342	342	464	472	1974	9058

5)

| Count of PACKET_STATUS	Column Labels								
Row Labels	NODE-10	NODE-2	NODE-4	NODE-5	NODE-6	NODE-7	NODE-8	NODE-9	Grand Total
NODE-1		2888							2888
NODE-10								1974	1974
NODE-3			398						398
NODE-5					342				342
NODE-6				342					342
NODE-7							472		472
NODE-8						464			464
NODE-9	2178								2178
Grand Total	2178	2888	398	342	342	464	472	1974	9058

These two tables are almost similar because the error bits are negligible.

6) The Histogram represents a Normal Distribution.
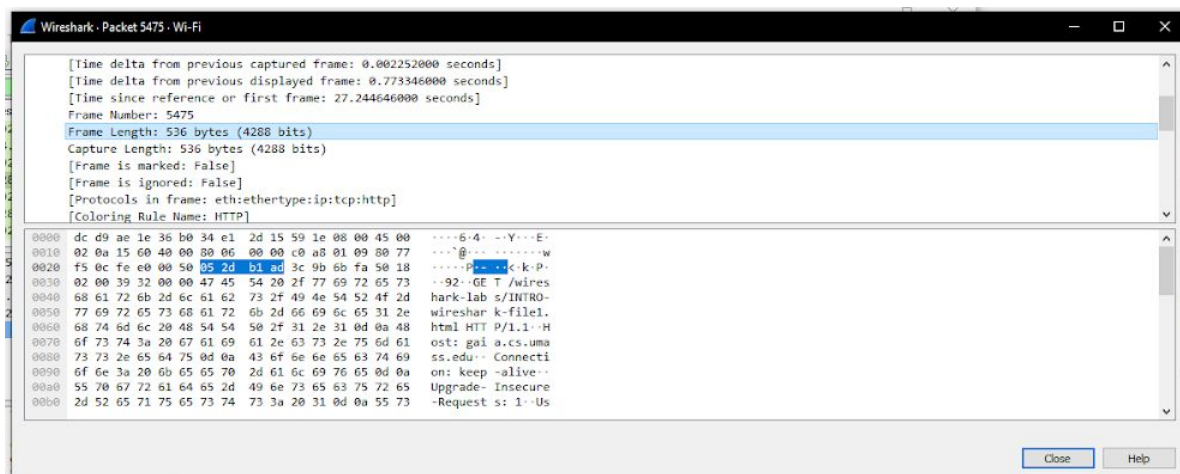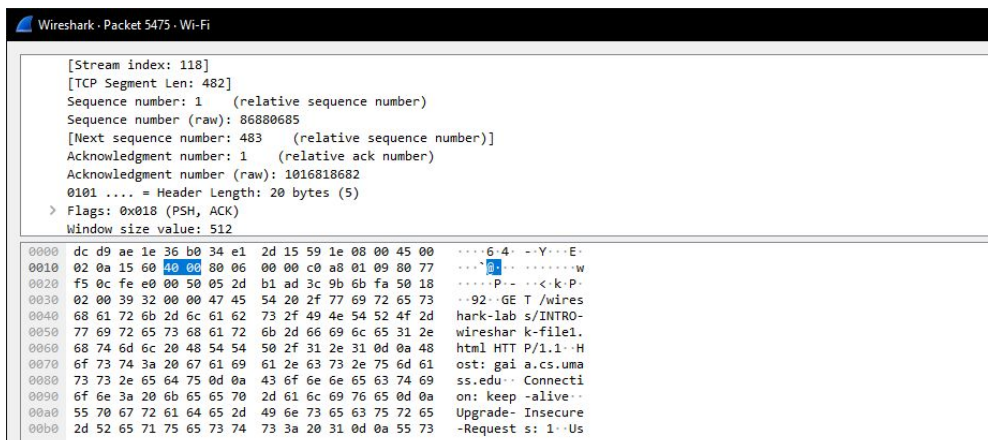

Histogram (Frequency Diagram)
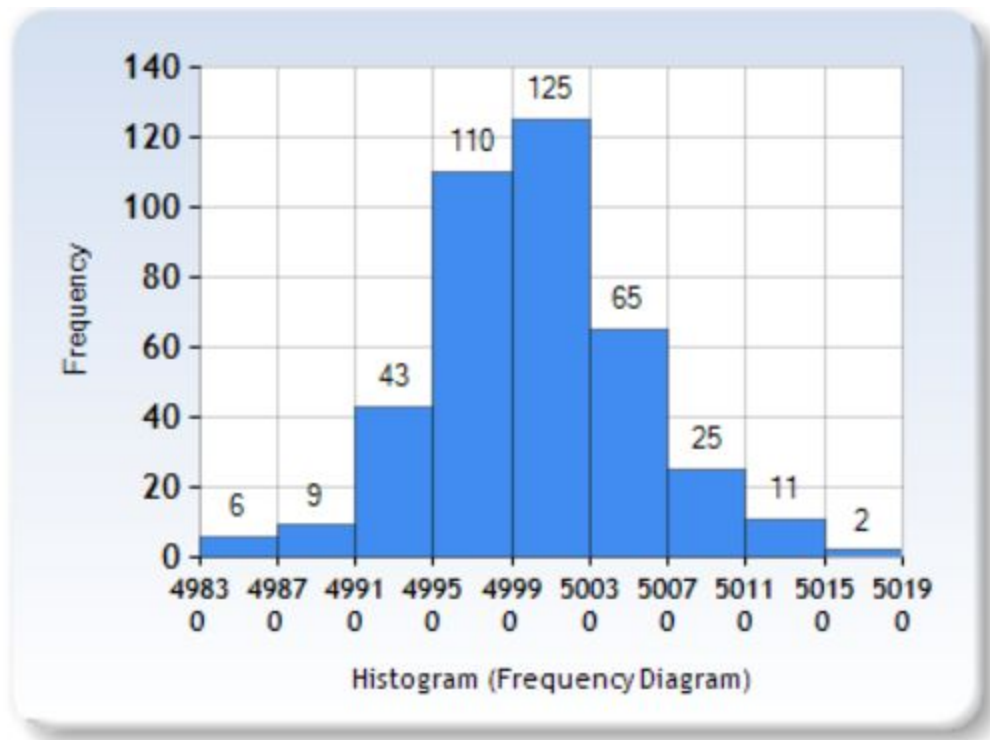
Q2.4)
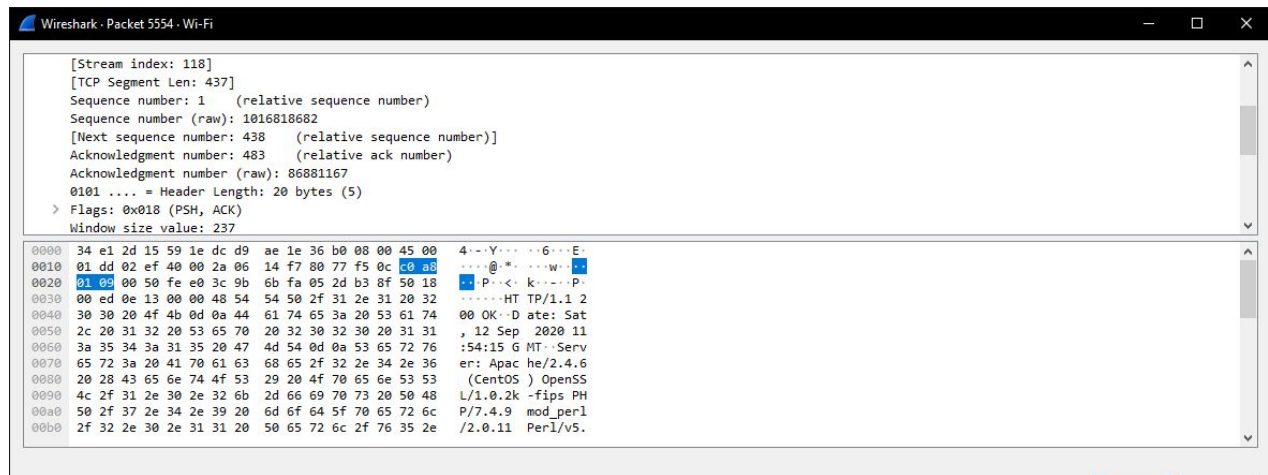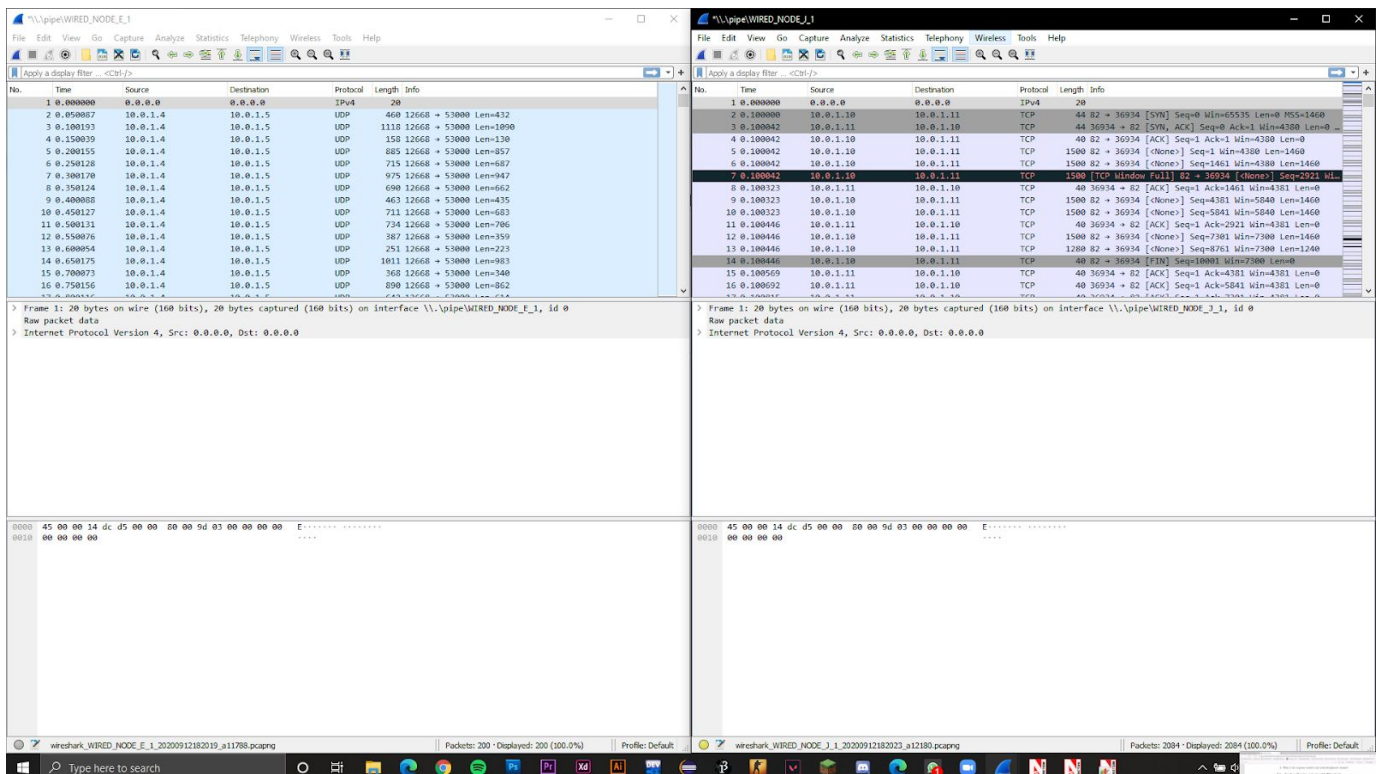1. Source: 192.168.1.9, Dest: 128.119.245.12
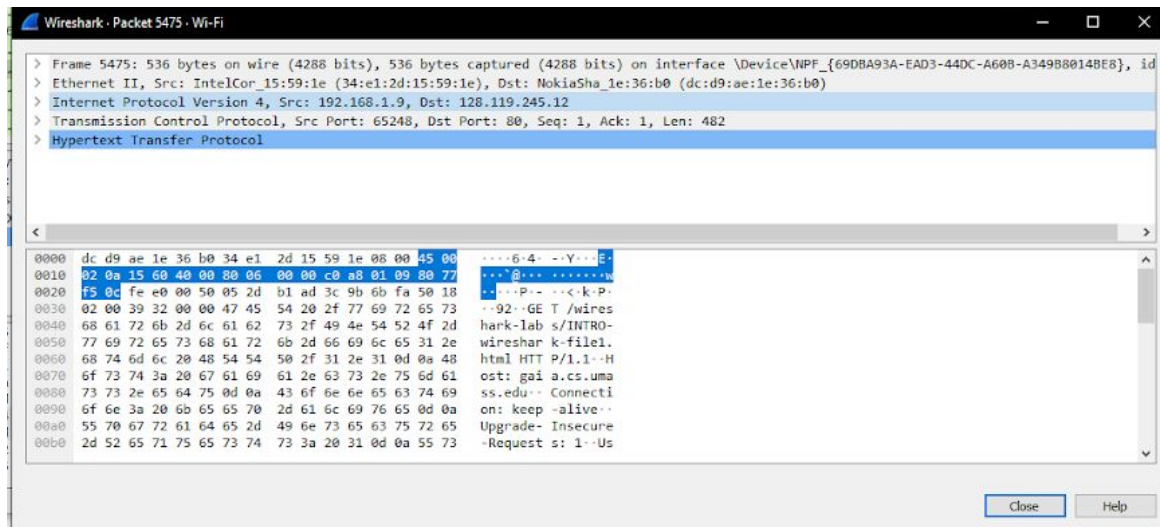
2. 536 bytes

3.

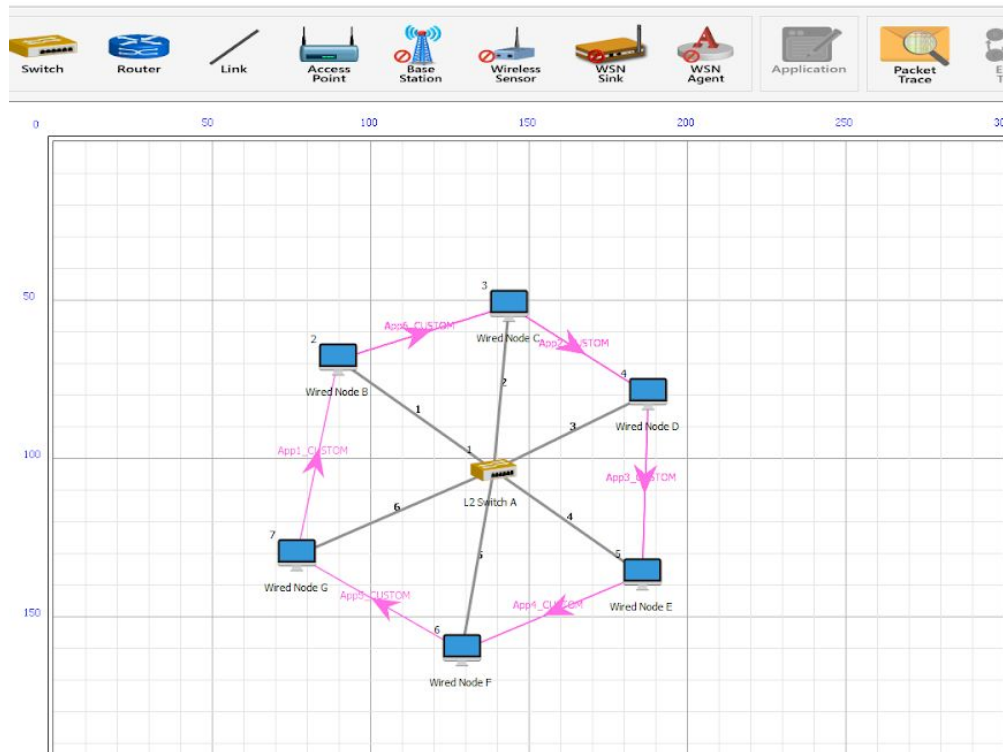1. Source: 128.119.245.12, Destination: 192.168.1.9

2. 491 Bytes

3.

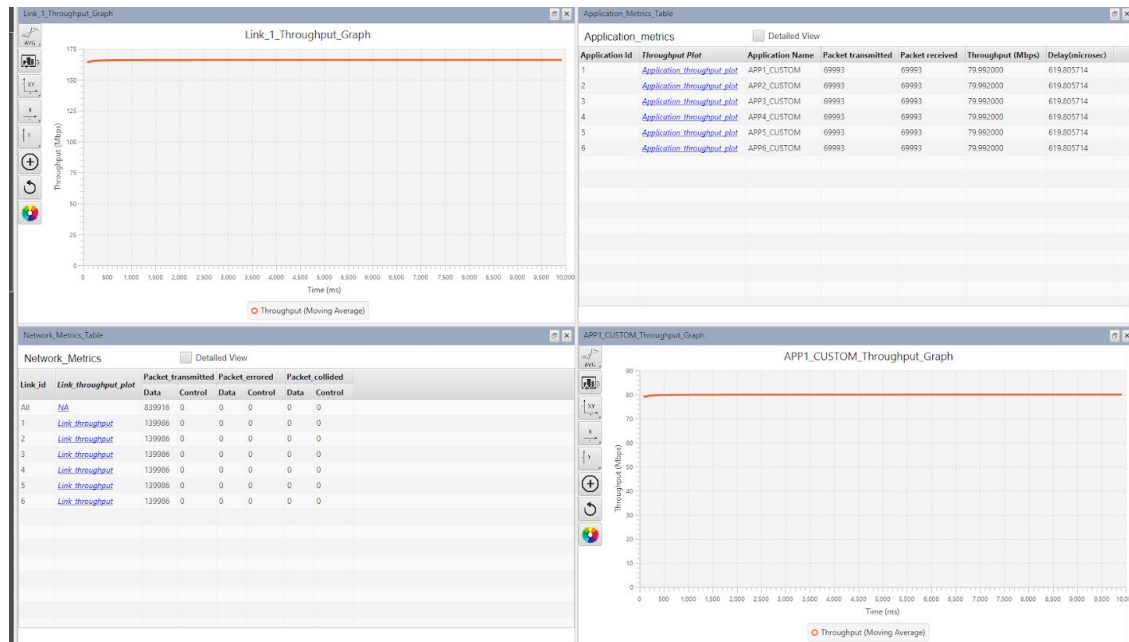Q2.5)
   (a) TCP for Database
   (b) UDP for Youtube

(c) database uses (ACK), (SYN), (FIN) and (SYN, ACK)
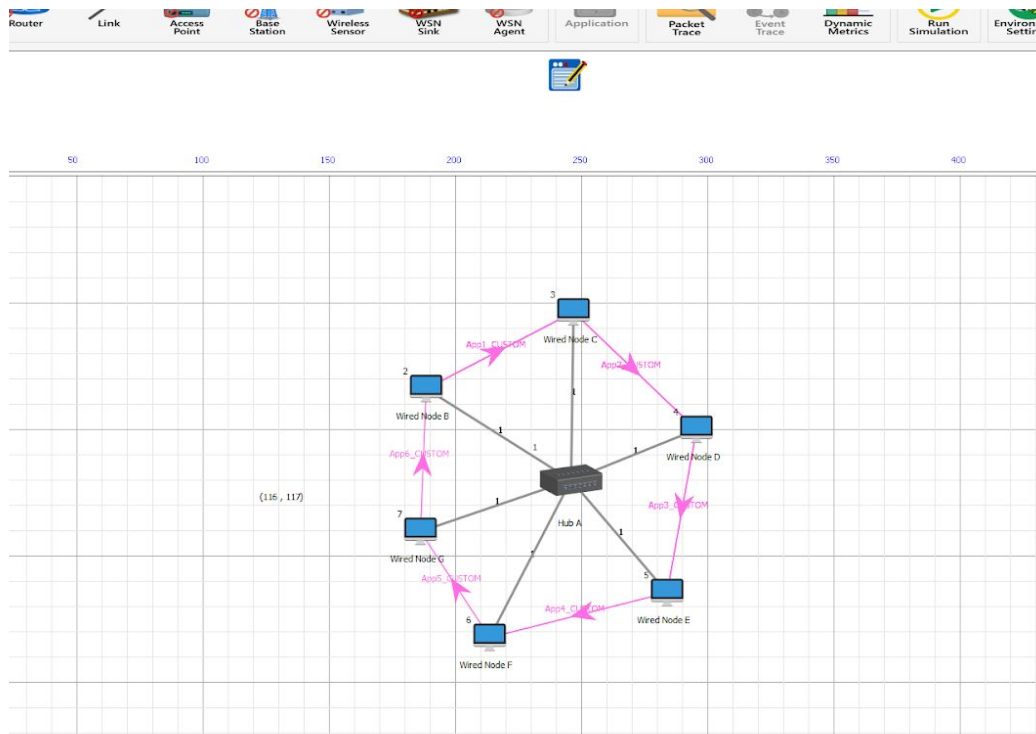   UDP does not show any such control packets
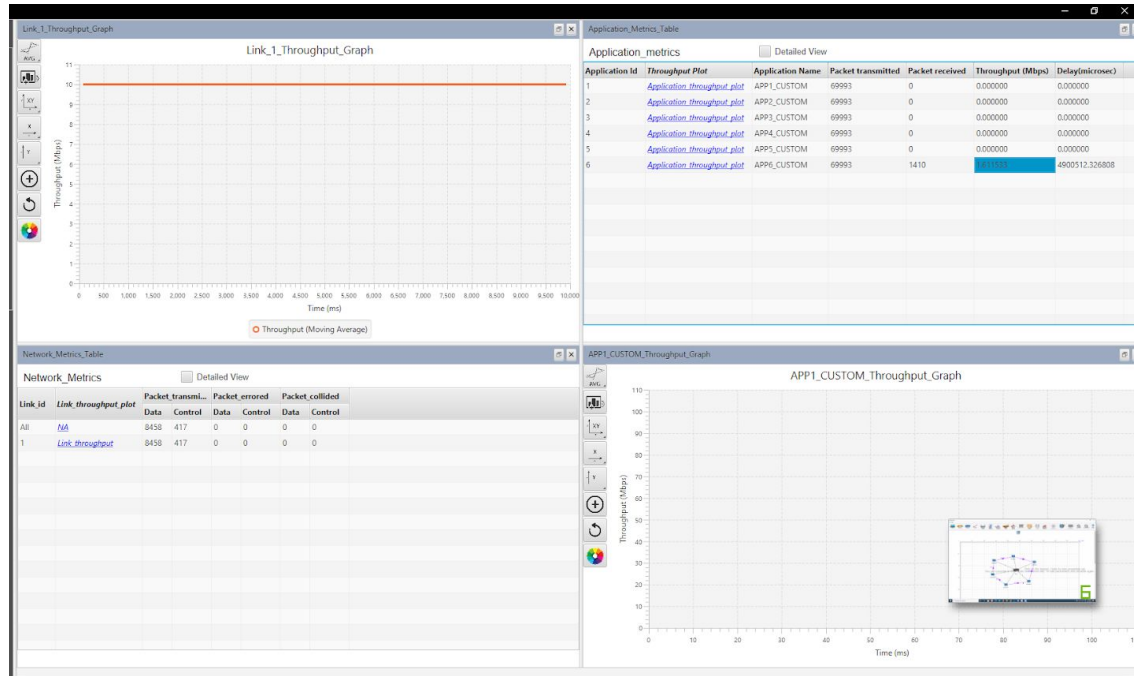
Q3.1.1)

Average throughput

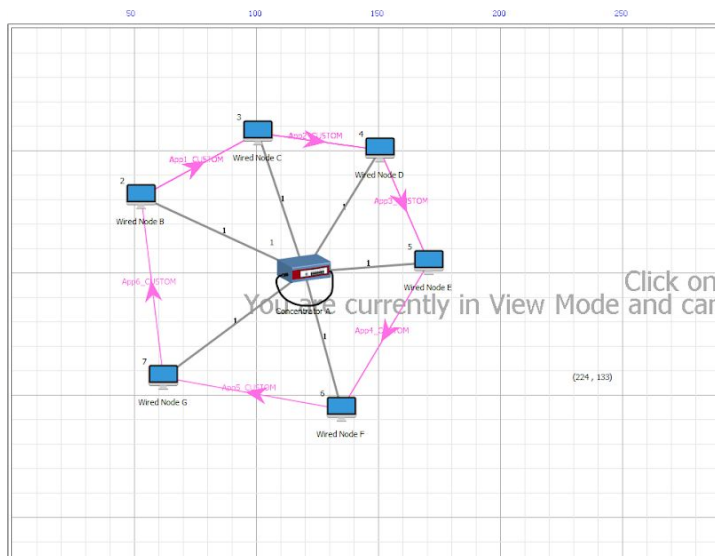
Average = 79.9920 mbps
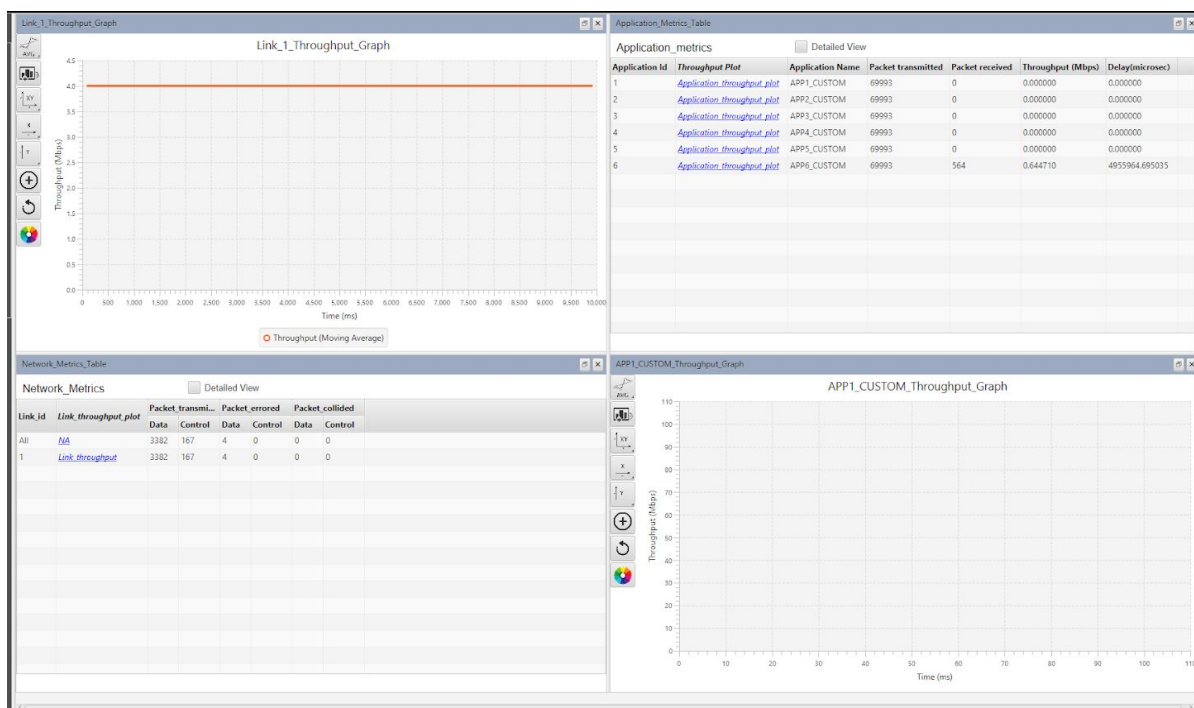
Q3.1.2)

Average throughput

Average = 1.61152 mbps

Q3.1.3)

average throughput

Average = 0.64471 mbps

Conclusion: Max throughput is for Star Topology then for Ring and the least for Bus Topology. This is because the star uses a switch which handles ports individually and the message is forwarded to all links. Ring uses a concentrator which has a token passing algorithm implemented but the bus does not have it implemented in the hardware so it has to send more packets. Both of these pass messages only when they have a token which explains the decreasing order of speed.