

1)

For UDP test case:

Application Layer - none

Transport Layer - UDP

Network Layer - IPv4

For TCP test case:

Application Layer - HTTP, JPEG File Interchange Format

Transport Layer - TCP

Network Layer - IPv4

Justification - For the UDP test case we ran the iperf command with flag “-u” which specifies only the transmission of UDP packets, so we received only the UDP packets in Transport Layer. For the TCP test case we ran the wget command which by default does the transmission by TCP protocol.

2)

a)

Pic1: 20 TCP Packets, 2 HTTP packets, Packet Sizes - 66, 74, 1514, 2962, 5858, 7306, 11650, 14546 bytes.

Pic2: 3029 TCP Packets, 1 HTTP packet, Packet Sizes - 66, 74, 78, 86, 94, 1514, 2962, 4410, 5858, 7306, 8754, 10202, 11650, 13098, 14546, 15994, 17442, 18890, 20338, 21786, 23234, 24682, 26130, 27578, 29026, 30474, 31922, 33370, 34818, 36266, 40610, 49298, 53642 bytes.

Pic3: 168 TCP Packets, 2 HTTP packets, Packet Sizes - 66, 74, 1514, 2962, 4410, 5858, 7306, 8754, 10202, 11650, 13098, 14546, 15994, 17442, 18890, 20338, 23234, 26130, 39162, 43506 bytes.

Pic4: 1044 TCP Packets, 1 HTTP packet, Packet Sizes - 66, 74, 1514, 2962, 4410, 5858, 7306, 8754, 10202, 11650, 13098, 14546, 15994, 17442, 18890, 20338, 21786, 23234, 26130, 27578, 29026, 30474, 31922, 33370, 34818, 36266, 39162, 40610, 42058, 44954 bytes.

Pic5: 211 TCP Packets, 2 HTTP packets, Packet Sizes - 66, 74, 1514, 2962, 4410, 5858, 7306, 8754, 10202, 11650, 13098, 14546, 15994, 17442, 20338, 23234, 24682, 34818, 39162 bytes.

The packets are of different size in TCP test case.

Packets of sizes 66, 10202, 4410, 13098, 7306, etc. bytes are observed. The most frequent is the size 66 which is common in all the 5 pics.

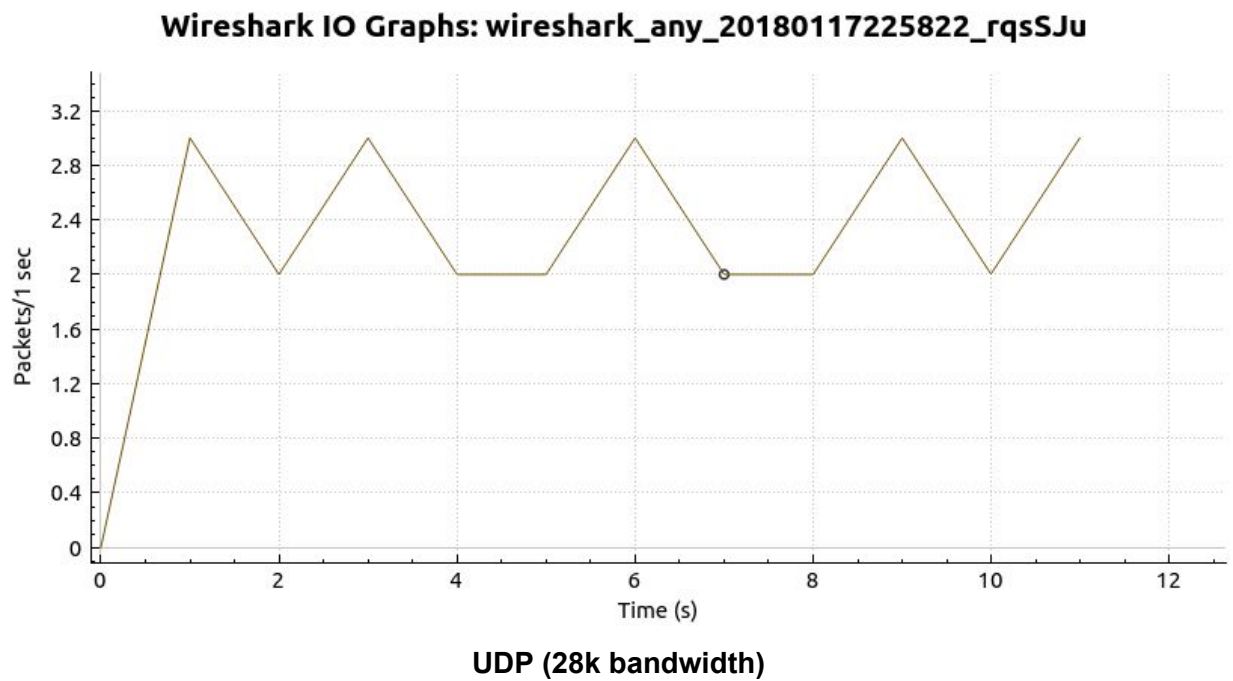
Justification - TCP protocol includes traffic control due to which we find that the packets received are of different sizes.

b)

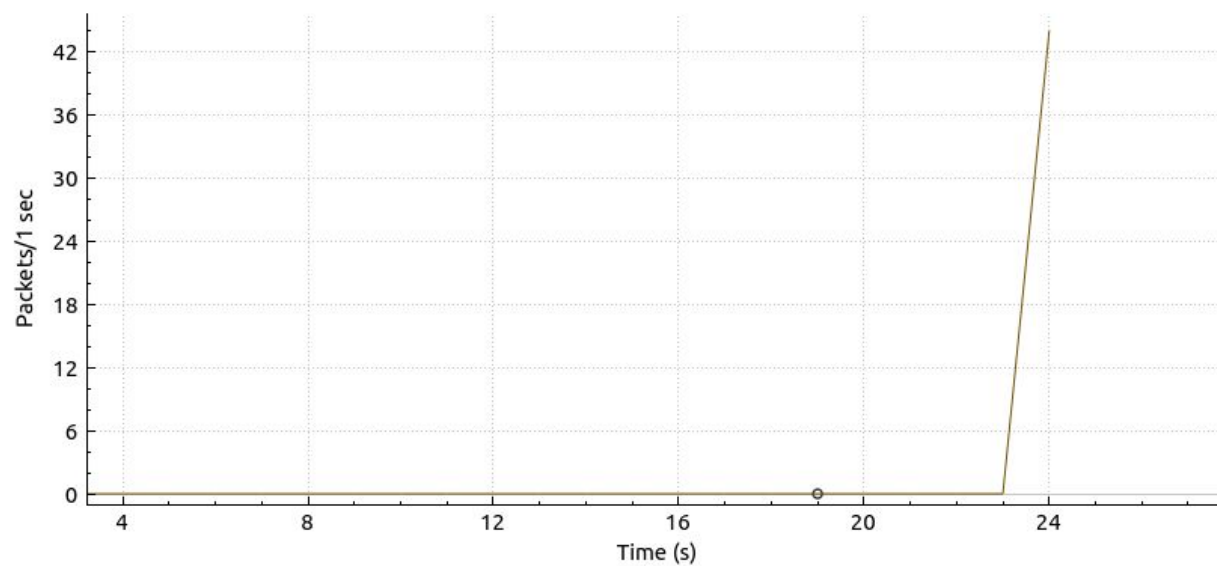
For the UDP test case, 27 packets are observed. Size of each of the packet is same being 1514 bytes.

Justification - In UDP there no extra services provided as in TCP, so it just transmits packets which are all of same size.

c)

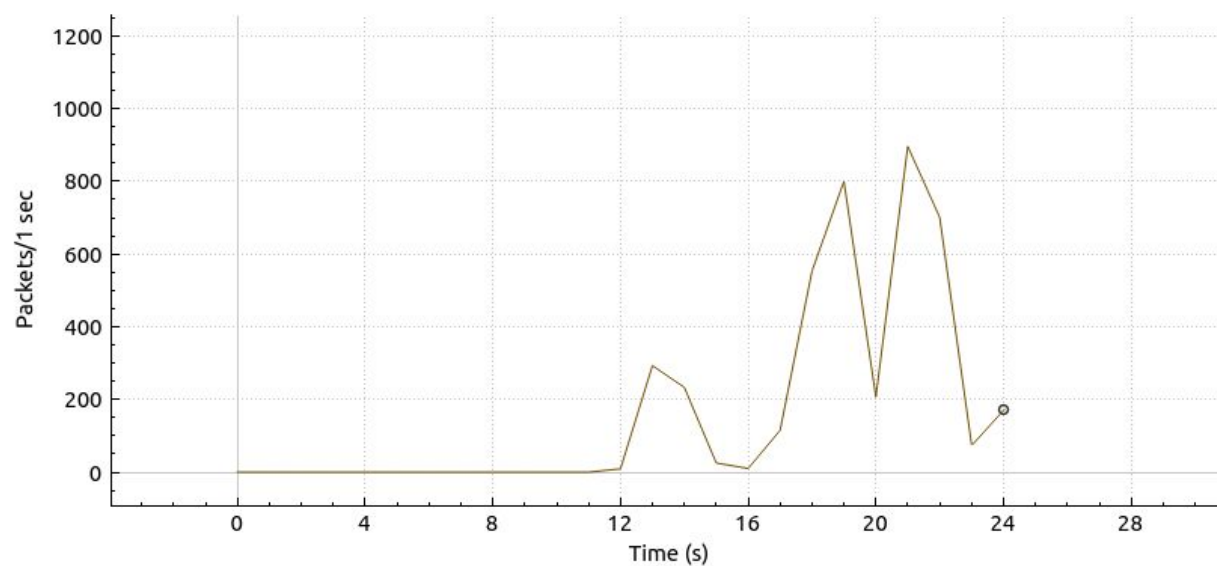


Wireshark IO Graphs: wireshark_any_20180117230638_K8JE4M



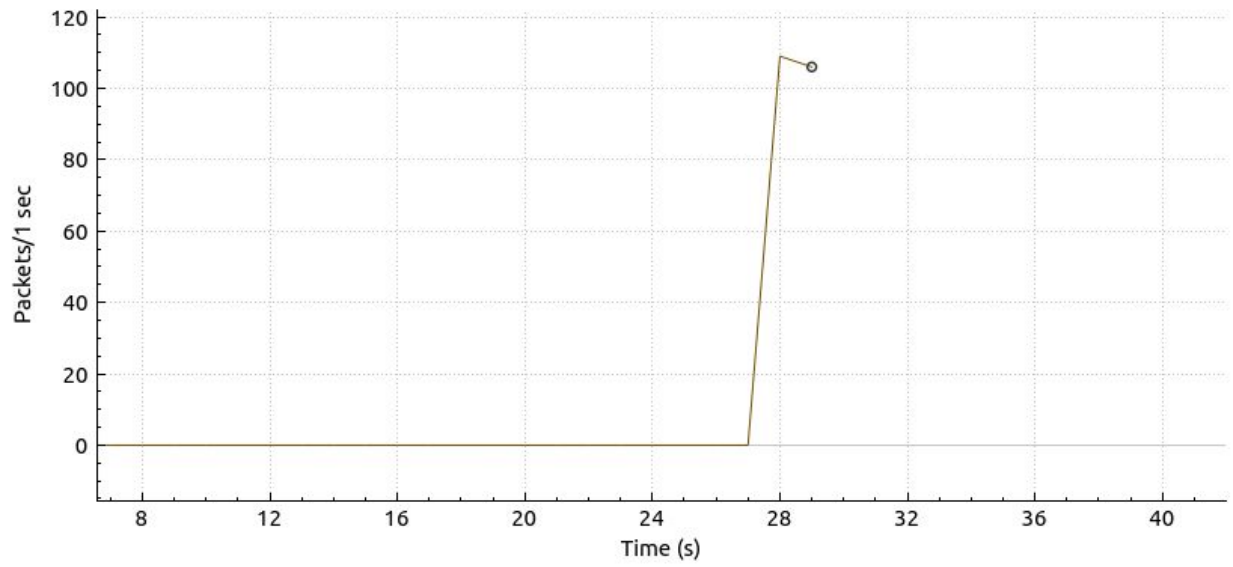
TCP pic1

Wireshark IO Graphs: wireshark_wlp3s0_20180117230843_20WJWr



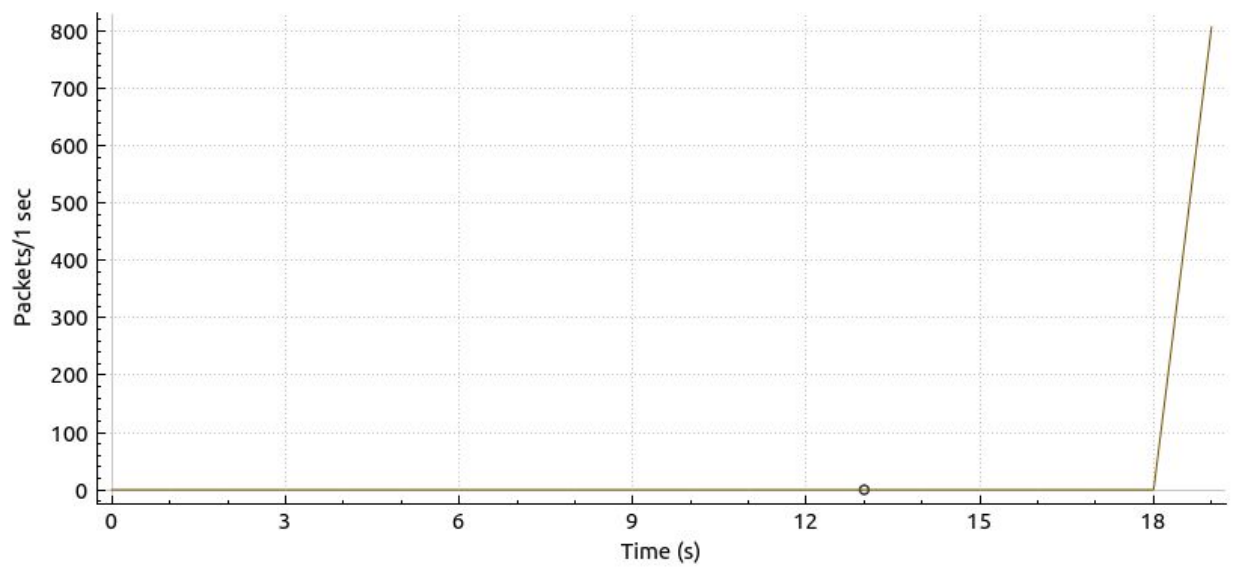
TCP pic2

Wireshark IO Graphs: wireshark_wlp3s0_20180118004128_EG8kxE



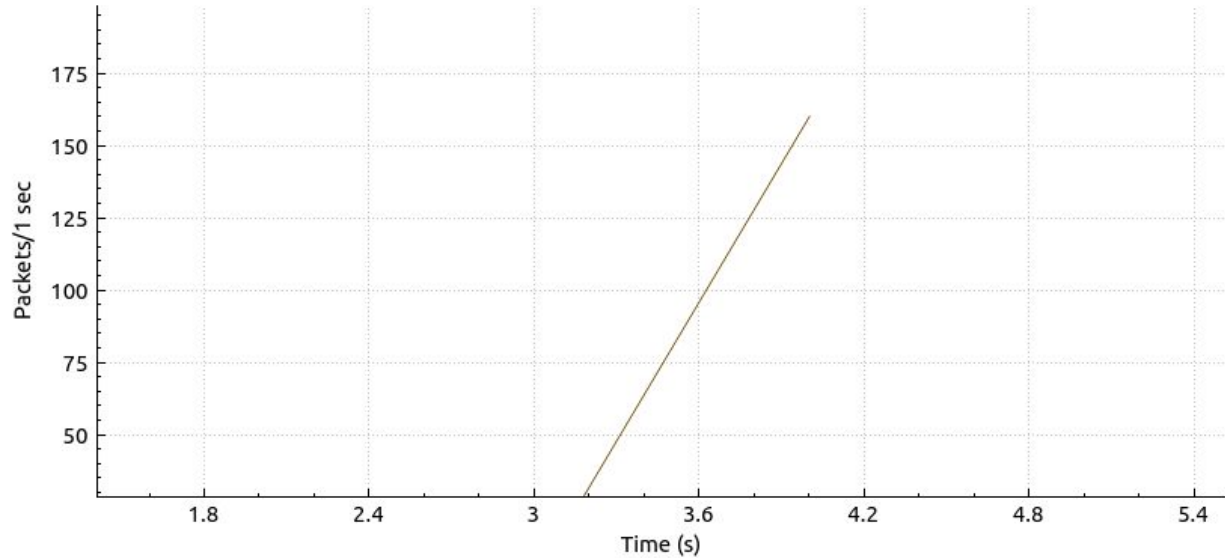
TCP pic3

Wireshark IO Graphs: wireshark_wlp3s0_20180117231211_ureSKg



TCP pic4

Wireshark IO Graphs: wireshark_any_20180117230948_ONaXZU



TCP pic5

d)

Speed (Kbps) - packets/(endTime - startTime) = (packets/sec)*size of packet = Throughput

28 - 13/(16.59 - 5.56) = 1.18 * 1514 = 1786.52 Bps

64 - 58/(15.63-5.32) = 5.62 * 1514 = 8508.68 Bps

128 - 112/(13.74 - 3.61) = 11.05 * 1514 = 167297 Bps

256 - 221/(11.30 - 1.23) = 21.95 * 1514 = 33232.3 Bps

512 - 439/(15.27 - 5.18) = 43.51 * 1514 = 65874.14 Bps

1024 - 874/(13.33 - 3.30) = 87.14 * 1514 = 131929.96 Bps

2048 - 1745/(14.13 - 4.12) = 174.32 * 1514 = 263920.48 Bps

3)

Pic1: None

Pic2: 7 - 1 TCP Fast Retransmission, 6 TCP retransmission

Pic3: None

Pic4: 9 - 3 TCP Fast Retransmission, 6 TCP retransmission

Pic5: None

Capturing from wlp3s0

Filter: ip.addr == 10.5.20.128 && tcp.analysis.retransmission

No.	Time	Source	Destination	Protocol	Length	Info
3230	5.974988149	10.5.20.128	10.147.84.185	TCP	1514	[TCP Fast Retransmission] 8000 - 50936 [ACK] Seq=16290001 Ack=152 Win=30080 Len=1448 TSval=37720970 TSecr=2268768647 [TCP segment of...
3232	5.977654587	10.5.20.128	10.147.84.185	TCP	1594	[TCP Retransmission] 8000 - 50936 [ACK] Seq=16291449 Ack=152 Win=30080 Len=15928 TSval=37720970 TSecr=2268768647
3234	5.977746316	10.5.20.128	10.147.84.185	TCP	1514	[TCP Retransmission] 8000 - 50936 [ACK] Seq=16359857 Ack=152 Win=30080 Len=1448 TSval=37720970 TSecr=2268768658
3236	5.978349124	10.5.20.128	10.147.84.185	TCP	5858	[TCP Retransmission] 8000 - 50936 [ACK] Seq=16359565 Ack=152 Win=30080 Len=5792 TSval=37720970 TSecr=2268768658
3238	5.982099631	10.5.20.128	10.147.84.185	TCP	17442	[TCP Retransmission] 8000 - 50936 [ACK] Seq=16365297 Ack=152 Win=30080 Len=17376 TSval=37720970 TSecr=2268768659
3240	5.982212980	10.5.20.128	10.147.84.185	TCP	1514	[TCP Retransmission] 8000 - 50936 [ACK] Seq=16362673 Ack=152 Win=30080 Len=1448 TSval=37720970 TSecr=2268768659
3242	5.982223284	10.5.20.128	10.147.84.185	TCP	2962	[TCP Retransmission] 8000 - 50936 [ACK] Seq=16407289 Ack=152 Win=30080 Len=2896 TSval=37720970 TSecr=2268768659

Frame 3238: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface 0

Ethernet II, Src: Cisco_E4:6c:41 (18:ef:63:e4:6c:41), Dst: IntelCor_08:29:08 (f8:34:41:68:29:08)

Internet Protocol Version 4, Src: 10.5.20.128, Dst: 10.147.84.185

Transmission Control Protocol, Src Port: 8000, Dst Port: 50936, Seq: 16290001, Ack: 152, Len: 1448

Packets: 3601 - Displayed: 7 (0.2%) Profile: Default

Retransmission for pic2

Capturing from wlp3s0

Filter: ip.addr == 10.5.20.128 && tcp.analysis.retransmission

No.	Time	Source	Destination	Protocol	Length	Info
245	7.757653997	10.5.20.128	10.147.84.185	TCP	1514	[TCP Fast Retransmission] 8000 - 50952 [ACK] Seq=363449 Ack=152 Win=30080 Len=1448 TSval=37742169 TSecr=2268789841 [TCP segment of a...
247	7.801712514	10.5.20.128	10.147.84.185	TCP	1514	[TCP Retransmission] 8000 - 50952 [ACK] Seq=56161 Ack=152 Win=30080 Len=1448 TSval=37742179 TSecr=2268789841
265	7.801842279	10.5.20.128	10.147.84.185	TCP	1514	[TCP Retransmission] 8000 - 50952 [ACK] Seq=569805 Ack=152 Win=30080 Len=1448 TSval=37742179 TSecr=2268789841
267	7.801860455	10.5.20.128	10.147.84.185	TCP	2962	[TCP Retransmission] 8000 - 50952 [ACK] Seq=570513 Ack=152 Win=30080 Len=2896 TSval=37742181 TSecr=2268789845
269	7.802951124	10.5.20.128	10.147.84.185	TCP	4410	[TCP Retransmission] 8000 - 50952 [ACK] Seq=573489 Ack=152 Win=30080 Len=4344 TSval=37742181 TSecr=2268789845
784	10.606055778	10.5.20.128	10.147.84.185	TCP	1514	[TCP Fast Retransmission] 8000 - 50952 [ACK] Seq=194937 Ack=152 Win=30080 Len=1448 TSval=37742048 TSecr=2268790665 [TCP segment of ...
1228	14.680202972	10.5.20.128	10.147.84.185	TCP	1514	[TCP Fast Retransmission] 8000 - 50952 [ACK] Seq=3741633 Ack=152 Win=30080 Len=1448 TSval=37744024 TSecr=2268791706 [TCP segment of ...
1238	14.655899138	10.5.20.128	10.147.84.185	TCP	2962	[TCP Retransmission] 8000 - 50952 [ACK] Seq=3763353 Ack=152 Win=30080 Len=2896 TSval=37744038 TSecr=2268791715
1240	14.655909922	10.5.20.128	10.147.84.185	TCP	2962	[TCP Retransmission] 8000 - 50952 [ACK] Seq=3769145 Ack=152 Win=30080 Len=2896 TSval=37744038 TSecr=2268791715

Frame 245: 1514 bytes on wire (12112 bits), 1514 bytes captured (12112 bits) on interface 0

Ethernet II, Src: Cisco_E4:6c:41 (18:ef:63:e4:6c:41), Dst: IntelCor_08:29:08 (f8:34:41:68:29:08)

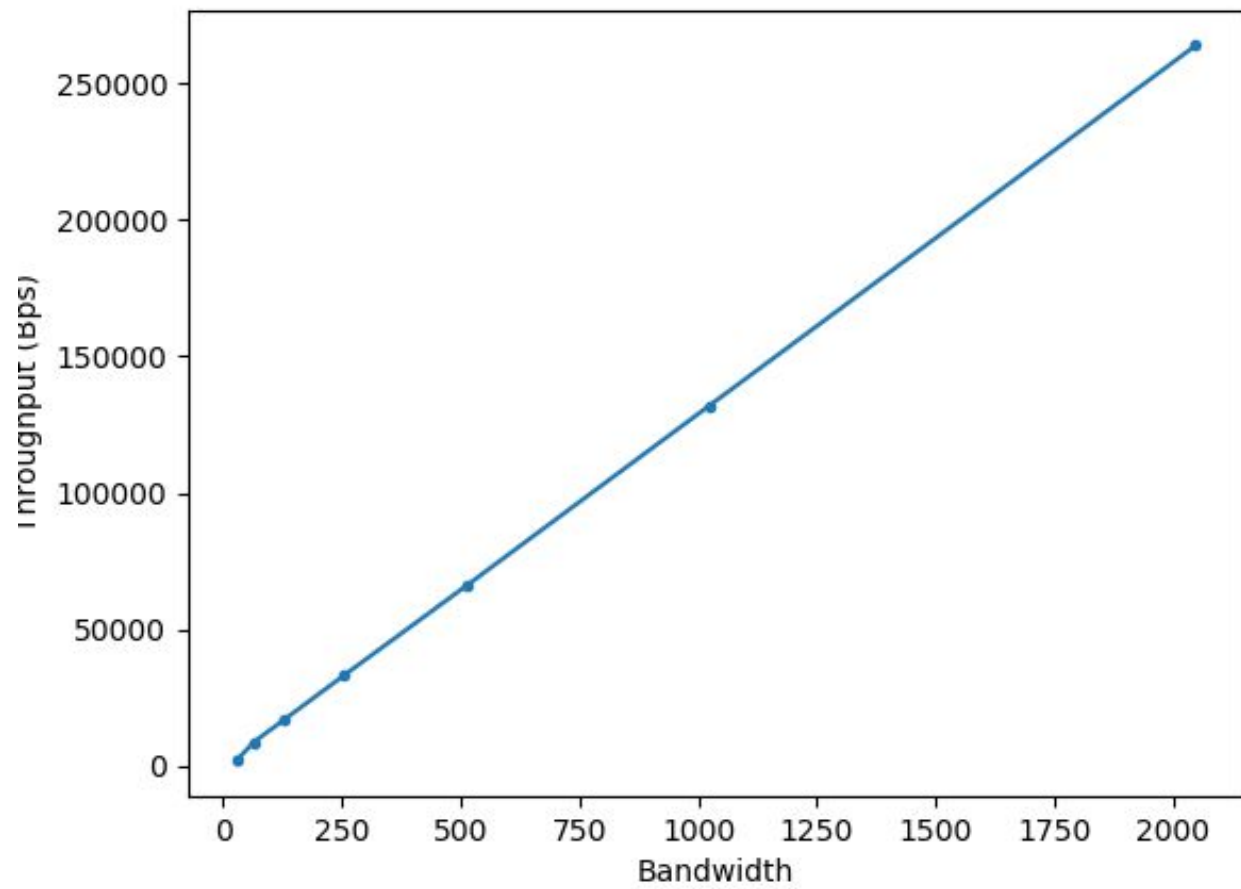
Internet Protocol Version 4, Src: 10.5.20.128, Dst: 10.147.84.185

Transmission Control Protocol, Src Port: 8000, Dst Port: 50952, Seq: 363449, Ack: 152, Len: 1448

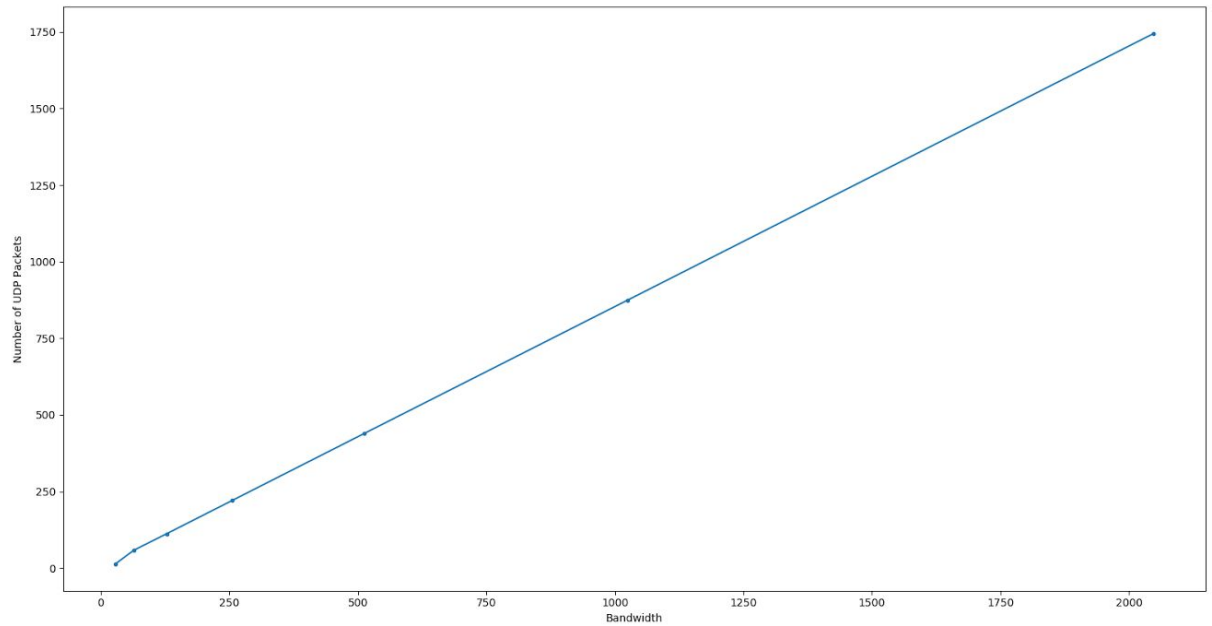
Packets: 1283 - Displayed: 9 (0.7%) Profile: Default

Retransmission for pic2

4)



Plot of UDP Throughput vs Bandwidth



Plot of Number of UDP packets transmitted vs Bandwidth

The straight line obtained in the plots signify that The no. of packets (amd also throughput) received is directly proportional to the bandwidth.