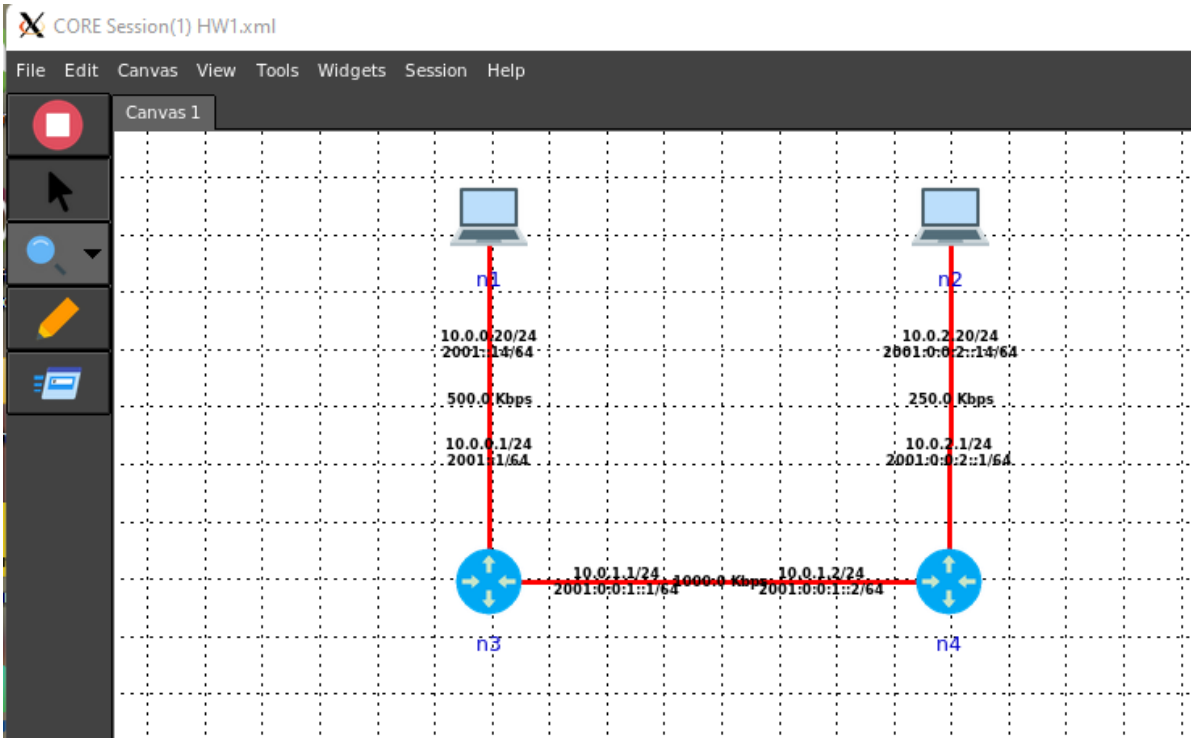
Part 1: Analyzing UDP traffic in Wireshark (2 points)

Run the CORE scenario



Open a terminal on node n2. Run a UDP server on port 8080 using netcat:

- a. nc –u -l 8080

```
root@n2:/tmp/pycore.1/n2.conf# nc -u -l 8080
```

- b. What does “-u’ mean?
  - UDP mode
- c. What does “-l” mean?
  - Listen mode, for inbound connects

Open another terminal on node n2. Run a UDP client on port 8080 using netcat:

- a. Show the output of: nc –u 10.0.0.20 8080
  - 10.0.0.20 8080 should be on n1, it doesn't provide any output
  - Assuming step1 runs nc on n1

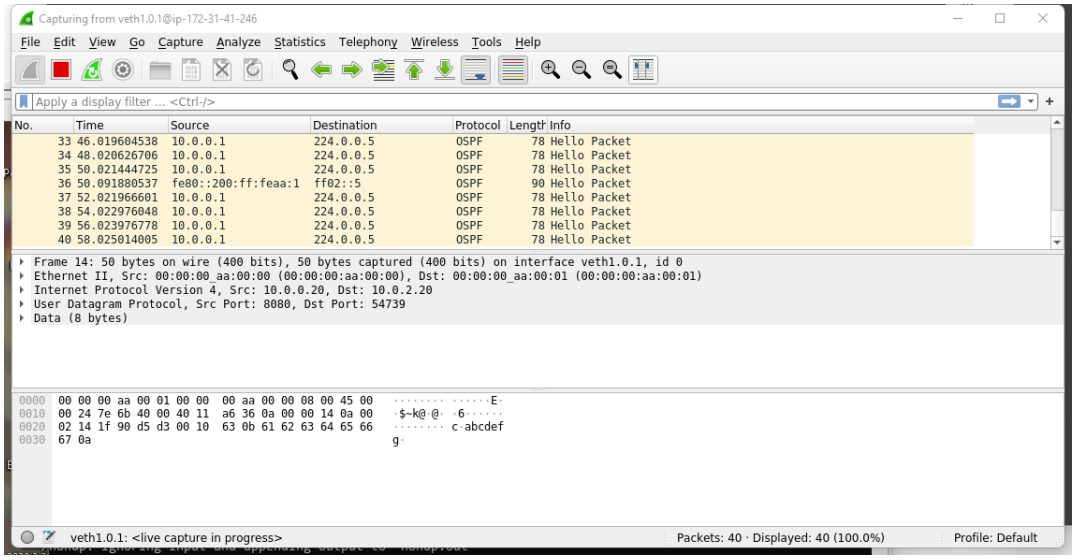
-
```
root@n2:/tmp/pycore.1/n2.conf# nc -u 10.0.0.20 8080
root@n2:/tmp/pycore.1/n2.conf# nc -u 10.0.2.20 8080
```

You can now start typing text on either the server or the client and you should see it appear on the other end.

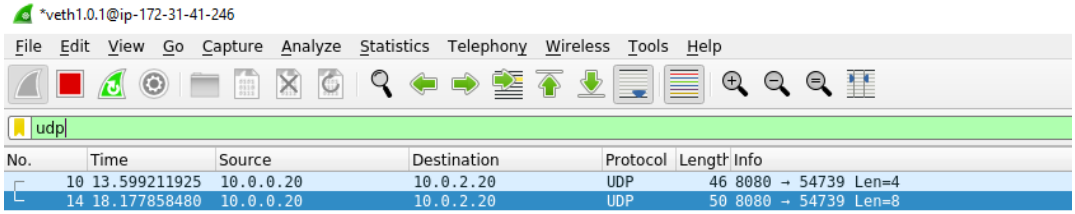
```
root@n2:/tmp/pycore.1/n2.conf# nc -u 10.0.2.20 8080

aaa
bbb
ccc
```

Open Wireshark from the Ubuntu host

- a. Open a terminal on Ubuntu
- b. Run: sudo wireshark
- c. Select the interface corresponding to the link between n1 and n3



- d. Set the filter to capture UDP traffic only



- e. Now type a message at the server: hello my name is {add your name} and I am a server
- f. Now type a message at the client: hello my name is {add your name} and I am a client
- g. Show the raw text of the two messages displayed in Wireshark (UDP payload content)

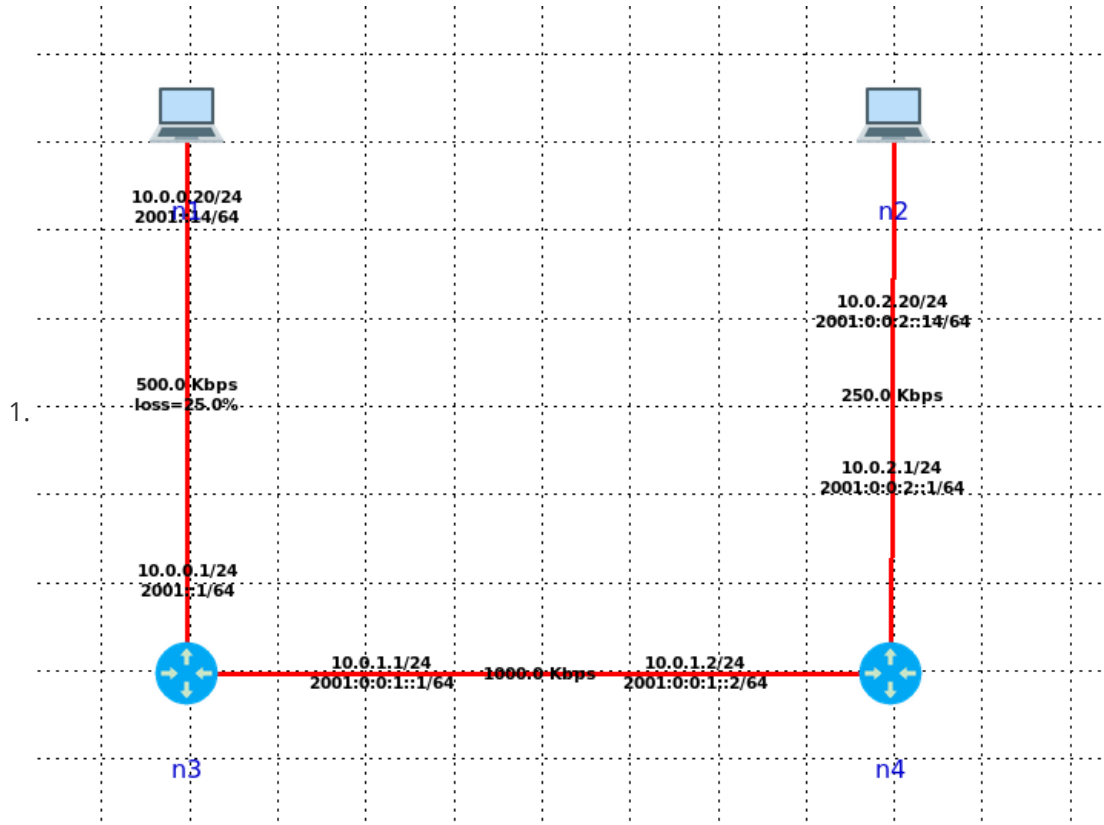
```
0000  00 00 00 aa 00 01 00 00  00 aa 00 00 08 00 45 00   ·····••• ••••••E·
0010  00 45 d5 2f 40 00 40 11  4f 51 0a 00 00 14 0a 00   ·E·/@·@· OQ••••••
0020  02 14 1f 90 d5 d3 00 31  09 db 68 65 6c 6c 6f 20   ••••••••1 ··hello
0030  6d 79 20 6e 61 6d 65 20  69 73 20 72 6f 67 65 72   my name  is roger
0040  20 61 6e 64 20 49 20 61  6d 20 61 20 73 65 72 76    and I a m a serv
0050  65 72 0a                                          er·
```

```
0000  00 00 00 aa 00 00 00 00  00 aa 00 01 08 00 45 00   ·••••••• ••••••E·
0010  00 45 52 0e 40 00 3e 11  d4 72 0a 00 02 14 0a 00   ·ER·@·>· ·r••••••
0020  00 14 d5 d3 1f 90 00 31  19 e3 68 65 6c 6c 6f 20   ••••••••1 ··hello
0030  6d 79 20 6e 61 6d 65 20  69 73 20 72 6f 67 65 72   my name  is roger
0040  20 61 6e 64 20 49 20 61  6d 20 61 20 63 6c 69 65    and I a m a clie
0050  6e 74 0a                                          nt·
```

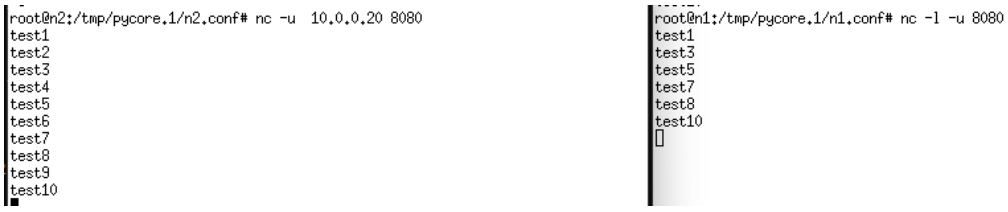
- h. What port number was the server using?
  - 8080
- i. What port number was the client using?
  - 54739
- j. Stop the client and the server then start them again
- k. Answer (h) and (i) again. The answer to one of them should be different.
  - server: port 8080
  - client: port 59775
  - Which one? Why do you think the answer changed?
    - The Client port has changed, for we have defined the port of server to be 8080. But client is just using a random available port
- l. Stop the scenario

Part 2: UDP, the unreliable transport (2 points)

1. Start the scenario again
2. This time we will run TCP client and TCP server. To do that, remove the –u option from both commands
   a. Server: nc –l 8080
   b. Client: nc 10.0.0.20 8080
3. Run the client only and no server. Describe what happens if you try to send a message from the client to the stopped server.
   - The Client send a TCP SYN packet to the server but got an port rejected return.
5. Stop the scenario
6. Add a 25% loss to the link from n1 to n3

1. 

7. Run the nc server and client again
8. Send 10 messages from client to server as shown below
9. How many of these messages did you get?
    1. 6
10. Are some messages lost?
    1. Yes, 4 messages are lost
11. If so, is the loss close to 25%?
    1. It's 40% percent. But maybe it's just certain randomness.
12. Show a screenshot of the messages delivered at the server. Remember TCP is a reliable transport. It will guarantee delivery.

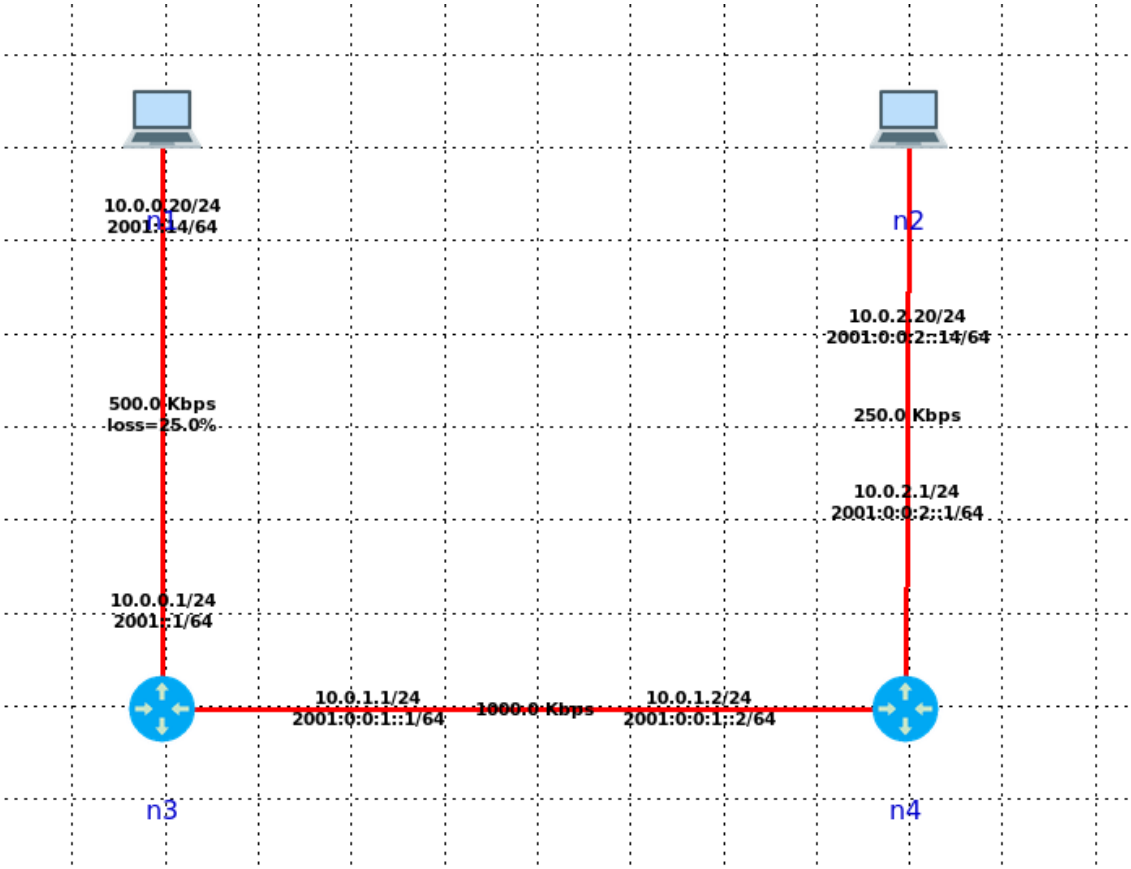
1. 

TCP, the unreliable transport (2 points)

1. Start the scenario again
2. Run the client only and no server. Describe what happens if you try to send a message from the client to the stopped server.

- The Client send a UDP packet to the server but got an ICMP port rejected return.

3. Stop the scenario
4. Add a 25% loss to the link from n1 to n3

1. 

5. Run the nc server and client again
6. Send 10 messages from client to server as shown below
7. How many of these messages did you get?
1. All messages are delivered
9. Are some messages lost?
    1. No
10. If so, is the loss close to 25%?
    1. No
11. Show a screenshot of the messages delivered at the server. Remember TCP is a reliable transport. It will guarantee delivery.

1.