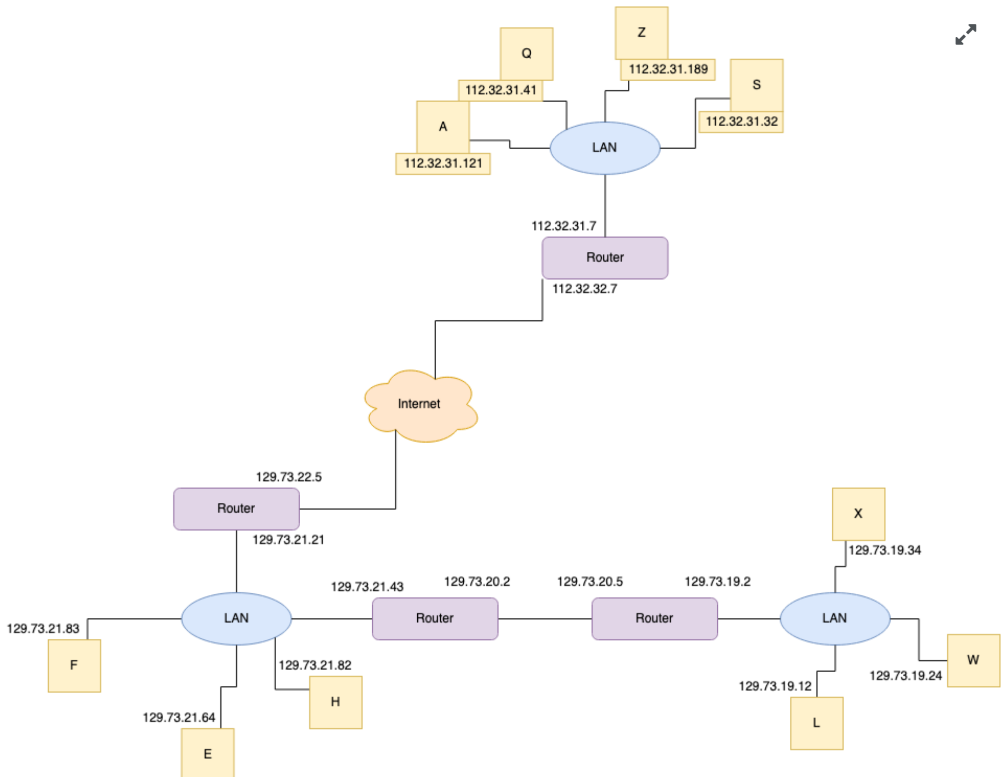
Q1 IP Networks

15 Points

Use the diagram to answer the following questions. Assume that the top 24 bits of the 32-bit address name an IP network.



Q1.1 Network Count

3 Points

How many IP networks are contained in the diagram? (Ignoring the Internet bubble)

6

Q1.2 Grouping Hosts

6 Points

Which hosts are on the same IP network as host S?

- [x] A
- [ ] E
- [ ] F
- [ ] H
- [ ] L
- [x] Q
- [ ] W
- [ ] X
- [x] Z

Q1.3 Locating Network

3 Points

Which host would be in the same IP network as a new host with the address 129.73.21.44?

- (●) F
- ( ) X
- ( ) A
- ( ) L

Q1.4

3 Points

In order for packets to flow from X to Z, How many intermediate network hops will it use? (Skip the internet bubble)

- ( ) 2
- (●) 4
- ( ) 5
- ( ) 6

Q2 Network Calculation

16 Points

You are to send a 4500 byte message over a network with the following specification:

- Wire Bandwidth: 8 Mbps (8×10^6 bits per second)

- Time of Flight: 18 ms
- Processing Delay at the Sender: 1.3 ms
- Processing Delay at the Receiver: 1.3 ms

Q2.1 Transmission Time

8 Points

Calculate the total time for message transmission in milliseconds. Do not include the units when you enter your answer. Round your answer to 1 decimal place.

Use the rounded value to answer the next question.

25.1

Q2.2 Throughput

8 Points

Calculate the throughput for the message in units of bits/sec. Do not include the units when you enter your answer. Round your answer to 1 decimal place.

1434262.9

Q2.3 Work (Optional)

0 Points

If you would like partial credit in case of an incorrect answer on the previous parts, show your work in the field below or attach it as a file:

No files uploaded

2.1:
transmission time = S + Tw + Tf + R = 1.3 + 1000*((4500 * 8)/(8 x 10^6)) + 18 + 1.3 = 25.1 ms

2.2:
throughput = size / transmission time = (4500 * 8)/(25.1 x 10^-3) = 1434262.9 bits/sec

Q3 Transport Layer Protocols

15 Points

Different transport-layer protocols perform differently; this question will show the difference in propagation time between different protocols.

For each question, we will send a message that contains **8 packets**. Additionally, assume that the time to send or receive the packet and the ACK (if present) are negligible compared to the propagation time on the medium, and that there is no packet loss in the medium.

Q3.1 Stop-and-Wait

5 Points

Assume we are using a stop-and-wait protocol with a RTT for a packet is 4 ms. How much time is required to complete the transmission?

32

Q3.2 No-ACK
5 Points

If the protocol does not send acknowledgements, how much time is required to complete the transmission if the time to send a packet from source to destination is 3 ms? Assume the source knows this time, and the time does not change.

3

Q3.3 Sliding Window
5 Points

Assume we are using a sliding window protocol with a window size of 4 and a RTT of 5 ms. How much time is required to complete the transmission?

10

Q3.4 Work (Optional)
0 Points

If you would like partial credit in case of an incorrect answer on the previous parts, show your work in the field below or attach it as a file:

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3.1:
time = #packets * RTT = 8 * 4 = 32 ms

3.2:
time = time to send a packet from src to dest = 3 ms

3.3:
time = (#packets / window size) * RTT = (8/4) * 5 = 10 ms

Q4 Packet Calculation
24 Points

Assume that a computer wants to send a message 120,000 bytes long. The computer sends the message packet by packet across a reliable connection using the stop-and-wait protocol.
Each packet has a header that is 20 bytes long and a payload of 256 bytes.

Q4.1 Number of Packets
8 Points

Calculate the minimum number of packets that need to be sent to transmit the entire message (assuming no packet loss).

469

Q4.2 Number of Bytes
8 Points

How many bytes does the sender transmit in total using the packets above?

129444

Q4.3 Loss Rate
8 Points

Now assume 1 out of every 10 packets is lost. How many packets will need to be sent to transmit all the packets?

Note: assume no acknowledgments are lost. If you lose a non-whole number of packets, **round down** to determine the number of packets lost.

519

Q4.4 Work (Optional)
0 Points

If you would like partial credit in case of an incorrect answer on the previous parts, show your work in the field below or attach it as a file:

No files uploaded

4.1:
#packets = ceiling(file size / payload) = ceiling(120000/256) = 469 packets

4.2:
#bytes = #packets * (payload + header) = 469 * (256 + 20) = 129444 bytes

4.3:
total packets = 469 + 46 + 4 + 0 = 519 packets

Q5 Link Layer
18 Points

Compare and contrast how CSMA/CD and CSMA/CA handle the problem of collisions, including when each method is used.

CSMA/CD (or carrier sense multiple access/collision detection) handles the problem of collisions after the collision is detected. To start, a station that wants to transmit data waits (idles) until there isn't any ongoing transmission before starting its own transmission. In the case that a collision happens, the transmitting station halts the transmission and instead sends out a noise burst. Then, after a random amount of time, the transmitting station tries to re-transmit the data, until the data is eventually sent. The CSMA/CD algorithm is relatively simple to manage, and works well with a light load; however, it is not suitable in high load situations, due to the larger number of collisions. This, essentially, is why CSMA/CD is used primarily in wired networks like Ethernet.

CSMA/CA (or carrier sense multiple access/collision avoidance) handles the problem of collisions by preventing the collisions from happening in the first place. To do this, before sending the data itself, a transmitting station instead sends a control RTS (request to send) packet. The destination station then responds with a CTS (clear to send) packet, which indicates that the transmitting station can go ahead and send the frame. Since all nodes in the LAN can see RTS/CTS packets, the other stations won't try to send RTS packets until the frame transmission is necessary. The only possible collisions are between RTS packets, and these are rather negligible, since the packets are so small. The CSMA/CA algorithm is slightly more complicated, due to the RTS/CTS system, and has slightly longer waiting times, for the benefit of drastically reducing the number of collisions, which makes it a very good choice for higher load networks. This, essentially, is why CSMA/CA is used primarily in wireless networks (higher load, higher chance of collisions happening).

Q6 Network Stack Layers

16 Points

Q6.1

4 Points

Which layer of the network stack has the role of sending a packet from the source to the destination?

- ○ Application
- ○ Transport
- ◉ Network
- ○ Link
- ○ Physical

Q6.2

4 Points

Which layer of network stack would be responsible for acquiring physical medium for transmission, and sending the packet to the destination host?

- ○ Application
- ○ Transport
- ○ Network
- ◉ Link
- ○ Physical

Q6.3
4 Points

Which layer of the network stack would protocols such as TCP and UDP be considered part of?

- ○ Application
- ◉ Transport
- ○ Network
- ○ Link
- ○ Physical

Q6.4
4 Points

Which layer of the network stack would protocols such as SMTP and HTTP be considered part of?

- ◉ Application
- ○ Transport
- ○ Network
- ○ Link
- ○ Physical

Homework 10

● UNGRADED

STUDENT
Avinash Athota

TOTAL POINTS
- / 104 pts

QUESTION 1

IP Networks		15 pts
1.1	Network Count	3 pts
1.2	Grouping Hosts	6 pts
1.3	Locating Network	3 pts
1.4	(no title)	3 pts

QUESTION 2

Network Calculation		16 pts
2.1	Transmission Time	8 pts

2.2	Throughput	8 pts
2.3	Work (Optional)	0 pts

QUESTION 3

Transport Layer Protocols — 15 pts

3.1	Stop-and-Wait	5 pts
3.2	No-ACK	5 pts
3.3	Sliding Window	5 pts
3.4	Work (Optional)	0 pts

QUESTION 4

Packet Calculation — 24 pts

4.1	Number of Packets	8 pts
4.2	Number of Bytes	8 pts
4.3	Loss Rate	8 pts
4.4	Work (Optional)	0 pts

QUESTION 5

Link Layer — 18 pts

QUESTION 6

Network Stack Layers — 16 pts

6.1	(no title)	4 pts
6.2	(no title)	4 pts
6.3	(no title)	4 pts
6.4	(no title)	4 pts