直接粘贴图片

Lzzy joins a BitTorrent torrent to download a file and connects to 6* peers – Alice, Bob, Joan, Lemmy, Axl and Ozzy. The file Lzzy wishes to download is divided into 6 chunks. Each peer tracks its availability of chunks using a vector of 6 bits. When the bit value is 1, the peer holds the chunk on the disk. When the bit value is 0, the chunk is not on the peer's disk. For example, (1, 0, 1, 0, 1, 0) indicates Chunks 1, 3 and 5 are available at this particular peer.

The vectors of Alice, Bob, Joan, Lemmy, Axl, and Ozzy are shown below:

Alice:	(0, 1, 1, 1, 1, 0)
Bob:	(0, 0, 1, 1, 1, 0)
Joan:	(0, 1, 1, 1, 1, 1)
Lemmy:	(1, 1, 1, 0, 1, 0)
Axl:	(0, 0, 1, 0, 0, 0)
Ozzy:	(1, 0, 1, 1, 1, 0)

Assume that Alice, Bob, Joan, Lemmy, Axl, and Ozzy are not interested in the file anymore and stop downloading the remaining chunks but continue to participate in the torrent and service requests for chunks.

What is the order in which Lzzy requests the chunks for downloading the file. Select the appropriate options in the right section.

* Assume that this version's BitTorrent client allows a user to select the number of peers that he/she wishes to connect to.

1 The first chunk to be requested is Select alternative .

Reset Maximum marks: 0.33

2 The second chunk to be requested is Select alternative .

Reset Maximum marks: 0.33

3 The fourth chunk to be requested is Select alternative .

Reset Maximum marks: 0.33

4 IMPORTANT: This question focuses on generic pipelined reliable delivery protocols (GBN and SR) and not specifically on TCP. Keep this in mind when providing your answers.

Assume that we are using 5 bit sequence numbers and the window size is 16. Assume that data only flows in one direction from a sender to a receiver. Supposed that the receiver has received all packets up to and including sequence number 29 and next receives packets with sequence numbers 31, 30 and 0, in that order.

(a) Assume that Go-Back-N is used (assume that the Go-Back-N implementation buffers out-of-order packet in the receiver). What are the sequence numbers in the ACK(s) sent out by the receiver in response to the above noted packets. Simply enter the answers in the space provided below. No explanation is necessary. 0.5 mark for each answer.

ACK sent in response to packet with sequence number 31 =

ACK sent in response to packet with sequence number 30 =

ACK sent in response to packet with sequence number 0 =

(b) Now assume that instead of Go-Back-N, Selective Repeat is used. What are the sequence numbers in the ACK(s) sent out by the receiver in response to the above noted packets. Simply enter the answers in the space provided below. No explanation is necessary. 0.5 mark for each answer.

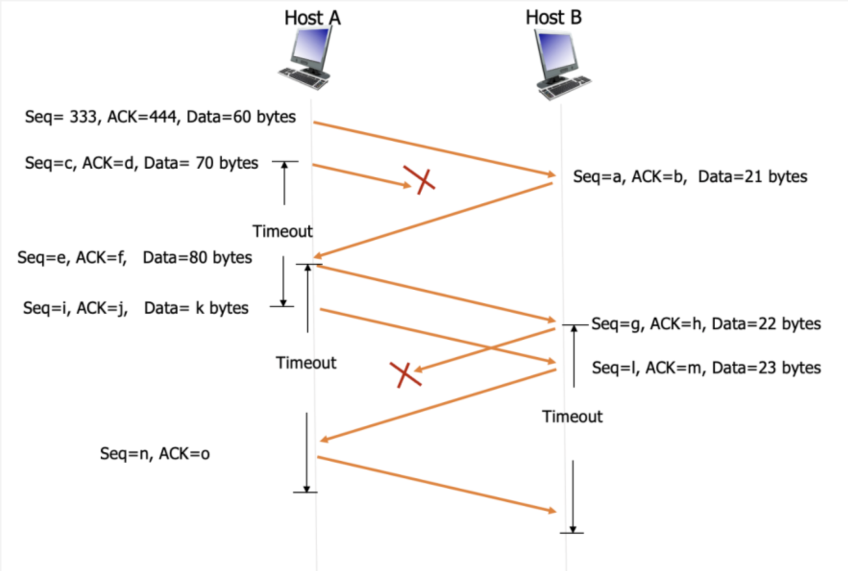
ACK sent in response to packet with sequence number 31 =

ACK sent in response to packet with sequence number 30 =

ACK sent in response to packet with sequence number 0 =

Maximum marks: 3

5 Consider the sequence of segments exchanged over a TCP Reno connection between Host A and Host B as depicted in the picture below. Assume that all segments sent prior to the sequence of segments shown below have been correctly received at both hosts. Neglect connection setup and teardown. A total of 8 segments are shown of which one segment sent from Host A (with sequence number **c**) and one segment sent from Host B (with sequence number **g**) are lost. No other segments are lost. The relevant timeout periods are indicated for you to determine if any one of the segments may be a retransmission. In the event of a timeout, the oldest unacknowledged segment is immediately retransmitted. Disregard TCP congestion control.



Enter the values of ACK and Sequence numbers specified below. You do not have to provide an explanation. 0.5 mark for each correct value.

a =

b =

c =

d =

g =

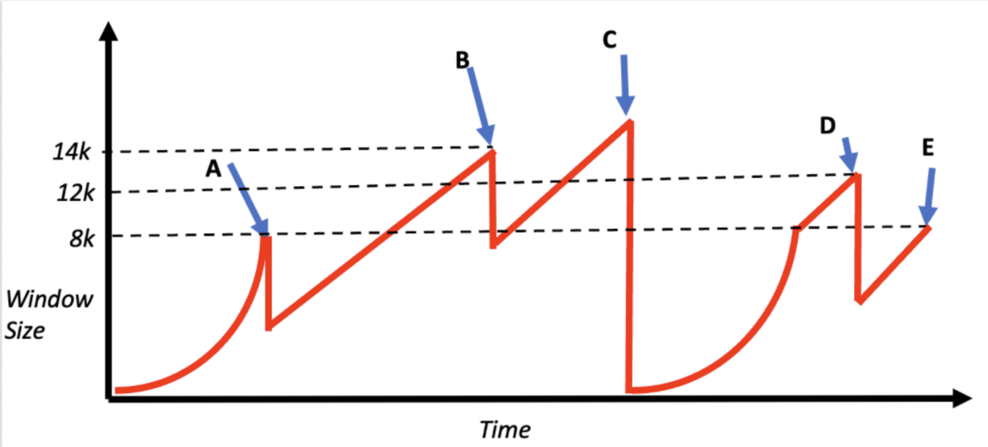
h =

n =

o =

Maximum marks: 4

Consider the following graph of the congestion window (**NOT DRAWN TO SCALE**) of a TCP Reno connection where the y-axis describes the TCP window size of the sender (expressed in bytes) and the x-axis denotes time. Assume that the receiver advertised window for flow control is very large.



Answer the questions in the right frame.

- Assume that the TCP connection has an MSS of 1000 bytes and all packets are 1 MSS. Assume that the the round-trip-time between sender and receiver is 100 milliseconds and fixed. Assume at time 0 the sender attempts to open the connection and it takes 1 round trip time to setup the connection. Assume that the transmission time of packets is negligible. Assume that there is no other traffic on the network. Note that, 1KBytes = 1000 bytes. (1 mark)
    - How much time has progressed between Point A and B? Explain briefly (2 - 3 sentences).

- The window size of the TCP sender decreases at several points in the graph, including those marked by B and C. (1 mark)
    - Name the event at B that occurs that causes the sender to decrease its window.
    - Does the event at B necessarily imply that the network discarded a packet (Yes or No)? Why or why not? (be brief, 2-3 sentences)

- Assume that the TCP connection has an MSS of 1000 bytes and all packets are 1 MSS. Assume that the the round-trip-time between sender and receiver is 100 milliseconds and fixed. Assume at time 0 the sender attempts to open the connection and it takes 1 round trip time to setup the connection. Assume that the transmission time of packets is negligible. Assume that there is no other traffic on the network. Note that, 1KBytes = 1000 bytes. (1 mark)
    - How much time has progressed between Points D and E? Explain briefly (2 - 3 sentences).

- Assume that the TCP connection has an MSS of 1000 bytes and all packets are 1 MSS. Assume that the the round-trip-time between sender and receiver is 100 milliseconds and fixed. Assume at time 0 the sender attempts to open the connection and it takes 1 round trip time to setup the connection. Assume that the transmission time of packets is negligible. Assume that there is no other traffic on the network. Note that, 1KBytes = 1000 bytes. (1 mark)
    - How much time has progressed between Points C and D? Explain briefly (2 - 3 sentences).

- The window size of the TCP sender decreases at several points in the graph, including those marked by B and C. (1 mark)
    - Name the event at C that occurs that causes the sender to decrease its window?
    - Does the event at C necessarily imply that the network discarded a packet (Yes or No)? Why or why not? (be brief, 2-3 sentences)

11 (1) Assume that an ISP has 4 subscribers which have been allocated the following IP address blocks:

192.122.248.0/24
192.122.249.0/24
192.122.250.0/24
192.122.251.0/24

The ISP would like to aggregate the above blocks into a single address block and advertise this block for the purpose of routing. The advertised IP address block should not contain IP addresses that do not belong to the above 4 blocks of addresses.

Note down the advertised IP address block in the space provided below in the a.b.c.d/x format. No explanation is required.

(2) An organisation has a class A network address block 8.0.0.0 and wishes to form 2 equally sized subnets.

Note down the two advertised IP address blocks in the spaces provided below in the a.b.c.d/x format. No explanation is required.

Block 1: (Please note that the order of the blocks won't matter.)

Block 2: (Please note that the order of the blocks won't matter.)

Maximum marks: 2

12 Consider a router with the following forwarding table.

Network	Interface	Next-hop
101.21.1.0/24	a0	directly connected
101.21.2.0/24	a1	directly connected
101.21.3.0/25	b0	directly connected
101.21.4.0/24	b1	directly connected
101.21.5.0/24	e0	101.21.1.2
101.21.5.64/28	e1	101.21.2.2
101.21.5.64/29	s0	101.21.3.3
101.21.5.64/27	s1	101.21.4.4

Which interface would an IP datagram with destination address 101.21.5.79 be forwarded to?

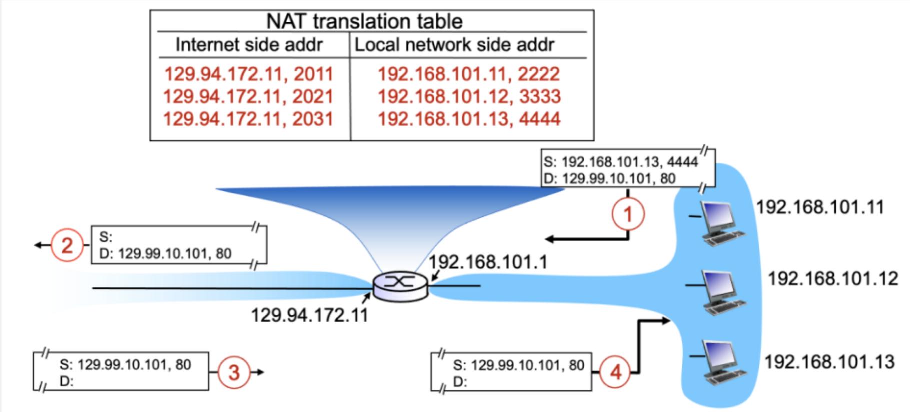
Select one alternative:

- s0
- s1
- e0
- e1

Reset

Maximum marks: 2

13 The figure below shows a local (private) network with a NAT router and its translation table. In Step 1, host 192.168.101.13 sends a datagram from its port 4444 to a destination host 129.99.10.101's port 80 (not shown in the figure). The NAT router will modify certain header fields after examining the NAT translation table.



1. In Step 2, the destination IP address and port number of the outgoing datagram are provided. What are the source IP address and port number within this datagram?
   - Source IP address (in a.b.c.d format):
   - Source port number:
2. In Step 3, the destination host 129.99.10.101 will return a datagram from its port 80 back to 192.168.101.13. The source IP address and port number of the returning datagram are provided. What are the destination IP address and port number within this datagram **before it arrives the NAT router**?
   - Destination IP address (in a.b.c.d format):
   - Destination port number:
3. In Step 4, The NAT router will notify certain header field of the returning datagram from 129.99.10.101 before forwarding it to the local network. What are the destination IP address and port number within this datagram?
   - Destination IP address (in a.b.c.d format):
   - Destination port number:

Reset

Maximum marks: 3

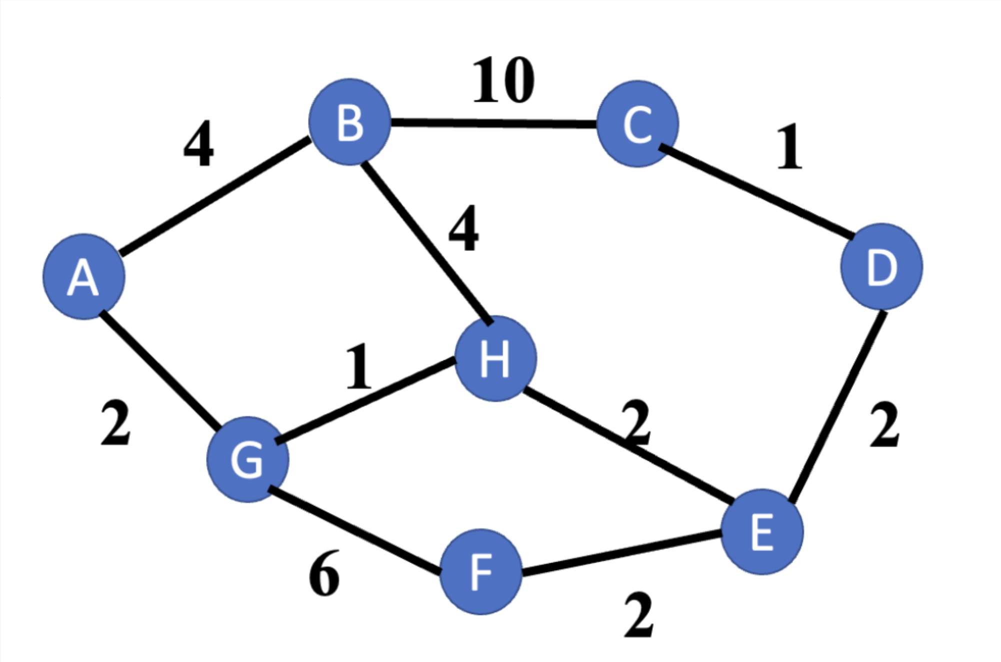
14 An IP datagram which is itself a fragment (of a larger datagram) is of size 1,060 bytes (inclusive of the IP header) and has an offset field of 50. It arrives at a router which has to forward it on an outgoing link with MTU of 740 bytes, and thus needs to create two fragments. What are the offset fields of these two fragments (fill in the values in the provided spaces)? Assume that IP headers are always 20 bytes (i.e. no options are used).

Offset for first fragment:

Offset for second fragment:

Maximum marks: 2

Consider the 8-node network shown in the figure below with link costs as shown. Note that each link shown in this network is bidirectional and has the same cost in either direction.



Answer the three questions in the right frame.

Based on the execution of the Dijkstra's algorithm in the above question, draw the forwarding
table for node **F**, which contains the outgoing link for reaching every other node in the network. A link between two nodes x and y should be denoted as (x, y).

17 Suppose the network in the figure runs a link-state routing protocol that computes shortest paths as a sum of link weights, and Nodes *A*, *B*, and *G* send packets to destination Node *H*. If link *G-H* (and *H-G*) *fails*, which of nodes *A*, *B*, and *G* could conceivably see their packets stuck in a temporary forwarding loop? Which nodes would not? Explain your answer.

Note: the number on each link is the weight of the link in each direction (e.g., links A-G and G-A both have weight 2).

Fill in your answer here

Help

Format B I U Ω Σ

Words: 0

Maximum marks: 2

18 Assume that Host A connected to an Ethernet network has an INCORRECT implementation of the exponential back-off algorithm such that after each collision, the value of *K* will be chosen from the set {0, 1, ..., n - 1} as opposed to the set {0, 1, … 2^n-1} used in Ethernet (*n* corresponds to the number of consecutive collisions). Now, another Host B, which is from another manufacturer and obeys the Ethernet back-off algorithm, is trying to send a frame at the same time as host A. Assume that A and B have already collided three times consecutively. What is the probability that host B will succeed in transmitting a frame before host A in its next attempted transmission? Explain your answer.

Fill in your answer here

Help

Format B I U x_2 x^2 I_x Ω Σ

Words: 0

Maximum marks: 3

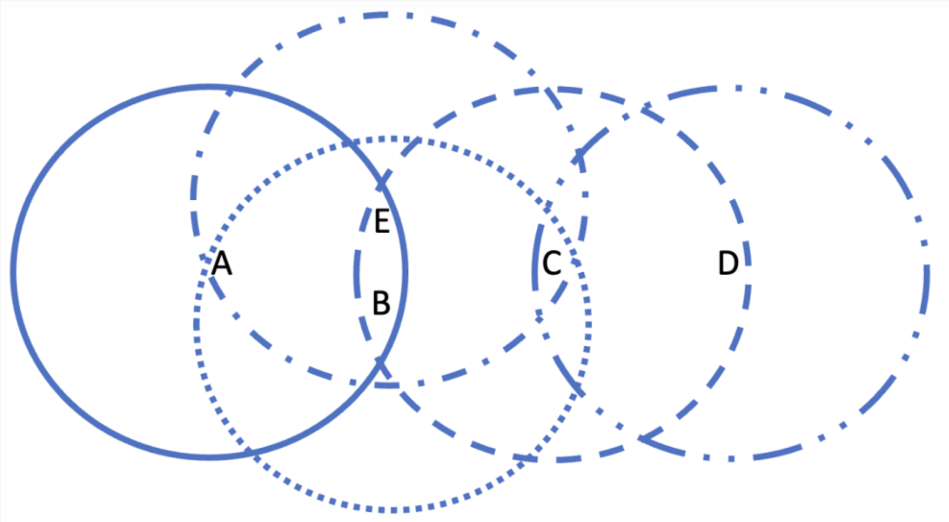
Answer the following questions.

(1) Suppose H4 sends a frame to H5. Which switches learn where H4 is? The Ethernet adapters of which hosts other than H5 may receive this frame? Explain your answer. (1.5 marks)

(2)Next, suppose H2 wants to send an IP datagram to H4 and knows H4's IP address. Must H2 also know H4's MAC address to send the datagram to H4? If so, how does H2 get this information? If not, explain why not. (1.5 marks)

(3) When Router R sends the frame encapsulating the datagram from question 2 to H4, the Ethernet adapters of which hosts other than H4 may receive this frame? Which switches (in the entire network) learn where H2 is? (2 marks)

20



Consider the wireless network in the illustration, which is an example of a wireless LAN topology comprised of 5 nodes marked A through E sharing the same frequency. Circles around each node illustrate their transmission range, e.g. A's range is shown by circle drawn in solid line. Assume that the transmissions from two nodes will interfere (or collide) at a location if and only if both nodes transmit at the same time and their transmission ranges overlap. Now assume that Node C transmits to Node B. **What are the potential hidden terminals and exposed terminals?**

Fill in your answer here Help

Format

Words: 0

Maximum marks: 3