Handout #15: Midterm Solutions — Section L0101

Questions 1-8: All the definitions and concepts in questions 1-8 can be found in the lecture slides.

9a) 1000 bytes of data + 20 bytes for header = 1020 bytes
9b) Packet #1: 480 bytes of data, 20 bytes of header
Packet #2: 480 bytes of data, 20 bytes of header
Packet #3: 40 bytes of data, 20 bytes of header

Total: 2*500+60 = 1060 bytes

9c) Packet #1: 80 bytes of data, 20 bytes of header
.
.
.
Packet #12: 80 bytes of data, 20 bytes of header
Packet #13: 40 bytes of data, 20 bytes of header

Total: 12*100+60 = 1260 bytes

10a) No, a peer does not carry traffic from peer to provider.
10b) No, peer doesn't act as transit for other peers.
10c) No, customer doesn't carry traffic between two providers.

11a) A sends SYN to B
B sends SYN-ACK to A
A sends DATA + ACK to B
B sends DATA + ACK to A
A sends ACK+FIN to B
B sends ACK+FIN to A
A sends ACK to B

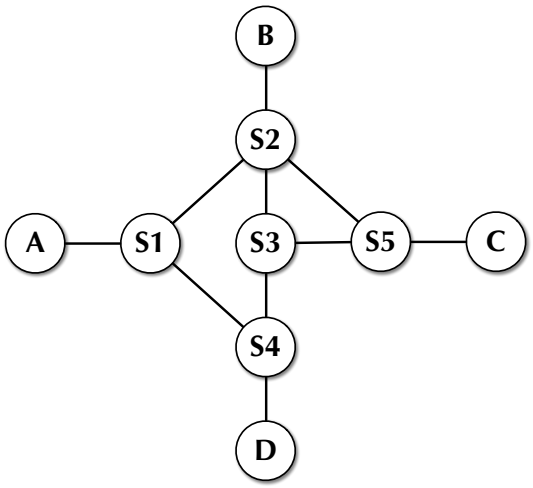
No marks were deducted if the messages were piggy-backed (DATA + ACK for example) or not.

11b) We represent the sequence number with S#, and Ack sequence number with A#)
A sends SYN to B (S#0, A#-)
B sends SYN-ACK to A (S#0, A#1)
A sends DATA + ACK to B (S#1, A#1)
B sends DATA + ACK to A (S#1, A#2)
A sends ACK+FIN to B (S#2, A#2)
B sends ACK+FIN to A (S#2, A#3)
A sends ACK to B (S#2, A#3)

11c) 7 packets of 40 bytes each + 2 bytes of data for a total of 282 bytes.

If you have a different number of packets in part (a), the number should be adjusted accordingly.

11d) (28+1)*2 = 58 bytes total.



12a) S1 is the root. (S3, S5) is removed. Either one of (S2, S3) or (S3, S4) or both need to be removed.

12b) Here is a step-by-step overview of the changes to switches:

- **A** sends to **D**: Since none of the switches know about D, the message will be broadcast by all of them. Therefore, all switches will learn about the source node A after this step.
- **D** sends to **A**: S4 and S1 know about A, therefore, they will direct the message to its final destination. Along the way, S4 and S1 learn about the source of this packet, i.e. D.
- **B** sends to **C**: None of the switches know about C, so the message is broadcast to all. Therefore, all switches learn about B.
- **C** sends to **A**: S5, S2, and S1 know where A is (from the first step) so they will direct the message to A, and along the way they will learn about C.
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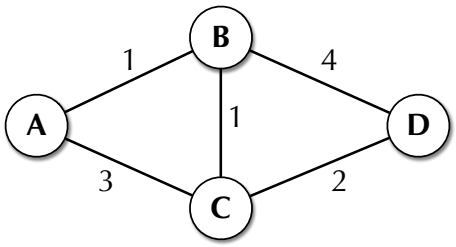
12c) S4 will broadcast since it doesn't know about C. When the packet arrives at S1, it will follow the known path of S1, S2, and S5 to C. Along that path, switches will learn about D. S1 and S4 already knew about D, S2 and S5 did not, and will learn about D in this stage.

13. Please see routing tables below.



Step 1:

Table for A

Dest	Cost	Next Hob
A	0	A
B	1	B
C	3	C
D	Infinity	-

Table for B

Dest	Cost	Next Hob
A	1	A
B	0	B
C	1	C
D	4	D

Table for C

Dest	Cost	Next Hob
A	3	A
B	1	B
C	0	C
D	2	D

Table for D

Dest	Cost	Next Hob
A	Infinity	-
B	4	B
C	2	C
D	0	D

Step 2:

Table for A

Dest	Cost	Next Hob
A	0	A
B	1	B
C	2	B
D	5	B

Table for B

Dest	Cost	Next Hob
A	1	A
B	0	B
C	1	C
D	3	C

Table for C

Dest	Cost	Next Hob
A	2	B
B	1	B
C	0	C
D	2	D

Table for D

Dest	Cost	Next Hob
A	5	B
B	3	C
C	2	C
D	0	D

Step 3:

Table for A

Dest	Cost	Next Hob
A	0	A
B	1	B
C	2	B
D	4	B

Table for B

Dest	Cost	Next Hob
A	1	A
B	0	B
C	1	C
D	3	C

Table for C

Dest	Cost	Next Hob
A	2	B
B	1	B
C	0	C
D	2	D

Table for D

Dest	Cost	Next Hob
A	3	B
B	3	C
C	2	C
D	0	D

14. Bit sequence 10101111101100000101 in **NRZ**, **NRZI**, and **Manchester** encodings, NRZI starts out low.