

Note: These answers are only reference answers. Other answers may also correct as long as you can provide reasonable explanations!

1. An IPv4 packet has arrived with the first 8 bits as shown:

01000010

The receiver discards the packet. Why?

Answer:

There is an error in this packet. The 4 leftmost bits (0100) show the version, which is correct. The next 4 bits (0010) show an invalid header length ($2 \times 4 = 8$). The minimum number of bytes in the header must be 20. The packet has been corrupted in transmission.

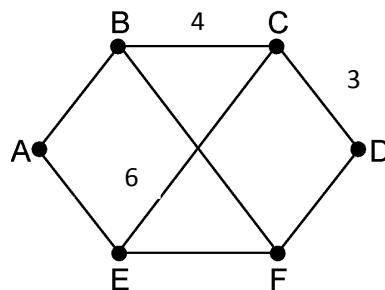
2. Consider the following network. All routers runs distance vector routing. Suppose that router C just boot up. Vector for each router means the cost to each destination from A to F (e.g., a vector $\{1, 2, 8, 0, 6, 5\}$ means the cost to A is 1, the cost to B is 2, the cost to C is 8, etc.). Suppose the following vectors come into router C:

from B: $\{5, 0, 8, 12, 6, 2\}$;

from D: $\{16, 12, 6, 0, 9, 10\}$;

from E: $\{7, 6, 3, 9, 0, 4\}$.

The cost of the links from C to B, D, and E, are shown in the figure respectively. What is C's new routing table? Give both the outgoing line (i.e., next hop) to use and the cost for the routing table.



Answer:

Going via B gives $(9, 4, 12, 16, 10, 6)$.

Going via D gives $(19, 15, 9, 3, 13, 13)$.

Going via E gives $(13, 12, 9, 15, 6, 10)$.

Taking the minimum for each destination except C gives new cost: $(9, 4, 0, 3, 6, 6)$.

The outgoing lines are $(B, B, -, D, E, B)$.

3. A UDP header in hexadecimal is: 07 21 00 45 00 2C E8 27. (Suppose this is the correct byte order. No byte re-ordering is needed.)

a) Please give the source port, destination port, length of total UDP packet and the length of UDP data respectively (in decimal number).

b) What's the upper layer application for this UDP packet? Is this UDP packet sent from client to server, or from server to client? Explain why. (Tips: please refer to

wiki for list of UDP port numbers assignment:
http://en.wikipedia.org/wiki/List_of_TCP_and_UDP_port_numbers)

Answer:

- a) Source port: 1825, destination port: 69, total length: 44 bytes, data length: 36 bytes
- b) The destination port is 69. According to the wiki, its upper layer application is TFTP. It is a packet sent from client to server.

4. Host A sends two TCP segments to Host B. The sequence numbers of those two segments are 70 and 100 respectively:

- a) How many *data bytes* carried by the first TCP segment sent from A?
- b) If host B sends back an acknowledgement upon receiving the first segment from A. What's the acknowledgment number in this acknowledgement packet from host B?
- c) Suppose B sends back an acknowledgement upon receiving the second segment from A, and the acknowledgment number is set to be 180. How many *data bytes* carried by the *second* TCP segment sent from A?
- d) Assume the first segment from A is lost, but the second segment arrives host B correctly. B should send back an acknowledgement. What's the acknowledgment number in this acknowledgement packet from host B?

Answer:

- a) 30 bytes
- b) 100
- c) 80 bytes
- d) 70