Internet Protocols Midterm #1 Solutions

2016. 3. 28

Student ID _____ Name _____

1. How many Class C IP address blocks are there?

   2^{21} or approximately 2 million (2pts)

2. Suppose the subnet mask is 255.255.255.192 in a Class A network with 123.0.0.0 prefix. What IP destination address should a sending host use to deliver a packet to all members in 123.45.67.0 subnet? 123.45.67.63 (6pts)

3. What packets would the Wireshark filter 'ip.flags.mf==1 && ip.frag_offset==0' capture? Describe the packets in your own words.

   The first fragment of a fragmented IP datagram (4pts)

4. What are the three general classes of applications that UDP can serve better than TCP?

   A. _____Short transaction_____ (2pts)

   B. _____Multicast_____ (2pts)

   C. _____Real-time_____ (2pts)

5. A user is sending 2000-byte data using UDP. The destination is directly connected through Ethernet. The receiver sees two fragments arriving without reordering. What values does the receiver observe in the fragments? Assume the IP header does not have any option. Write the fragment offsets in decimal.

   A. First fragment: DF = ___0__, M = __1__, Fragment offset = __0___ (4pts)

   B. Second fragment: DF = __0__, M = __0__, Fragment offset = ___185____ (4pts)

6. When you execute 'arp -a' on 163.152.161.0/24 subnet, you see the following entries in the output. Can the first entry be used? Explain why or why not.

   No. The routing table entry that uses 121.129.49.81 as next hop will not exist because this is 163.152.161.0/24 subnet. Any interface that resides in the subnet should have its IP address in the form of 163.152.161.X. (8pts)

121.129.49.81	64-ae-0c-41-32-c0	dynamic
163.152.161.1	64-ae-0c-41-32-c0	dynamic

7. Show how to remove only the first entry using arp command.

arp -d 121.129.49.81 (2pts)

8. You want to know whose IP address 121.129.49.81 is. What service can you use to find out? whois (2pts)

9. Suppose an IP datagram arrives at a computer that has two interfaces whose IP addresses are 163.152.161.2 and 10.16.10.3, respectively. Now, the datagram has destination address 121.129.49.80, and the computer is configured to function as a router. If the routing table at the computer is as shown below,

Destination	Netmask	Gateway	Interface	Metric
0.0.0.0	0.0.0.0	163.152.161.1	163.152.161.2	20
0.0.0.0	0.0.0.0	10.16.10.1	10.16.10.3	25
10.16.10.0	255.255.255.0	Connected	10.16.10.3	281
10.16.10.167	255.255.255.255	Connected	10.16.10.3	281
10.16.10.255	255.255.255.255	Connected	10.16.10.3	281
127.0.0.0	255.0.0.0	Connected	127.0.0.1	306
127.0.0.1	255.255.255.255	Connected	127.0.0.1	306
127.255.255.255	255.255.255.255	Connected	127.0.0.1	306
163.152.161.0	255.255.255.0	Connected	163.152.161.2	266
163.152.161.54	255.255.255.255	Connected	163.152.161.2	266
163.152.161.255	255.255.255.255	Connected	163.152.161.2	266
255.255.255.255	255.255.255.255	Connected	127.0.0.1	306
255.255.255.255	255.255.255.255	Connected	163.152.161.2	266
255.255.255.255	255.255.255.255	Connected	169.254.195.4	286
255.255.255.255	255.255.255.255	Connected	10.16.10.167	281

A. How many matching entries are there for the arriving packet?

two (2pts)

B. Suppose if there are multiple matches with the same prefix length, the one with the smallest metric value is declared the final match. What next hop IP address will the datagram use? 163.152.161.1 (2pts)

C. What will be the destination address in the datalink layer header if the ARP cache is as given below? 64-ae-0c-41-32-c0 (3pts)

121.129.49.81	64-ae-0c-41-32-c0	dynamic
163.152.161.1	64-ae-0c-41-32-c0	dynamic
10.16.10.1	f8-66-f2-7d-99-ff	dynamic
255.255.255.255	ff-ff-ff-ff-ff-ff	static

D. Suppose you change the network mask of the final matching entry in (B) to 255.255.255.255. If a datagram going to 121.129.49.80 arrives, what outgoing interface will it use? (Identify the IP address of the interface)

10.16.10.3 (4pts)

E. If you perform a limited broadcast, what interface will the packet go out on? (Identify the IP address of the interface) 163.152.161.2 (4pts)

10. Compute the UDP checksum for a single byte UDP payload ‘0F’ (00001111), given the source and the destination addresses 1.2.3.4 and 1.1.1.1, respectively. Write your answer in hexadecimal. The port numbers are 8 and 10. [Hint: Don’t forget to use the pseudo-header.]

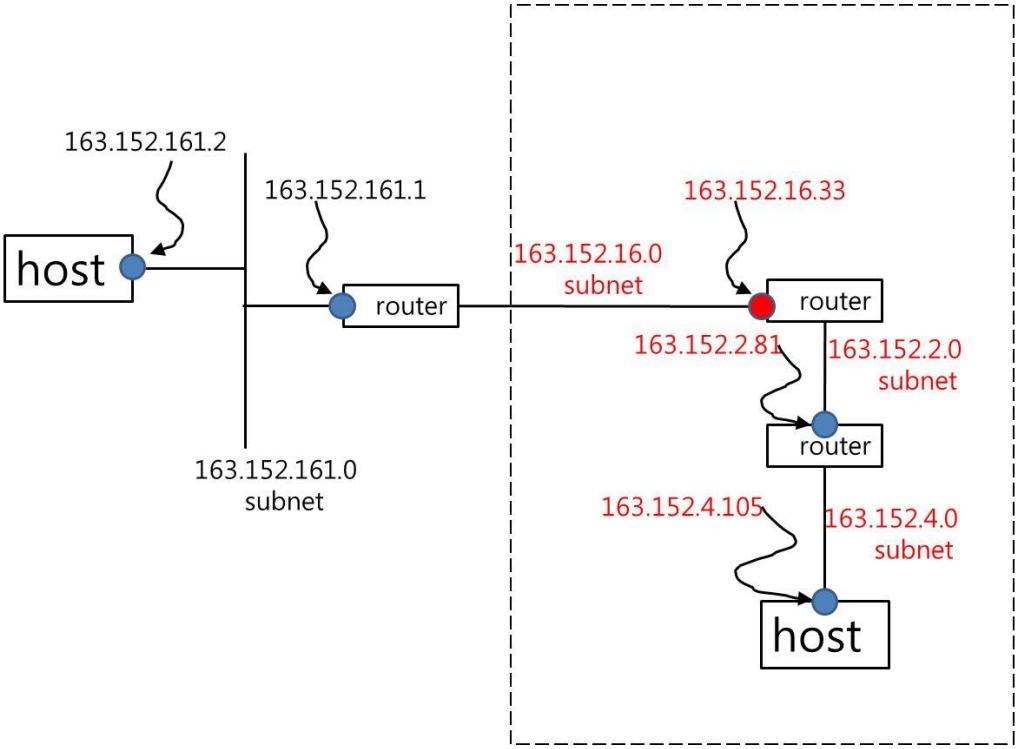
ea c2

(12pts)

```
                01 02
                03 04          IP(src)
                01 01
                01 01          IP(dest)
                00 11          Zero & protocol (=17)
                00 09          length (=9)
                00 08          port (src)
                00 0A          port (dest)
                00 09          length(=9)
                00 00          checksum (=0)
          +     0F 00          data + Pad Byte
                15 3D          sum
          →     EA C2    checksum
```

11. If the tracert from 163.152.161.2 to kufw5.korea.ac.kr is as follows, complete the network topology that corresponds to the tracert output, in the box. Your drawing should explicitly specify the relevant subnets, interfaces, and addresses. (8pts)

```
1    <1 ms    <1 ms    <1 ms  163.152.161.1
2    <1 ms    <1 ms    <1 ms  163.152.16.33
3    <1 ms    <1 ms    <1 ms  163.152.2.81
4     1 ms    <1 ms    <1 ms  kufw5.korea.ac.kr [163.152.4.105]
```



12. In Prob. 11,

    A. What field in the IP header is exploited to obtain the behavior as shown in the result? TTL (2pts)

    B. A router always performs three mandatory operations on an arriving IP datagram. (Hint: Tracert exploits one of these three to derive the IP address of the routers on a path to a destination.) Among the fields in the IP header that are directly related to these three mandatory operations, write down the two fields that are not the answer of (A). Destination address, checksum (4pts)

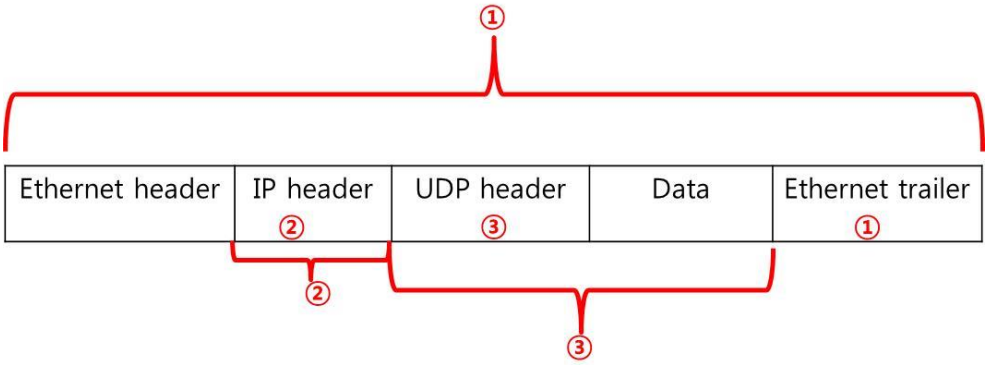
13. Consider the routing table in Prob. 9. If you want to send a datagram to all memebers of the 10.16.10.0/24 subnet,

    A. What should be the destination address? 10.16.10.255 (2pts)

    B. What is the corresponding datalink layer address? [in hexadecimal] ff ff ff ff ff ff (3pts)

    C. Would ARP be used to get the datalink layer address in (B)? No (1pts)

14. Consider the following Ethernet frame that carries a UDP/IP encapsulated data.



※ Alternatively, ③ covering the IP header is also considered a partially valid answer because the UDP checksum checks the IP addresses and the protocol field in the IP header as well.

A. Mark all locations (in header or trailer) that have a field for error checking. (3pts)

B. Mark the coverage of each error check field. (6pts)

15. What field is used for multiplexing/demultiplexing on each of the following technologies on different layers?

A. Ethernet: Ethertype (2pts)

B. IP: protocol (2pts)

C. UDP: port (2pts)