Assignment 5

Chen Jiang

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1.Chapter 5, R11. (10 points)

Why is an ARP query sent within a broadcast frame? Why is an ARP response sent within a frame with a specific destination MAC address?

An ARP query is sent in a broadcast frame for the reason that the querying host does not know which adapter address matches the IP address in question. For the response, the sending node knows the adapter address that the response should send to, therefore, we don’t have to send a broadcast frame.

2. Chapter 5, P1. (10 points)

Suppose the information content of a packet is the bit pattern 1110 0110 1001 1101 and an even parity scheme is being used. What would the value of the field containing the parity bits be for the case of a two-dimensional parity scheme? Your answer should be such that a minimum-length checksum field is used.

The value should be:

11101

01100

10010

11011

11000

3.Chapter 5, P5. (10 points)

Consider the 7-bit generator, G=10011, and suppose that D has the value 1010101010. What is the value of R?

We can first divide 10011 into 1010101010 0000, we will have 1011011100, which has a remainder of R that equals 0100. We should note that G is in CRC-4-ITU standard.

4.Chapter 5, P15. (15 points)

Consider Figure (see textbook). Now we replace the router between subnets 1 and 2 with a switch S1, and label the router between subnets 2 and 3 as Rl.

Consider sending an IP datagram from Host E to Host F. Will Host E ask router Rl to help forward the datagram? Why? In the Ethernet frame containing the IP datagram, what are the source and destination IP and MAC addresses?

a.

No， because E will check the subnet prefix of IP address Host F, and then acquire that Host F is in the same LAN. Thus, E will not send the packet to the default router R1.

Ethernet frame from E to F:

Source IP is E’s IP address

Destination IP is Host F’s IP address

And Source MAC is E’s MAC address and at last, Destination MAC is F’s MAC address

b. No, because they are not in the same LAN, and thus E can recognize this by looking at B’s IP address.

Ethernet frame from E to R1:

Source IP = E’s IP address, Destination IP =B’s IP address; Source MAC = E’s MAC address, and destination MAC equals the MAC address of R1’s interface connecting to Subnet 3.

c.

Yes, the router R1 alo receives this ARP request msg, however, R1 will not forward the message to Subnet 3. B won’t send ARP query message asking for A’s MAC address, as this address can be obtained from A’s query msg. Once switch S1 recives B’s response msg, it will add an entry for host B in its forwarding table, and then drop the received frame as destination host A is on the same interface as Host B.

Switch S1 will broadcast the Ethernet frame via both its interfaces as received ARP frame’s destination address is a broadcast address. It learns that A resides on Subnet 1 which is connected to S1 at the interface connecting to Subnet 1. S1 will update its forwarding table to include an entry for Host A.

5. Chapter 5, P26. (10 points)

Let's consider the operation of a learning switch in the context of Figure (see textbook). Suppose that (i) B sends a frame to E, (ii) E replies with a frame to B, (iii) A sends a frame to B, (iv) B replies with a frame to A. The switch table is initially empty. Show the state of the switch table before and after each of these events. For each of these events, identify the link(s) on which the transmitted frame will be forwarded, and briefly justify your answers.

|  |  |  |  |
| --- | --- | --- | --- |
| Action | Switch Table State | Link packet forwarding to | Explanation |
| B sends to E | Switch learns interface corresponding to MAC address of B | A,C,D ,E,F | Since switch table is empty, so switch does not know the interface corresponding to MAC address of E |
| E replies to B | Switch learns interface corresponding to MAC address of E | B | Since switch already knows interface corresponding to MAC address of B |
| A sends to B | Switch learns the interface corresponding to MAC address of A | B | Since switch already knows the interface corresponding to MAC address of B |
| B replies to A | Switch table remains the same | A | Since switch already knows the interface corresponding to MAC address of A |

6.Chapter 6, R6. (5 points)

True or false: Before an 802.11 station transmits a data frame. it must first send an RTS frame and receive a corresponding CTS frame.

False.

7. Explain the hidden terminal problem in 802.11 WiFi networks and how the RTS and CTS frames help solve it

The hidden terminal problem occurs when a node C transmits to B while B is receiving from A, a node that C cannot hear. If the A-B communication is preceded by an RTS-CTS mechanism, then C hears the CTS sent by B, which contains the length of the packet transmission, and waits until the completion of the data transmission to initiate its communication with B. Packet length is important to include in CTS since that indicates to neighbors how long the channel is going to be occupied. For the length to be included in CTS, the sender needs to send the packet length in RTS.

8. Chapter 8, P21. (10 points)

Suppose Alice and Bob are communicating over an SSL session. Suppose an attacker, who does not have any of the shared keys, inserts a bogus TCP segment into a packet stream with correct TCP checksum and sequence numbers (and correct IP addresses and port numbers). Will SSL at the receiving side accept the bogus packet and pass the payload to the receiving application? Why or why not?

No, because the integrity check will use a shared MAC key, and the bogus packer would fail the integrity check.

9.Chapter 8, P22. (10 points)

The following True/False questions pertain to Figure (see textbook).

When a host in 172.16.1/24 sends a datagram to an Amazon.com server. the router Rl will encrypt the datagram using IPsec.

When a host in 172.16.1/24 sends a datagram to a host in 172.16.2/24, the router R1 will change the source and destination address of the IP datagram.

Suppose a host in 172.16.1/24 initiates a TCP connection to a Web server in 172.16.2/24. As part of this connection, all datagrams sent by R1 will have protocol number 50 in the left-most 1Pv4 header field.

Consider sending a TCP segment from a host in 172.16.1124 to a host in 172.16.2/24. Suppose the acknowledgment for this segment gets lost, so that TCP resends the segment. Because IPsec uses sequence numbers, Rl will not resend the TCP segment.

(a) F

(b) T

(c) T

(d) F

10.Chapter 8, P25. (10 points)

Provide a filter table and a connection table for a stateful firewall that is restrictive as possible but accomplishes the following:

Allows all internal users to establish Telnet sessions with external hosts.

Allows external users to surf the company Web site at 222.22.0.12.

But otherwise blocks all inbound and outbound taffic. The internal network is 222.22/16.

In your solution, suppose that the connection table is currently caching three connections, all from inside to outside. You'll need to invent appropriate IP addresses and port numbers.

Filter Table

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Action | Source Addr | Dest Addr | Protocol | Source port | Dest  port | Flag bit | Check Connection |
| allow | 222.22/16 | Outside 222.22/16 | TCP | >1023 | 22 | any |  |
| allow | Outside 222.22/16 | 222.22/16 | TCP | 22 | >1023 | ACK | x |
| allow | The same as above | 222.22.0.12 | TCP | >1023 | 80 | any |  |
| allow | 222.22.0.12 | outside of  222.22/16 | TCP | 80 | >1023 | any |  |
| deny | All | All | all | all | all | all |  |

Connection Table

|  |  |  |  |
| --- | --- | --- | --- |
| Source Address | Dest Address | Source Port | Dest Port |
| 222.22.1.7 | 37.96.87.123 | 12699 | 22 |
| 222.22.93.2 | 199.1.205.23 | 37654 | 22 |
| 222.22.65.143 | 203.77.240.43 | 48712 | 22 |