Kenneth Campbell

Yanyan Li

CS 436

11/29/2022

Homework 4

P1

1. S: 10.0.0.56, 5200
   D: 172.217.14.69, 25

2. S: 128.36.21.72, 2800
   D: 172.217.14.69, 25

3. S: 172.217.14.69, 25
   D: 128.36.21.72, 2800

4. S: 172.217.14.69, 25
   D: 10.0.0.56, 5200

P2

NAT translation table	
WAN side address	**LAN side address**
Public IP, Public Port	**Private IP, Private Port**
31.45.26.37, 6200	192.168.0.101, 4300
31.45.26.37, 6201	192.168.0.101, 4301
31.45.26.37, 6202	192.168.0.160, 8700

P3

1. DHCP (Dynamic Host Configuration Protocol)
2. messages are exchanged between your device and the router during this process:
    a. DHCP discovery request
        i. Client sends a broadcast message to reach out to any available DHCP servers
    b. DHCP offer message

        i. When a DHCP broadcast message is received, the DHCP server sets aside an (unused) IP for the client , then responds with an offer message (offering the client to ip to connect to).
    c. DHCP request packet
        i. Upon receiving the offer message, the client will responds to the DHCP server using a DHCP request packet to acknowledge or accept the IP / DHCP offer.
    d. DHCP ACK
        i. Upon receiving the DHCP request packet (i.e. the message saying that the client accepts the offered IP address), the DHCP server sends an ACK to the client, acknowledging that the IP has been reserved/assigned to that client device for future use / network communication (until the next time the IP gets released)
3. What major network info your new device obtains:
    a. destination ip
    b. destination MAC
    c. source ip
    d. source MAC
    e. DHCP source MAC

P4

Tunneling is used so that when a client sends a message to another client, any routers between the two, do not need to support the same protocol. The way tunneling works is, the router takes the IPv6 payload (data) and encapsule it inside an IPv4 packet (with matching header info, such as the same source and destination address). Thus, IPv6 can travel through the IPv4 network / routers without discrimination. And just before the packet reaches its destination, the IPv4 message is decapsulated, returning the original IPv6 message / payload.

P5

a. IPv4
b. B
c. E
d. A
e. IPv6

P6

1. What is the graph abstraction of the following network?

    Routers = u,v,w,x,y,z

    Lines connecting the nodes/routers are the links between the routers (with their respective distances)

2. Given the cost of each link, can you get the least-cost path from u to z?

   U > X > W > Z

3. What is the least cost?

   = 1+3+2

   = 6

P7

1. What is the goal of the ARP protocol?

   ARP (address resolution protocol) is used to find the (unknown) MAC address corresponding to the destination (known) IP, thus establishing the connection between the source and destination devices.

2. Why is ARP called a “plug-and-play” protocol?
   a. Because ARP is used to automatically connect devices based on their mac addess and IP. This means when you connect a new device, ARP handles establishing the connection so that all the devices can communicate and share resources/data. So you can start “playing” with the device as soon as you “plug” it in to a network (using ARP)

3. What are the 3 steps defined in ARP in order for a node A to get node B’s MAC address?
   a. Node A sends an ARP Request broadcast frame
   b. All nodes on the network will
      i. Receive the ARP Request from A (since it is broadcasted).
      ii. Determine if they are the intended target

          If not

              Silently discard the packet

          If it is (i.e. Node B)

              Send an ARP Response directly back to source A.
   c. Node A receives the unicast ARP Response packet directly from Node B, and now knows the MAC address of Node B (and vice versa).