

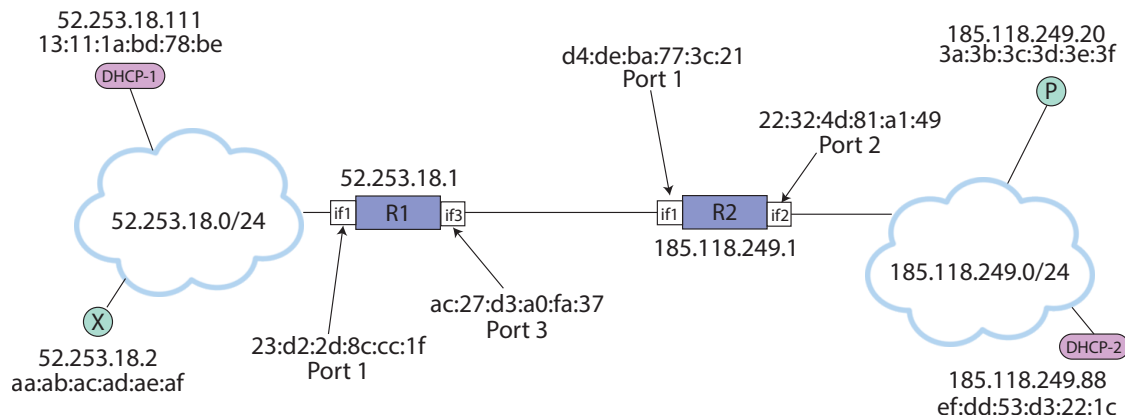
# Homework Assignment #3

CS168 Fall 2016

*Treat this as a worksheet to prepare for midterm*

*You will all get full credit for this assignment....*

## 1) Getting packets from one end to another....



As in section 6, let's see how hosts communicate across networks.

Say that host X just attached to the network, and knows nothing other than the fact that it wants to send a packet to host P. Assume that host X already knows IP address of host P, that no packets are lost, no failures occur in the network, and no IP allocations expire during this question.

### Part 1: DHCP

First, let's consider the messages exchanged between host X and the DHCP server as part of the DHCP protocol. Assume no messages are dropped.

As we talked about in lecture and section, the DHCP protocol consists of four types of messages. For each of the four messages, choose its "type", destination MAC address,

and destination IP address.

### **First message**

- A. What type is the **first** message?
- a. DHCP request
  - b. DHCP offer
  - c. DHCP discover
  - d. DHCP ACK
- B. What is the destination IP address of the **first** message?
- a. 52.253.18.111
  - b. 52.253.18.2
  - c. 52.253.18.0
  - d. 255.255.255.255
- C. What is the destination MAC address of the **first** message?
- a. aa:ab:ac:ad:ae:af
  - b. 23:d2:2d:8c:cc:1f
  - c. 13:11:1a:bd:78:be
  - d. ff:ff:ff:ff:ff:ff

### **Second message**

- D. What is the type of the **second** message?
- a. DHCP request
  - b. DHCP offer
  - c. DHCP discover
  - d. DHCP ACK

E. What is the destination IP address of the **second** message?

- a. 52.253.18.111
- b. 52.253.18.2
- c. 52.253.18.0
- d. 255.255.255.255

F. What is the destination MAC address of the **second** message?

- a. aa:ab:ac:ad:ae:af
- b. 23:d2:2d:8c:cc:1f
- c. 13:11:1a:bd:78:be
- d. ff:ff:ff:ff:ff:ff

### **Third message**

G. What is the type of the **third** message?

- a. DHCP request
- b. DHCP offer
- c. DHCP discover
- d. DHCP ACK

H. What is the destination IP address of the **third** message?

- a. 52.253.18.111
- b. 52.253.18.2
- c. 52.253.18.0
- d. 255.255.255.255

I. What is the destination MAC address of the **third** message?

- a. aa:ab:ac:ad:ae:af
- b. 23:d2:2d:8c:cc:1f

- c. 13:11:1a:bd:78:be
- d. ff:ff:ff:ff:ff:ff

### Fourth message

- J. What is the type of the **fourth** message?
- a. DHCP request
  - b. DHCP offer
  - c. DHCP discover
  - d. DHCP ACK
- K. What is the destination IP address of the **fourth** message?
- a. 52.253.18.111
  - b. 52.253.18.2
  - c. 52.253.18.0
  - d. 255.255.255.255
- L. What is the destination MAC address of the **fourth** message?
- a. aa:ab:ac:ad:ae:af
  - b. 23:d2:2d:8c:cc:1f
  - c. 13:11:1a:bd:78:be
  - d. ff:ff:ff:ff:ff:ff

### Part 2: Host-to-Host

Now that host X knows its subnet mask, and the IP address of itself, its default router, and its DNS server, let's see how it gets the packet all the way to host P.

- A. Let `&` be the bitwise AND operator. Which two of the following values does host X compare in order to decide if it is on the same subnet as host P?

- a. 52.253.18.2 & 52.253.18.0
- b. 52.253.18.2 & 185.118.249.0
- c. 52.253.18.2 & 255.255.255.0
- d. 185.118.249.20 & 52.253.18.0
- e. 185.118.249.20 & 185.118.249.0
- f. 185.118.249.20 & 255.255.255.0

B. Which ARP request message does X send next?

- a. ARP request for 52.253.18.2
- b. ARP request for aa:ab:ac:ad:ae:af
- c. ARP request for 3a:3b:3c:3d:3e:3f
- d. ARP request for 185.118.249.20
- e. ARP request for ac:27:d3:a0:fa:37
- f. ARP request for 23:d2:2d:8c:cc:1f
- g. ARP request for 52.253.18.1

C. Which ARP response does X receive afterwards?

- a. ARP response: 52.253.18.2
- b. ARP response: aa:ab:ac:ad:ae:af
- c. ARP response: 3a:3b:3c:3d:3e:3f
- d. ARP response: 185.118.249.20
- e. ARP response: ac:27:d3:a0:fa:37
- f. ARP response: 23:d2:2d:8c:cc:1f
- g. ARP response: 52.253.18.1

When host X now sends the datagram towards host P, the packet must go through R1.

- D. What is the source IP address of the packet X sends to R1?
- a. 52.253.18.1
  - b. 52.253.18.2
  - c. 185.118.249.1
  - d. 185.118.249.20
- E. What is the source MAC address of the packet X sends to R1?
- a. aa:ab:ac:ad:ae:af
  - b. 23:d2:2d:8c:cc:1f
  - c. ac:27:d3:a0:fa:37
  - d. d4:de:ba:77:3c:21
  - e. 22:32:4d:81:a1:49
  - f. 3a:3b:3c:3d:3e:3f
- F. What is the destination IP address of the packet X sends to R1?
- a. 52.253.18.1
  - b. 52.253.18.2
  - c. 185.118.249.1
  - d. 185.118.249.20
- G. What is the destination MAC address of the packet X sends to R1?
- a. aa:ab:ac:ad:ae:af
  - b. 23:d2:2d:8c:cc:1f
  - c. ac:27:d3:a0:fa:37
  - d. d4:de:ba:77:3c:21
  - e. 22:32:4d:81:a1:49
  - f. 3a:3b:3c:3d:3e:3f

R1 now received the packet from host X and must send it to router R2 as the next hop. As any other packet, this packet must naturally “move down the layers” towards the physical layer. It therefore needs an L2 header in order to be forwarded correctly in the datalink layer.

H. What ARP request message will R1 send before sending the packet to R2?

- a. ARP request for 185.118.249.1
- b. ARP request for 185.118.249.0
- c. ARP request for 185.118.249.20
- d. APR request for d4:de:ba:77:3c:21
- e. ARP request for 22:32:4d:81:a1:49
- f. ARP request for 3a:3b:3c:3d:3e:3f

R1 can now pass on the packet to R2.

I. What is the source IP address of the packet R1 sends to R2?

- a. 52.253.18.1
- b. 52.253.18.2
- c. 185.118.249.1
- d. 185.118.249.20

J. What is the source MAC address of the packet R1 sends to R2?

- a. aa:ab:ac:ad:ae:af
- b. 23:d2:2d:8c:cc:1f
- c. ac:27:d3:a0:fa:37
- d. d4:de:ba:77:3c:21
- e. 22:32:4d:81:a1:49
- f. 3a:3b:3c:3d:3e:3f

K. What is the destination IP address of the packet R1 sends to R2?

- a. 52.253.18.1
- b. 52.253.18.2
- c. 185.118.249.1
- d. 185.118.249.20

L. What is the destination MAC address of the packet R1 sends to R2?

- a. aa:ab:ac:ad:ae:af
- b. 23:d2:2d:8c:cc:1f
- c. ac:27:d3:a0:fa:37
- d. d4:de:ba:77:3c:21
- e. 22:32:4d:81:a1:49
- f. 3a:3b:3c:3d:3e:3f

Now R2 has the packet.

M. What ARP request will R2 send before forwarding the packet to host P?

- a. ARP request for 52.253.18.1
- b. ARP request for 185.118.249.1
- c. ARP request for 185.118.249.20
- d. ARP request for ac:27:d3:a0:fa:37
- e. ARP request for d4:de:ba:77:3c:21
- f. ARP request for 22:32:4d:81:a1:49
- g. ARP request for 3a:3b:3c:3d:3e:3f

R2 can now finally send the packet to host P.

N. What is the source IP address of the packet R2 sends to host P?

- a. 52.253.18.1



- b. 52.253.18.2
  - c. 185.118.249.1
  - d. 185.118.249.20
- O. What is the source MAC address of the packet R2 sends to host P?
- g. aa:ab:ac:ad:ae:af
  - h. 23:d2:2d:8c:cc:1f
  - i. ac:27:d3:a0:fa:37
  - j. d4:de:ba:77:3c:21
  - k. 22:32:4d:81:a1:49
  - l. 3a:3b:3c:3d:3e:3f
- P. What is the destination IP address of the packet R2 sends to host P?
- a. 52.253.18.1
  - b. 52.253.18.2
  - c. 185.118.249.1
  - d. 185.118.249.20
- Q. What is the destination MAC address of the packet R2 sends to host P?
- a. aa:ab:ac:ad:ae:af
  - b. 23:d2:2d:8c:cc:1f
  - c. ac:27:d3:a0:fa:37
  - d. d4:de:ba:77:3c:21
  - e. 22:32:4d:81:a1:49
  - f. 3a:3b:3c:3d:3e:3f

Now host P got the packet! As you saw, there are a lot of addresses, requests and responses involved in getting a single packet from X to P.

- R. Considering just the packet from host X to host P, which of the following header fields changed at some point on the way?
- a. The source MAC address
  - b. The source IP address
  - c. The destination MAC address
  - d. The destination IP address

## 2) LPM

Consider the following routing table:

- /0 → port 4
- 23.128/11 → port 3
- 23.160/12 → port 2
- 23.168/15 → port 1
- 23.176/13 → port 2
- 23.184/13 → port 2
- 24/7 → port 0

For each of the following packets, list the port that the packet is sent to:

- A. 23.170.17.4 \_\_\_\_\_
  - B. 23.189.17.4 \_\_\_\_\_
  - C. 23.192.17.4 \_\_\_\_\_
  - D. 25.185.53.106 \_\_\_\_\_
- E. The entries in the routing table can be consolidated into a smaller number of equivalent entries. Which of the following entries is included in the most efficient representation of the routing table above? Select all that apply.
- i. 23.176/12
  - ii. 23.160/11
  - iii. 23.168/15
  - iv. 23.128/10