17/6/2019

Lecture 06 tutorial: Network Layer. Part 2.

During tutorials prepare a short report of your activities and show it to your tutor.
Study the following **questions** and verify the correctness of any **answers** if given.
Be aware that the exam question might be directly related to the tutorial questions

Additional Instructions: Where a **group number** is indicated, please discuss this particular question with other members of your group, prepare a short written answer and email this to your tutor before the end of the day (you may wish to verify the correctness of your answer first). This will be used to produce a set of sample answers for the class for study purposes. *Note:* You should work through all questions in the tutorials, not just ones assigned to your group. I also recommend that you complete Q4, 5 and 6 individually.

Wireshark: ARP Experiment

ALL

Group 10 : please email report

1. Inspect the file **ethernet-ARP-trace -1.pcap** and comment on the ARP request and response.
2. Record your own ARP request response Wireshark file. To do it you might either need to clear the ARP table/cache with **arp –d** (you need to be an administrator) or reboot your PC to have the ARP table/cache

Group 1

Question 1.
What is an ARP and what is it used for?

Group 2

Question 2.
A host A would like to send a packet to another host B or C. How can the host A can know if the receiver is in the same subnet? Consider the following example with the subnet mask \26 or 255.255.255.192.

```
IP-A          134.105.44.193
IP-B          134.105.44.224
IP-C          134.105.44.191
```

Group 3

Question 3.
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?

Because the sender doesn't know the target's physical address, so it broadcast it to all hosts in this subnet.
Because responder know the sender's physical address, it can send the respond directly to the destination without broadcast.

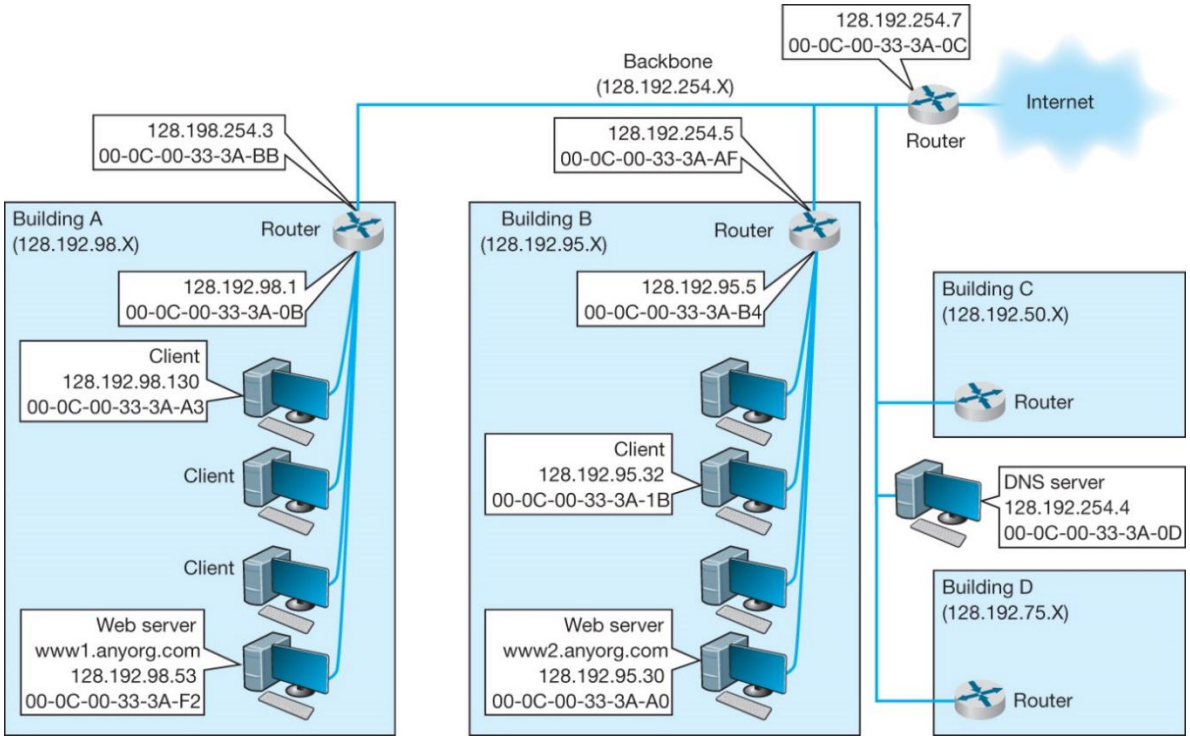
ALL

Group 4 : please email report

Question 4.

Consider the following network and write the answers to the following questions:

a. How many IP and MAC addresses does each router have? 2 IP 2 MAC
b. How many subnets are in the network? 5, ABCD and total
c. What are expected subnets masks in each subnet? .X



ALL

Group 5 : please email report

Question 5.

For the network as above, list/sketch all data link layer packets that encapsulate IP packets exchanged between the client computer, gateways and the Web server in response to the Web page request until the page is delivered to the client.

- Suppose a client computer in Building B (128.192.95.32) requests a Web page from the server in building A (www1.anyorg.com).
- The size of the Web page is approximately 2.5kB.
- Assume that the client computer, all gateways and Web servers involved **know all network layer and data link layer addresses.**
- Show only last pair of bytes of Ethernet and IP addresses.

a. List/sketch all data link layer packets encapsulating IP packets exchanged between the client computer, routers and web server during the **request of the Web page.**

Step 1: Client in B to Router in B:

E-Dst	E-Src	IP-Src	IP-Dst		
-3A-B4	-3A-1B	.95.32	.98.53	TCP	HTTP Request

Step 2: Router in B to Router in A

3A-BB	3A-AF	254.5	98.53	Link?	

Step 3: Router in A to the Web server in A

3A-F2	3A-0B	98.1	98.53	TCP	HTTP Request

b. Fill in in a similar way the steps related to the **Web server response.** Here we are assuming that all IP and Ethernet addresses are known to all hosts. The HTTP response from server in A to client in B will travel via routers A and B.

A single Ethernet frame **carrying the HTTP response** will take the path as below

Step 1: From Server in A to Router in A

-3A-0B	-3A-F2	.98.53	.95.32	TCP	HTTP Resp

Step 2: From Router in A to Router in B

3A-AF	3A-BB	254.3	95.32	Link?	

Step 3: From Router in B to Client in B

3A-1B	3A-B4	95.5	95.32	TCP	HTTP Resp

c. It will take multiple Ethernet frames to deliver the full HTTP response (size 2.5KB). As discussed in previous lectures, the maximum size of data (or payload) that an Ethernet frame can carry is 1500 bytes. How many frames are required to completely deliver the HTTP response?

2?

ALL

Group 6 : please email report

Question 6.

For the same network consider the Client in building B requests the web page from the www1.anyorg.com server which is located in different subnet. Assume that the Client B knows only addresses as in the **configuration file** and needs to use ARP and DNS to get required IP addresses.

List/sketch all data link layer packets that encapsulate IP packets exchanged between the client computer, gateways and the Web server **in response** to the Web page request until the page is delivered to the client.

Hint: Follow the steps describe in slides 15, 16, 14, ... (Case 3: Different Subnets, Unknown Addresses)

Group 7

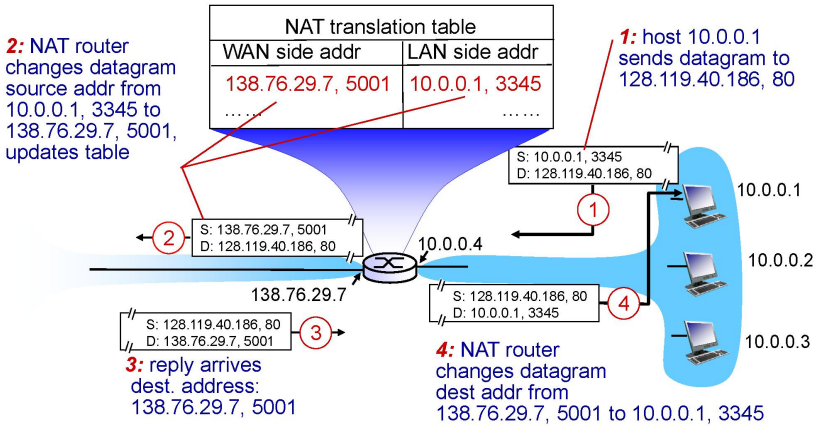
Question 7.

What is the Network Address Translation and why do we use it?

Group 8

Question 8.

Consider the NAT problem as in the following figure:



Describe step-by-step how the addresses are translated. Itemize your answer.

Group 9

Question 9.

Consider the Internet Control Message Protocol (ICMP)

a. What is it used for?
b. What is the format of the ICMP message?
c. What two popular commands use the ICMP?