Brian Lam
Z5035087

Exercise 1: Understanding NAT using Wireshark

Question 1: What is the IP address of the client?

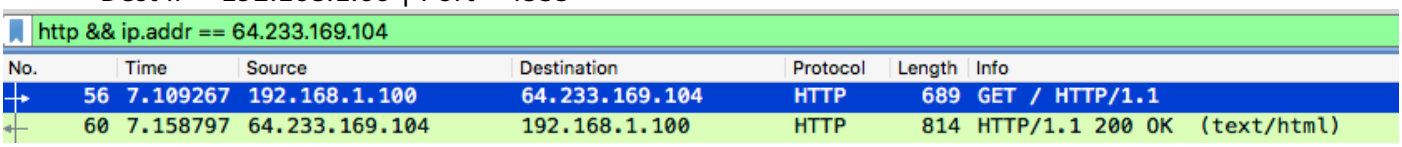
- 192.168.1.100

Question 2: What are the source and destination IP addresses and TCP source and destination ports on the IP datagram carrying this HTTP GET?

- Src IP = 192.168.1.199 | Port = 4335
- Dest IP = 64.233.169.104 | Port = 80

Question 3: At what time is the corresponding 200 OK HTTP message received from the Google server? What are the source and destination IP addresses and TCP source and destination ports on the IP datagram carrying this HTTP 200 OK message?

- Time = 7.158797
- Src IP = 64.233.169.104 | Port = 80
- Dest IP = 192.168.1.00 | Port = 4335

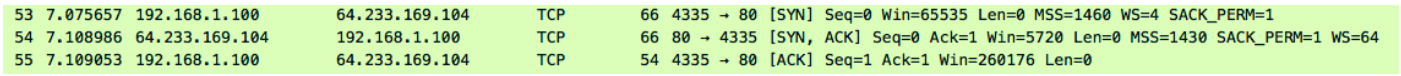


Question 4: At what time is the client-to-server TCP SYN segment sent that sets up the connection used by the GET sent at time 7.109267? What are the source and destination IP addresses and source and destination ports for the TCP SYN segment?

- Time of SYN segment sent to set up connection = 7.075657
- Src IP = 192.168.1.100 | Port = 4335
- Dest IP = 64.233.169.104 | Port = 80

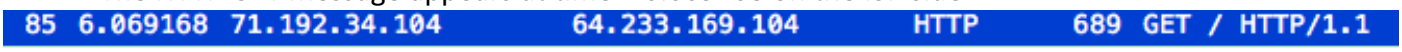
Question 5: What are the source and destination IP addresses and source and destination ports of the ACK sent in response to the SYN. At what time is this ACK received at the client?

- Src IP = 64.233.169.104 | Port = 80
- Src IP = 192.168.1.100 | Port = 4335
- Ack was received by client at time = 7.108986



Question 6: At what time does this message appear in the ISP side trace file?

- The HTTP GET message appears at time = 6.069168 on the ISP side



Question 7: What are the source and destination IP addresses and TCP source and destination ports on the IP datagram carrying this HTTP GET message (as recording in the NAT_ISP_side trace file)? Which of these fields are the same, and which are different, than in your answer to Question 2 above?

- Src IP = 71.192.34.104 | Port = 4335
- Dest IP = 64.233.169.104 | Port 80
- The source IP address field was previously 192.169.1.100 and is now 71.192.34.104

Question 8: Are any fields in the HTTP GET message changed?

- No

Question 9: Which of the following fields in the IP datagram carrying the HTTP GET are changed: Version, Header Length, Flags, Checksum. If any of these fields have changed, give a reason (in one sentence) stating why this field needed to change.

- Version: NO
- Header Length: NO
- Flags: NO
- Checksum: YES it has changed from 0xa94a → 0x4576
  Because of the change in the source IP address field, the checksum which includes this IP address value will also change.

Question 10: In the NAT_ISP_side trace file, at what time is the first 200 OK HTTP message received from the Google server?

- In the ISP side, the OK message is received at time = 6.308118

Question 11: What are the source and destination IP addresses and TCP source and destination ports on the IP datagram carrying this HTTP 200 OK message? Which of these fields are the same, and which are different than your answer to Question 3 above?

- Source IP = 64.233.169.104 | Port = 80
- Dest IP = 71.192.34.104 | Port = 4335
- The dest IP in Q4 was 64.233.169.104 and is now 71.192.34.104

Question 12: In the NAT_ISP_side trace file, at what time were the client-to-server TCP SYN segment and the server-to-client TCP ACK segment corresponding to the segments in Question 4 and 5 above captured?

- SYN segment capture time = 6.035475
- ACK segment capture time = 6.067775

Question 13: What are the source and destination IP addresses and source and destination ports for these two segments? Which of these fields are the same, and which are different than your answer to Question 4 and 5 above?

- SYN Source IP = 71.192.34.104 | Port = 4335
  SYN Dest IP = 64.233.169.104 | Port = 80
- ACK Source IP = 64.233.169.104 | Port = 80
  ACK Dest IP = 71.192.34.104 | Port = 4335
- For SYN, source IP address is different and for ACK, destination IP address is different.

Question 14: The discussion on NAT in the Week 8 lecture slides shows the NAT translation table used by a NAT router. Using your answers to the questions above, fill in the NAT translation table entries for the HTTP connection considered in the questions above.

NAT TRANSLATION TABLE

WAN side address	LAN side address
71.192.34.104 | 4335	192.168.100 | 4335

Exercise 2: Understanding the impact of Network Dynamics on Routing

Question 1: Which nodes communicate with which other nodes? Which route do the packets follow? Does it change over time?

- Node 0 communicates with Node 5, sending packets via. UDP.
- The route = 0 → 1 → 4 → 5
- The route does not change over time

Question 2: What happens at time 1.0 and at time 1.2? Does the route between the communicating node change as a result of that?

- At time 1.0, link 1-4 is down but route does not change, thus node 0 cannot reach node 5
- At time 1.2, link 1-4 is up and packets waiting at node 1 go to node 4 and then node 5

Question 3: How does the network react to the changes that take place at time 1.0 and time 1.2?

- When nodes 1-4 is down, a different route is discovered and that is used.
- When nodes 1-4 is up again, it goes back to the original route.

Question 4: How does this change affect the routing? Explain why.

- This changes the cost of link 1-4 to cost = 3. The flow will now use the route 0→1→2→3→5 as it is lower than the cost of link 0→1→4→5

Question 5:

- The routes now have equal cost to the dest.