Lab 5 - Network Address Translation
Computer Networks

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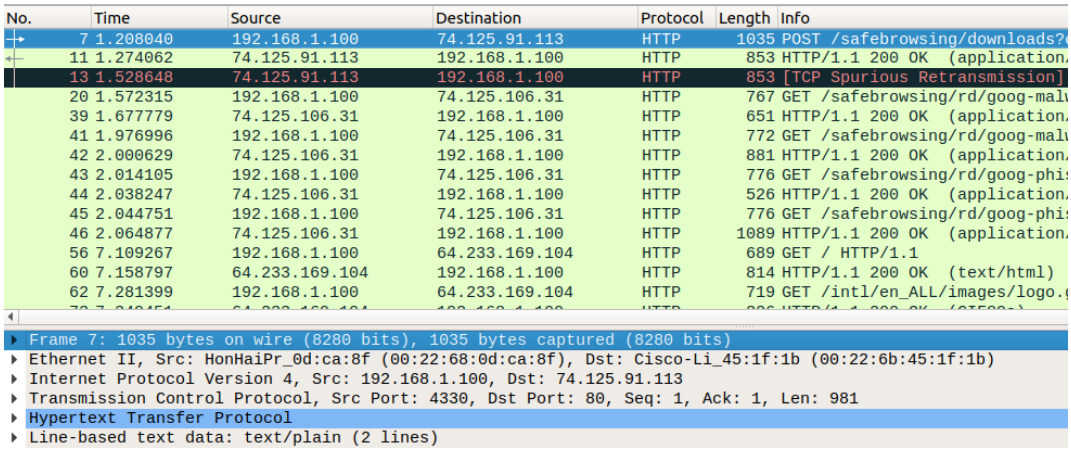
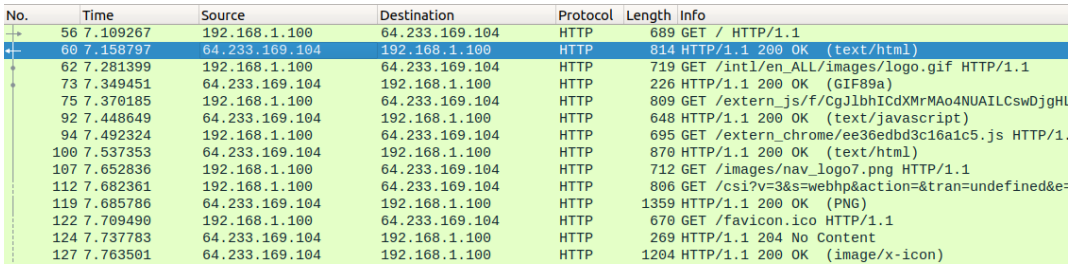
1 What is the IP address of the client?

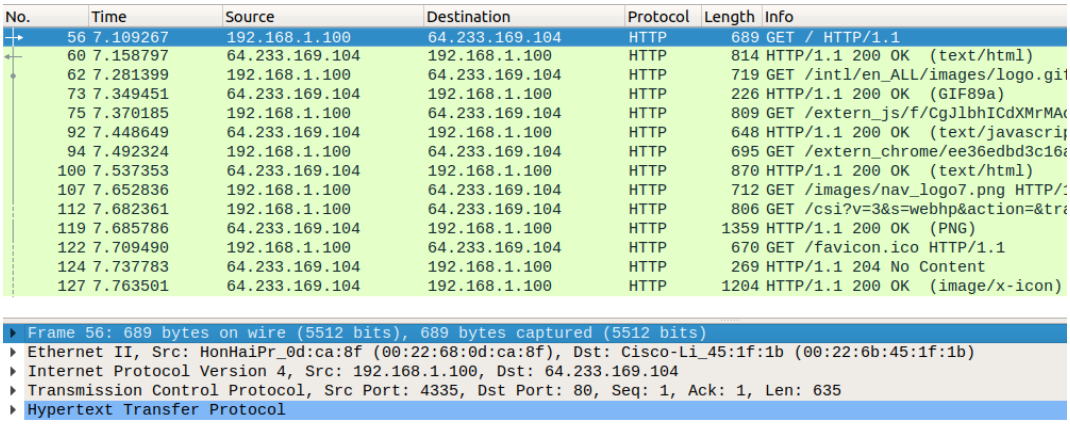


Answers: The IP address of the client is 192.168.1.100

2 The client actually communicates with several different Google servers in order to implement "safe browsing." (See extra credit section at the end of this lab). The main Google server that will serve up the main Google web page has IP address 64.233.169.104. In order to display only those frames containing HTTP messages that are sent to/from this Google, server, enter the expression "http && ip.addr == 64.233.169.104" (without quotes) into the Filter: field in Wireshark .



3 Consider now the HTTP GET sent from the client to the Google server (whose IP address is IP address 64.233.169.104) at time 7.109267. What are the source and destination IP addresses and TCP source and destination ports on the IP datagram carrying this HTTP GET?



No.	Time	Source	Destination	Protocol	Length	Info
56	7.109267	192.168.1.100	64.233.169.104	HTTP	689	GET / HTTP/1.1
60	7.158797	64.233.169.104	192.168.1.100	HTTP	814	HTTP/1.1 200 OK (text/html)
62	7.281399	192.168.1.100	64.233.169.104	HTTP	719	GET /intl/en_ALL/images/logo.gi
73	7.349451	64.233.169.104	192.168.1.100	HTTP	226	HTTP/1.1 200 OK (GIF89a)
75	7.370185	192.168.1.100	64.233.169.104	HTTP	809	GET /extern_js/f/CgJlbhICdXMrMA
92	7.448649	64.233.169.104	192.168.1.100	HTTP	648	HTTP/1.1 200 OK (text/javascri
94	7.492324	192.168.1.100	64.233.169.104	HTTP	695	GET /extern_chrome/ee36edbd3c16
100	7.537353	64.233.169.104	192.168.1.100	HTTP	870	HTTP/1.1 200 OK (text/html)
107	7.652836	192.168.1.100	64.233.169.104	HTTP	712	GET /images/nav_logo7.png HTTP/1
112	7.682361	192.168.1.100	64.233.169.104	HTTP	806	GET /csi?v=3&s=webhp&action=&tra
119	7.685786	64.233.169.104	192.168.1.100	HTTP	1359	HTTP/1.1 200 OK (PNG)
122	7.709490	192.168.1.100	64.233.169.104	HTTP	670	GET /favicon.ico HTTP/1.1
124	7.737783	64.233.169.104	192.168.1.100	HTTP	269	HTTP/1.1 204 No Content
127	7.763501	64.233.169.104	192.168.1.100	HTTP	1204	HTTP/1.1 200 OK (image/x-icon)

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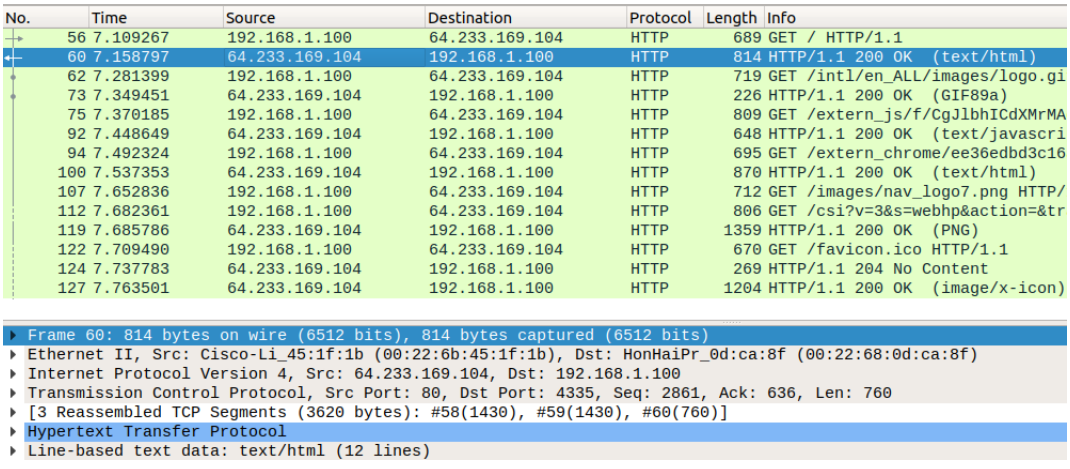
▸ Frame 56: 689 bytes on wire (5512 bits), 689 bytes captured (5512 bits)
▸ Ethernet II, Src: HonHaiPr_0d:ca:8f (00:22:68:0d:ca:8f), Dst: Cisco-Li_45:1f:1b (00:22:6b:45:1f:1b)
▸ Internet Protocol Version 4, Src: 192.168.1.100, Dst: 64.233.169.104
▸ Transmission Control Protocol, Src Port: 4335, Dst Port: 80, Seq: 1, Ack: 1, Len: 635
▸ Hypertext Transfer Protocol
```

Answers:

- The source IP address is 192.168.1.100
- The destination IP address is 64.233.169.104
- TCP source port is 4335
- TCP destination port is 80

4 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?



No.	Time	Source	Destination	Protocol	Length	Info
56	7.109267	192.168.1.100	64.233.169.104	HTTP	689	GET / HTTP/1.1
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94	7.492324	192.168.1.100	64.233.169.104	HTTP	695	GET /extern_chrome/ee36edbd3c16
100	7.537353	64.233.169.104	192.168.1.100	HTTP	870	HTTP/1.1 200 OK (text/html)
107	7.652836	192.168.1.100	64.233.169.104	HTTP	712	GET /images/nav_logo7.png HTTP/
112	7.682361	192.168.1.100	64.233.169.104	HTTP	806	GET /csi?v=3&s=webhp&action=&tr
119	7.685786	64.233.169.104	192.168.1.100	HTTP	1359	HTTP/1.1 200 OK (PNG)
122	7.709490	192.168.1.100	64.233.169.104	HTTP	670	GET /favicon.ico HTTP/1.1
124	7.737783	64.233.169.104	192.168.1.100	HTTP	269	HTTP/1.1 204 No Content
127	7.763501	64.233.169.104	192.168.1.100	HTTP	1204	HTTP/1.1 200 OK (image/x-icon)

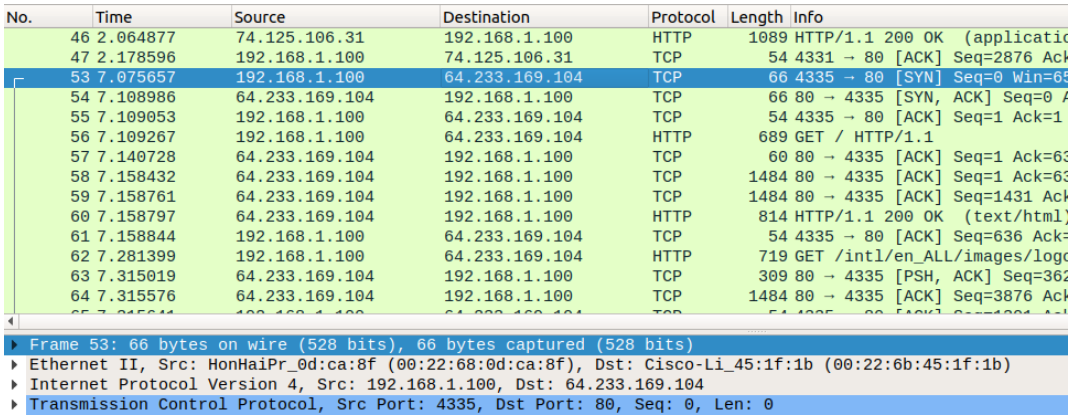
```
▸ Frame 60: 814 bytes on wire (6512 bits), 814 bytes captured (6512 bits)
▸ Ethernet II, Src: Cisco-Li_45:1f:1b (00:22:6b:45:1f:1b), Dst: HonHaiPr_0d:ca:8f (00:22:68:0d:ca:8f)
▸ Internet Protocol Version 4, Src: 64.233.169.104, Dst: 192.168.1.100
▸ Transmission Control Protocol, Src Port: 80, Dst Port: 4335, Seq: 2861, Ack: 636, Len: 760
▸ [3 Reassembled TCP Segments (3620 bytes): #58(1430), #59(1430), #60(760)]
▸ Hypertext Transfer Protocol
▸ Line-based text data: text/html (12 lines)
```

Answers:

- 200 OK HTTP message received from the Google server at 7.158797

- The source IP address is 64.233.169.104
- The destination IP address is 192.168.1.100
- TCP source port is 80
- TCP destination port is 4335

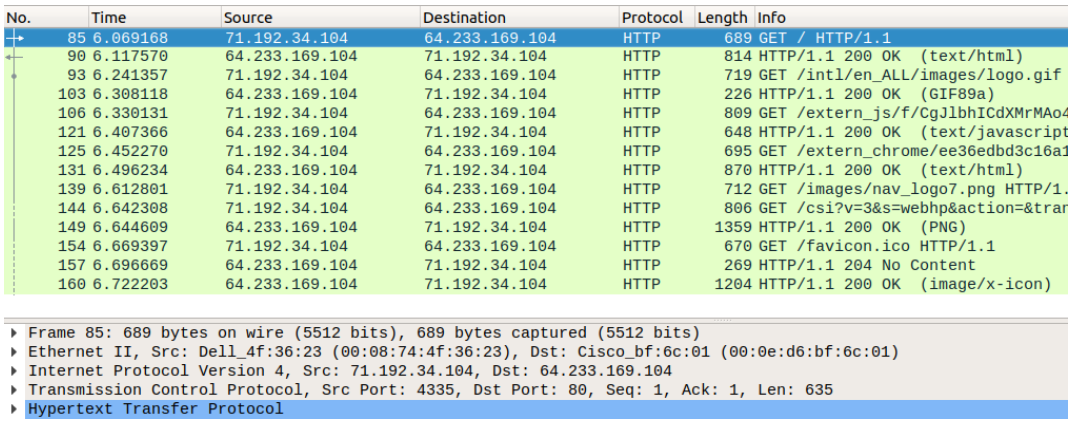
5 At what time is the client-to-server TCP SYN segment sent that sets up the connection used by the GET sent at time 7.109267? What are the source and destination IP addresses and source and destination ports for the TCP SYN segment? What are the source and destination IP addresses and source and destination ports of the ACK sent in response to the SYN. At what time is this ACK received at the client?



Answers:

- The client-to-server TCP SYN segment sent that sets up the connection used by the GET sent at time 7.109267 is segment at 7.075657
- The source IP address is 192.168.1.100
- The destination IP address is 64.233.169.104
- The source port is 4335
- The destination port is 80
- This ACK received at 7.108986

6 In the NAT_ISP_side trace file, find the HTTP GET message was sent from the client to the Google server at time 7.109267 (where t=7.109267 is time at which this was sent as recorded in the NAT_home_side trace file). At what time does this message appear in the NAT_ISP_side trace file? What are the source and destination IP addresses and TCP source and destination ports on the IP datagram carrying this HTTP GET (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 3 above?



No.	Time	Source	Destination	Protocol	Length	Info
85	6.069168	71.192.34.104	64.233.169.104	HTTP	689	GET / HTTP/1.1
90	6.117570	64.233.169.104	71.192.34.104	HTTP	814	HTTP/1.1 200 OK (text/html)
93	6.241357	71.192.34.104	64.233.169.104	HTTP	719	GET /intl/en_ALL/images/logo.gif
103	6.308118	64.233.169.104	71.192.34.104	HTTP	226	HTTP/1.1 200 OK (GIF89a)
106	6.330131	71.192.34.104	64.233.169.104	HTTP	809	GET /extern_js/f/CgJlbhICdXMrMAo4
121	6.407366	64.233.169.104	71.192.34.104	HTTP	648	HTTP/1.1 200 OK (text/javascript
125	6.452270	71.192.34.104	64.233.169.104	HTTP	695	GET /extern_chrome/ee36edbd3c16a1
131	6.496234	64.233.169.104	71.192.34.104	HTTP	870	HTTP/1.1 200 OK (text/html)
139	6.612801	71.192.34.104	64.233.169.104	HTTP	712	GET /images/nav_logo7.png HTTP/1.
144	6.642308	71.192.34.104	64.233.169.104	HTTP	806	GET /csi?v=3&s=webhp&action=&trar
149	6.644609	64.233.169.104	71.192.34.104	HTTP	1359	HTTP/1.1 200 OK (PNG)
154	6.669397	71.192.34.104	64.233.169.104	HTTP	670	GET /favicon.ico HTTP/1.1
157	6.696669	64.233.169.104	71.192.34.104	HTTP	269	HTTP/1.1 204 No Content
160	6.722203	64.233.169.104	71.192.34.104	HTTP	1204	HTTP/1.1 200 OK (image/x-icon)

```
▸ Frame 85: 689 bytes on wire (5512 bits), 689 bytes captured (5512 bits)
▸ Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: Cisco_bf:6c:01 (00:0e:d6:bf:6c:01)
▸ Internet Protocol Version 4, Src: 71.192.34.104, Dst: 64.233.169.104
▸ Transmission Control Protocol, Src Port: 4335, Dst Port: 80, Seq: 1, Ack: 1, Len: 635
▸ Hypertext Transfer Protocol
```

Answers:

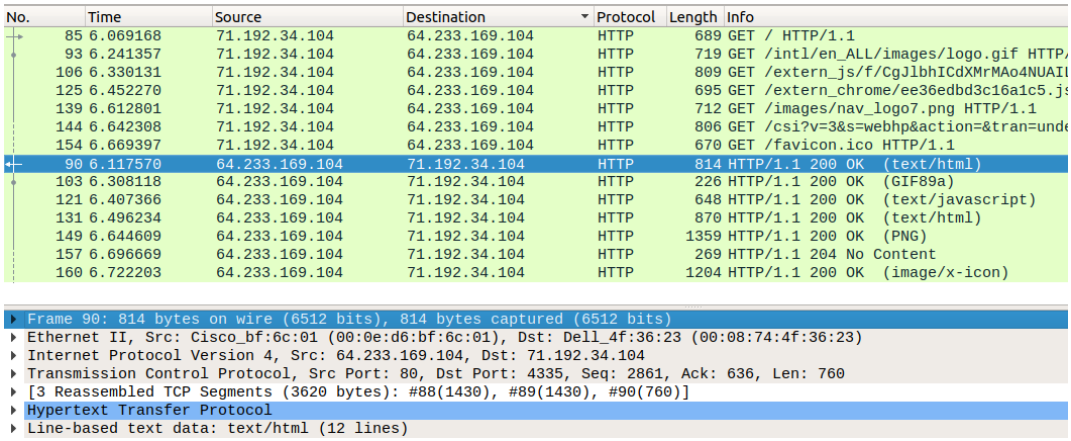
- This message appear in the NAT_ISP_side at 6.069168
- Source: 71.192.34.104:4335
- Destination: 64.233.169.104:80
- Only the source IP address has changed

7 Are any fields in the HTTP GET message changed? 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.

Answers:

- No. Not all have changed
- The fields in the IP datagram carrying the HTTP GET are changed: Checksum
- Because the IP source address has changed, and the checksum includes the value of the source IP address, the checksum has changed

8 In the NAT_ISP_side trace file, at what time is the first 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? Which of these fields are the same, and which are different than your answer to question 4 above?



No.	Time	Source	Destination	Protocol	Length	Info
85	6.069168	71.192.34.104	64.233.169.104	HTTP	689	GET / HTTP/1.1
93	6.241357	71.192.34.104	64.233.169.104	HTTP	719	GET /intl/en_ALL/images/logo.gif HTTP/
106	6.330131	71.192.34.104	64.233.169.104	HTTP	809	GET /extern_js/f/CgJlbhICdXMrMAo4NUAIl
125	6.452270	71.192.34.104	64.233.169.104	HTTP	695	GET /extern_chrome/ee36edbd3c16a1c5.js
139	6.612801	71.192.34.104	64.233.169.104	HTTP	712	GET /images/nav_logo7.png HTTP/1.1
144	6.642308	71.192.34.104	64.233.169.104	HTTP	806	GET /csi?v=3&s=webhp&action=&tran=unde
154	6.669397	71.192.34.104	64.233.169.104	HTTP	670	GET /favicon.ico HTTP/1.1
90	6.117570	64.233.169.104	71.192.34.104	HTTP	814	HTTP/1.1 200 OK (text/html)
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157	6.696669	64.233.169.104	71.192.34.104	HTTP	269	HTTP/1.1 204 No Content
160	6.722203	64.233.169.104	71.192.34.104	HTTP	1204	HTTP/1.1 200 OK (image/x-icon)

```
Frame 90: 814 bytes on wire (6512 bits), 814 bytes captured (6512 bits)
Ethernet II, Src: Cisco_bf:6c:01 (00:0e:d6:bf:6c:01), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
Internet Protocol Version 4, Src: 64.233.169.104, Dst: 71.192.34.104
Transmission Control Protocol, Src Port: 80, Dst Port: 4335, Seq: 2861, Ack: 636, Len: 760
[3 Reassembled TCP Segments (3620 bytes): #88(1430), #89(1430), #90(760)]
Hypertext Transfer Protocol
Line-based text data: text/html (12 lines)
```

Answers:

- The first 200 OK HTTP message received at 6.117570
- Source: 64.233.169.104:80
- Destination: 71.192.34.104:4335
- Only the destination IP address has changed

9 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 5 above captured? 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 5 above?

Answers:

- The time of client-to-server TCP SYN segment and the server-to-client TCP ACK segment are 6.035475 and 6.067775,respectively
- SYN segment: source(71.192.34.104:4335) and destination(64.233.169.104:80)
- ACK segment: source(64.233.169.104:80) and destination(71.192.34.104:4335)
- For the SYN, the source IP address has changed, For the ACK, the destination IP address has changed. The port numbers are unchanged

10 Using your answers to 1-8 above, fill in the NAT translation table entries for HTTP connection considered in questions 1-8 above.

Answers:

NAT translate table	
WAN side	LAN side
71.192.34.104:4335	192.168.1.100:4335