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LAB 4b

(Using dhcp-ethereal-trace-1 trace file)

Question 1: Are DHCP messages sent over UDP or TCP?

ANSWER:

DHCP messages are sent over UDP (User Datagram Protocol)

The screenshot displays the Wireshark interface with a trace file named 'dhcp-ethereal-trace-1'. The packet list pane shows the following packets:

No.	Time	Source	Destination	Protocol	Length	Info
1	23:57:15,026833	192.168.1.102	192.168.1.255	BROWSER	250	Domain/Workgroup Announcement WORKGROUP, NT Workstation, Domain Enum
2	23:57:22,614018	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
3	23:57:22,615714	LinksysG_da:af:73	Broadcast	ARP	60	Who has 192.168.1.101? Tell 192.168.1.1
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
7	23:57:23,664981	De11_4f:36:23	Broadcast	ARP	42	ARP Announcement for 192.168.1.101
8	23:57:24,312590	De11_4f:36:23	Broadcast	ARP	42	ARP Announcement for 192.168.1.101
9	23:57:25,312647	De11_4f:36:23	Broadcast	ARP	42	ARP Announcement for 192.168.1.101
10	23:57:26,336433	192.168.1.101	224.0.0.22	IGMPv3	54	Membership Report / Join group 239.255.255.250 for any sources

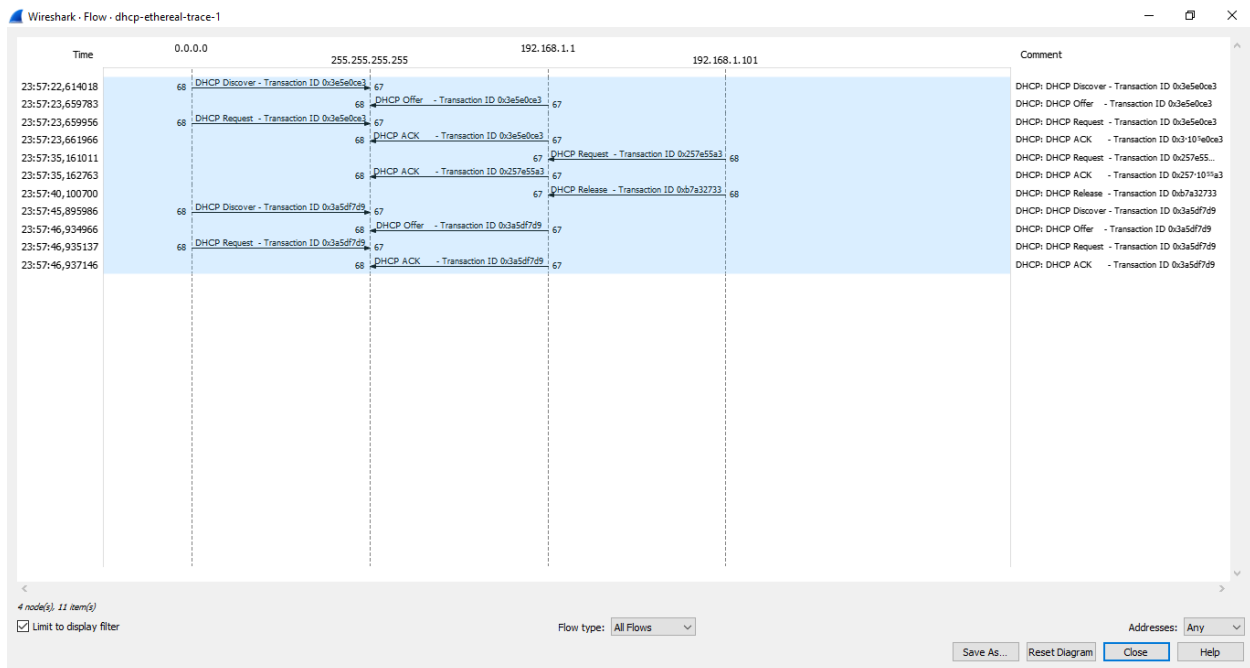
The packet details pane for packet 4 (DHCP Offer) is expanded, showing the following structure:

- Frame 4: 590 bytes on wire (4720 bits), 590 bytes captured (4720 bits)
- Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
- Internet Protocol Version 4, Src: 192.168.1.1, Dst: 255.255.255.255
- User Datagram Protocol, Src Port: 67, Dst Port: 68
 - Source Port: 67
 - Destination Port: 68
 - Length: 556
 - Checksum: 0x7223 [unverified]
 - [Checksum Status: Unverified]
 - [Stream index: 2]
 - [Timestamps]
 - UDP payload (548 bytes)
- Dynamic Host Configuration Protocol (Offer)

The packet bytes pane shows the raw data of the UDP packet, starting with the Ethernet II header and the UDP header.

Question 2: Draw a timing datagram illustrating the sequence of the first four-packet Discover/Offer/Request/ACK DHCP exchange between the client and server. For each packet, indicated the source and destination port numbers. Are the port numbers the same as in the example given in this lab assignment?

ANSWER:



The port numbers are the same as the example given in this lab assignment
(67 and 68)

(The ports are displayed on the diagram for each packet:
source port -----(Packet)-----> destination port)

Question 3: What is the link-layer (e.g., Ethernet) address of your host?

ANSWER:

The link-layer address of my host is (00:08:74:4f:36:23)

The packet list shows the following DHCP transactions:

No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614018	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ca3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ca3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ca3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ca3
36	23:57:35,161011	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35,162763	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

The details pane shows the following information for the selected packet (Frame 2):

- Frame 2: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits)
- Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
- Destination: Broadcast (ff:ff:ff:ff:ff:ff)
- Source: Dell_4f:36:23 (00:08:74:4f:36:23)
- Type: IPv4 (0x0800)
- Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
- User Datagram Protocol, Src Port: 68, Dst Port: 67
- Dynamic Host Configuration Protocol (Discover)

The packet bytes pane shows the raw data of the frame:

```

0000 ff ff ff ff ff ff 00 08 74 4f 36 23 00 00 45 00 .....tOG#..E
0010 01 48 b3 10 00 00 00 11 86 95 00 00 00 00 ff ff ..H.....
0020 ff ff 00 44 00 43 01 34 e9 7b 01 01 06 00 3e 5e ...D.C.4.:{....>^
0030 0c e3 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....tOG#....
0040 00 00 00 00 00 00 00 00 74 4f 36 23 00 00 00 00 .....tOG#....
0050 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....

```

Question 4: What values in the DHCP discover message differentiate this message from the DHCP request message?

ANSWER:

The values which differentiate the Discover message from the Request message:

Option: (53) DHCP Message Type

The screenshot shows a Wireshark packet capture of a DHCP Discover message. The packet list table is as follows:

No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22.614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23.659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23.659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23.661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35.161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35.162763	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40.100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45.895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46.934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46.935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

The packet details pane for the selected DHCP Discover message (No. 2) shows the following fields:

- Client IP address: 0.0.0.0
- Your (client) IP address: 0.0.0.0
- Next server IP address: 0.0.0.0
- Relay agent IP address: 0.0.0.0
- Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)
- Client hardware address padding: 00000000000000000000
- Server host name not given
- Boot file name not given
- Magic cookie: DHCP
- Option: (53) DHCP Message Type (Discover)**
 - Length: 1
 - DHCP: Discover (1)
- Option: (116) DHCP Auto-Configuration
- Option: (61) Client identifier
- Option: (50) Requested IP Address (192.168.1.101)
- Option: (12) Host Name
- Option: (60) Vendor class identifier

The packet bytes pane shows the raw data of the DHCP Discover message, including the magic cookie and the message type field (01).

Vs

The screenshot shows a Wireshark packet capture of a DHCP Request message. The packet list table is as follows:

No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22.614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23.659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23.659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23.661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35.161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35.162763	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40.100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45.895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46.934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46.935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

The packet details pane for the selected DHCP Request message (No. 5) shows the following fields:

- Client IP address: 0.0.0.0
- Your (client) IP address: 0.0.0.0
- Next server IP address: 0.0.0.0
- Relay agent IP address: 0.0.0.0
- Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)
- Client hardware address padding: 00000000000000000000
- Server host name not given
- Boot file name not given
- Magic cookie: DHCP
- Option: (53) DHCP Message Type (Request)**
 - Length: 1
 - DHCP: Request (3)
- Option: (61) Client identifier
 - Length: 7
 - Hardware type: Ethernet (0x01)
 - Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)
- Option: (50) Requested IP Address (192.168.1.101)
 - Length: 4

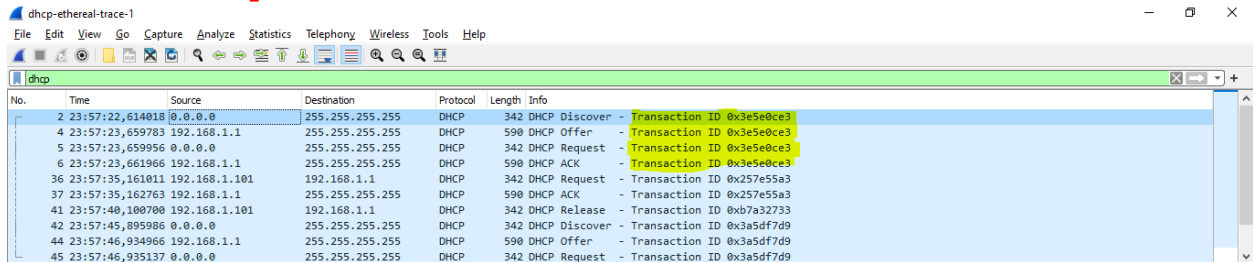
The packet bytes pane shows the raw data of the DHCP Request message, including the magic cookie and the message type field (03).

Question 5: What is the value of the Transaction-ID in each of the first four (Discover/Offer/Request/ACK) DHCP messages? What are the values of the

Transaction-ID in the second set (Request/ACK) set of DHCP messages? What is the purpose of the Transaction-ID field?

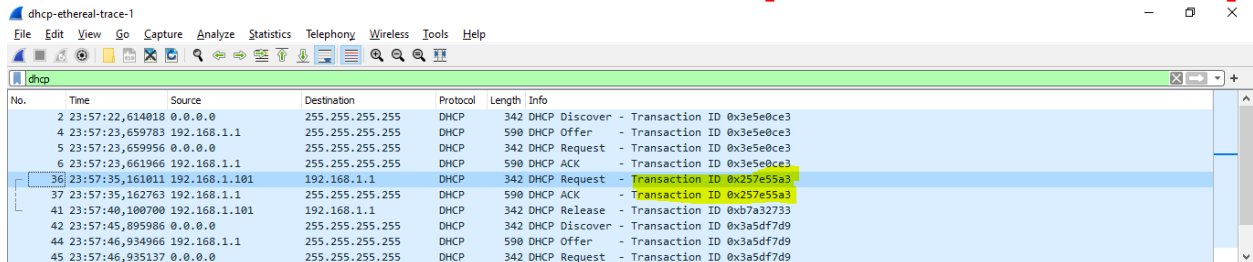
ANSWER:

The value of the transaction id in the first four DHCP messages is: **[Transaction ID: 0x3e5e0ce3]**



No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3

The value of the transaction id in the second set is **[Transaction ID: 0x257e55a3]**



No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35,161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35,162763	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

=> Purpose: The transaction ID is different so that the host can differentiate between different requests made by the user.

Question 6: A host uses DHCP to obtain an IP address, among other things. But a host's IP address is not confirmed until the end of the four-message exchange! If the IP address is not set until the end of the four-message exchange, then what values are used in the IP datagrams in the four-message exchange? For each of the four DHCP messages (Discover/Offer/Request/ACK DHCP), indicate the source and destination IP addresses that are carried in the encapsulating IP datagram.

ANSWER:

The DHCP client and server both use **255.255.255.255** as the destination address. The client uses source IP address **0.0.0.0**, while the server uses its actual IP address as the source.

Discover Src – **0.0.0.0**, Dst – **255.255.255.255**

Offer Src – **192.168.1.1**, Dst – **255.255.255.255**

Request Src – **0.0.0.0**, Dst – **255.255.255.255**

ACK DHCP – **192.168.1.1**, Dst – **255.255.255.255**

dhcp-ethereal-trace-1

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No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
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41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

Question 7: What is the IP address of your DHCP server?

ANSWER:

The IP address of my DHCP server is: **192.168.1.1**

dhcp-ethereal-trace-1

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No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35,161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35,162763	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

Question 8: What IP address is the DHCP server offering to your host in the DHCP Offer message? Indicate which DHCP message contains the offered DHCP address.

ANSWER:

The IP address in which the DHCP server is offering to my host in the DHCP Offer message is **192.168.1.101**

dhcp-ethereal-trace-1

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No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35,161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35,162763	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

Hardware type: Ethernet (0x01)	
Hardware address length: 6	
Hops: 0	
Transaction ID: 0x3e5e0ce3	
Seconds elapsed: 0	
> Bootp flags: 0x0000 (Unicast)	
Client IP address: 0.0.0.0	
Your (client) IP address: 192.168.1.101	
Next server IP address: 0.0.0.0	
Relay agent IP address: 0.0.0.0	
Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)	
Client hardware address padding: 00000000000000000000	
Server host name not given	
Boot file name not given	
Magic cookie: DHCP	
> Option: (53) DHCP Message Type (Offer)	
v Option: (1) Subnet Mask (255.255.255.0)	
Length: 4	

0030	0c e3 00 00 00 00 00 00 c0 a8 01 65 00 00C.O.A.1.65.....
0040	00 00 00 00 00 00 74 4f 36 23 00 00 00 0074.4f.36.23.....
0050	00 00 00 00 00 00 00 00 00 00 00 00 00 000000000000000000
0060	00 00 00 00 00 00 00 00 00 00 00 00 00 000000000000000000
0070	00 00 00 00 00 00 00 00 00 00 00 00 00 000000000000000000
0080	00 00 00 00 00 00 00 00 00 00 00 00 00 000000000000000000
0090	00 00 00 00 00 00 00 00 00 00 00 00 00 000000000000000000

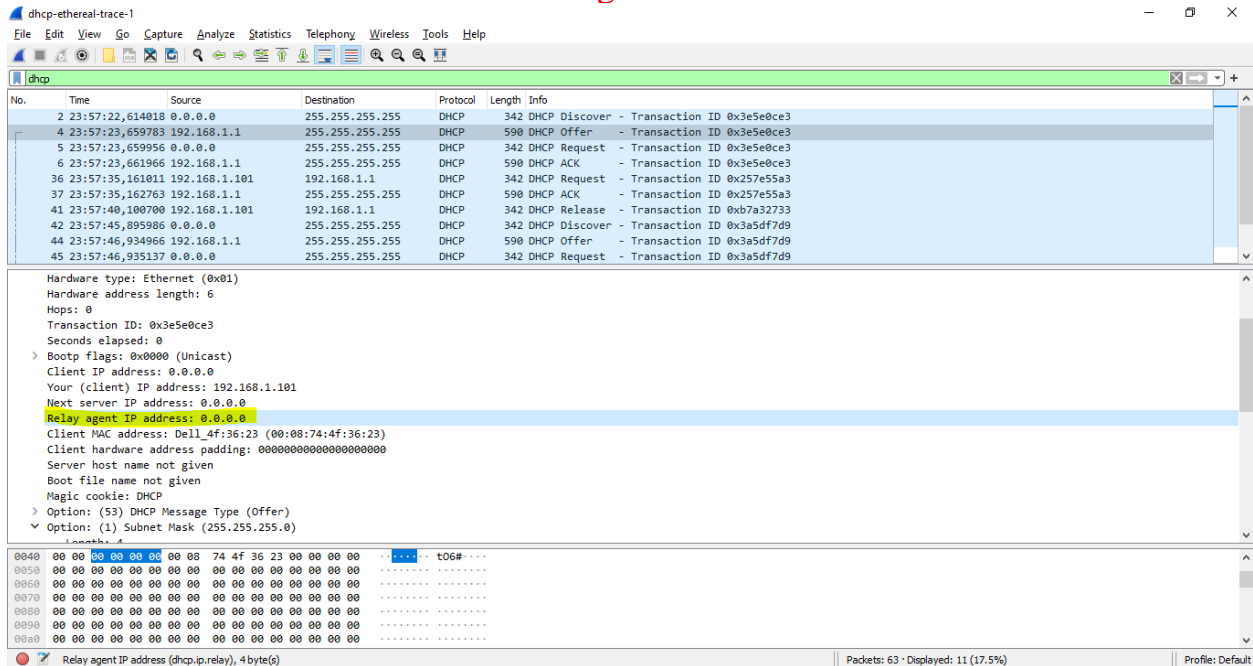
● Your (client) IP address (dhcp.p.your), 4byte(s) | Packets: 63 | Displayed: 11 (17.5%) | Profile: Default

Question 9: In the example screenshot in this assignment, there is no relay agent between the host and the DHCP server. What values in the trace indicate the absence of a relay agent? Is there a relay agent in your experiment? If so what is the IP address of the agent?

ANSWER:

The IP is **0.0.0.0** => There is no relay agent.

If there were an IP there then we could give values in the trace



No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35,161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
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41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

Hardware type: Ethernet (0x01)
Hardware address length: 6
Hops: 0
Transaction ID: 0x3e5e0ce3
Seconds elapsed: 0
> Bootp flags: 0x0000 (Unicast)
Client IP address: 0.0.0.0
Your (client) IP address: 192.168.1.101
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
Option: (53) DHCP Message Type (Offer)
Option: (1) Subnet Mask (255.255.255.0)
Length: 4

0040 00 00 00 00 00 00 00 74 4f 36 23 00 00 00 00 ... t06#...
0050 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0060 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0080 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Relay agent IP address (dhcp.ip.relay), 4 byte(s)

Packets: 63 · Displayed: 11 (17.5%)

Profile: Default

Question 10: Explain the purpose of the router and subnet mask lines in the DHCP offer message.

ANSWER:

The router line indicates to the client what its default gateway should be.

dhcpc-ethereal-trace-1

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dhcpc

No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	598	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	598	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35,161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35,162763	192.168.1.1	255.255.255.255	DHCP	598	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	598	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

Relay agent IP address: 0.0.0.0
Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)
Client hardware address padding: 000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
> Option: (53) DHCP Message Type (Offer)
> Option: (1) Subnet Mask (255.255.255.0)
Length: 4
Subnet Mask: 255.255.255.0
> Option: (3) Router
Length: 4
Router: 192.168.1.1
> Option: (6) Domain Name Server
Length: 8
Domain Name Server: 63.240.76.19
Domain Name Server: 204.127.198.19
> Option: (15) Domain Name

0120 ff ff 00 03 04 c0 a8 01 01 06 08 3f f0 4c 13 cc?..L..
0130 7f c6 13 0f 16 6e 65 32 2e 63 6c 69 65 6e 74 32ne2..client2
0140 2e 61 74 74 62 69 2e 63 6f 6d 00 33 04 00 01 51attbi.c om:3...Q
0150 80 36 04 c0 a8 01 01 ff 00 00 00 00 00 00 00 006.....
0160 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0170 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0180 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DHCP/BOOTP option type (dhcp.option.type), 6 byte(s) Packets: 63 * Displayed: 11 (17.5%) Profile: Default

The subnet mask line tells the client which subnet mask it should use.

dhcpc-ethereal-trace-1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

dhcpc

No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	598	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	598	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35,161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35,162763	192.168.1.1	255.255.255.255	DHCP	598	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	598	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

Relay agent IP address: 0.0.0.0
Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)
Client hardware address padding: 000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
> Option: (53) DHCP Message Type (Offer)
> Option: (1) Subnet Mask (255.255.255.0)
Length: 4
Subnet Mask: 255.255.255.0
> Option: (3) Router
Length: 4
Router: 192.168.1.1
> Option: (6) Domain Name Server
Length: 8
Domain Name Server: 63.240.76.19
Domain Name Server: 204.127.198.19
> Option: (15) Domain Name

0110 00 00 00 00 00 00 00 03 82 53 63 35 01 02 01 04 ffc..Sc5...
0120 ff ff 00 03 04 c0 a8 01 01 06 08 3f f0 4c 13 cc?..L..
0130 7f c6 13 0f 16 6e 65 32 2e 63 6c 69 65 6e 74 32ne2..client2
0140 2e 61 74 74 62 69 2e 63 6f 6d 00 33 04 00 01 51attbi.c om:3...Q
0150 80 36 04 c0 a8 01 01 ff 00 00 00 00 00 00 00 006.....
0160 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0170 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DHCP/BOOTP option type (dhcp.option.type), 6 byte(s) Packets: 63 * Displayed: 11 (17.5%) Profile: Default

Question 11: In the DHCP trace file noted in footnote 2, the DHCP server offers a specific IP address to the client (see also question 8. above). In the client's response to the first server OFFER message, does the client accept this IP address? Where in the client's RESPONSE is the client's requested address?

ANSWER:

In my experiment, the client accept this IP address
The client requests the offered IP address in the DHCP Request message.

dhcpc-ethereal-trace-1

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dhcpc

No.	Time	Source	Destination	Protocol	Length	Info
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
36	23:57:35,161811	192.168.1.101	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x257e55a3
37	23:57:35,162763	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x257e55a3
41	23:57:40,100700	192.168.1.101	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0xb7a32733
42	23:57:45,895986	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3a5df7d9
44	23:57:46,934966	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3a5df7d9
45	23:57:46,935137	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3a5df7d9

Server host name not given
Boot file name not given
Magic cookie: DHCP

Option: (53) DHCP Message Type (Request)
Length: 1
DHCP: Request (3)

Option: (61) Client identifier
Length: 7
Hardware type: Ethernet (0x01)
Client MAC address: Dell_4f:36:23 (00:08:74:4f:36:23)

Option: (50) Requested IP Address (192.168.1.101)
Length: 4
Requested IP Address: 192.168.1.101

Option: (54) DHCP Server Identifier (192.168.1.1)
Length: 4
DHCP Server Identifier: 192.168.1.1

Option: (12) Host Name
Length: 4

00f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0110 00 00 00 00 00 00 63 82 53 63 35 01 03 3d 07 01c..ScS.....
0120 00 08 74 4f 36 23 32 04 c0 a8 01 63 36 04 c0 a8 ...t06#2...6...
0130 01 01 0c 04 4e 6f 68 6f 3c 08 4d 53 46 54 20 35Noho <MSFT 5
0140 2e 30 37 0b 01 0f 03 06 2c 2e 2f 1f 21 f9 2b ff .07.....,./:~!+~
0150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Option 50: Requested IP Address (dhcp.option.requested_ip_address), 4 byte(s)

Packets: 63 · Displayed: 11 (17.5%)

Profile: Default

Question 12: Explain the purpose of the lease time. How long is the lease time in your experiment?

ANSWER:

The purpose of lease time: tell the client how long they can use the specific IP address assigned by the server before they will have to be assigned a new one.

The lease time in my experiment is **[IP Address Lease Time: (86400s) 1 day]**

[illegible]

dhcp-ethereal-trace-1

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Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
1	23:57:15,026833	192.168.1.102	192.168.1.255	BROWSER	250	Domain/Workgroup Announcement WORKGROUP, NT Workstation, Domain Enum
2	23:57:22,614818	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x3e5e0ce3
3	23:57:22,615714	LinksysG_da:af:73	Broadcast	ARP	60	Who has 192.168.1.101? Tell 192.168.1.1
4	23:57:23,659783	192.168.1.1	255.255.255.255	DHCP	590	DHCP Offer - Transaction ID 0x3e5e0ce3
5	23:57:23,659956	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x3e5e0ce3
6	23:57:23,661966	192.168.1.1	255.255.255.255	DHCP	590	DHCP ACK - Transaction ID 0x3e5e0ce3
7	23:57:23,664981	Dell_4f:36:23	Broadcast	ARP	42	ARP Announcement for 192.168.1.101
8	23:57:24,312590	Dell_4f:36:23	Broadcast	ARP	42	ARP Announcement for 192.168.1.101
9	23:57:25,312647	Dell_4f:36:23	Broadcast	ARP	42	ARP Announcement for 192.168.1.101
10	23:57:26,336433	192.168.1.101	224.0.0.22	IGMPv3	54	Membership Report / Join group 239.255.255.250 for any sources

> Frame 3: 60 bytes on wire (480 bits), 60 bytes captured (480 bits)
> Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
▼ Address Resolution Protocol (request)
Hardware type: Ethernet (1)
Protocol type: IPv4 (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: LinksysG_da:af:73 (00:06:25:da:af:73)
Sender IP address: 192.168.1.1
Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
Target IP address: 192.168.1.101

0000 ff ff ff ff ff ff 00 06 25 da af 73 08 06 00 01 %..s...
0010 08 00 06 04 00 01 00 06 25 da af 73 c0 a8 01 01 %..s...
0020 00 00 00 00 00 00 c0 a8 01 05 00 00 00 00 00c..
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Target IP address (arp.dst.proto_ipv4), 4 byte(s)

Packets: 63 · Displayed: 63 (100.0%)

Profile: Default

The capture of terminal:

```
Administrator: C:\WINDOWS\system32\cmd.exe - ipconfig /renew
Microsoft Windows [Version 10.0.19042.1288]
(c) Microsoft Corporation. All rights reserved.

C:\WINDOWS\system32>ipconfig /release

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 8 while it has its media disconnected.
No operation can be performed on Local Area Connection* 11 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Ethernet adapter Hamachi:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::ed2a:90a0:7ea8:da01%11
    Autoconfiguration IPv4 Address. . : 169.254.218.1
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :

Ethernet adapter VirtualBox Host-Only Network:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::893e:fdfe:ef78:7090%12
    Autoconfiguration IPv4 Address. . : 169.254.112.144
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 8:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 11:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . :
    IPv6 Address. . . . . : 2001:ee0:4c19:7cd0:9c8b:713e:34de:df46
    Temporary IPv6 Address. . . . . : 2001:ee0:4c19:7cd0:6dde:7b80:3c7b:3cd6
    Link-local IPv6 Address . . . . . : fe80::9c8b:713e:34de:df46%27
    Default Gateway . . . . . : fe80::1%27

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

C:\WINDOWS\system32>ipconfig /renew

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
An error occurred while renewing interface Hamachi : unable to contact your DHCP server. Request has timed out.
No operation can be performed on Local Area Connection* 8 while it has its media disconnected.
No operation can be performed on Local Area Connection* 11 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Ethernet adapter Hamachi:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::ed2a:90a0:7ea8:da01%11
    Autoconfiguration IPv4 Address. . : 169.254.218.1
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :

Ethernet adapter VirtualBox Host-Only Network:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::893e:fdfe:ef78:7090%12
    Autoconfiguration IPv4 Address. . : 169.254.112.144
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :
```

Administrator: C:\WINDOWS\system32\cmd.exe

Ethernet adapter VirtualBox Host-Only Network:

```
Connection-specific DNS Suffix  . :  
Link-Local IPv6 Address . . . . . : fe80::893e:fdfe:ef78:7090%12  
Autoconfiguration IPv4 Address. . : 169.254.112.144  
Subnet Mask . . . . . : 255.255.0.0  
Default Gateway . . . . . :
```

Wireless LAN adapter Local Area Connection* 8:

```
Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix  . :
```

Wireless LAN adapter Local Area Connection* 11:

```
Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix  . :
```

Wireless LAN adapter Wi-Fi:

```
Connection-specific DNS Suffix  . :  
IPv6 Address. . . . . : 2001:ee0:4c19:7cd0:9c8b:713e:34de:df46  
Temporary IPv6 Address. . . . . : 2001:ee0:4c19:7cd0:6dde:7b80:3c7b:3cd6  
Link-Local IPv6 Address . . . . . : fe80::9c8b:713e:34de:df46%27  
IPv4 Address. . . . . : 192.168.1.10  
Subnet Mask . . . . . : 255.255.255.0  
Default Gateway . . . . . : fe80::1%27  
                          192.168.1.1
```

Ethernet adapter Bluetooth Network Connection:

```
Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix  . :
```

C:\WINDOWS\system32>ipconfig /renew

Administrator: C:\WINDOWS\system32\cmd.exe

```
Connection-specific DNS Suffix  . :  
C:\WINDOWS\system32>ipconfig /renew
```

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
An error occurred while renewing interface Hamachi : unable to contact your DHCP server. Request has timed out.
No operation can be performed on Local Area Connection* 8 while it has its media disconnected.
No operation can be performed on Local Area Connection* 11 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

Ethernet adapter Ethernet:

```
Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix  . :
```

Ethernet adapter Hamachi:

```
Connection-specific DNS Suffix  . :  
Link-Local IPv6 Address . . . . . : fe80::ed2a:90a0:7ea8:da01%11  
Autoconfiguration IPv4 Address. . : 169.254.218.1  
Subnet Mask . . . . . : 255.255.0.0  
Default Gateway . . . . . :
```

Ethernet adapter VirtualBox Host-Only Network:

```
Connection-specific DNS Suffix  . :  
Link-Local IPv6 Address . . . . . : fe80::893e:fdfe:ef78:7090%12  
Autoconfiguration IPv4 Address. . : 169.254.112.144  
Subnet Mask . . . . . : 255.255.0.0  
Default Gateway . . . . . :
```

Wireless LAN adapter Local Area Connection* 8:

```
Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix  . :
```

Wireless LAN adapter Local Area Connection* 11:

```
Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix  . :
```

Wireless LAN adapter Wi-Fi:

Administrator: C:\WINDOWS\system32\cmd.exe

Wireless LAN adapter Wi-Fi:

```
Connection-specific DNS Suffix  . :  
IPv6 Address. . . . . : 2001:ee0:4c19:7cd0:9c8b:713e:34de:df46  
Temporary IPv6 Address. . . . . : 2001:ee0:4c19:7cd0:6dde:7b80:3c7b:3cd6  
Link-Local IPv6 Address . . . . . : fe80::9c8b:713e:34de:df46%27  
IPv4 Address. . . . . : 192.168.1.10  
Subnet Mask . . . . . : 255.255.255.0  
Default Gateway . . . . . : fe80::1%27  
                          192.168.1.1
```

Ethernet adapter Bluetooth Network Connection:

```
Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix  . :
```

C:\WINDOWS\system32>ipconfig /release

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 8 while it has its media disconnected.
No operation can be performed on Local Area Connection* 11 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

```
Administrator: C:\WINDOWS\system32\cmd.exe
Connection-specific DNS Suffix . :
C:\WINDOWS\system32\ipconfig /release

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 8 while it has its media disconnected.
No operation can be performed on Local Area Connection* 11 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Ethernet adapter Hamachi:

    Connection-specific DNS Suffix . :
    Link-local IPv6 Address . . . . : fe80::ed2a:90a0:7ea8:da01%11
    Autoconfiguration IPv4 Address. . : 169.254.218.1
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :

Ethernet adapter VirtualBox Host-Only Network:

    Connection-specific DNS Suffix . :
    Link-local IPv6 Address . . . . : fe80::893e:fdfe:ef78:7090%12
    Autoconfiguration IPv4 Address. . : 169.254.112.144
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 8:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 11:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . :
    IPv6 Address. . . . . : 2001:ee0:4c19:7cd0:9c8b:713e:34de:df46
    Temporary IPv6 Address. . . . : 2001:ee0:4c19:7cd0:6dde:7b80:3c7b:3cd6
    Link-local IPv6 Address . . . . : fe80::9c8b:713e:34de:df46%27
    Default Gateway . . . . . : fe80::1%27

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :

C:\WINDOWS\system32>ipconfig /renew

Windows IP Configuration
```

Administrator: C:\WINDOWS\system32\cmd.exe

C:\WINDOWS\system32>ipconfig /renew

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
An error occurred while renewing interface Hamachi : unable to contact your DHCP server. Request has timed out.
No operation can be performed on Local Area Connection* 8 while it has its media disconnected.
No operation can be performed on Local Area Connection* 11 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

Ethernet adapter Ethernet:

Media State : Media disconnected
Connection-specific DNS Suffix . :

Ethernet adapter Hamachi:

Connection-specific DNS Suffix . :
Link-local IPv6 Address : fe80::ed2a:90a0:7ea8:da01%11
Autoconfiguration IPv4 Address. . : 169.254.218.1
Subnet Mask : 255.255.0.0
Default Gateway :

Ethernet adapter VirtualBox Host-Only Network:

Connection-specific DNS Suffix . :
Link-local IPv6 Address : fe80::893e:fdfe:ef78:7090%12
Autoconfiguration IPv4 Address. . : 169.254.112.144
Subnet Mask : 255.255.0.0
Default Gateway :

Wireless LAN adapter Local Area Connection* 8:

Media State : Media disconnected
Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 11:

Media State : Media disconnected
Connection-specific DNS Suffix . :

Wireless LAN adapter Wi-Fi:

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . :
IPv6 Address. : 2001:ee0:4c19:7cd0:9c8b:713e:34de:df46
Temporary IPv6 Address. . . . : 2001:ee0:4c19:7cd0:6dde:7b80:3c7b:3cd6
Link-local IPv6 Address : fe80::9c8b:713e:34de:df46%27
IPv4 Address. : 192.168.1.10
Subnet Mask : 255.255.255.0
Default Gateway : fe80::1%27
192.168.1.1

Ethernet adapter Bluetooth Network Connection:

Media State : Media disconnected
Connection-specific DNS Suffix . :

C:\WINDOWS\system32>