COMPUTER NETWORK
Lab 4b

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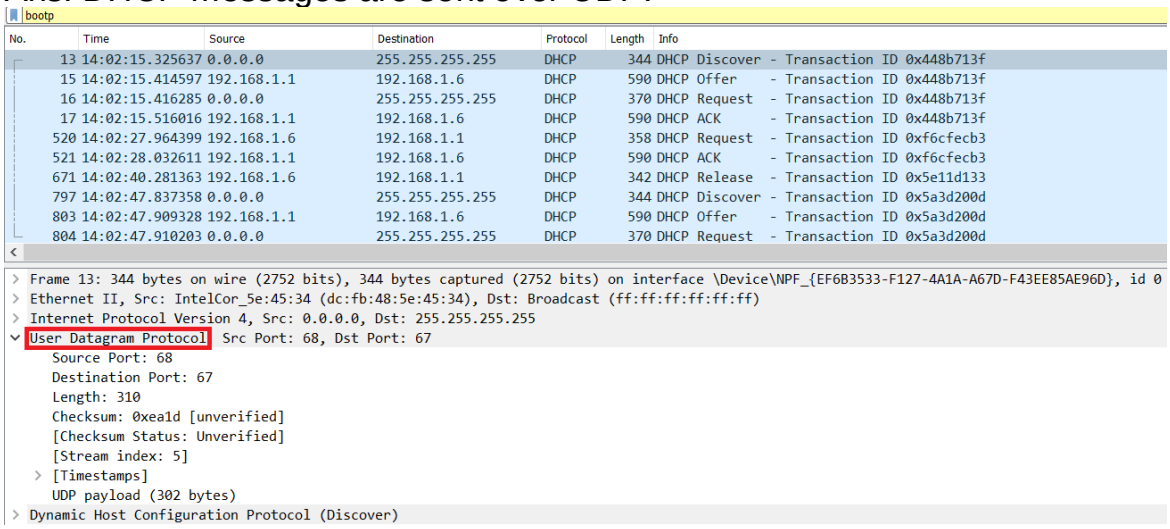
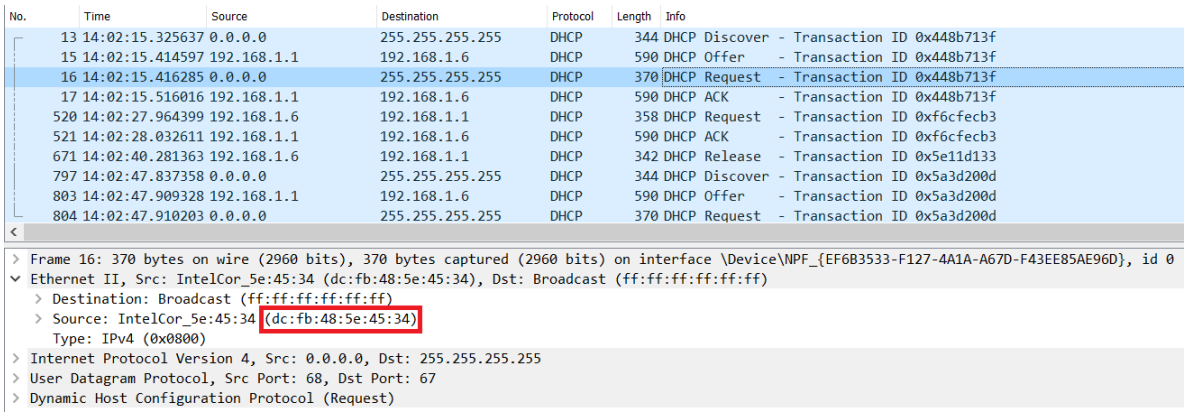
1. Are DHCP messages sent over UDP or TCP?
   Ans: DHCP messages are sent over UDP.



2. Draw a timing diagram 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?
   Ans:
   The Discover packet has a source port of 68 and destination port of 67.
   The Offer packet has a source port of 67 and a destination port of 68.
   The Request packet has a source port of 68 and a destination of 67.
   The ACK packet has a source port of 67 and a destination of 68.
   The port numbers are the same as in the example given in this lab assignment.

3. What is the link-layer address of your host?
   Ans: The link-layer address of my host: dc:fb:48:5e:45:34



4. What values in the DHCP discover message differentiate this message from the DHCP request message?
   Ans: The value in the DHCP discover message differentiates this message from the DHCP request message is Option 53.

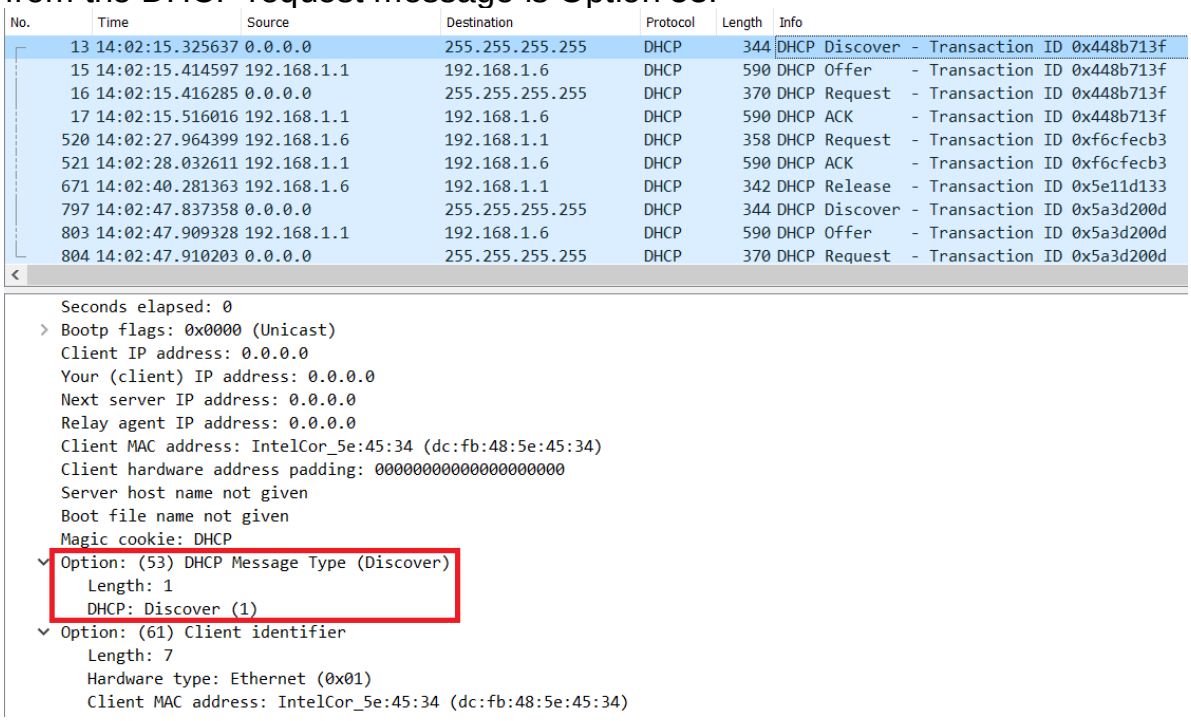
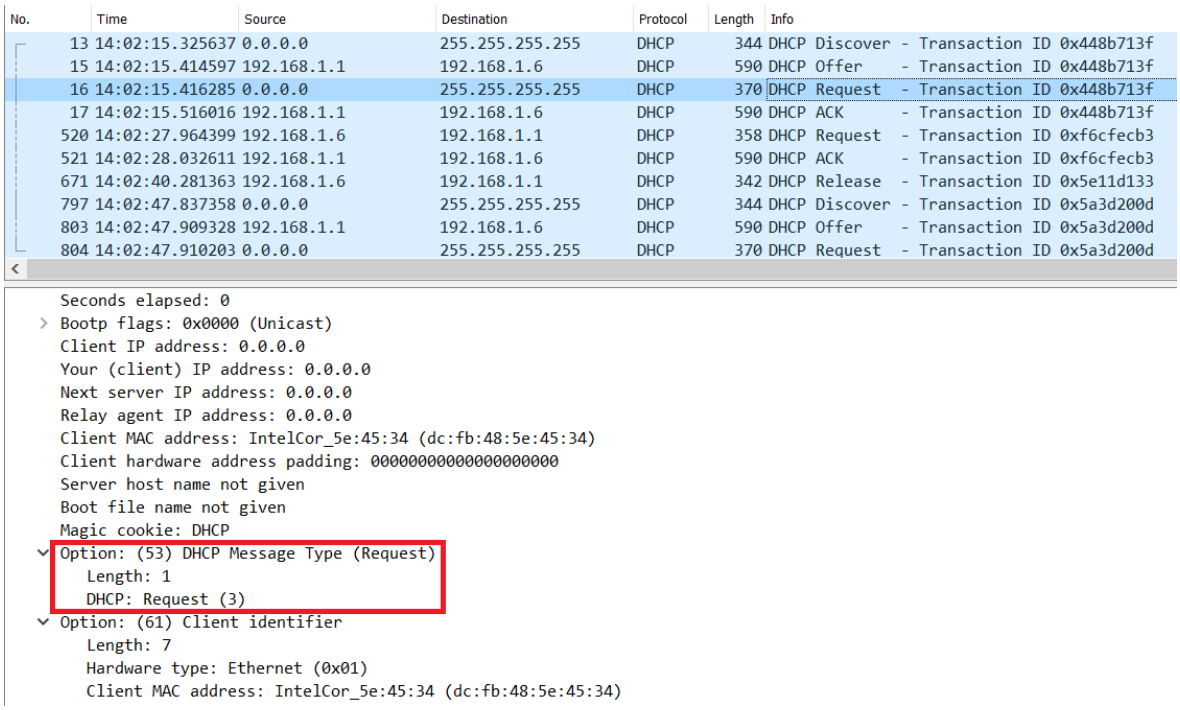


Figure 1: DHCP Discover message

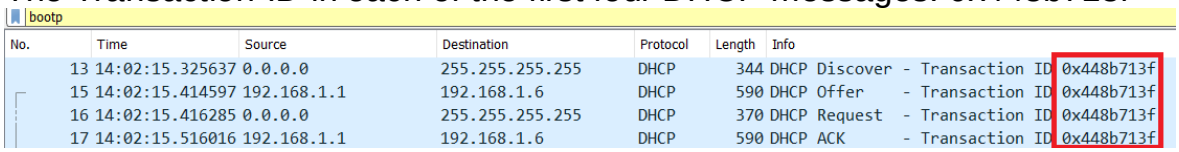


No.	Time	Source	Destination	Protocol	Length	Info
13	14:02:15.325637	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x448b713f
15	14:02:15.414597	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x448b713f
16	14:02:15.416285	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x448b713f
17	14:02:15.516016	192.168.1.1	192.168.1.6	DHCP	590	DHCP ACK - Transaction ID 0x448b713f
520	14:02:27.964399	192.168.1.6	192.168.1.1	DHCP	358	DHCP Request - Transaction ID 0xf6cfecb3
521	14:02:28.032611	192.168.1.1	192.168.1.6	DHCP	590	DHCP ACK - Transaction ID 0xf6cfecb3
671	14:02:40.281363	192.168.1.6	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0x5e11d133
797	14:02:47.837358	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x5a3d200d
803	14:02:47.909328	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x5a3d200d
804	14:02:47.910203	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x5a3d200d

```
Seconds elapsed: 0
Bootp flags: 0x0000 (Unicast)
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: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
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: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
```

Figure 2: DHCP Request message

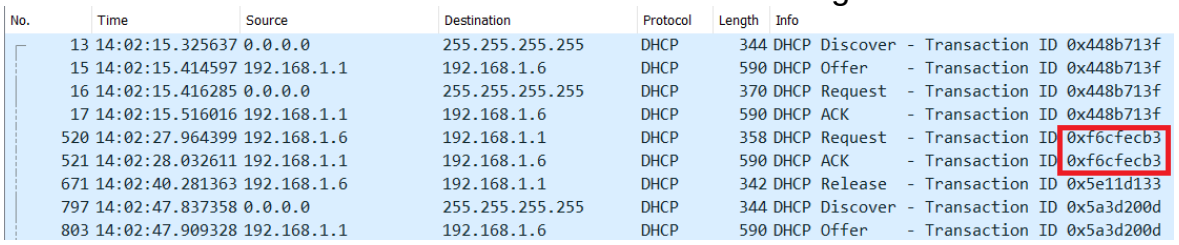
5. What is the value of the Transaction-ID in each of the first four DHCP messages? What are the values of the Transaction-ID in the second set of DHCP messages? What is the purpose of the Transaction-ID field?
   Ans:
   The Transaction-ID in each of the first four DHCP messages: 0x448b713f



bootp

No.	Time	Source	Destination	Protocol	Length	Info
13	14:02:15.325637	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x448b713f
15	14:02:15.414597	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x448b713f
16	14:02:15.416285	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x448b713f
17	14:02:15.516016	192.168.1.1	192.168.1.6	DHCP	590	DHCP ACK - Transaction ID 0x448b713f

   The Transaction-ID in the second set of DHCP messages: 0xf6cfecb3



No.	Time	Source	Destination	Protocol	Length	Info
13	14:02:15.325637	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x448b713f
15	14:02:15.414597	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x448b713f
16	14:02:15.416285	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x448b713f
17	14:02:15.516016	192.168.1.1	192.168.1.6	DHCP	590	DHCP ACK - Transaction ID 0x448b713f
520	14:02:27.964399	192.168.1.6	192.168.1.1	DHCP	358	DHCP Request - Transaction ID 0xf6cfecb3
521	14:02:28.032611	192.168.1.1	192.168.1.6	DHCP	590	DHCP ACK - Transaction ID 0xf6cfecb3
671	14:02:40.281363	192.168.1.6	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0x5e11d133
797	14:02:47.837358	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x5a3d200d
803	14:02:47.909328	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x5a3d200d

   The Transaction ID identifies if a message is part of a set of messages related to one transaction.

6. 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, indicate the source and destination IP addresses that are carried in the encapsulating IP datagram.
   Ans:
   Discover source 0.0.0.0 destination 255.255.255.255
   Offer source 192.168.1.1 destination 192.8.1.6

Request source 0.0.0.0 destination 255.255.255.255
ACK source 192.168.1.1 destination 192.8.1.6

No.	Time	Source	Destination	Protocol	Length	Info
13	14:02:15.325637	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x448b713f
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671	14:02:40.281363	192.168.1.6	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0x5e11d133
797	14:02:47.837358	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x5a3d200d
803	14:02:47.909328	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x5a3d200d

7. What is the IP address of your DHCP server?
   Ans: the IP address of my DHCP server: 192.168.1.1

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.
   Ans:
   The IP address that the DHCP server offer to my host: 192.168.1.6.
   Option 53 contains the DHCP Message type with a length of 1 and the DHCP offer is (2).

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13	14:02:15.325637	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x448b713f
15	14:02:15.414597	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x448b713f
16	14:02:15.416285	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x448b713f
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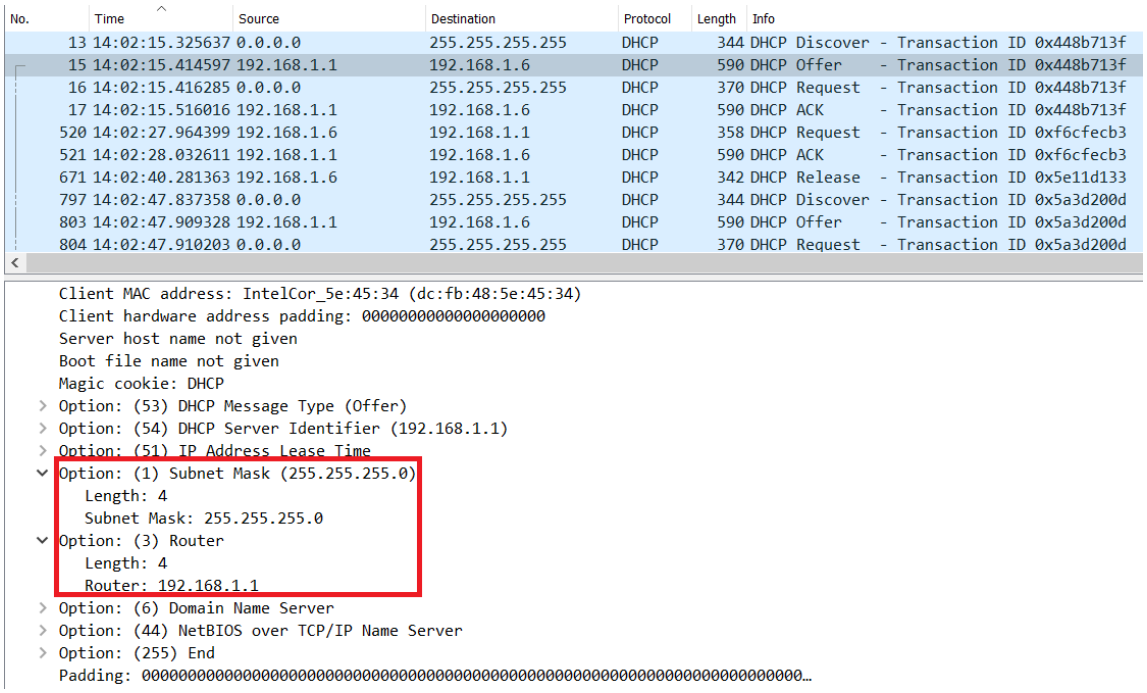
797	14:02:47.837358	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x5a3d200d
803	14:02:47.909328	192.168.1.1	192.168.1.6	DHCP	590	DHCP Offer - Transaction ID 0x5a3d200d
804	14:02:47.910203	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x5a3d200d

```
Hops: 0
Transaction ID: 0x448b713f
Seconds elapsed: 0
> Bootp flags: 0x0000 (Unicast)
Client IP address: 0.0.0.0
Your (client) IP address: 192.168.1.6
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
Client MAC address: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
v Option: (53) DHCP Message Type (Offer)
    Length: 1
    DHCP: Offer (2)
> Option: (54) DHCP Server Identifier (192.168.1.1)
> Option: (51) IP Address Lease Time
```

9. 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?
   Ans: The ip address being 0.0.0.0 indicates the absence of a relay agent. There is no relay agent in my experiment.

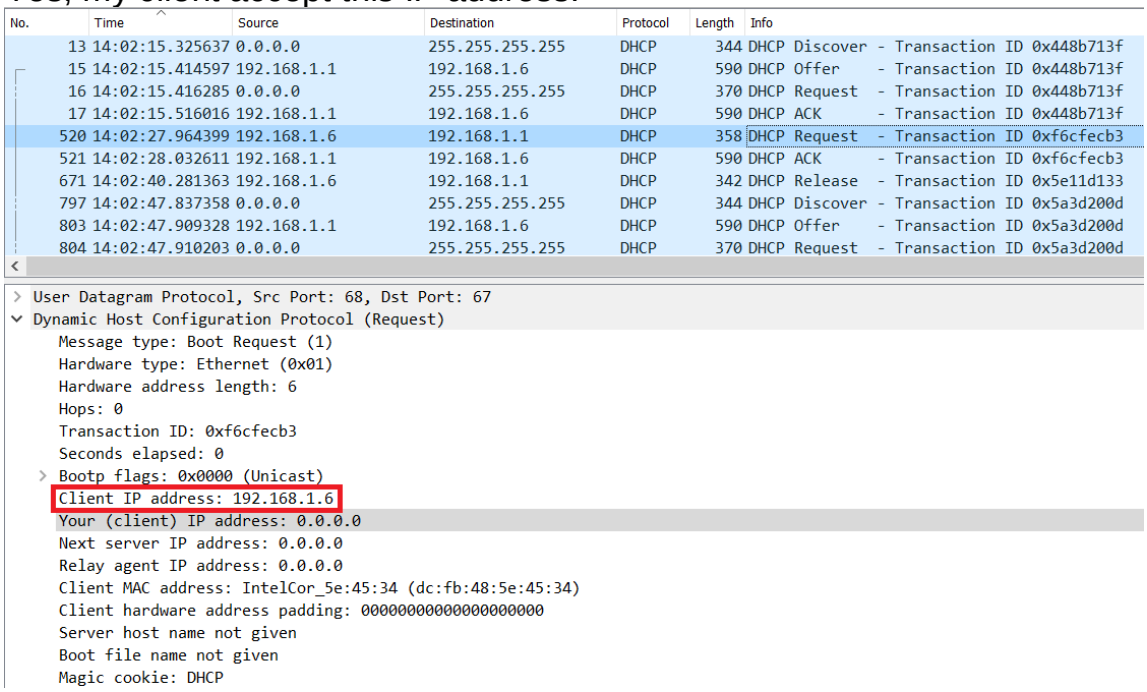
10. Explain the purpose of the router and subnet mask lines in the DHCP offer message.
    Ans: The IP address for the router identifies the default internet gateway. The subnet mask defines the subnet that is available.



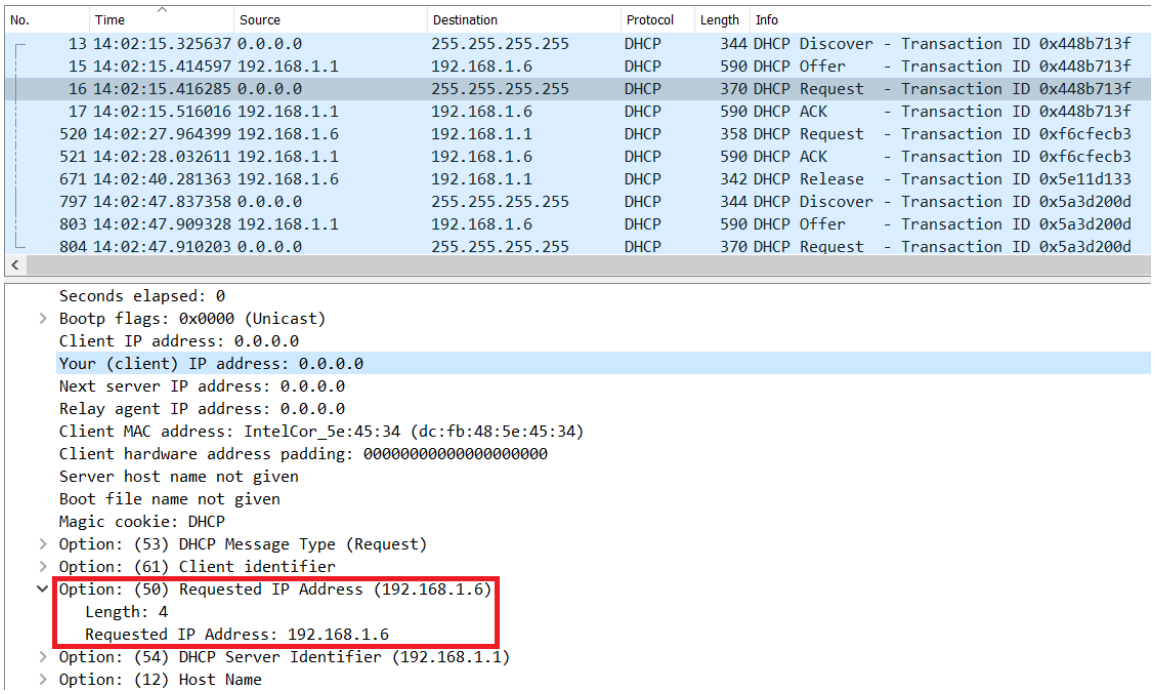
11. In the client's response to the first server OFFER message, does the client accept this IP address? Where in the client's RESPONSE is the client's requested address?

Ans:

Yes, my client accept this IP address.



The client's requested address is in Option 50.



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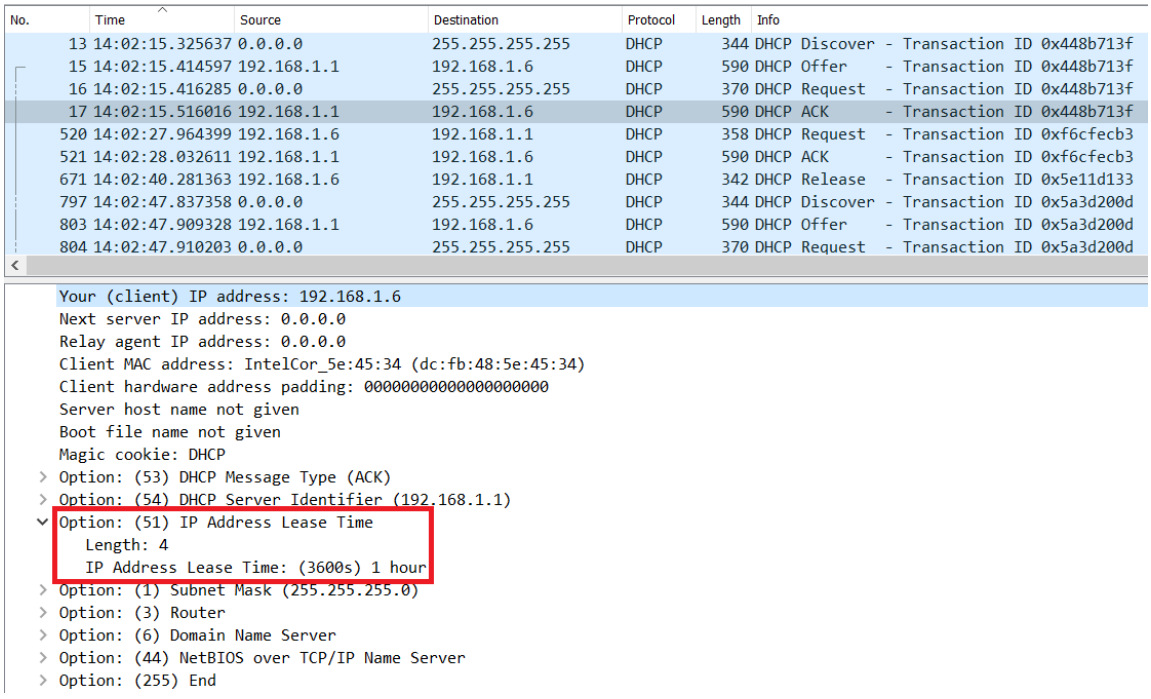
804	14:02:47.910203	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x5a3d200d

```
Seconds elapsed: 0
> Bootp flags: 0x0000 (Unicast)
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: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
> Option: (53) DHCP Message Type (Request)
> Option: (61) Client identifier
v Option: (50) Requested IP Address (192.168.1.6)
    Length: 4
    Requested IP Address: 192.168.1.6
> Option: (54) DHCP Server Identifier (192.168.1.1)
> Option: (12) Host Name
```

12. Explain the purpose of the lease time. How long is the lease time in your experiment?
Ans: The purpose of the lease time is the amount of time the DHCP server assigns an IP address to a client. The lease time in my experiment is 1 hour.



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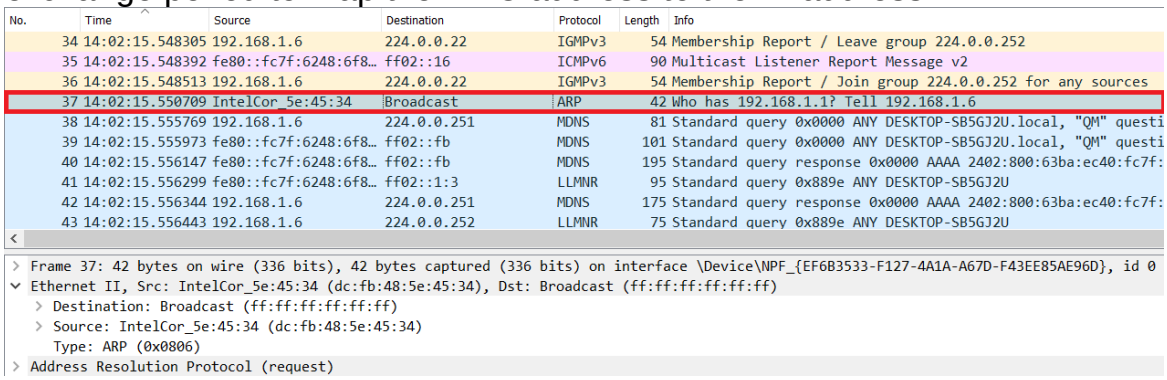
804	14:02:47.910203	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x5a3d200d

```
Your (client) IP address: 192.168.1.6
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
Client MAC address: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
> Option: (53) DHCP Message Type (ACK)
> Option: (54) DHCP Server Identifier (192.168.1.1)
v Option: (51) IP Address Lease Time
    Length: 4
    IP Address Lease Time: (3600s) 1 hour
> Option: (1) Subnet Mask (255.255.255.0)
> Option: (3) Router
> Option: (6) Domain Name Server
> Option: (44) NetBIOS over TCP/IP Name Server
> Option: (255) End
```

13. What is the purpose of the DHCP release message? Does the DHCP server issue an acknowledgment of receipt of the client's DHCP request? What would happen if the client's DHCP release message is lost?
Ans: The purpose of the DHCP release message is to tell the DHCP server that you want to cancel the IP address offered. The DHCP server does not

issue an acknowledge of receipt of the client's DHCP request. If the release message is lost then the DHCP server retains the IP address until the lease time expires.

14. Were any ARP packets sent or received during the DHCP packet-exchange period? If so, explain the purpose of those ARP packets.
Ans:
Yes, there were ARP packets sent or received during the DHCP packet-exchange period to map the MAC address to the IP address.



No.	Time	Source	Destination	Protocol	Length	Info
34	14:02:15.548305	192.168.1.6	224.0.0.22	IGMPv3	54	Membership Report / Leave group 224.0.0.252
35	14:02:15.548392	fe80::fc7f:6248:6f8…	ff02::16	ICMPv6	90	Multicast Listener Report Message v2
36	14:02:15.548513	192.168.1.6	224.0.0.22	IGMPv3	54	Membership Report / Join group 224.0.0.252 for any sources
37	14:02:15.550709	IntelCor_5e:45:34	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.6
38	14:02:15.555769	192.168.1.6	224.0.0.251	MDNS	81	Standard query 0x0000 ANY DESKTOP-SB5GJ2U.local, "QM" questi
39	14:02:15.555973	fe80::fc7f:6248:6f8…	ff02::fb	MDNS	101	Standard query 0x0000 ANY DESKTOP-SB5GJ2U.local, "QM" questi
40	14:02:15.556147	fe80::fc7f:6248:6f8…	ff02::fb	MDNS	195	Standard query response 0x0000 AAAA 2402:800:63ba:ec40:fc7f:
41	14:02:15.556299	fe80::fc7f:6248:6f8…	ff02::1:3	LLMNR	95	Standard query 0x889e ANY DESKTOP-SB5GJ2U
42	14:02:15.556344	192.168.1.6	224.0.0.251	MDNS	175	Standard query response 0x0000 AAAA 2402:800:63ba:ec40:fc7f:
43	14:02:15.556443	192.168.1.6	224.0.0.252	LLMNR	75	Standard query 0x889e ANY DESKTOP-SB5GJ2U

```
> Frame 37: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{EF6B3533-F127-4A1A-A67D-F43EE85AE96D}, id 0
v Ethernet II, Src: IntelCor_5e:45:34 (dc:fb:48:5e:45:34), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
    > Destination: Broadcast (ff:ff:ff:ff:ff:ff)
    > Source: IntelCor_5e:45:34 (dc:fb:48:5e:45:34)
      Type: ARP (0x0806)
> Address Resolution Protocol (request)
```