

# Wireshark DHCP

```
C:\Windows\System32>ipconfig /renew

Windows IP Configuration

No operation can be performed on Local Area Connection* 2 while it has its media disconnected.
No operation can be performed on Ethernet 3 while it has its media disconnected.
No operation can be performed on Bluetooth Network Connection while it has its media disconnected.

Wireless LAN adapter Local Area Connection* 2:

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

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : Fcname
    Link-local IPv6 Address . . . . . : fe80::78f3:ba61:5d0f:5b6b%9
    IPv4 Address. . . . . : 192.168.1.10
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1

Tunnel adapter isatap.Fcname:

    Connection-specific DNS Suffix  . : Fcname
    Link-local IPv6 Address . . . . . : fe80::5efe:192.168.1.10%13
    Default Gateway . . . . . :

Ethernet adapter Ethernet 3:

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

Ethernet adapter Bluetooth Network Connection:

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

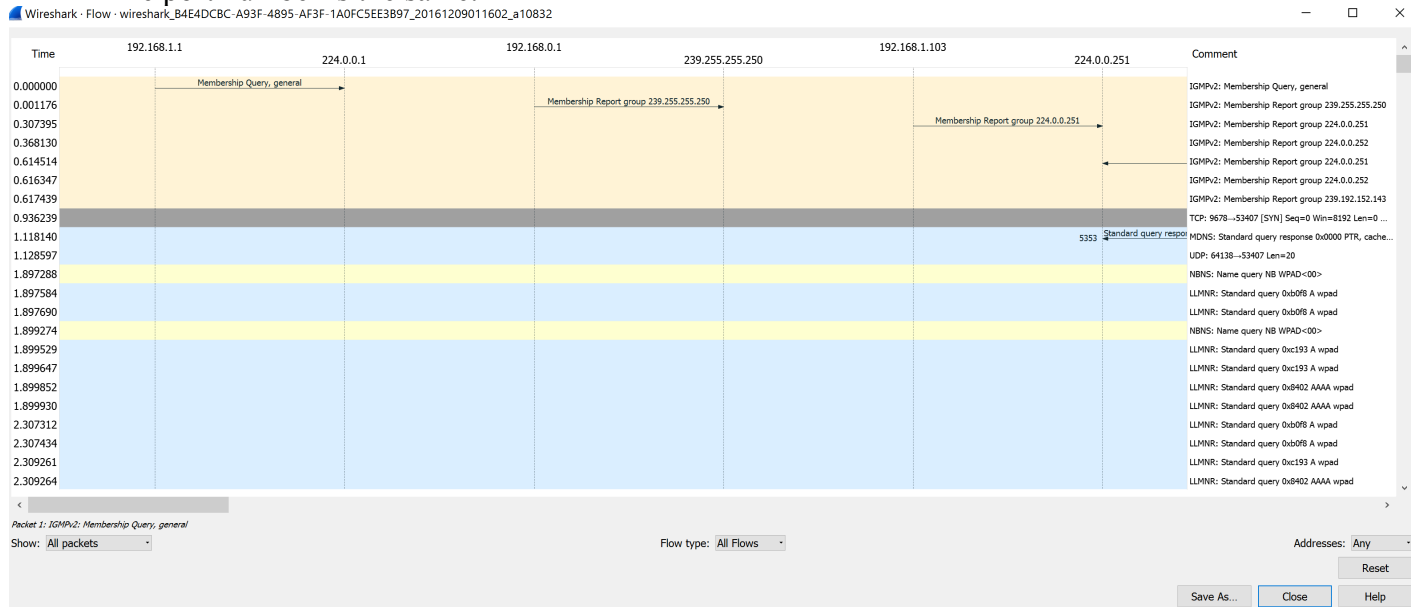
Tunnel adapter Local Area Connection* 4:

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

C:\Windows\System32>
```

- 1. Are DHCP messages sent over UDP or TCP?**  
DHCP message sent via UDP
- 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?**

The port number is the same.



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

The ethernet address host: c8:ff:28:b5:42:55

Wireshark capture of a DHCP Discover message. The packet list shows a DHCP Discover from 0.0.0.0 to 255.255.255.255. The packet details pane shows Ethernet II, Internet Protocol Version 4, User Datagram Protocol, and Bootstrap Protocol (Discover). The packet bytes pane shows the raw data of the DHCP Discover message.

No.	Time	Source	Destination	Protocol	Length	Info
39	12.648940	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x68e44332
40	12.653649	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0x68e44332
41	12.654048	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0x68e44332
42	12.665238	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x68e44332
271	13.843690	192.168.0.1	255.255.255.255	DHCP	318	DHCP Offer - Transaction ID 0x68e44332
692	24.372634	192.168.1.10	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x3f5a5f99
693	24.383838	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x3f5a5f99

Frame 39: 342 bytes on wire (2736 bits) captured (2736 bits) on interface 0  
Ethernet II, Src: LiteonTe\_b5:42:55 (c8:ff:28:b5:42:55), Dst: Broadcast (ff:ff:ff:ff:ff:ff)  
Destination: Broadcast (ff:ff:ff:ff:ff:ff)  
Source: LiteonTe\_b5:42:55 (c8:ff:28:b5:42:55)  
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  
Source Port: 68  
Destination Port: 67  
Length: 308  
Checksum: 0x42c3 [unverified]  
[Checksum Status: Unverified]  
[Stream Index: 10]  
Bootstrap Protocol (Discover)

0020 ff ff 00 44 00 43 01 34 42 c3 01 01 06 00 68 e4 ..D.C.4.B....h.  
0030 43 32 00 00 00 00 00 00 00 00 00 00 00 00 00 00 C2.....  
0040 00 00 00 00 00 00 c8 ff 28 b5 42 55 00 00 00 00 .....(.BU....  
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 .....  
0070 00 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 00 .....  
0090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
User Datagram Protocol (udp), 8 bytes  
Packets: 1566 · Displayed: 13 (0.8%) · Dropped: 0 (0.0%) · Profile: Default

### 4. What values in the DHCP discover message differentiate this message from the DHCP request message?

DHCP message type

Wireshark capture of a DHCP Discover message. The packet list shows a DHCP Discover from 0.0.0.0 to 255.255.255.255. The packet details pane shows Hardware address length, Transaction ID, Seconds elapsed, Bootp flags, Client IP address, Your (client) IP address, Next server IP address, Relay agent IP address, Client MAC address, Client hardware address padding, Server host name, Boot file name, Magic cookie, and DHCP Message Type (Discover). The packet bytes pane shows the raw data of the DHCP Discover message.

No.	Time	Source	Destination	Protocol	Length	Info
39	12.648940	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x68e44332
40	12.653649	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0x68e44332
41	12.654048	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0x68e44332
42	12.665238	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x68e44332
271	13.843690	192.168.0.1	255.255.255.255	DHCP	318	DHCP Offer - Transaction ID 0x68e44332
692	24.372634	192.168.1.10	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x3f5a5f99
693	24.383838	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x3f5a5f99

Hardware address length: 6  
Hops: 0  
Transaction ID: 0x68e44332  
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: LiteonTe\_b5:42:55 (c8:ff:28:b5:42:55)  
Client hardware address padding: 00000000000000000000  
Server host name not given  
Boot file name not given  
Magic cookie: DHCP  
Option: (3) DHCP Message Type (Discover)  
Option: (61) Client identifier  
Option: (50) Requested IP address  
Option: (12) Host Name  
Option: (60) Vendor class identifier  
Option: (55) Parameter Request List  
Option: (255) End  
Padding: 0000000000000000

00e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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 b5 01 01 3d 07 01 .....c.Sc5...  
0120 c8 ff 28 b5 42 55 32 04 c0 a8 01 0a 0c 07 44 45 ..(.BU2....DE  
0130 4c 4c 2d 50 43 3c 08 4d 53 46 54 20 35 2e 30 37 LL-PC<M SFT 5.07  
0140 0d 01 03 06 0f 1f 21 2b 2c 2e 2f 79 f9 fc ff 00 .....lt../y....  
0150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
Bootstrap/Dhcp option type (bootp.option.type), 3 bytes  
Packets: 1566 · Displayed: 13 (0.8%) · Dropped: 0 (0.0%) · Profile: Default

### 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?

DHCP message type

First set: Transaction ID: 0x68e44332

Second set: Transaction ID: 0xa428ffd2

Wireshark packet capture showing DHCP transactions. The packet list shows a sequence of DHCP messages with Transaction IDs 0x68e44332 and 0xa428ffd2. The packet details pane shows the structure of a DHCP Discover message. The packet bytes pane shows the raw data of the first packet.

No.	Time	Source	Destination	Protocol	Length	Info
39	12.648940	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x68e44332
40	12.653649	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0x68e44332
41	12.654048	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0x68e44332
42	12.665238	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x68e44332
271	13.843690	192.168.0.1	255.255.255.255	DHCP	318	DHCP Offer - Transaction ID 0x68e44332
692	24.372634	192.168.1.10	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x3f5a5f99
693	24.383838	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x3f5a5f99
772	36.590530	192.168.1.10	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0x1aaaf160
893	45.208096	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa428ffd2
894	45.212192	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0xa428ffd2
895	45.213323	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0xa428ffd2

Length: 308  
Checksum: 0x4ade [unverified]  
[Checksum Status: Unverified]  
[Stream index: 10]

▼ Bootstrap Protocol (Discover)  
Message type: Boot Request (1)  
Hardware type: Ethernet (0x01)  
Hardware address length: 6  
Hops: 0  
Transaction ID: 0xa428ffd2  
Seconds elapsed: 0  
Boot 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: LiteonTe\_b5:42:55 (c8:ff:28:b5:42:55)  
Client hardware address padding: 00000000000000000000  
Server host name not given

0020 ff ff 00 44 00 43 01 34 4a de 01 01 06 00 a4 28 ...D.C.4 J....  
0030 ff d2 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...  
0040 00 00 00 00 00 00 c8 ff 28 b5 42 55 00 00 00 00 ... (.BU...  
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 ...  
0070 00 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 00 ...  
0090 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...

Transaction ID (bootp.id), 4 bytes

Packets: 1566 · Displayed: 13 (0.8%) · Dropped: 0 (0.0%) Profile: Default

The purpose is for the host to differentiate between different requests from user.

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.

39	12.648940	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover	- Transaction ID 0x68e44332
40	12.653649	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer	- Transaction ID 0x68e44332
41	12.654048	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request	- Transaction ID 0x68e44332
42	12.665238	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK	- Transaction ID 0x68e44332

7. What is the IP address of your 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.

IP: 192.168.1.10

No.	Time	Source	Destination	Protocol	Length	Info
39	12.648940	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x68e44332
40	12.653649	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0x68e44332
41	12.654048	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0x68e44332
42	12.665238	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x68e44332
271	13.843690	192.168.0.1	255.255.255.255	DHCP	318	DHCP Offer - Transaction ID 0x68e44332
692	24.372634	192.168.1.10	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x3f5a5f99
693	24.383838	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x3f5a5f99
772	36.590530	192.168.1.10	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0x1aaaf160
893	45.208096	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa428ffd2
894	45.212192	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0xa428ffd2
895	45.213323	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0xa428ffd2

Bootstrap Protocol (Offer)	
Message type:	Boot Reply (2)
Hardware type:	Ethernet (0x01)
Hardware address length:	6
Hops:	0
Transaction ID:	0x68e44332
Seconds elapsed:	0
Bootp flags:	0x0000 (Unicast)
Client IP address:	0.0.0.0
Your (client) IP address:	192.168.1.10
Next server IP address:	0.0.0.0
Relay agent IP address:	0.0.0.0
Client MAC address:	LiteonTe_b5:42:55 (c8:ff:28:b5:42:55)
Client hardware address padding:	00000000000000000000
Server host name:	not given
Boot file name:	not given

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?

The value that indicate no relay agents is 0.0.0.0

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

The router line indicates to the client what its default gateway should be. The subnet mask line tells the client which subnet mask it should use.

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?

The client accepts the ip address.

Requested IP Address: 192.168.1.10

\*Wi-Fi

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter: <Ctrl-F>

No.	Time	Source	Destination	Protocol	Length	Info
39	12.648940	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x68e44332
40	12.653649	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0x68e44332
41	12.654048	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0x68e44332
42	12.665238	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x68e44332
271	13.843690	192.168.0.1	255.255.255.255	DHCP	318	DHCP Offer - Transaction ID 0x68e44332
692	24.372634	192.168.1.10	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x3f5a5f99
693	24.383838	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x3f5a5f99
772	36.590530	192.168.1.10	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0x1aaaf160
893	45.208096	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa428ff02
894	45.212192	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0xa428ff02
895	45.213323	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0xa428ff02

Length: 1  
DHCP: Request (3)

- Option: (61) Client identifier  
Length: 7  
Hardware type: Ethernet (0x01)  
Client MAC address: LiteonTe\_b5:42:55 (c8:ff:28:b5:42:55)
- Option: (50) Requested IP Address  
Length: 4  
**Requested IP Address: 192.168.1.10**
- Option: (54) DHCP Server Identifier  
Length: 4  
DHCP Server Identifier: 192.168.1.1
- Option: (12) Host Name  
Length: 7  
Host Name: DELL-PC
- Option: (81) Client Fully Qualified Domain Name  
Length: 10  
Flags: 0x00  
A-RR result: 0

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 00 63 82 53 63 35 01 03 3d 07 01 .....c.SCS...  
0120 c8 ff 28 b5 42 55 32 04 40 ab 01 0a 36 04 c0 a8 ...(.BU2. 6...  
0130 01 01 0c 07 44 45 4c 4c 2d 50 43 51 0a 00 00 00 ...DELL-PCQ...  
0140 44 45 4c 4c 2d 50 43 3c 08 4d 53 46 54 20 35 2e DELL-PC .MSFT 5.  
0150 30 37 0d 01 03 06 0f 1f 21 2b 2c 2e 2f 79 f9 fc 07..... !+.,/y..  
0160 ff

Option 50: Requested IP Address (bootp.option.requested\_ip\_address), 4 bytes

Packets: 1566 · Displayed: 13 (0.8%) · Dropped: 0 (0.0%) Profile: Default

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

How long they can use the address assigned by the server before they will have to be assigned a new one.

Lease time is 28800s (8 hours)

\*Wi-Fi

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter: <Ctrl-F>

Packet list: Narrow & Wide Case sensitive Display filter Find Cancel

No.	Time	Source	Destination	Protocol	Length	Info
39	12.648940	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x68e44332
40	12.653649	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0x68e44332
41	12.654048	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0x68e44332
42	12.665238	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x68e44332
271	13.843690	192.168.0.1	255.255.255.255	DHCP	318	DHCP Offer - Transaction ID 0x68e44332
692	24.372634	192.168.1.10	192.168.1.1	DHCP	342	DHCP Request - Transaction ID 0x3f5a5f99
693	24.383838	192.168.1.1	192.168.1.10	DHCP	590	DHCP ACK - Transaction ID 0x3f5a5f99
772	36.590530	192.168.1.10	192.168.1.1	DHCP	342	DHCP Release - Transaction ID 0x1aaaf160
893	45.208096	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0xa428ff02
894	45.212192	192.168.1.1	192.168.1.10	DHCP	590	DHCP Offer - Transaction ID 0xa428ff02
895	45.213323	0.0.0.0	255.255.255.255	DHCP	353	DHCP Request - Transaction ID 0xa428ff02

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

Option: (58) Renewal Time Value  
Length: 4  
Renewal Time Value: (14400s) 4 hours

Option: (59) Rebinding Time Value  
Length: 4  
Rebinding Time Value: (25200s) 7 hours

Option: (51) IP Address Lease Time  
Length: 4  
**IP Address Lease Time: (28800s) 8 hours**

Option: (1) Subnet Mask  
Length: 4  
Subnet Mask: 255.255.255.0

Option: (3) Router  
Length: 4  
Router: 192.168.1.1

0000 c8 ff 28 b5 42 55 78 44 76 56 fd 9f 08 00 45 00 ...(.BUXD vV...E.  
0010 02 40 00 00 00 00 40 11 f5 51 c0 a8 01 01 c0 a8 .@...@. .Q.....  
0020 01 0a 00 43 00 44 02 2c 1c 7c 02 01 06 00 68 e4 ...C.D., .|...h.  
0030 43 32 00 00 00 00 00 00 00 c0 a8 01 0a 00 00 C2.....  
0040 00 00 00 00 00 c8 ff 28 b5 42 55 00 00 00 00 ..... (.BU...  
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 .....  
00b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
00c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
00d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
00e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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 00 00 00 00 00 00 00 00 00 .....  
0120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0130 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0140 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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 .....  
0190 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
01a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
01b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
01c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
01d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
01e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
01f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0200 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0210 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0220 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0230 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0240 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0250 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0260 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0270 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0280 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0290 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
02a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
02b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
02c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
02d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
02e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
02f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0300 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0310 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0320 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0330 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0340 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0350 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0360 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0370 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0380 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0390 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
03a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
03b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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03d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
03e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
03f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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0490 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
04a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
04b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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0690 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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06c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
06d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
06e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
06f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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0770 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0780 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0790 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
07a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
07b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
07c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
07d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
07e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
07f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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0810 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0820 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0830 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
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0870 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0880 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0890 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
08a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
08b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
08c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
08d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
08e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
08f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0900 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0910 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0920 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0930 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0940 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0950 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0960 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0970 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0980 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0990 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
09a0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
09b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
09c0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
09d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
09e0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
09f0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0a00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0a10 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....  
0a20

**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?**

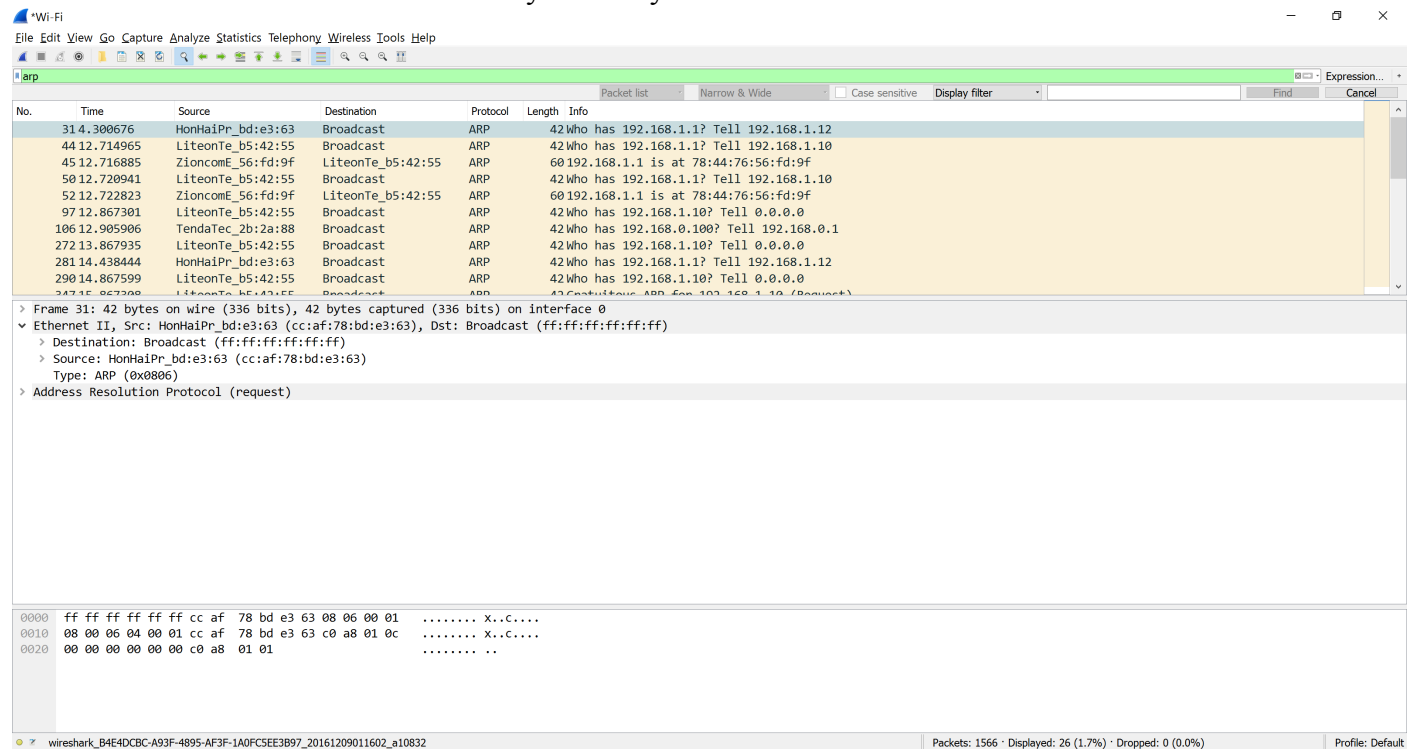
The purpose is to release the IP address back to the server.

The DHCP server does not send a message back to the client acknowledging the DHCP Release message.

If the DHCP Release message from the client is lost, the DHCP server would have to wait until the lease period is over for that IP address until it could reuse it for another client.

**14. Clear the bootp filter from your Wireshark window. Were any ARP packets sent or received during the DHCP packet-exchange period? If so, explain the purpose of those ARP packets.**

Yes. Before offering an IP address to a client, the DHCP server issues an ARP request for the offered IP to make sure the IP address is not already in use by another workstation.



The screenshot shows the Wireshark interface with a packet capture filter set to 'arp'. The packet list displays several ARP requests from the client (HonHaiPr\_bd:e3:63) to the broadcast address (ff:ff:ff:ff:ff:ff). The selected packet (No. 31) is an ARP request for the IP address 192.168.1.10. The packet details pane shows the Ethernet II header, the destination and source MAC addresses, and the ARP request structure. The packet bytes pane shows the raw data in hexadecimal and ASCII.

No.	Time	Source	Destination	Protocol	Length	Info
31	4.300676	HonHaiPr_bd:e3:63	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.12
44	12.714965	LiteonTe_b5:42:55	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.10
45	12.716885	ZioncomE_56:fd:9f	LiteonTe_b5:42:55	ARP	60	192.168.1.1 is at 78:44:76:56:fd:9f
50	12.720941	LiteonTe_b5:42:55	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.10
52	12.722823	ZioncomE_56:fd:9f	LiteonTe_b5:42:55	ARP	60	192.168.1.1 is at 78:44:76:56:fd:9f
97	12.867301	LiteonTe_b5:42:55	Broadcast	ARP	42	Who has 192.168.1.10? Tell 0.0.0.0
106	12.905906	TendaTec_2b:2a:88	Broadcast	ARP	42	Who has 192.168.0.100? Tell 192.168.0.1
272	13.867935	LiteonTe_b5:42:55	Broadcast	ARP	42	Who has 192.168.1.10? Tell 0.0.0.0
281	14.438444	HonHaiPr_bd:e3:63	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.12
290	14.867599	LiteonTe_b5:42:55	Broadcast	ARP	42	Who has 192.168.1.10? Tell 0.0.0.0
347	15.867398	LiteonTe_b5:42:55	Broadcast	ARP	42	Who has 192.168.1.10? Tell 0.0.0.0

Frame 31: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface 0  
Ethernet II, Src: HonHaiPr\_bd:e3:63 (cc:af:78:bd:e3:63), Dst: Broadcast (ff:ff:ff:ff:ff:ff)  
Destination: Broadcast (ff:ff:ff:ff:ff:ff)  
Source: HonHaiPr\_bd:e3:63 (cc:af:78:bd:e3:63)  
Type: ARP (0x0806)  
Address Resolution Protocol (request)

```
0000  ff ff ff ff ff cc af 78 bd e3 63 08 06 00 01  ....X..C....
0010  08 00 06 04 00 01 cc af 78 bd e3 63 c0 a8 01 0c  ....X..C....
0020  00 00 00 00 00 00 c0 a8 01 01  ....X..C....
```