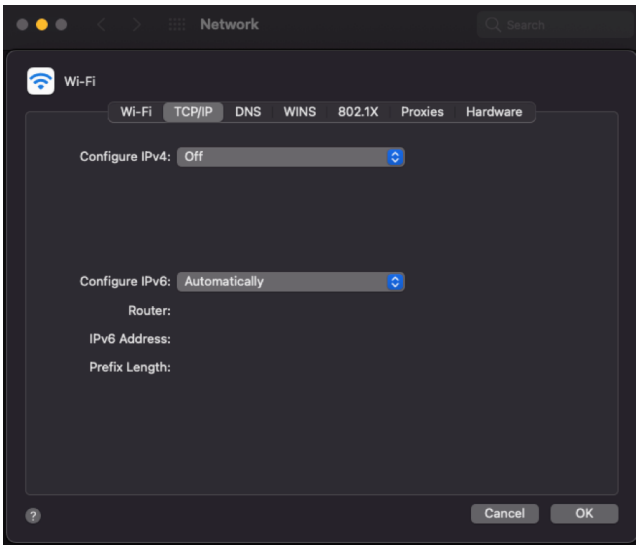
EE 450

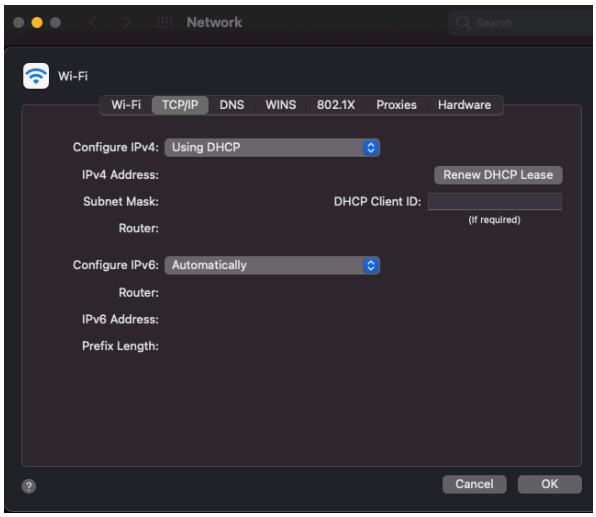
Lab #1

Name: Shih-Ju Hsu

- release IP address

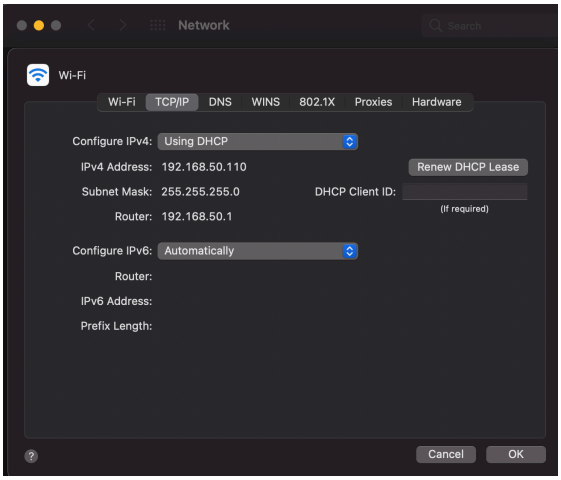


- renew IP address



- second renew

(Renew DHCP Lease)



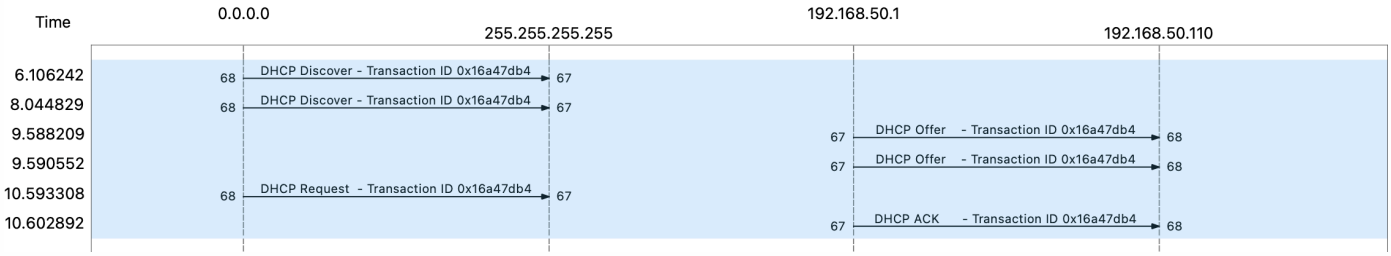
(1)

DHCP messages are sent over UDP

```
No.     Time           Source                Destination           Protocol Length Info
     23 6.106242       0.0.0.0               255.255.255.255       DHCP     342    DHCP
Discover - Transaction ID 0x16a47db4
Frame 23: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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)
No.     Time           Source                Destination           Protocol Length Info
     29 8.044829       0.0.0.0               255.255.255.255       DHCP     342    DHCP
Discover - Transaction ID 0x16a47db4
Frame 29: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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)
No.     Time           Source                Destination           Protocol Length Info
     48 9.588209       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 48: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
No.     Time           Source                Destination           Protocol Length Info
     65 9.590552       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 65: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
No.     Time           Source                Destination           Protocol Length Info
     83 10.593308      0.0.0.0               255.255.255.255       DHCP     342    DHCP Request
- Transaction ID 0x16a47db4
Frame 83: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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 (Request)
No.     Time           Source                Destination           Protocol Length Info
     85 10.602892      192.168.50.1          192.168.50.110        DHCP     342    DHCP ACK
- Transaction ID 0x16a47db4
Frame 85: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (ACK)
```

(2)

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



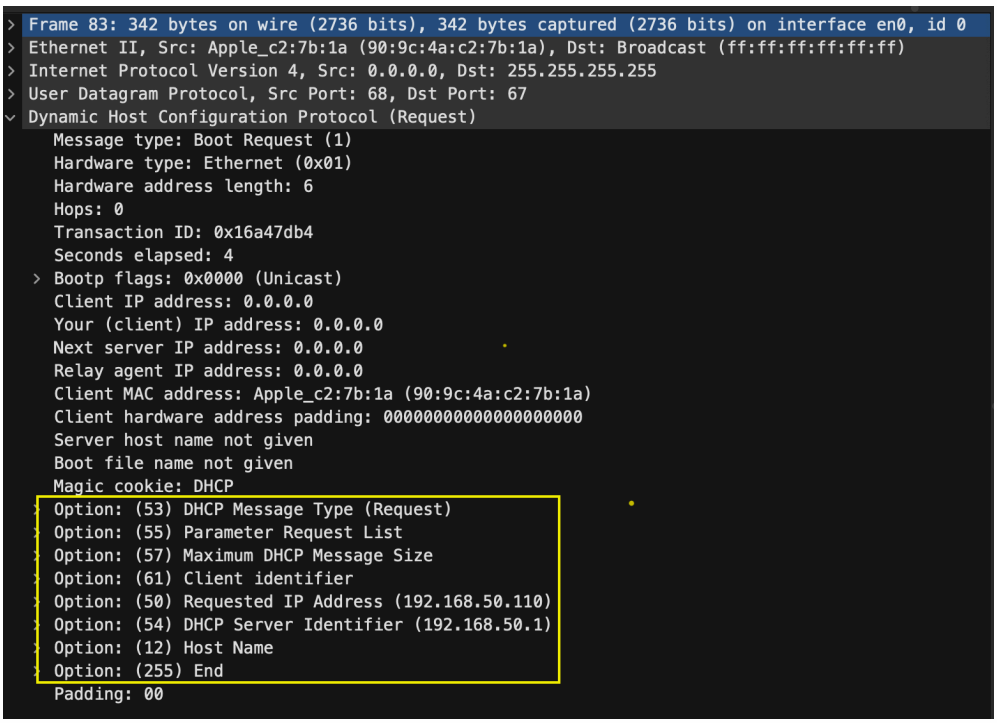
(3)

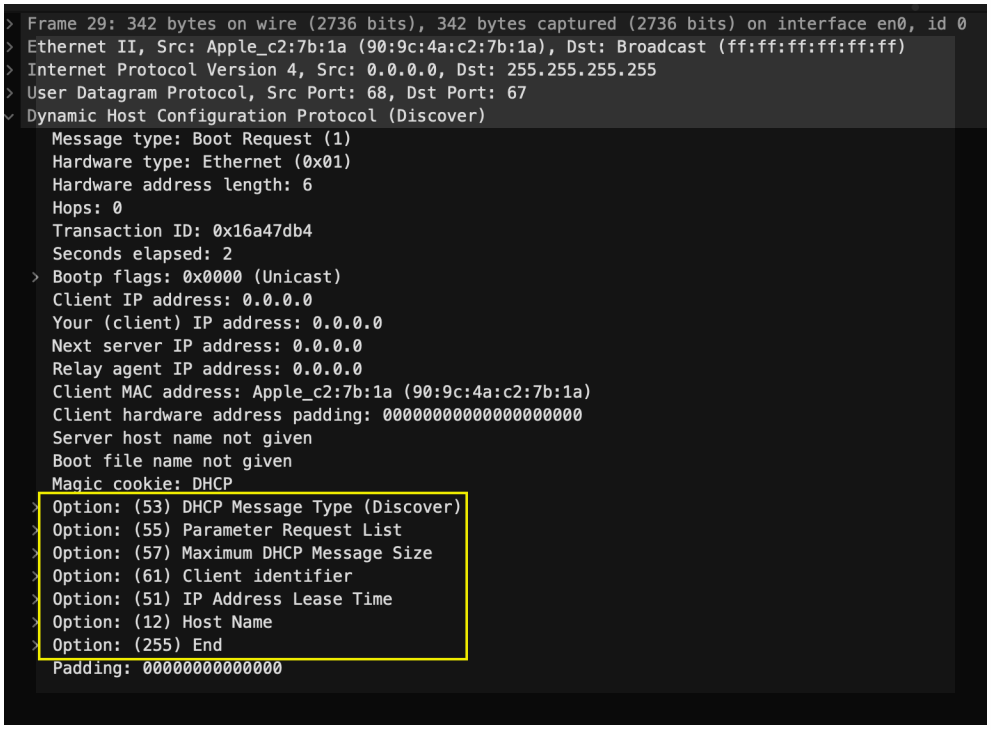
The link-layer address of my host is **Apple_c2:7b:1a (90:9c:4a:c2:7b:1a)**.

```
No.     Time           Source                Destination           Protocol Length Info
     23 6.106242       0.0.0.0               255.255.255.255       DHCP     342    DHCP
Discover - Transaction ID 0x16a47db4
Frame 23: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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)
```

(4)

The **DHCP Message Type** are different. Also, the DHCP request message includes the information of **Requested IP Address** and **DHCP Server Identifier** while the DHCP discover message doesn't.





(5)

- First DHCP Transaction ID: 0x16a47db4

```
No.     Time           Source                Destination           Protocol Length Info
     23 6.106242       0.0.0.0               255.255.255.255       DHCP     342    DHCP
Discover - Transaction ID 0x16a47db4
Frame 23: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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)
No.     Time           Source                Destination           Protocol Length Info
     29 8.044829       0.0.0.0               255.255.255.255       DHCP     342    DHCP
Discover - Transaction ID 0x16a47db4
Frame 29: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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)
No.     Time           Source                Destination           Protocol Length Info
     48 9.588209       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 48: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
No.     Time           Source                Destination           Protocol Length Info
     65 9.590552       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 65: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
No.     Time           Source                Destination           Protocol Length Info
     83 10.593308      0.0.0.0               255.255.255.255       DHCP     342    DHCP Request
- Transaction ID 0x16a47db4
Frame 83: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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 (Request)
No.     Time           Source                Destination           Protocol Length Info
     85 10.602892      192.168.50.1          192.168.50.110        DHCP     342    DHCP ACK
- Transaction ID 0x16a47db4
Frame 85: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (ACK)
```

- Second DHCP Transaction ID: 0x87fa7ef

```
No.     Time           Source                Destination           Protocol Length Info
     30 12.879955      0.0.0.0               255.255.255.255       DHCP     342    DHCP Request
- Transaction ID 0x87fa7ef
Frame 30: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
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 (Request)
No.     Time           Source                Destination           Protocol Length Info
     31 12.891290      192.168.50.1          192.168.50.110        DHCP     342    DHCP ACK
- Transaction ID 0x87fa7ef
Frame 31: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (ACK)
```

- The purpose of Transaction ID is used by the client and server to identify the associated DHCP requests and responses.

(6)

- Discover: 0.0.0.0 / 255.255.255.255

```
No.     Time           Source                Destination           Protocol Length Info
     23 6.106242       0.0.0.0               255.255.255.255       DHCP     342    DHCP
Discover - Transaction ID 0x16a47db4
Frame 23: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 328
    Identification: 0xc246 (49734)
    000. .... = Flags: 0x0
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 255
    Protocol: UDP (17)
    Header Checksum: 0xf85e [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 0.0.0.0
    Destination Address: 255.255.255.255
User Datagram Protocol, Src Port: 68, Dst Port: 67
Dynamic Host Configuration Protocol (Discover)
```

- Offer: 192.168.50.1 / 192.168.50.110

```
No.     Time           Source                Destination           Protocol Length Info
     48 9.588209       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 48: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
    Total Length: 328
    Identification: 0xb0c2 (45250)
    000. .... = Flags: 0x0
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 64
    Protocol: UDP (17)
    Header Checksum: 0xe262 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.50.1
    Destination Address: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
```

- Request: 0.0.0.0 / 255.255.255.255

```
No.     Time           Source                Destination           Protocol Length Info
     83 10.593308      0.0.0.0               255.255.255.255       DHCP     342    DHCP Request
- Transaction ID 0x16a47db4
Frame 83: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 328
    Identification: 0xc248 (49736)
    000. .... = Flags: 0x0
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 255
    Protocol: UDP (17)
    Header Checksum: 0xf85c [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 0.0.0.0
    Destination Address: 255.255.255.255
```

- ACK: 192.168.50.1 / 192.168.50.110

```
No.     Time           Source                Destination           Protocol Length Info
     85 10.602892      192.168.50.1          192.168.50.110        DHCP     342    DHCP ACK
- Transaction ID 0x16a47db4
Frame 85: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
    Total Length: 328
    Identification: 0xb281 (45697)
    000. .... = Flags: 0x0
    ...0 0000 0000 0000 = Fragment Offset: 0
    Time to Live: 64
    Protocol: UDP (17)
    Header Checksum: 0xe0a3 [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 192.168.50.1
    Destination Address: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (ACK)
```

(7)

The IP address of my DHCP server is **192.168.50.1**.

```
No.     Time           Source                Destination           Protocol Length Info
     48 9.588209       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 48: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
```

(8)

- DHCP server offers **192.168.50.110** to my host in DHCP Offer message.

```
No.     Time           Source                Destination           Protocol Length Info
     48 9.588209       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 48: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
    Message type: Boot Reply (2)
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x16a47db4
    Seconds elapsed: 0
    Bootp flags: 0x0000 (Unicast)
    Client IP address: 0.0.0.0
    Your (client) IP address: 192.168.50.110
    Next server IP address: 192.168.50.1
    Relay agent IP address: 0.0.0.0
```

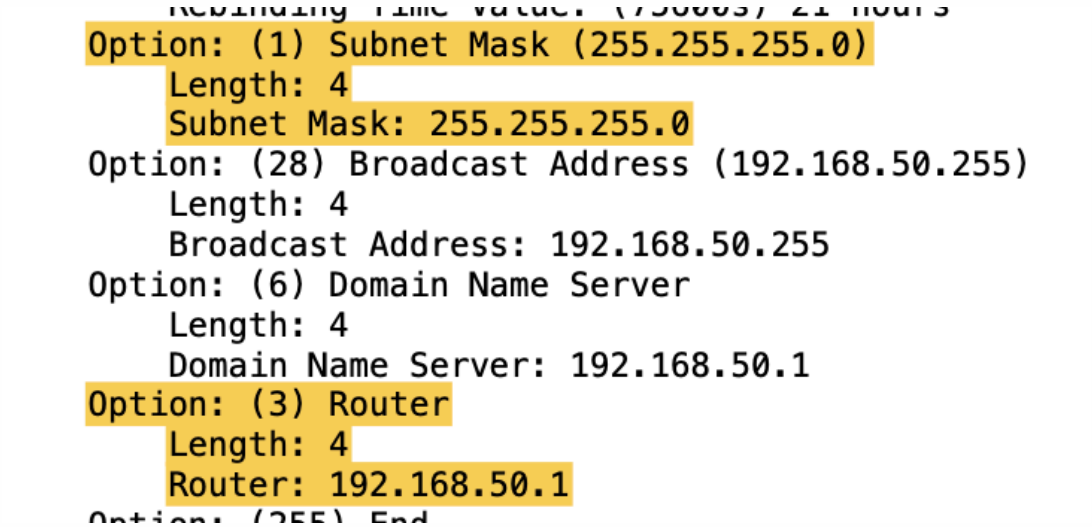
(9)

In the example screenshot, the IP address is **0.0.0.0**. In my experiment, the relay agent IP address is also **0.0.0.0**. Therefore, there is no relay agent in my experiment.

```
No.     Time           Source                Destination           Protocol Length Info
     48 9.588209       192.168.50.1          192.168.50.110        DHCP     342    DHCP Offer
- Transaction ID 0x16a47db4
Frame 48: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Apple_c2:7b:1a (90:9c:4a:c2:7b:
1a)
Internet Protocol Version 4, Src: 192.168.50.1, Dst: 192.168.50.110
User Datagram Protocol, Src Port: 67, Dst Port: 68
Dynamic Host Configuration Protocol (Offer)
    Message type: Boot Reply (2)
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x16a47db4
    Seconds elapsed: 0
    Bootp flags: 0x0000 (Unicast)
    Client IP address: 0.0.0.0
    Your (client) IP address: 192.168.50.110
    Next server IP address: 192.168.50.1
    Relay agent IP address: 0.0.0.0
    Client MAC address: Apple_c2:7b:1a (90:9c:4a:c2:7b:1a)
    Client hardware address padding: 00000000000000000000
```

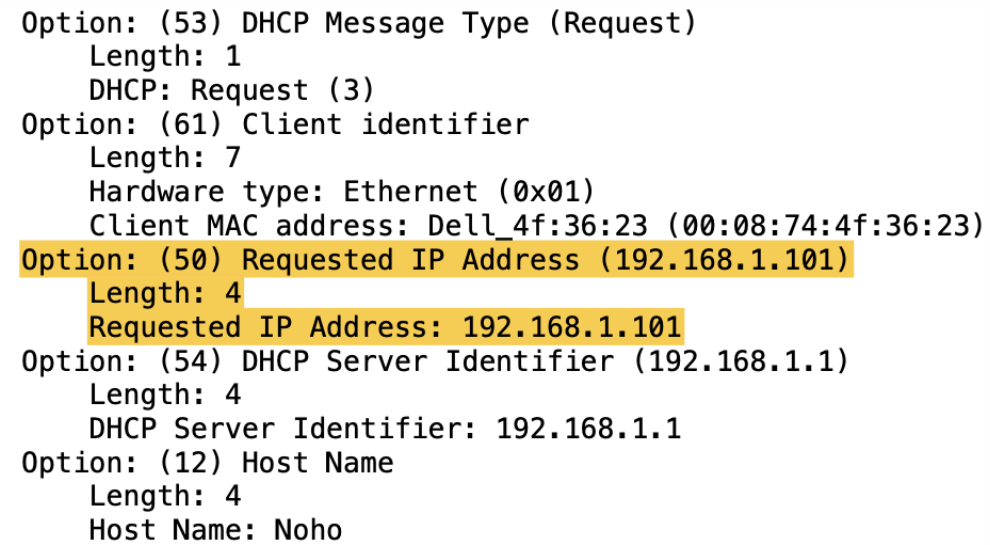
(10)

- The router line is to tell the client the IP address of the default gateway, which helps the client to transmit packets to the destination outside of the local network.
- The subnet mask line is to tell the client the subnet mask should be used. It helps the client to tell which part of the IP address belongs to the device and which part belongs to the network.



(11)

Yes. The client accepted the offered IP address. The client's requested IP address (192.168.1.101) is in "Option: Requested IP Address" of the DHCP request message.



(12)

- The purpose of the lease time is to tell the client how long will the assigned IP address be expired.
- In my experiment, the lease time is **1day**.

```
Option: (51) IP Address Lease Time
    Length: 4
    IP Address Lease Time: (86400s) 1 day
```

(13)

- The DHCP release message is the request by the client to release the IP address and return to the server.
- No. The DHCP server does not issue any acknowledgement of receipt of the client's DHCP request to the client. There is no verification of DHCP release message has been received.
- The server will not assign the IP address to others until the IP address expired. (ruuning out of the lease time)

(14)

Yes. There are broadcast ARP packets sent during the DHCP packet-exchange period. The purpose of the ARP packets is to make sure no other devices using the same IP address. If no devices have taken the IP address, the server will acknowledge the client's request.

```
No.     Time           Source                Destination           Protocol Length Info
     27 7.168267       ASUSTekC_91:2d:58     Broadcast             ARP      42     Who has
192.168.50.110? Tell 192.168.50.1
Frame 27: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface en0, id 0
Ethernet II, Src: ASUSTekC_91:2d:58 (c8:7f:54:91:2d:58), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)
```