山东大学 计算机 学院

计算机网络 课程实验报告

学号：	姓名：	班级：
实验题目： 实验六 DHCP		
实验学时：2h	实验日期： 2023.04.03	
实验目的： 学习掌握 DHCP 的相关内容，并了解 IP 地址分配过程。		
硬件环境： Windows10 家庭版		
软件环境： Wireshark		
实验步骤与内容： 实验内容： 1. Are DHCP messages sent over UDP or TCP? 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? 3. What is the link-layer (e.g., Ethernet) address of your host? 4. What values in the DHCP discover message differentiate this message from the DHCP request message? 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? 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. 7. What is the IP address of your DHCP server? 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. 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? 10. Explain the purpose of the router and subnet mask lines in the DHCP offer message. 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?
12. Explain the purpose of the lease time. How long is the lease time in your experiment?
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?
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.

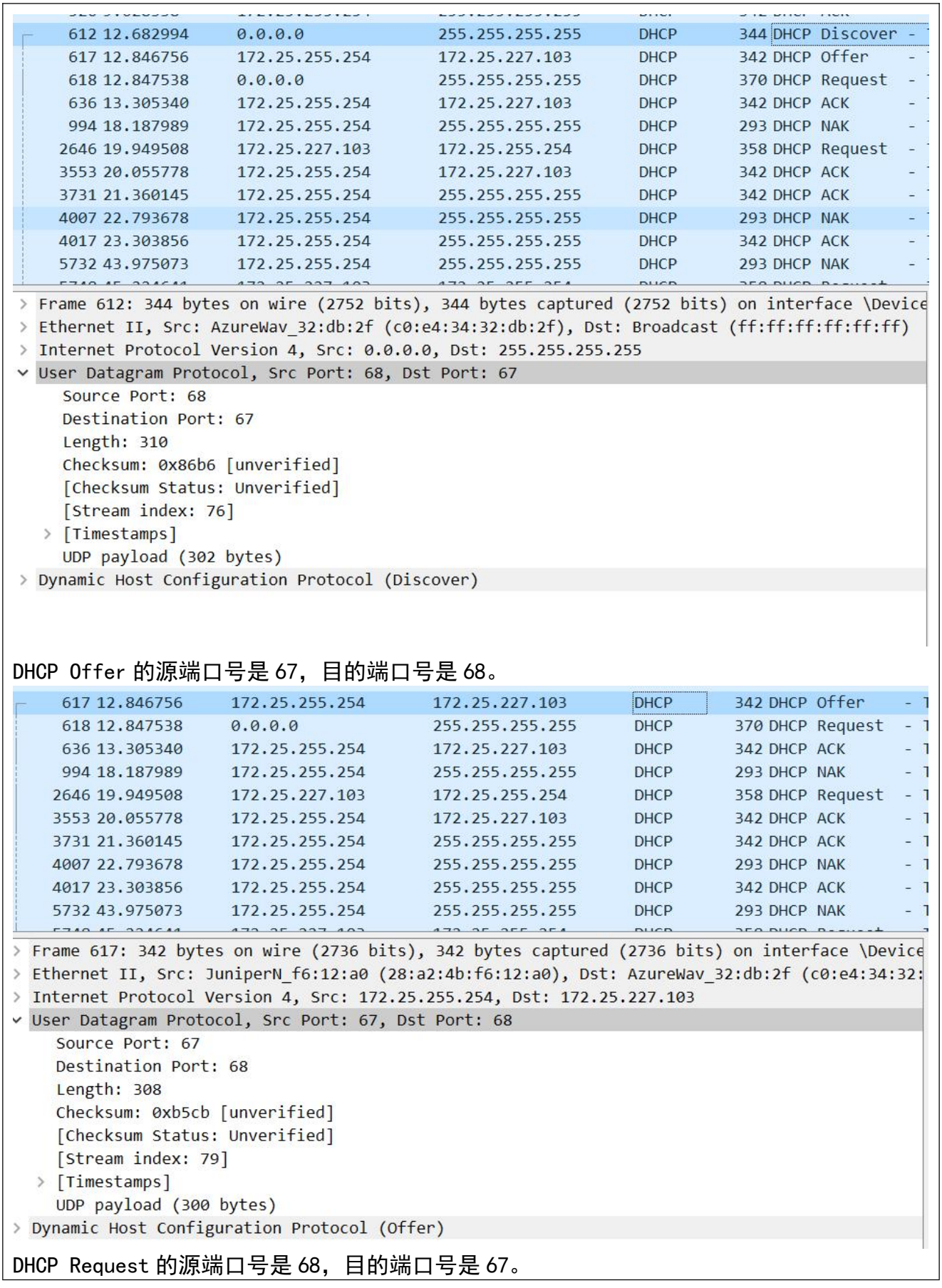
实验步骤：
先打开 CMD 并输入 ipconfig/release 释放当前 IP 地址，之后打开 Wireshark 并开始抓包，在 CMD 中输入 ipconfig/renew 获取新的 IP 地址，待 ipconfig/renew 终止后，再输入 ipconfig/renew，待第二个 ipconfig/renew 终止后，输入 ipconfig/release 释放 IP 地址，最后再输入 ipconfig/renew，并停止数据包捕获。

1. DHCP 的消息是通过 UDP 发送的。

2646	19.949508	172.25.227.103	172.25.255.254	DHCP	358	DHCP Request	- T
3553	20.055778	172.25.255.254	172.25.227.103	DHCP	342	DHCP ACK	- T
3731	21.360145	172.25.255.254	255.255.255.255	DHCP	342	DHCP ACK	- T
4007	22.793678	172.25.255.254	255.255.255.255	DHCP	293	DHCP NAK	- T
4017	23.303856	172.25.255.254	255.255.255.255	DHCP	342	DHCP ACK	- T
5732	43.975073	172.25.255.254	255.255.255.255	DHCP	293	DHCP NAK	- T
5748	45.224641	172.25.227.103	172.25.255.254	DHCP	358	DHCP Request	- T
5749	45.250938	172.25.255.254	172.25.227.103	DHCP	342	DHCP ACK	- T
5841	51.764021	172.25.227.103	172.25.255.254	DHCP	342	DHCP Release	- T
6083	63.134557	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover	- T
6087	63.326211	172.25.255.254	172.25.227.103	DHCP	342	DHCP Offer	- T
6088	63.326887	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request	- T
6098	63.698365	172.25.255.254	172.25.227.103	DHCP	342	DHCP ACK	- T
6358	72.730479	172.25.255.254	255.255.255.255	DHCP	293	DHCP NAK	- T

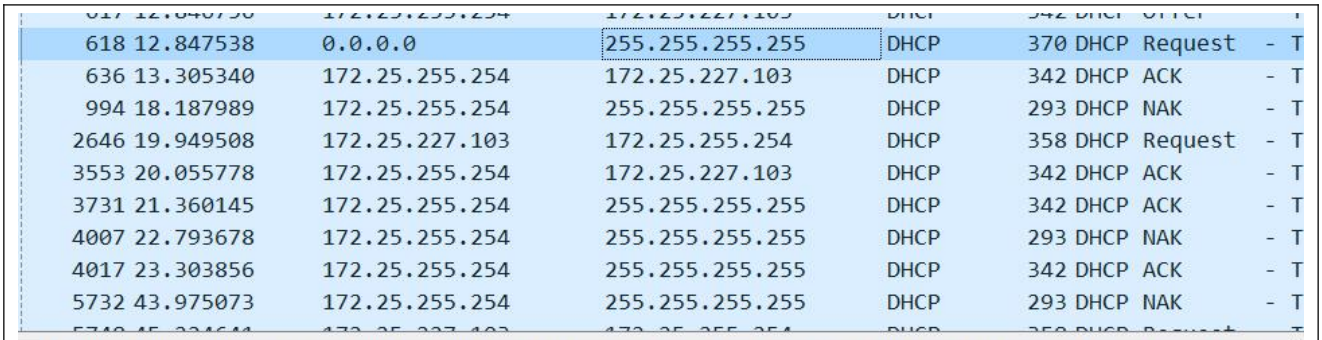
```
Frame 2646: 358 bytes on wire (2864 bits), 358 bytes captured (2864 bits) on interface \Devic
Ethernet II, Src: AzureWav_32:db:2f (c0:e4:34:32:db:2f), Dst: JuniperN_f6:12:a0 (28:a2:4b:f6:
Internet Protocol Version 4, Src: 172.25.227.103, Dst: 172.25.255.254
User Datagram Protocol, Src Port: 68, Dst Port: 67
   Source Port: 68
   Destination Port: 67
   Length: 324
   Checksum: 0xaa11 [unverified]
   [Checksum Status: Unverified]
   [Stream index: 79]
 > [Timestamps]
   UDP payload (316 bytes)
Dynamic Host Configuration Protocol (Request)
```

2. 客户机发送 DHCP Discover，服务器回复 DHCP Offer,客户机发送 DHCP Request,服务器回复 DHCP ACK。
DHCP Discover 的源端口号是 68，目的端口号是 67。



DHCP Offer 的源端口号是 67，目的端口号是 68。

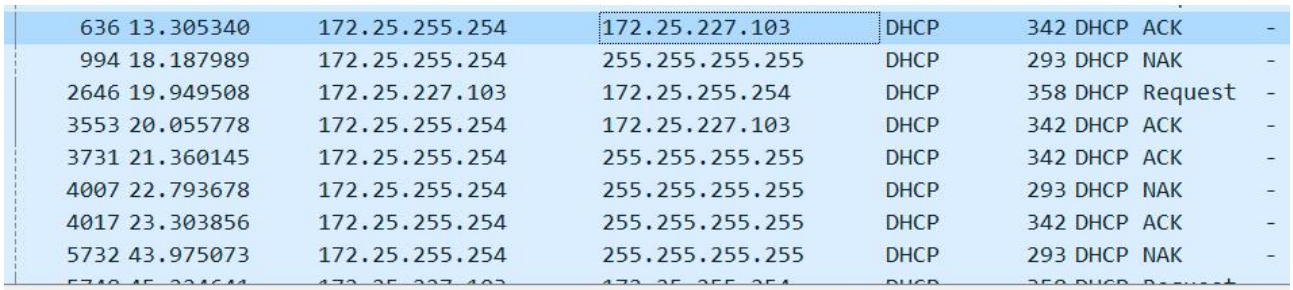
DHCP Request 的源端口号是 68，目的端口号是 67。



618	12.847538	0.0.0.0	255.255.255.255	DHCP	370 DHCP Request - T
636	13.305340	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK - T
994	18.187989	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK - T
2646	19.949508	172.25.227.103	172.25.255.254	DHCP	358 DHCP Request - T
3553	20.055778	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK - T
3731	21.360145	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK - T
4007	22.793678	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK - T
4017	23.303856	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK - T
5732	43.975073	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK - T

```
> Frame 618: 370 bytes on wire (2960 bits), 370 bytes captured (2960 bits) on interface \Device
> Ethernet II, Src: AzureWav_32:db:2f (c0:e4:34:32:db:2f), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
> Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255
v User Datagram Protocol, Src Port: 68, Dst Port: 67
    Source Port: 68
    Destination Port: 67
    Length: 336
    Checksum: 0x6c2d [unverified]
    [Checksum Status: Unverified]
    [Stream index: 76]
  > [Timestamps]
    UDP payload (328 bytes)
> Dynamic Host Configuration Protocol (Request)
```

DHCP ACK 的源端口号是 67，目的端口号是 68



636	13.305340	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK -
994	18.187989	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK -
2646	19.949508	172.25.227.103	172.25.255.254	DHCP	358 DHCP Request -
3553	20.055778	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK -
3731	21.360145	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK -
4007	22.793678	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK -
4017	23.303856	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK -
5732	43.975073	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK -

```
> Frame 636: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Device
> Ethernet II, Src: JuniperN_f6:12:a0 (28:a2:4b:f6:12:a0), Dst: AzureWav_32:db:2f (c0:e4:34:32:
> Internet Protocol Version 4, Src: 172.25.255.254, Dst: 172.25.227.103
v User Datagram Protocol, Src Port: 67, Dst Port: 68
    Source Port: 67
    Destination Port: 68
    Length: 308
    Checksum: 0xb2cb [unverified]
    [Checksum Status: Unverified]
    [Stream index: 79]
  > [Timestamps]
    UDP payload (300 bytes)
> Dynamic Host Configuration Protocol (ACK)
```

3. 本机主机链路层地址是 28：a2:4b:f6:12:a0，如下图所示：

```
   617 12.846756     172.25.255.254       172.25.227.103       DHCP      342 DHCP Offer
   618 12.847538     0.0.0.0              255.255.255.255      DHCP      370 DHCP Request
   636 13.305340     172.25.255.254       172.25.227.103       DHCP      342 DHCP ACK
   994 18.187989     172.25.255.254       255.255.255.255      DHCP      293 DHCP NAK
  2646 19.949508     172.25.227.103       172.25.255.254       DHCP      358 DHCP Request
  3553 20.055778     172.25.255.254       172.25.227.103       DHCP      342 DHCP ACK
  3731 21.360145     172.25.255.254       255.255.255.255      DHCP      342 DHCP ACK
  4007 22.793678     172.25.255.254       255.255.255.255      DHCP      293 DHCP NAK
  4017 23.303856     172.25.255.254       255.255.255.255      DHCP      342 DHCP ACK
  5732 43.975073     172.25.255.254       255.255.255.255      DHCP      293 DHCP NAK
```

```
> Frame 617: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Devi
> Ethernet II, Src: JuniperN_f6:12:a0 (28:a2:4b:f6:12:a0), Dst: AzureWav_32:db:2f (c0:e4:34:3
> Internet Protocol Version 4, Src: 172.25.255.254, Dst: 172.25.227.103
v User Datagram Protocol, Src Port: 67, Dst Port: 68
    Source Port: 67
    Destination Port: 68
    Length: 308
    Checksum: 0xb5cb [unverified]
    [Checksum Status: Unverified]
    [Stream index: 79]
  > [Timestamps]
    UDP payload (300 bytes)
> Dynamic Host Configuration Protocol (Offer)
```

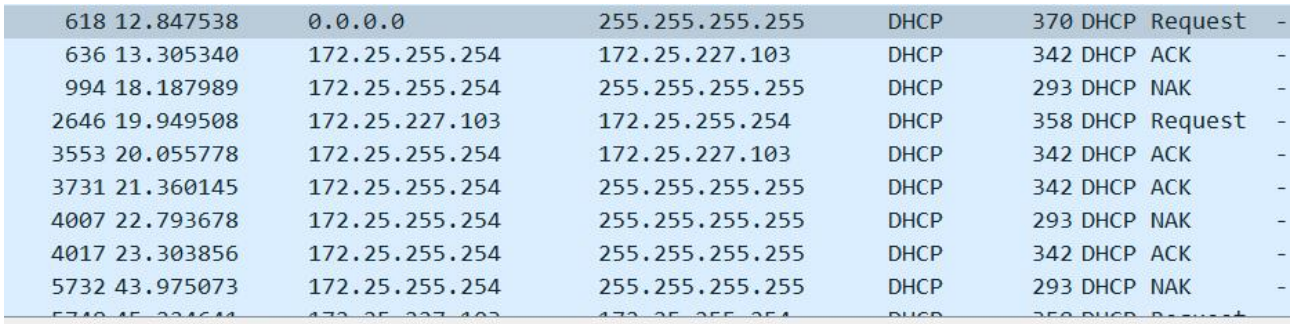
4. 可以从 Option 选项中看出来。

DHCP Discover 中的 Option：

```
   612 12.682994     0.0.0.0              255.255.255.255      DHCP      344 DHCP Discover - T
   617 12.846756     172.25.255.254       172.25.227.103       DHCP      342 DHCP Offer    - T
   618 12.847538     0.0.0.0              255.255.255.255      DHCP      370 DHCP Request  - T
   636 13.305340     172.25.255.254       172.25.227.103       DHCP      342 DHCP ACK      - T
   994 18.187989     172.25.255.254       255.255.255.255      DHCP      293 DHCP NAK      - T
  2646 19.949508     172.25.227.103       172.25.255.254       DHCP      358 DHCP Request  - T
  3553 20.055778     172.25.255.254       172.25.227.103       DHCP      342 DHCP ACK      - T
  3731 21.360145     172.25.255.254       255.255.255.255      DHCP      342 DHCP ACK      - T
  4007 22.793678     172.25.255.254       255.255.255.255      DHCP      293 DHCP NAK      - T
  4017 23.303856     172.25.255.254       255.255.255.255      DHCP      342 DHCP ACK      - T
  5732 43.975073     172.25.255.254       255.255.255.255      DHCP      293 DHCP NAK      - T
```

```
    Relay agent IP address: 0.0.0.0
    Client MAC address: AzureWav_32:db:2f (c0:e4:34:32:db:2f)
    Client hardware address padding: 00000000000000000000
    Server host name not given
    Boot file name not given
    Magic cookie: DHCP
  v Option: (53) DHCP Message Type (Discover)
      Length: 1
      DHCP: Discover (1)
```

DHCP Request 中的 Option：



```
  618 12.847538     0.0.0.0           255.255.255.255     DHCP      370 DHCP Request  -
  636 13.305340     172.25.255.254    172.25.227.103      DHCP      342 DHCP ACK      -
  994 18.187989     172.25.255.254    255.255.255.255     DHCP      293 DHCP NAK      -
 2646 19.949508     172.25.227.103    172.25.255.254      DHCP      358 DHCP Request  -
 3553 20.055778     172.25.255.254    172.25.227.103      DHCP      342 DHCP ACK      -
 3731 21.360145     172.25.255.254    255.255.255.255     DHCP      342 DHCP ACK      -
 4007 22.793678     172.25.255.254    255.255.255.255     DHCP      293 DHCP NAK      -
 4017 23.303856     172.25.255.254    255.255.255.255     DHCP      342 DHCP ACK      -
 5732 43.975073     172.25.255.254    255.255.255.255     DHCP      293 DHCP NAK      -
```

```
Client MAC address: AzureWav_32:db:2f (c0:e4:34:32:db:2f)
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)
```

5. 前四条消息 ID 为 0xfb36c499, 后四条消息 ID 为 0x63d74b4c，ID 消息的作用是用于确认是哪条请求，与 TCP 的序列号类似。

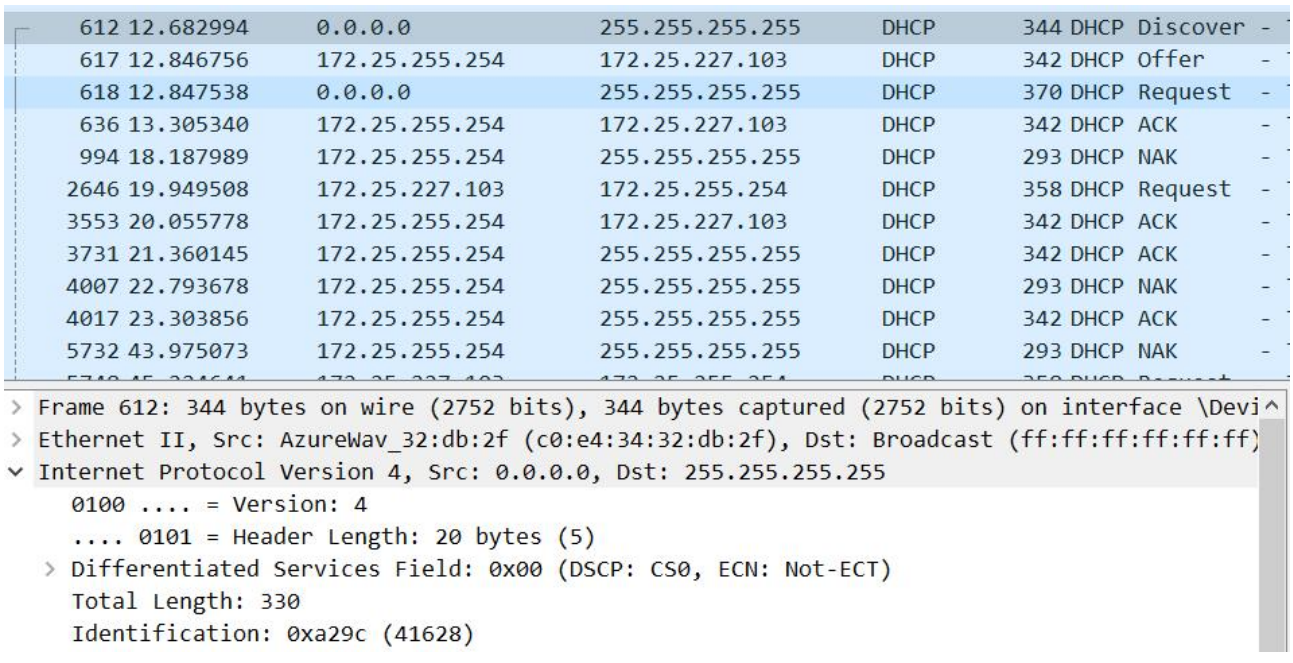
前四条消息 ID

```
 612 12.682994    0.0.0.0          255.255.255.255    DHCP    344 DHCP Discover - Transaction ID 0xfb36c499
 617 12.846756    172.25.255.254   172.25.227.103     DHCP    342 DHCP Offer    - Transaction ID 0xfb36c499
 618 12.847538    0.0.0.0          255.255.255.255    DHCP    370 DHCP Request  - Transaction ID 0xfb36c499
 636 13.305340    172.25.255.254   172.25.227.103     DHCP    342 DHCP ACK      - Transaction ID 0xfb36c499
```

后四条消息 ID

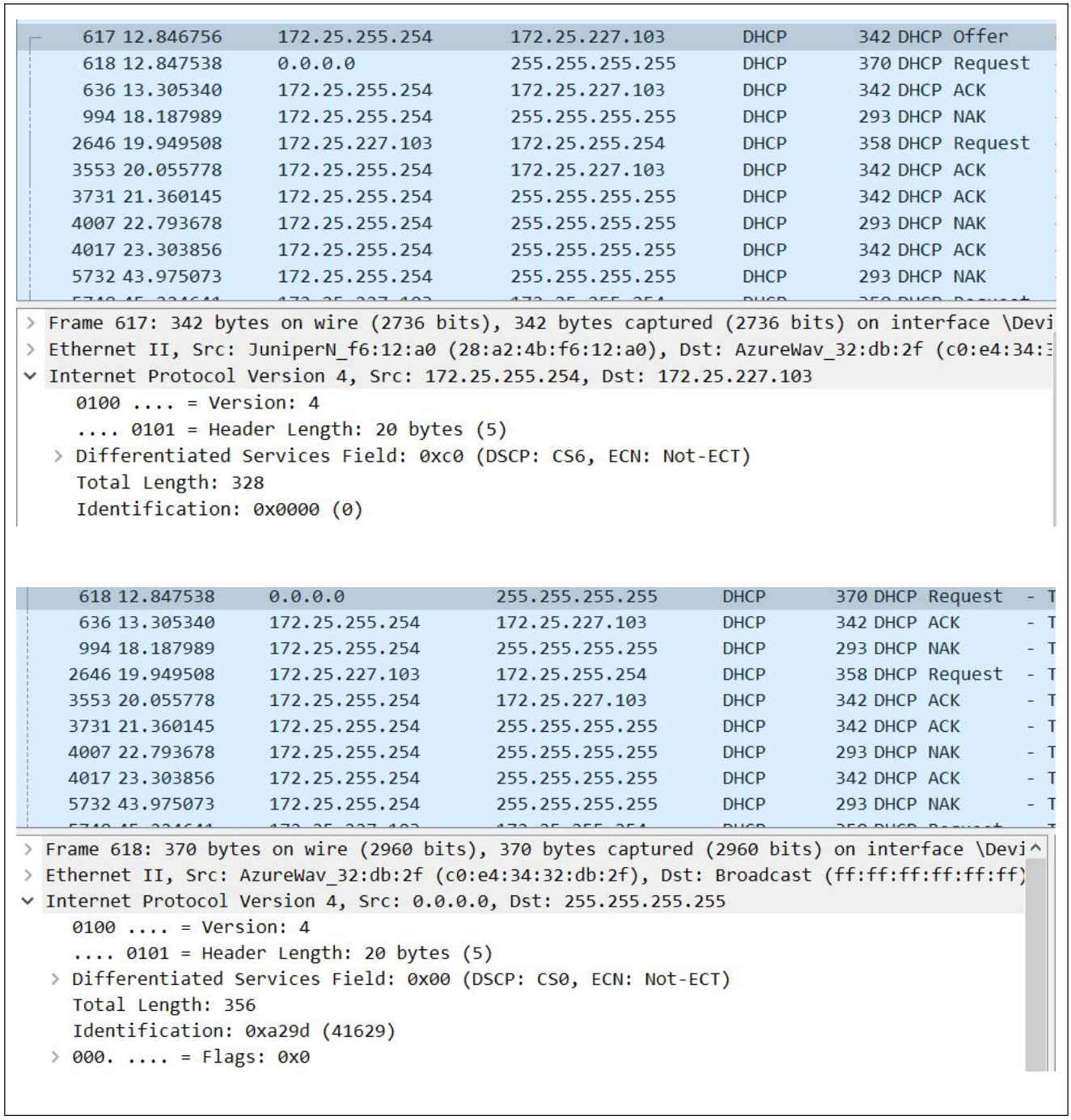
```
6083 63.134557    0.0.0.0          255.255.255.255    DHCP    344 DHCP Discover - Transaction ID 0x63d74b4c
6087 63.326211    172.25.255.254   172.25.227.103     DHCP    342 DHCP Offer    - Transaction ID 0x63d74b4c
6088 63.326887    0.0.0.0          255.255.255.255    DHCP    370 DHCP Request  - Transaction ID 0x63d74b4c
6098 63.698365    172.25.255.254   172.25.227.103     DHCP    342 DHCP ACK      - Transaction ID 0x63d74b4c
```

6.



```
  612 12.682994     0.0.0.0           255.255.255.255     DHCP      344 DHCP Discover -
  617 12.846756     172.25.255.254    172.25.227.103      DHCP      342 DHCP Offer    -
  618 12.847538     0.0.0.0           255.255.255.255     DHCP      370 DHCP Request  -
  636 13.305340     172.25.255.254    172.25.227.103      DHCP      342 DHCP ACK      -
  994 18.187989     172.25.255.254    255.255.255.255     DHCP      293 DHCP NAK      -
 2646 19.949508     172.25.227.103    172.25.255.254      DHCP      358 DHCP Request  -
 3553 20.055778     172.25.255.254    172.25.227.103      DHCP      342 DHCP ACK      -
 3731 21.360145     172.25.255.254    255.255.255.255     DHCP      342 DHCP ACK      -
 4007 22.793678     172.25.255.254    255.255.255.255     DHCP      293 DHCP NAK      -
 4017 23.303856     172.25.255.254    255.255.255.255     DHCP      342 DHCP ACK      -
 5732 43.975073     172.25.255.254    255.255.255.255     DHCP      293 DHCP NAK      -
```

```
Frame 612: 344 bytes on wire (2752 bits), 344 bytes captured (2752 bits) on interface \Devi
Ethernet II, Src: AzureWav_32:db:2f (c0:e4:34:32:db:2f), 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: 330
    Identification: 0xa29c (41628)
```


617 12.846756 172.25.255.254 172.25.227.103 DHCP 342 DHCP Offer
618 12.847538 0.0.0.0 255.255.255.255 DHCP 370 DHCP Request
636 13.305340 172.25.255.254 172.25.227.103 DHCP 342 DHCP ACK
994 18.187989 172.25.255.254 255.255.255.255 DHCP 293 DHCP NAK
2646 19.949508 172.25.227.103 172.25.255.254 DHCP 358 DHCP Request
3553 20.055778 172.25.255.254 172.25.227.103 DHCP 342 DHCP ACK
3731 21.360145 172.25.255.254 255.255.255.255 DHCP 342 DHCP ACK
4007 22.793678 172.25.255.254 255.255.255.255 DHCP 293 DHCP NAK
4017 23.303856 172.25.255.254 255.255.255.255 DHCP 342 DHCP ACK
5732 43.975073 172.25.255.254 255.255.255.255 DHCP 293 DHCP NAK
Frame 617: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Devi
Ethernet II, Src: JuniperN_f6:12:a0 (28:a2:4b:f6:12:a0), Dst: AzureWav_32:db:2f (c0:e4:34:
Internet Protocol Version 4, Src: 172.25.255.254, Dst: 172.25.227.103
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
Total Length: 328
Identification: 0x0000 (0)
618 12.847538 0.0.0.0 255.255.255.255 DHCP 370 DHCP Request - T
636 13.305340 172.25.255.254 172.25.227.103 DHCP 342 DHCP ACK - T
994 18.187989 172.25.255.254 255.255.255.255 DHCP 293 DHCP NAK - T
2646 19.949508 172.25.227.103 172.25.255.254 DHCP 358 DHCP Request - T
3553 20.055778 172.25.255.254 172.25.227.103 DHCP 342 DHCP ACK - T
3731 21.360145 172.25.255.254 255.255.255.255 DHCP 342 DHCP ACK - T
4007 22.793678 172.25.255.254 255.255.255.255 DHCP 293 DHCP NAK - T
4017 23.303856 172.25.255.254 255.255.255.255 DHCP 342 DHCP ACK - T
5732 43.975073 172.25.255.254 255.255.255.255 DHCP 293 DHCP NAK - T
Frame 618: 370 bytes on wire (2960 bits), 370 bytes captured (2960 bits) on interface \Devi
Ethernet II, Src: AzureWav_32:db:2f (c0:e4:34:32:db:2f), 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: 356
Identification: 0xa29d (41629)
000. .... = Flags: 0x0

```
 636 13.305340    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK      -
 994 18.187989    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK      -
2646 19.949508    172.25.227.103    172.25.255.254    DHCP    358 DHCP Request  -
3553 20.055778    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK      -
3731 21.360145    172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK      -
4007 22.793678    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK      -
4017 23.303856    172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK      -
5732 43.975073    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK      -
```

```
> Frame 636: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Devi
> Ethernet II, Src: JuniperN_f6:12:a0 (28:a2:4b:f6:12:a0), Dst: AzureWav_32:db:2f (c0:e4:34:3
v Internet Protocol Version 4, Src: 172.25.255.254, Dst: 172.25.227.103
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0xc0 (DSCP: CS6, ECN: Not-ECT)
    Total Length: 328
    Identification: 0x0000 (0)
  > 000. .... = Flags: 0x0
```

7. 本机的 DHCP 的 IP 地址为 172.25.255.254。

```
 617 12.846756    172.25.255.254    172.25.227.103    DHCP    342 DHCP Offer    -
 618 12.847538    0.0.0.0           255.255.255.255   DHCP    370 DHCP Request  -
 636 13.305340    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK      -
 994 18.187989    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK      -
2646 19.949508    172.25.227.103    172.25.255.254    DHCP    358 DHCP Request  -
3553 20.055778    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK      -
3731 21.360145    172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK      -
4007 22.793678    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK      -
4017 23.303856    172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK      -
5732 43.975073    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK      -
```

```
> 000. .... = Flags: 0x0
  ...0 0000 0000 0000 = Fragment Offset: 0
  Time to Live: 255
  Protocol: UDP (17)
  Header Checksum: 0x7e4b [validation disabled]
  [Header checksum status: Unverified]
  Source Address: 172.25.255.254
  Destination Address: 172.25.227.103
```

8. 在 Offer 中提供的 DHCP 地址为 172.25.227.103。

```
 617 12.846756    172.25.255.254    172.25.227.103    DHCP    342 DHCP Offer
 618 12.847538    0.0.0.0           255.255.255.255   DHCP    370 DHCP Request
 636 13.305340    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK
 994 18.187989    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
2646 19.949508    172.25.227.103    172.25.255.254    DHCP    358 DHCP Request
3553 20.055778    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK
3731 21.360145    172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK
4007 22.793678    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
4017 23.303856    172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK
5732 43.975073    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
```

```
  Transaction ID: 0xfb36c499
  Seconds elapsed: 0
> Bootp flags: 0x0000 (Unicast)
  Client IP address: 0.0.0.0
  Your (client) IP address: 172.25.227.103
```

9. 并没有中继代理。

```
617 12.846756    172.25.255.254    172.25.227.103    DHCP    342 DHCP Offer
618 12.847538    0.0.0.0           255.255.255.255   DHCP    370 DHCP Request
636 13.305340    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK
994 18.187989    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
2646 19.949508   172.25.227.103    172.25.255.254    DHCP    358 DHCP Request
3553 20.055778   172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK
3731 21.360145   172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK
4007 22.793678   172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
4017 23.303856   172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK
5732 43.975073   172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
```

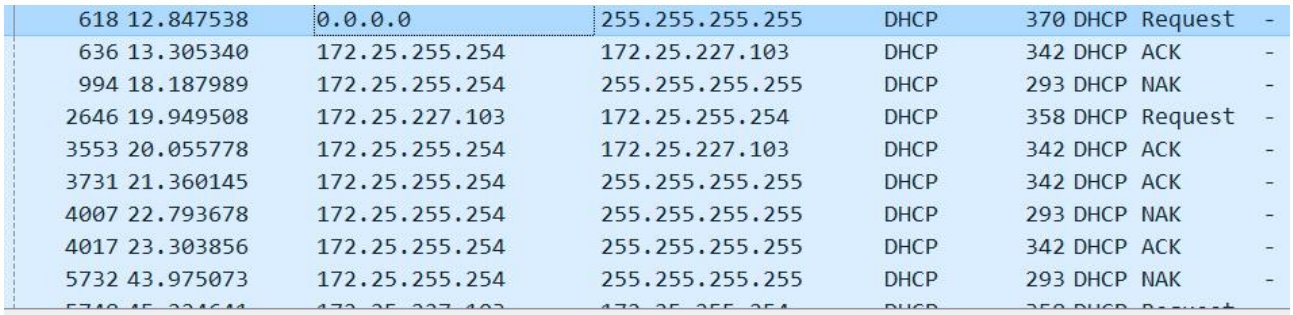
```
Transaction ID: 0xfb36c499
Seconds elapsed: 0
> Bootp flags: 0x0000 (Unicast)
Client IP address: 0.0.0.0
Your (client) IP address: 172.25.227.103
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
```

10. 路由器起到了中续代理、转发的作用，而子网掩码的作用是指示地址部分的网络号和主机号，区分该网段。

11. DHCP Offer 提供的 IP 地址为 172.25.227.103，而客户端是接受了该地址的，因为在 DHCP Request 中可以看到。

```
617 12.846756    172.25.255.254    172.25.227.103    DHCP    342 DHCP Offer
618 12.847538    0.0.0.0           255.255.255.255   DHCP    370 DHCP Request
636 13.305340    172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK
994 18.187989    172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
2646 19.949508   172.25.227.103    172.25.255.254    DHCP    358 DHCP Request
3553 20.055778   172.25.255.254    172.25.227.103    DHCP    342 DHCP ACK
3731 21.360145   172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK
4007 22.793678   172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
4017 23.303856   172.25.255.254    255.255.255.255   DHCP    342 DHCP ACK
5732 43.975073   172.25.255.254    255.255.255.255   DHCP    293 DHCP NAK
```

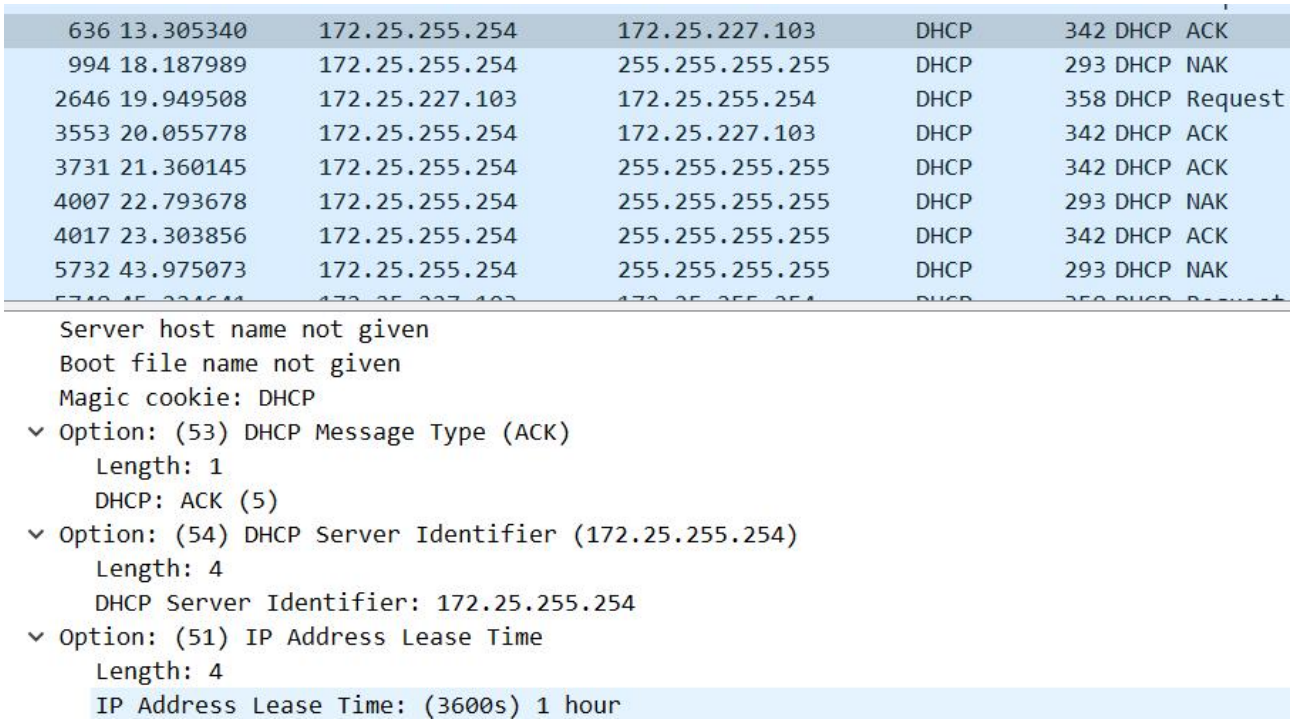
```
> Frame 617: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Devi
> Ethernet II, Src: JuniperN_f6:12:a0 (28:a2:4b:f6:12:a0), Dst: AzureWav_32:db:2f (c0:e4:34:3
> Internet Protocol Version 4, Src: 172.25.255.254, Dst: 172.25.227.103
> User Datagram Protocol, Src Port: 67, Dst Port: 68
v Dynamic Host Configuration Protocol (Offer)
    Message type: Boot Reply (2)
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 1
    Transaction ID: 0xfb36c499
    Seconds elapsed: 0
  > Bootp flags: 0x0000 (Unicast)
    Client IP address: 0.0.0.0
    Your (client) IP address: 172.25.227.103
```



618	12.847538	0.0.0.0	255.255.255.255	DHCP	370 DHCP Request -
636	13.305340	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK -
994	18.187989	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK -
2646	19.949508	172.25.227.103	172.25.255.254	DHCP	358 DHCP Request -
3553	20.055778	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK -
3731	21.360145	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK -
4007	22.793678	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK -
4017	23.303856	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK -
5732	43.975073	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK -

```
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: AzureWav_32:db:2f (c0:e4:34:32:db:2f)
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
> Option: (50) Requested IP Address (172.25.227.103)
```

12. 租约时间是 DHCP 服务器分配 IP 地址给客户使用的时间，在租约期间，DHCP 服务器不会分配 IP 地址给其他客户端，除非客户端自己释放，租约时间过了以后，DHCP 服务器可以分配该 IP 地址给其他客户端。实验中租约时间是 1 小时。



636	13.305340	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK
994	18.187989	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK
2646	19.949508	172.25.227.103	172.25.255.254	DHCP	358 DHCP Request
3553	20.055778	172.25.255.254	172.25.227.103	DHCP	342 DHCP ACK
3731	21.360145	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK
4007	22.793678	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK
4017	23.303856	172.25.255.254	255.255.255.255	DHCP	342 DHCP ACK
5732	43.975073	172.25.255.254	255.255.255.255	DHCP	293 DHCP NAK

```
Server host name not given
Boot file name not given
Magic cookie: DHCP
v Option: (53) DHCP Message Type (ACK)
    Length: 1
    DHCP: ACK (5)
v Option: (54) DHCP Server Identifier (172.25.255.254)
    Length: 4
    DHCP Server Identifier: 172.25.255.254
v Option: (51) IP Address Lease Time
    Length: 4
    IP Address Lease Time: (3600s) 1 hour
```

13. 客户端发送 DHCP Release 消息是为了取消其 DHCP 服务器为其提供对 IP 地址的租用，DHCP 服务器不会向客户端发送确认 DHCP 释放消息的信息，如果来自客户端的 DHCP Release 消息丢失，则 DHCP 服务器必须等待该 IP 地址的租用期结束，才可以将其用于另一个客户。

14. 发送了 ARP 数据包，主要用途就是地址解析，负责把目的主机的 IP 地址解析成目的 MAC 地址，同时 DHCP 服务器广播给这个子网中的所有主机，告诉 IP 所用的 MAC 地址。

结论分析与体会：
通过本实验，学习了 DHCP 的工作过程，进一步了解到 DHCP 服务器是如何给客户端分配 IP 地址的，对 DHCP 协议中的租期等概念有了深一步的理解。