

HO CHI MINH UNIVERSITY OF TECHNOLOGY
Faculty of Computer Science and Engineering



Computer Networks

Report for lab 4b

Lecturer: Nguyễn Mạnh Thìn
Student name: Đặng Trần Khánh-1852037



1/ Are DHCP messages sent over UDP or TCP?

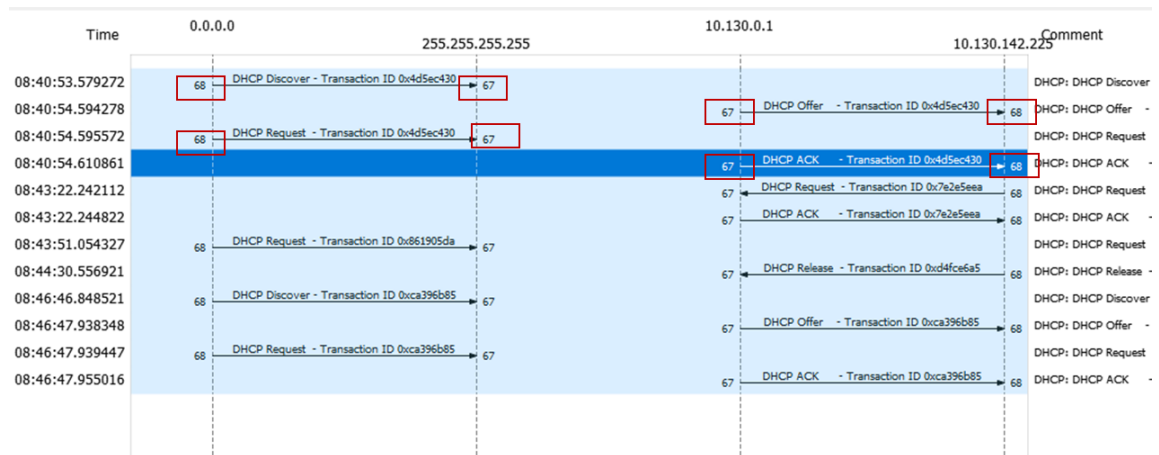
Answer: DHCP messages are sent over UDP

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

> Frame 668: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Device\NPF_{3219B7F4-C797-4F0F-9E1A-7D5DFE7}
> Ethernet II, Src: HewlettP_55:90:de (2c:76:8a:55:90:de), Dst: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
> Internet Protocol Version 4, Src: 10.130.0.1, Dst: 10.130.142.225
> User Datagram Protocol, Src Port: 67, Dst Port: 68
Source Port: 67
Destination Port: 68
Length: 308
Checksum: 0xc137 [unverified]
[Checksum Status: Unverified]
[Stream index: 75]
> [Timestamps]
> Dynamic Host Configuration Protocol (ACK)

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 Discover packet has source port number 68 and destination port number 67.
The Offer packet has source port number 67 and destination port number 68.
The Request packet has source port number 68 and destination port number 67.
The ACK packet has source port number 67 and destination port number 68.
It is the same as in the given lab assignment example.



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

Answer: The link-layer address my host is (2c:76:8a:55:90:de)

```
> Frame 668: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Device\NPF_
▼ Ethernet II, Src: HewlettP_55:90:de (2c:76:8a:55:90:de), Dst: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
  > Destination: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
  ▼ Source: HewlettP_55:90:de (2c:76:8a:55:90:de)
    Address: HewlettP_55:90:de (2c:76:8a:55:90:de)
      .... 0. .... = LG bit: Globally unique address (factory default)
      .... 0. .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
▼ Internet Protocol Version 4, Src: 10.130.0.1, Dst: 10.130.142.225
```

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

Answer: The DHCP Message Type of DHCP discover message is 'Discover', while the message type of DHCP request message is request. DHCP request message also includes a DHCP server identifier field.

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xd45ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xd45ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xd45ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xd45ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85


```
Message type: Boot Request (1)
Hardware type: Ethernet (0x01)
Hardware address length: 6
Hops: 0
Transaction ID: 0xd45ec430
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: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
Client hardware address padding: 0000000000000000
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: (61) Client identifier
> Option: (50) Requested IP Address (10.130.142.225)
> Option: (12) Host Name
> Option: (60) Vendor class identifier
> Option: (55) Parameter Request List
▼ Option: (255) End
  Option End: 255
```

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85


```

Message type: Boot Request (1)
Hardware type: Ethernet (0x01)
Hardware address length: 6
Hops: 0
Transaction ID: 0x4d5ec430
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: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
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
  > Option: (50) Requested IP Address (10.130.142.225)
  > Option: (54) DHCP Server Identifier (10.130.0.1)
    Length: 4
    DHCP Server Identifier: 10.130.0.1
  > Option: (12) Host Name
  > Option: (81) Client Fully Qualified Domain Name

```

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 first four DHCP messages' Transaction-ID is 0x4d5ec430. The second set' Transaction-ID is 0x7e2e5eea. The Transaction-ID field. The transaction ID is different so that the host can differentiate between different requests made by the user.

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

6/ 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:

Discover message: IP source address is 0.0.0.0, IP destination address is 255.255.255.255

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

> Frame 660: 344 bytes on wire (2752 bits), 344 bytes captured (2752 bits) on interface \Device\NPF_{3219B7F4-C797-4F0F-9E}

> Ethernet II, Src: AzureWav_5b:72:7f (70:66:55:5b:72:7f), 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: 0x828f (33423)

> Flags: 0x0000

Fragment offset: 0

Time to live: 128

Protocol: UDP (17)

Header checksum: 0xb714 [validation disabled]

[Header checksum status: Unverified]

Source: 0.0.0.0

Destination: 255.255.255.255

Offer message: IP source address is 10.130.0.1, IP destination address is 10.130.142.225

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

> Frame 666: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Device\NPF_{3219B7F4-C797-4F0F-9E}

> Ethernet II, Src: HewlettP_55:90:de (2c:76:8a:55:90:de), Dst: AzureWav_5b:72:7f (70:66:55:5b:72:7f)

> Internet Protocol Version 4, Src: 10.130.0.1, Dst: 10.130.142.225

0100 = Version: 4

.... 0101 = Header Length: 20 bytes (5)

> Differentiated Services Field: 0x10 (DSCP: Unknown, ECN: Not-ECT)

Total Length: 328

Identification: 0x0000 (0)

> Flags: 0x0000

Fragment offset: 0

Time to live: 128

Protocol: UDP (17)

Header checksum: 0x95af [validation disabled]

[Header checksum status: Unverified]

Source: 10.130.0.1

Destination: 10.130.142.225

Request message: IP source address is 0.0.0.0, IP destination address is 255.255.255.255

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

> Frame 667: 370 bytes on wire (2960 bits), 370 bytes captured (2960 bits) on interface \Device\NPF_{3219B7F4-C797-4F0F-9E1A}

> Ethernet II, Src: AzureWav_5b:72:7f (70:66:55:5b:72:7f), 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: 0x8290 (33424)

> Flags: 0x0000

Fragment offset: 0

Time to live: 128

Protocol: UDP (17)

Header checksum: 0xb6f9 [validation disabled]

[Header checksum status: Unverified]

Source: 0.0.0.0

Destination: 255.255.255.255

ACK message: IP source address is 10.130.0.1, IP destination address is 10.130.142.225

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

> Frame 668: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Device\NPF_{3219B7F4-C797-4F0F-9E1A}

> Ethernet II, Src: HewlettP_55:90:de (2c:76:8a:55:90:de), Dst: AzureWav_5b:72:7f (70:66:55:5b:72:7f)

> Internet Protocol Version 4, Src: 10.130.0.1, Dst: 10.130.142.225

0100 = Version: 4

.... 0101 = Header Length: 20 bytes (5)

> Differentiated Services Field: 0x10 (DSCP: Unknown, ECN: Not-ECT)

Total Length: 328

Identification: 0x0000 (0)

> Flags: 0x0000

Fragment offset: 0

Time to live: 128

Protocol: UDP (17)

Header checksum: 0x95af [validation disabled]

[Header checksum status: Unverified]

Source: 10.130.0.1

Destination: 10.130.142.225

7/ What is the IP address of your DHCP server?

Answer: The IP address of my DHCP server is 10.130.0.1

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

> [Timestamps]	
▼ Dynamic Host Configuration Protocol (ACK)	
Message type: Boot Reply (2)	
Hardware type: Ethernet (0x01)	
Hardware address length: 6	
Hops: 0	
Transaction ID: 0x4d5ec430	
Seconds elapsed: 0	
> Bootp flags: 0x0000 (Unicast)	
Client IP address: 0.0.0.0	
Your (client) IP address: 10.130.142.225	
Next server IP address: 0.0.0.0	
Relay agent IP address: 0.0.0.0	
Client MAC address: AzureWav_5b:72:7f (70:66:55:5b:72:7f)	
Client hardware address padding: 00000000000000000000	
Server host name not given	
Boot file name not given	
Magic cookie: DHCP	
▼ Option: (53) DHCP Message Type (ACK)	
Length: 1	
DHCP: ACK (5)	
▼ Option: (54) DHCP Server Identifier (10.130.0.1)	
Length: 4	
DHCP Server Identifier: 10.130.0.1	
▼ Option: (51) IP Address Lease Time	
Length: 4	
IP Address Lease Time: (7200s) 2 hours	

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 the DHCP server offering to my host is 10.130.142.225. The DHCP message type indicates the DHCP message contains the offered DHCP address.

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

```

Client IP address: 0.0.0.0
Your (client) IP address: 10.130.142.225
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
Client MAC address: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
Option: (53) DHCP Message Type (Offer)
  Length: 1
  DHCP: Offer (2)
Option: (54) DHCP Server Identifier (10.130.0.1)
  Length: 4
  DHCP Server Identifier: 10.130.0.1
Option: (51) IP Address Lease Time
  Length: 4
  IP Address Lease Time: (7200s) 2 hours
Option: (1) Subnet Mask (255.255.0.0)

```

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?

Answer: Since 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
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

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

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

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85


```

Relay agent IP address: 0.0.0.0
Client MAC address: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
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: (54) DHCP Server Identifier (10.130.0.1)
> Option: (51) IP Address Lease Time
v Option: (1) Subnet Mask (255.255.0.0)
  Length: 4
  Subnet Mask: 255.255.0.0
v Option: (3) Router
  Length: 4
  Router: 10.130.0.1
v Option: (6) Domain Name Server
  Length: 16
  Domain Name Server: 208.67.220.220
  Domain Name Server: 208.67.222.222
  Domain Name Server: 8.8.4.4
  Domain Name Server: 8.8.8.8

```

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?

Answer: The client accepts this IP address, indicated by the requested IP address in the RESPONSE message which is offered in the OFFER message.

No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85

```

Length: 1
DHCP: Request (3)
  Option: (61) Client identifier
    Length: 7
    Hardware type: Ethernet (0x01)
    Client MAC address: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
  Option: (50) Requested IP Address (10.130.142.225)
    Length: 4
    Requested IP Address: 10.130.142.225
  Option: (54) DHCP Server Identifier (10.130.0.1)
    Length: 4
    DHCP Server Identifier: 10.130.0.1
  Option: (12) Host Name
    Length: 15
    Host Name: LAPTOP-5008E88M
  Option: (81) Client Fully Qualified Domain Name
    Length: 18

```

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

Answer: The lease time is the amount of time the DHCP server assigns an IP address to a client. During the lease time, the DHCP server will not assign the IP given to the client to another client, unless it is released by the client. Once the lease time has expired, the IP address can be reused by the DHCP server to give to another client.

In my experiment, the lease time is 1 hour, 57 minutes, 32 seconds.

bootp						
No.	Time	Source	Destination	Protocol	Length	Info
660	08:40:53.579272	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x4d5ec430
666	08:40:54.594278	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0x4d5ec430
667	08:40:54.595572	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x4d5ec430
668	08:40:54.610861	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x4d5ec430
11847	08:43:22.242112	10.130.142.225	10.130.0.1	DHCP	358	DHCP Request - Transaction ID 0x7e2e5eea
11848	08:43:22.244822	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0x7e2e5eea
12480	08:43:51.054327	0.0.0.0	255.255.255.255	DHCP	342	DHCP Request - Transaction ID 0x861905da
15770	08:44:30.556921	10.130.142.225	10.130.0.1	DHCP	342	DHCP Release - Transaction ID 0xd4fce6a5
16989	08:46:46.848521	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0xca396b85
16991	08:46:47.938348	10.130.0.1	10.130.142.225	DHCP	342	DHCP Offer - Transaction ID 0xca396b85
16992	08:46:47.939447	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0xca396b85
16993	08:46:47.955016	10.130.0.1	10.130.142.225	DHCP	342	DHCP ACK - Transaction ID 0xca396b85


```

Message type: Boot Reply (2)
Hardware type: Ethernet (0x01)
Hardware address length: 6
Hops: 0
Transaction ID: 0x7e2e5eea
Seconds elapsed: 0
> Bootp flags: 0x0000 (Unicast)
Client IP address: 10.130.142.225
Your (client) IP address: 10.130.142.225
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
Client MAC address: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
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 (10.130.0.1)
✓ Option: (51) IP Address Lease Time
  Length: 4
  IP Address Lease Time: (7052s) 1 hour, 57 minutes, 32 seconds

```

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?

Answer: The client sends a DHCP Release message to cancel its lease on the IP address given to it by the DHCP server. The DHCP server will not issue an ack 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/ 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.

Answer: There were ARP packets received. The purpose of these packets is to map the MAC address with the IP address.

680	08:40:54.641592	AzureWav_5b:72:7f	Broadcast	ARP	42 Who has 10.130.0.1? Tell 10.130.142.225
681	08:40:54.642690	HewlettP_55:90:de	AzureWav_5b:72:7f	ARP	56 10.130.0.1 is at 2c:76:8a:55:90:de
682	08:40:54.649334	AzureWav_5b:72:7f	Broadcast	ARP	42 Who has 10.130.0.1? Tell 10.130.142.225
683	08:40:54.650908	HewlettP_55:90:de	AzureWav_5b:72:7f	ARP	56 10.130.0.1 is at 2c:76:8a:55:90:de


```

> Frame 680: 42 bytes on wire (336 bits), 42 bytes captured (336 bits) on interface \Device\NPF_{3219B7F4-C797-4F0F-9E1A-7D5DFE741F02}, id 0
Ethernet II, Src: AzureWav_5b:72:7f (70:66:55:5b:72:7f), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  Destination: Broadcast (ff:ff:ff:ff:ff:ff)
    Address: Broadcast (ff:ff:ff:ff:ff:ff)
      .... 1. .... = LG bit: Locally administered address (this is NOT the factory default)
      .... 1. .... = IG bit: Group address (multicast/broadcast)
  Source: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
    Address: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
      .... 0. .... = LG bit: Globally unique address (factory default)
      .... 0. .... = IG bit: Individual address (unicast)
    Type: ARP (0x0806)
  Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: AzureWav_5b:72:7f (70:66:55:5b:72:7f)
    Sender IP address: 10.130.142.225
    Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
    Target IP address: 10.130.0.1

```