

Trường Đại Học Bách Khoa Tp.Hồ Chí Minh  
Khoa Khoa Học và Kỹ Thuật Máy Tính

**ĐẠI HỌC QUỐC GIA TP. HỒ CHÍ MINH**  
**TRƯỜNG ĐẠI HỌC BÁCH KHOA**  
**KHOA KHOA HỌC VÀ KỸ THUẬT MÁY TÍNH**



**BÁO CÁO**  
**MẠNG MÁY TÍNH THỰC HÀNH (CO3094)**

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**LAB 4B**

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Thành phố Hồ Chí Minh, Tháng 3 năm 2025

## 1. Question 1

**Question:** Are DHCP messages sent over UDP or TCP?

**Answer:** DHCP messages are sent over UDP

No.	Time	Source	Destination	Protocol	Length	Info
5637	13:40:49.591211	192.168.137.138	192.168.137.1	DHCP	358	DHCP Request - Transaction ID 0x1d381518
5638	13:40:49.603835	192.168.137.1	192.168.137.138	DHCP	349	DHCP ACK - Transaction ID 0x1d381518
6083	13:41:01.188174	192.168.137.138	192.168.137.1	DHCP	358	DHCP Request - Transaction ID 0x55954ca6
6084	13:41:01.204095	192.168.137.1	192.168.137.138	DHCP	349	DHCP ACK - Transaction ID 0x55954ca6
7171	13:41:22.949653	192.168.137.138	192.168.137.1	DHCP	342	DHCP Release - Transaction ID 0x388f332
7210	13:41:31.237812	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x6db97d80
7211	13:41:31.254248	192.168.137.1	192.168.137.138	DHCP	344	DHCP Offer - Transaction ID 0x6db97d80
7212	13:41:31.255863	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x6db97d80
7213	13:41:31.270509	192.168.137.1	192.168.137.138	DHCP	349	DHCP ACK - Transaction ID 0x6db97d80

Frame 5637: 358 bytes on wire (2864 bits), 358 bytes captured (2864 bits) on interface \Device\NPF_{...}	0000	4e 03 4f e5 b4 a6 28 c5 d2 d3 7a b6 08 00 45 00
Ethernet II, Src: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6), Dst: 4e:03:4f:e5:b4:a6 (4e:03:4f:e5:b4:a6)	0010	01 58 97 28 00 00 80 11 00 00 c0 a8 89 8a c0 a8
Internet Protocol Version 4, Src: 192.168.137.138, Dst: 192.168.137.1	0020	89 01 00 44 00 43 01 44 95 32 01 01 06 00 1d 38
0100 .... = Version: 4	0030	15 18 00 00 00 00 c0 a8 89 8a 00 00 00 00 00
.... 0101 = Header Length: 20 bytes (5)	0040	00 00 00 00 00 00 28 c5 d2 d3 7a b6 08 00 00
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)	0050	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Total Length: 344	0060	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Identification: 0x9728 (38696)	0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000. .... = Flags: 0x0	0080	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
...0 0000 0000 0000 = Fragment Offset: 0	0090	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Time to Live: 128	00a0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Protocol: UDP (17)	00b0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Header Checksum: 0x0000 [validation disabled]	00c0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
[Header checksum status: Unverified]	00d0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Source Address: 192.168.137.138	00e0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Destination Address: 192.168.137.1	00f0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
[Stream index: 39]	0100	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
User Datagram Protocol, Src Port: 68, Dst Port: 67	0110	00 00 00 00 00 00 63 82 53 63 35 01 03 3d 07 01
Dynamic Host Configuration Protocol (Request)	0120	28 c5 d2 d3 7a b6 0c 0f 4c 41 50 54 4f 50 2d 36
Message type: Boot Request (1)	0130	42 55 55 46 38 55 38 51 12 00 00 00 4c 41 50 54
Hardware type: Ethernet (0x01)	0140	4f 50 2d 36 42 55 55 46 38 55 38 3c 08 4d 53 46
	0150	54 20 35 2e 30 37 0e 01 03 06 0f 1f 21 2b 2c 2e
	0160	2f 77 79 f9 fc ff

## 2. Question 2

**Question:** 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?

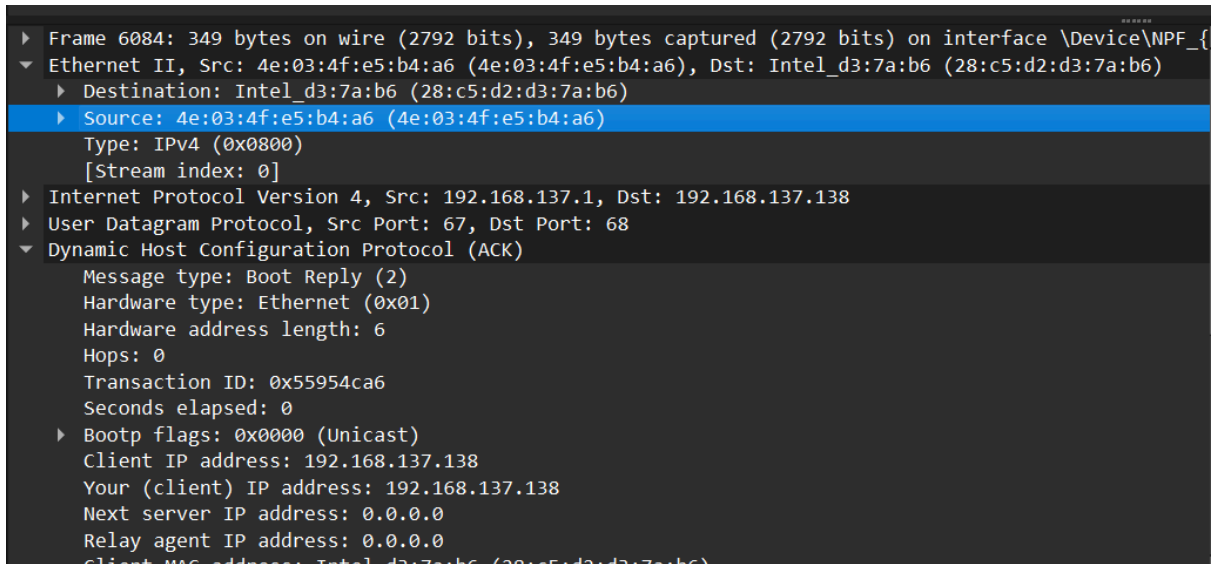
**Answer:**

- Discover source port- 68 and destination port – 67
- Offer source port – 67 and destination port – 68
- Request source port – 68 and destination port – 67
- ACK source port – 67 and destination port – 68

### 3. Question 3

**Question:** What is the link-layer (e.g., Ethernet) address of your host?

**Answer:** The ethernet address of my host is 4e:03:4f:e5:b4:a6



```
▶ Frame 6084: 349 bytes on wire (2792 bits), 349 bytes captured (2792 bits) on interface \Device\NPF_{...}
▼ Ethernet II, Src: 4e:03:4f:e5:b4:a6 (4e:03:4f:e5:b4:a6), Dst: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
  ▶ Destination: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
  ▶ Source: 4e:03:4f:e5:b4:a6 (4e:03:4f:e5:b4:a6)
    Type: IPv4 (0x0800)
    [Stream index: 0]
  ▶ Internet Protocol Version 4, Src: 192.168.137.1, Dst: 192.168.137.138
  ▶ User Datagram Protocol, Src Port: 67, Dst Port: 68
  ▼ Dynamic Host Configuration Protocol (ACK)
    Message type: Boot Reply (2)
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x55954ca6
    Seconds elapsed: 0
    ▶ Bootp flags: 0x0000 (Unicast)
      Client IP address: 192.168.137.138
      Your (client) IP address: 192.168.137.138
      Next server IP address: 0.0.0.0
      Relay agent IP address: 0.0.0.0
      Client MAC address: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
```

### 4. Question 4

**Question:** Source: 4e:03:4f:e5:b4:a6 (4e:03:4f:e5:b4:a6)

**Answer:**

- DHCP Message Type
- Request includes a server identifier field

### 5. Question 5

**Question:** 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:**

- 1st set of messages: 0x6db97d80

```
▶ Frame 7210: 344 bytes on wire (2752 bits), 344 bytes captured (2752 bits) on interface \Device\NPF_{...}
▼ Ethernet II, Src: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  ▶ Destination: Broadcast (ff:ff:ff:ff:ff:ff)
  ▶ Source: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
  Type: IPv4 (0x0800)
  [Stream index: 11]
▶ 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)
  Message type: Boot Request (1)
  Hardware type: Ethernet (0x01)
  Hardware address length: 6
  Hops: 0
  Transaction ID: 0x6db97d80
  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: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
```

- 2st set of messages: 0x1d381518

```
▶ Frame 5637: 358 bytes on wire (2864 bits), 358 bytes captured (2864 bits) on interface \Device\NPF_{...}
▼ Ethernet II, Src: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6), Dst: 4e:03:4f:e5:b4:a6 (4e:03:4f:e5:b4:a6)
  ▶ Destination: 4e:03:4f:e5:b4:a6 (4e:03:4f:e5:b4:a6)
  ▶ Source: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
  Type: IPv4 (0x0800)
  [Stream index: 0]
▶ Internet Protocol Version 4, Src: 192.168.137.138, Dst: 192.168.137.1
▶ User Datagram Protocol, Src Port: 68, Dst Port: 67
▼ Dynamic Host Configuration Protocol (Request)
  Message type: Boot Request (1)
  Hardware type: Ethernet (0x01)
  Hardware address length: 6
  Hops: 0
  Transaction ID: 0x1d381518
  Seconds elapsed: 0
  ▶ Bootp flags: 0x0000 (Unicast)
  Client IP address: 192.168.137.138
  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: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
```

## 6. Question 6

**Question:** 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.

**Answer:**

- Discover: 0.0.0.0/255.255.255.255
- Offer: 192.168.137.1/192.168.137.138
- Request: 0.0.0.0/255.255.255.255
- ACK: 192.168.137.1/192.168.137.138

## 7. Question 7

**Question:** What is the IP address of your DHCP server?

**Answer:** 192.168.137.1

```
Client IP address: 0.0.0.0
Your (client) IP address: 192.168.137.138
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
Client MAC address: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
Client hardware address padding: 00000000000000000000
Server host name not given
Boot file name not given
Magic cookie: DHCP
> Option: (53) DHCP Message Type (ACK)
> Option: (54) DHCP Server Identifier (192.168.137.1)
> Option: (1) Subnet Mask (255.255.255.0)
> Option: (3) Router
> Option: (6) Domain Name Server
> Option: (58) Renewal Time Value
> Option: (59) Rebinding Time Value
> Option: (51) IP Address Lease Time
> Option: (46) NetBIOS over TCP/IP Node Type
> Option: (81) Client Fully Qualified Domain Name
> Option: (15) Domain Name
> Option: (255) End
```

## 8. Question 8

**Question:** 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:** My client is offered 192.168.137.138 by the DHCP server. The offer message contains the DHCP address offered by the server

```
➤ Bootp flags: 0x0000 (unicast)
Client IP address: 0.0.0.0
Your (client) IP address: 192.168.137.138
Next server IP address: 0.0.0.0
Relay agent IP address: 0.0.0.0
Client MAC address: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)
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 (192.168.137.1)
➤ Option: (1) Subnet Mask (255.255.255.0)
➤ Option: (3) Router
➤ Option: (6) Domain Name Server
➤ Option: (58) Renewal Time Value
➤ Option: (59) Rebinding Time Value
➤ Option: (51) IP Address Lease Time
➤ Option: (46) NetBIOS over TCP/IP Node Type
➤ Option: (15) Domain Name
➤ Option: (255) End
```

## 9. Question 9

**Question:** 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?

**Answer:** In the example given, the value that indicates there is no relay agent is 0.0.0.0, in the case of my capture, I also have a value for the relay agent of 0.0.0.0 indicating that I too did not have a relay agent.

## 10. Question 10

**Question:** 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 to use.
- The router line indicates where the client should send messages by default.

## 11. Question 11

**Question:** . 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?

**Answer:** The client accepts the IP address given in the offer message within the request message. After being offered the IP address 192.168.137.138 in the offer message, my client sent back a message further requesting that specific IP address.

Time	Source IP	Destination IP	Source MAC	Destination MAC	Type	Details
7212	13:41:31.255863	0.0.0.0	255.255.255.255		DHCP	370 DHCP Request - Transaction ID 0x6db97d80
7213	13:41:31.270509	192.168.137.1	192.168.137.138		DHCP	349 DHCP ACK - Transaction ID 0x6db97d80

Next server IP address: 0.0.0.0	0010	01 64 e1 da 00 00 80 11	00 00 00 00 00 ff ff
Relay agent IP address: 0.0.0.0	0020	ff ff 00 44 00 43 01 50	a2 23 01 01 06 00 6d b9
Client MAC address: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)	0030	7d 80 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Client hardware address padding: 00000000000000000000	0040	00 00 00 00 00 00 28 c5	d2 d3 7a b6 00 00 00 00
Server host name not given	0050	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Boot file name not given	0060	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Magic cookie: DHCP	0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Option: (53) DHCP Message Type (Request)	0080	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Length: 1	0090	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
DHCP: Request (3)	00a0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Option: (61) Client identifier	00b0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Length: 7	00c0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Hardware type: Ethernet (0x01)	00d0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Client MAC address: Intel_d3:7a:b6 (28:c5:d2:d3:7a:b6)	00e0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Option: (50) Requested IP Address (192.168.137.138)	00f0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Length: 4	0100	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00
Requested IP Address: 192.168.137.138	0110	00 00 00 00 00 00 63 82	53 63 35 01 03 3d 07 01
Option: (54) DHCP Server Identifier (192.168.137.1)	0120	28 c5 d2 d3 7a b6 32 04	c0 a8 89 8a 36 04 c0 a8
Length: 4	0130	89 01 0c 0f 4c 41 50 54	4f 50 2d 36 42 55 55 46
DHCP Server Identifier: 192.168.137.1	0140	38 55 38 51 12 00 00 00	4c 41 50 54 4f 50 2d 36
Option: (12) Host Name	0150	42 55 55 46 38 55 38 3c	08 4d 53 46 54 20 35 2e
	0160	30 37 0e 01 03 06 0f 1f	21 2b 2c 2e 2f 77 79 f9
	0170	fc ff	

## 12. Question 12

**Question:** Explain the purpose of the lease time. How long is the lease time in your experiment?

**Answer:**

- The purpose of lease time is to tell the client how long they can use the specific IP address assigned by the server before they will have to be assigned a new one.
- The lease time in my experiment is 86400 seconds or 1 day

### 13. Question 13

**Question:** 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 purpose of the release message is to release the IP address back to the server.
- There is no verification that the release message has been received by the server.
- If the message is lost, the client releases the IP address, but the server will not reassign that address until the clients lease on the address expires.

### 14. Question 14

**Question:** 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:** Yes, they appear to be broadcasts sent out by the network to build up the known IP addresses by the clients network.

No.	Time	Source	Destination	Protocol	Length	Info
7195	13:41:27.991367	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7196	13:41:28.962734	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7197	13:41:28.963114	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7198	13:41:28.978142	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7199	13:41:28.978686	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7200	13:41:28.993508	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7201	13:41:28.993925	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7202	13:41:29.925596	Intel_d3:7a:b6	Broadcast	ARP	42	Who has 169.254.187.73? (ARP Probe)
7203	13:41:30.926866	Intel_d3:7a:b6	Broadcast	ARP	42	Who has 169.254.187.73? (ARP Probe)
7204	13:41:30.974719	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7205	13:41:30.975271	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7206	13:41:30.990705	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7207	13:41:30.991323	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7208	13:41:30.998499	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7209	13:41:30.998886	fe80::7c61:c3d1:f51c...	ff02::fb	MDNS	102	Standard query 0x0000 PTR _googlecast._tcp.local, "QM" question
7210	13:41:31.237812	0.0.0.0	255.255.255.255	DHCP	344	DHCP Discover - Transaction ID 0x6db97d80
7211	13:41:31.254248	192.168.137.1	192.168.137.138	DHCP	344	DHCP Offer - Transaction ID 0x6db97d80
7212	13:41:31.255863	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transaction ID 0x6db97d80