

CS-315 COMPUTER NETWORKS LAB-9 (DHCP)

No.	Time	Source	Destination	Protocol	Length	Info
15	1.954884	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x57a7f2c8
133	5.522517	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transaction ID 0x5cadf314
142	5.966494	192.168.0.1	192.168.0.194	DHCP	342	DHCP Offer - Transaction ID 0x57a7f2c8
174	8.671619	192.168.0.1	192.168.0.194	DHCP	342	DHCP Offer - Transaction ID 0x5cadf314
182	8.672945	0.0.0.0	255.255.255.255	DHCP	362	DHCP Request - Transaction ID 0x5cadf314
184	8.688272	192.168.0.1	192.168.0.194	DHCP	350	DHCP ACK - Transaction ID 0x5cadf314

> Frame 133: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Device\NPF{...}	0000	ff ff ff ff ff ff 20 c1 9b 1f 79 8a 08 00 45 00	.....y...E
> Ethernet II, Src: Intel_1f:79:8a (20:c1:9b:1f:79:8a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)	0010	01 48 b4 b3 00 00 00 11 00 00 00 00 00 ff ff	...H.....
> Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255	0020	ff ff 00 44 00 43 01 34 ee a7 01 01 06 00 5c ad	...D.C.4.....\.
> User Datagram Protocol, Src Port: 68, Dst Port: 67	0030	f3 14 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....y.....
> Dynamic Host Configuration Protocol (Discover)	0040	00 00 00 00 00 00 20 c1 9b 1f 79 8a 00 00 00 00	.....y.....
Message type: Boot Request (1)	0050	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Hardware type: Ethernet (0x01)	0060	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Hardware address length: 6	0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Hops: 0	0080	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Transaction ID: 0x5cadf314	0090	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Seconds elapsed: 0	00a0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Bootp flags: 0x0000 (Unicast)	00b0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Client IP address: 0.0.0.0	00c0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Your (client) IP address: 0.0.0.0	00d0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Next server IP address: 0.0.0.0	00e0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Relay agent IP address: 0.0.0.0	00f0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Client MAC address: Intel_1f:79:8a (20:c1:9b:1f:79:8a)	0100	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Client hardware address padding: 00000000000000000000	0110	00 00 00 00 00 00 63 82 53 63 35 01 01 3d 07 01	.....c..Sc5....
Server host name not given	0120	20 c1 9b 1f 79 8a 32 04 c0 a8 00 c2 0c 0b 4d 61	...y.2.....Ma
Boot file name not given	0130	6e 69 6b 61 6e 74 61 39 39 3c 08 4d 53 46 54 20	nikanta9 9<MSFT
Magic cookie: DHCP	0140	35 2e 30 37 0e 01 03 06 0f 1f 21 2b 2c 2e 2f 77	5.07.....!+.,/w
Option: (53) DHCP Message Type (Discover)	0150	79 1f fc ff 00 00	y.....

1. **UDP**, as we can see in the screenshot above.
2. **Source IP address = 0.0.0.0** [can be seen in the screenshot above].
The speciality of this IP address is that it is used by a client/device when it doesn't have a configured IP address yet or when it wants to request a new IP address from a DHCP server. In the context of DHCP (Dynamic Host Configuration Protocol), the 0.0.0.0 address in the source field indicates to the DHCP server that the device sending the Discover message does not have an assigned IP address and is seeking one. This allows the DHCP server to allocate an available IP address from its pool and assign it to the requesting device. In short, the source hasn't been allotted any IP address yet and therefore it is using the default IP address as 0.0.0.0.
3. **Destination IP address = 255.255.255.255** [from screenshot].
The speciality of this IP address is that it represents the broadcast

address in IPv4 networks. This means that just like a network broadcast IP this message will be transmitted to all network adapters on the local network segment. When a device sends a DHCP Discover message, it doesn't yet know the IP address of the DHCP server. Therefore, it sends the Discover message to the broadcast address 255.255.255.255, indicating that it wants any DHCP server on the network to respond.

4. Value in the transaction ID field = **0x5cadf314** [from screenshot]
5. Other than the IP address, the 5 pieces of information the client is suggesting or requesting to receive are DHCP message type, Client identifier, Host Name, Vendor class identifier, and **Parameter Request List – Subnet Mask, Router, Domain Name Server, Domain Name, Static Route etc.**

```
> Option: (53) DHCP Message Type (Discover)
> Option: (61) Client identifier
> Option: (50) Requested IP Address (192.168.0.194)
> Option: (12) Host Name
> Option: (60) Vendor class identifier
> Option: (55) Parameter Request List
> Option: (255) End
✓ Option: (55) Parameter Request List
  Length: 14
  Parameter Request List Item: (1) Subnet Mask
  Parameter Request List Item: (3) Router
  Parameter Request List Item: (6) Domain Name Server
  Parameter Request List Item: (15) Domain Name
  Parameter Request List Item: (31) Perform Router Discover
  Parameter Request List Item: (33) Static Route
  Parameter Request List Item: (43) Vendor-Specific Information
  Parameter Request List Item: (44) NetBIOS over TCP/IP Name Server
  Parameter Request List Item: (46) NetBIOS over TCP/IP Node Type
  Parameter Request List Item: (47) NetBIOS over TCP/IP Scope
  Parameter Request List Item: (119) Domain Search
  Parameter Request List Item: (121) Classless Static Route
  Parameter Request List Item: (249) Private/Classless Static Route (Microsoft)
  Parameter Request List Item: (252) Private/Proxy autodiscovery
> Option: (255) End
```

15	1.954884	0.0.0.0	255.255.255.255	DHCP	342 DHCP Discover - Transaction ID 0x57a7f2c8
133	5.522517	0.0.0.0	255.255.255.255	DHCP	342 DHCP Discover - Transaction ID 0x5cadf314
142	5.966494	192.168.0.1	192.168.0.194	DHCP	342 DHCP Offer - Transaction ID 0x57a7f2c8
174	8.671619	192.168.0.1	192.168.0.194	DHCP	342 DHCP Offer - Transaction ID 0x5cadf314
182	8.672945	0.0.0.0	255.255.255.255	DHCP	362 DHCP Request - Transaction ID 0x5cadf314
184	8.688272	192.168.0.1	192.168.0.194	DHCP	350 DHCP ACK - Transaction ID 0x5cadf314

> Frame 174: 342 bytes on wire (2736 bits), 342 bytes captured (2736 bits) on interface \Device\NPF	0000	20 c1 9b 1f 79 8a e0 1c	fc ed 68 1e 08 00 45 00	...y... ..h...E
> Ethernet II, Src: DLinkInterna_ed:68:1e (e0:1c:fc:ed:68:1e), Dst: Intel_1f:79:8a (20:c1:9b:1f:79	0010	01 48 0d ef 00 00 40 11	e9 a2 c0 a8 00 01 c0 a8	H...@...
> Internet Protocol Version 4, Src: 192.168.0.1, Dst: 192.168.0.194	0020	00 c2 00 43 00 44 01 34	22 9a 02 01 06 00 5c ad	...C D 4 "... \
> User Datagram Protocol, Src Port: 67, Dst Port: 68	0030	f3 14 00 00 00 00 00 00	00 00 c0 a8 00 c2 c0 a8	.....
> Dynamic Host Configuration Protocol (Offer)	0040	00 01 00 00 00 00 20 c1	9b 1f 79 8a 00 00 00 00	.....y.....
Message type: Boot Reply (2)	0050	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Hardware type: Ethernet (0x01)	0060	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Hardware address length: 6	0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Hops: 0	0080	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Transaction ID: 0x5cadf314	0090	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Seconds elapsed: 0	00a0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
> Bootp flags: 0x0000 (Unicast)	00b0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Client IP address: 0.0.0.0	00c0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Your (client) IP address: 192.168.0.194	00d0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Next server IP address: 192.168.0.1	00e0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Relay agent IP address: 0.0.0.0	00f0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Client MAC address: Intel_1f:79:8a (20:c1:9b:1f:79:8a)	0100	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Client hardware address padding: 00000000000000000000	0110	00 00 00 00 00 00 63 82	53 63 35 01 02 36 04 c0	...c...Sc5...6...
Server host name not given	0120	a8 00 01 33 04 00 01 51	80 3a 04 00 00 a8 c0 3b	...3...Q...;
Boot file name not given	0130	04 00 01 27 50 01 04 ff	ff ff 00 1c 04 c0 a8 00	...'P...:
Magic cookie: DHCP	0140	ff 06 04 c0 a8 00 01 03	04 c0 a8 00 01 ff 00 00	.....
> Option: (53) DHCP Message Type (Offer)	0150	00 00 00 00 00 00		.....
> Option: (54) DHCP Server Identifier (192.168.0.1)				
> Option: (51) IP Address Lease Time				

6. We know this Offer message is being sent in response to the DHCP Discover message we studied above because both messages **share the same Transaction ID: 0x5cadf314**.
7. **Source IP address = 192.168.0.1** [from screenshot above].
The speciality of this address is that it represents the DHCP server. DHCP server sends an Offer message using its own IP address as the source to indicate to the client where the offer is coming from.
8. **Destination IP address = 192.168.0.194** [from screenshot above].
The speciality of this address is that it is the IP address of the client to which the DHCP server is sending the offer, i.e., This is the new IP address that will be allotted to the client.
9. The pieces of information that the DHCP server is providing to the DHCP client in the DHCP Offer message are DHCP Message Type, DHCP Server Identifier, **IP Address Lease Time, Renewal Time Value, Rebinding Time Value, Subnet mask, Broadcast Address, Domain Name Server and Router**.

- > Option: (53) DHCP Message Type (Offer)
- > Option: (54) DHCP Server Identifier (192.168.0.1)
- > Option: (51) IP Address Lease Time
- > Option: (58) Renewal Time Value
- > Option: (59) Rebinding Time Value
- > Option: (1) Subnet Mask (255.255.255.0)
- > Option: (28) Broadcast Address (192.168.0.255)
- > Option: (6) Domain Name Server
- > Option: (3) Router
- > Option: (255) End

15	1.954884	0.0.0.0	255.255.255.255	DHCP	342 DHCP Discover	- Transaction ID 0x57a7f2c8
133	5.522517	0.0.0.0	255.255.255.255	DHCP	342 DHCP Discover	- Transaction ID 0x5cadf314
142	5.966494	192.168.0.1	192.168.0.194	DHCP	342 DHCP Offer	- Transaction ID 0x57a7f2c8
174	8.671619	192.168.0.1	192.168.0.194	DHCP	342 DHCP Offer	- Transaction ID 0x5cadf314
182	8.672945	0.0.0.0	255.255.255.255	DHCP	362 DHCP Request	- Transaction ID 0x5cadf314
184	8.688272	192.168.0.1	192.168.0.194	DHCP	350 DHCP ACK	- Transaction ID 0x5cadf314

> Frame 182: 362 bytes on wire (2896 bits), 362 bytes captured (2896 bits) on interface \Device\NPF_{...}	0000	ff ff ff ff ff ff 20 c1 9b 1f 79 8a 08 00 45 00	.....y...E
> Ethernet II, Src: Intel_1f:79:8a (20:c1:9b:1f:79:8a), Dst: Broadcast (ff:ff:ff:ff:ff:ff)	0010	01 5c b4 b4 00 00 00 11 00 00 00 00 00 00 ff ff	..\.....
> Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255.255	0020	ff ff 00 44 00 43 01 48 b7 a6 01 01 06 00 5c ad	...D.C.H.....\
> User Datagram Protocol, Src Port: 68, Dst Port: 67	0030	f3 14 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....y.....
Source Port: 68	0040	00 00 00 00 00 00 20 c1 9b 1f 79 8a 00 00 00 00	.....y.....
Destination Port: 67	0050	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Length: 328	0060	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
Checksum: 0xb7a6 [unverified]	0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
[Checksum Status: Unverified]	0080	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
[Stream index: 4]	0090	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
> [Timestamps]	00a0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
UDP payload (320 bytes)	00b0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
> Dynamic Host Configuration Protocol (Request)	00c0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
	00d0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
	00e0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
	00f0	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
	0100	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
	0110	00 00 00 00 00 00 63 82 53 63 35 01 03 3d 07 01	.....c-Sc=
	0120	20 c1 9b 1f 79 8a 32 04 c0 a8 00 c2 36 04 c0 a8	...y-2-...6...
	0130	00 01 0c 0b 4d 61 6e 69 6b 61 6e 74 61 39 39 51	....Mani kanta99Q
	0140	0e 00 00 00 4d 61 6e 69 6b 61 6e 74 61 39 39 3c	....Mani kanta99Q
	0150	08 4d 53 46 54 20 35 2e 30 37 0e 01 03 06 0f 1f	..MSFT 5. 07.....
	0160	21 2b 2c 2e 2f 77 79 f9 fc ff	!+.,/wy. ..

10. **UDP source port no. = 68 & destination port no. = 67.**

11. **Source IP address = 0.0.0.0 [from screenshot above].**

The speciality of this IP address is that it signifies that the client does not have a configured IP address yet or that it is requesting a new IP address from a DHCP server. The source IP address is set to 0.0.0.0 by the client to indicate its desire to acquire an IP address dynamically.

12. **Destination IP address = 255.255.255.255**[from screenshot].

The speciality of this IP address is that it represents the broadcast address in IPv4 networks. When a client sends a DHCP Request message, it does not yet know the IP address of the DHCP server that made the offer. Therefore, it sends the Discover message to the broadcast address 255.255.255.255, indicating that it wants any DHCP server on the network to respond.

13. Value in the transaction ID field = **0x5cadf314**. Yes, it matches the transaction IDs of the earlier Discover and Offer messages that we studied above.

14. No differences can be seen between the entries in the 'parameter request list' option in this Request message and the same list option in the earlier Discover message.

The parameter request list of the DHCP request message is:

```

  v Option: (55) Parameter Request List
    Length: 14
    Parameter Request List Item: (1) Subnet Mask
    Parameter Request List Item: (3) Router
    Parameter Request List Item: (6) Domain Name Server
    Parameter Request List Item: (15) Domain Name
    Parameter Request List Item: (31) Perform Router Discover
    Parameter Request List Item: (33) Static Route
    Parameter Request List Item: (43) Vendor-Specific Information
    Parameter Request List Item: (44) NetBIOS over TCP/IP Name Server
    Parameter Request List Item: (46) NetBIOS over TCP/IP Node Type
    Parameter Request List Item: (47) NetBIOS over TCP/IP Scope
    Parameter Request List Item: (119) Domain Search
    Parameter Request List Item: (121) Classless Static Route
    Parameter Request List Item: (249) Private/Classless Static Route (Microsoft)
    Parameter Request List Item: (252) Private/Proxy autodiscovery
```

The parameter request list of the earlier DHCP discover message is:

Option: (55) Parameter Request List

Length: 14

Parameter Request List Item: (1) Subnet Mask

Parameter Request List Item: (3) Router

Parameter Request List Item: (6) Domain Name Server

Parameter Request List Item: (15) Domain Name

Parameter Request List Item: (31) Perform Router Discover

Parameter Request List Item: (33) Static Route

Parameter Request List Item: (43) Vendor-Specific Information

Parameter Request List Item: (44) NetBIOS over TCP/IP Name Server

Parameter Request List Item: (46) NetBIOS over TCP/IP Node Type

Parameter Request List Item: (47) NetBIOS over TCP/IP Scope

Parameter Request List Item: (119) Domain Search

Parameter Request List Item: (121) Classless Static Route

Parameter Request List Item: (249) Private/Classless Static Route (Microsoft)

Parameter Request List Item: (252) Private/Proxy autodiscovery

15	1.954884	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover	- Transaction ID 0x57a7f2c8
133	5.522517	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover	- Transaction ID 0x5cadf314
142	5.966494	192.168.0.1	192.168.0.194	DHCP	342	DHCP Offer	- Transaction ID 0x57a7f2c8
174	8.671619	192.168.0.1	192.168.0.194	DHCP	342	DHCP Offer	- Transaction ID 0x5cadf314
182	8.672945	0.0.0.0	255.255.255.255	DHCP	362	DHCP Request	- Transaction ID 0x5cadf314
184	8.688272	192.168.0.1	192.168.0.194	DHCP	350	DHCP ACK	- Transaction ID 0x5cadf314

> Ethernet II, Src: DLinkInterna_ed:68:1e (e0:1c:fc:ed:68:1e), Dst: Intel_1f:79:8a (20:c1:9b:1f:79:8a)	0000	20 c1 9b 1f 79 8a e0 1c	fc ed 68 1e 00 00 45 00	.....h...E:
> Internet Protocol Version 4, Src: 192.168.0.1, Dst: 192.168.0.194	0010	01 50 0d f0 00 00 40 11	e9 99 c0 a8 00 01 c0 a8	P...@.....
> User Datagram Protocol, Src Port: 67, Dst Port: 68	0020	00 c2 00 43 00 00 01 3c	e1 5b 02 01 06 00 5c ad	...C.D<[.....\.
> Dynamic Host Configuration Protocol (ACK)	0030	f3 14 00 00 00 00 00 00	00 00 c0 a8 00 c2 c0 a8	.....y.....
Message type: Boot Reply (2)	0040	00 01 00 00 00 00 20 c1	9b 1f 79 8a 00 00 00 00	.....y.....
Hardware type: Ethernet (0x01)	0050	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Hardware address length: 6	0060	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Hops: 0	0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Transaction ID: 0x5cadf314	0080	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Seconds elapsed: 0	0090	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Bootp flags: 0x0000 (Unicast)	00a0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Client IP address: 0.0.0.0	00b0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Your (client) IP address: 192.168.0.194	00c0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Next server IP address: 192.168.0.1	00d0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Relay agent IP address: 0.0.0.0	00e0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Client MAC address: Intel_1f:79:8a (20:c1:9b:1f:79:8a)	00f0	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Client hardware address padding: 00000000000000000000	0100	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
Server host name not given	0110	00 00 00 00 00 00 63 82	53 63 35 01 05 36 04 c0	.....c..Sc5..6..
Boot file name not given	0120	a8 00 01 33 04 00 01 51	80 3a 04 00 00 a8 c0 3b	...3...Q...;
Magic cookie: DHCP	0130	04 00 01 27 50 01 04 ff	ff ff 00 1c 04 c0 a8 00	...P...Q...Mani
> Option: (53) DHCP Message Type (ACK)	0140	ff 06 04 c0 a8 00 01 51	0e 03 ff ff 4d 61 6e 69	.....Q...Mani
> Option: (54) DHCP Server Identifier (192.168.0.1)	0150	6b 61 6e 74 61 39 39 03	04 c0 a8 00 01 ff	kanta99.....
> Option: (51) IP Address Lease Time				
> Option: (58) Renewal Time Value				

15. Source IP address = 192.168.0.1.

The speciality of this IP address is that it is the IP address of the DHCP server. The DHCP server sends ACK messages to confirm that it has assigned an IP address to the client and to provide other network configuration information. Therefore, the source IP address of the DHCP server indicates that the ACK message is coming from the DHCP server.

16. **Destination IP address = 192.168.0.194.**

The speciality of this IP address is that it is the IP address that would be assigned to the client. The DHCP server sends the ACK message directly to the client's IP address to confirm the assignment of the IP address and provide network configuration parameters.

17. The field in the DHCP ACK message that contains the assigned client IP address is "**Your (client) IP address**". This field contains the value "192.168.0.194", which is the IP address assigned to the client by the DHCP server.

18. The DHCP server assigned this IP address to the client for **86400 seconds or 1 day.**

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

19. The IP address of the first-hop router on the default path from the client to the rest of the Internet is **192.168.0.1** as seen in the screenshots below.

Your (client) IP address: 192.168.0.194
Next server IP address: 192.168.0.1

 v Option: (3) Router
 Length: 4
 Router: 192.168.0.1