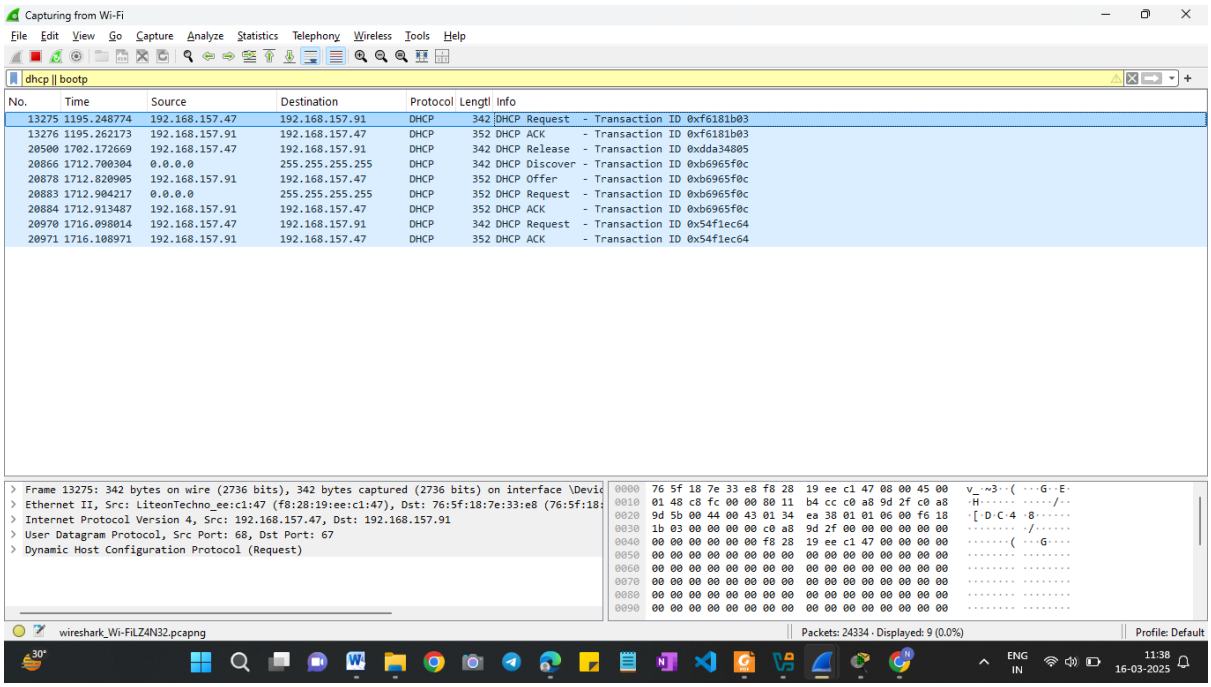
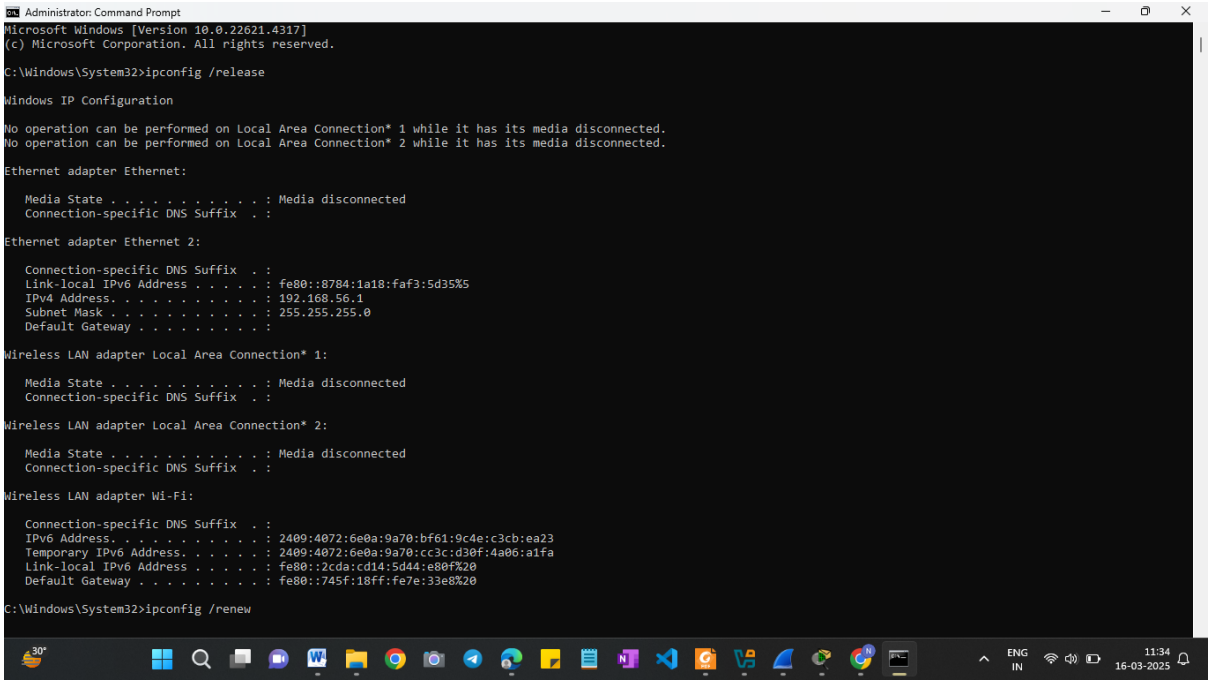
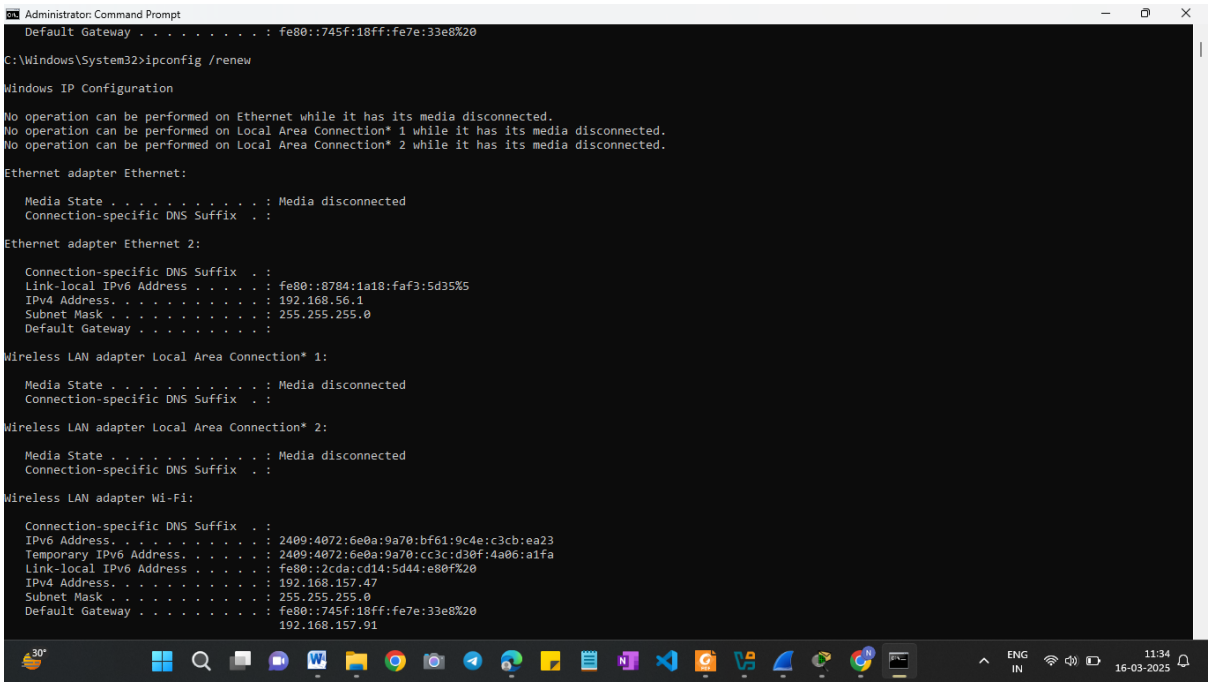
Q4) Use Wireshark to capture DHCP Discover, Offer, Request, and Acknowledge messages and explain the process.

Dynamic Host Configuration Protocol (DHCP) automates IP address assignment. It follows a four-step process, commonly known as **DORA (Discover, Offer, Request, Acknowledge)**:

1. **DHCP Discover:**
    - The client (new device) broadcasts a request to find a DHCP server.
    - Source MAC: Client's MAC Address
    - Destination MAC: Broadcast (FF:FF:FF:FF:FF:FF)
2. **DHCP Offer:**
    - The DHCP server responds with an available IP address.
    - Contains: Offered IP, Subnet Mask, Gateway, Lease Duration.
    - Source MAC: DHCP Server
    - Destination MAC: Client's MAC
3. **DHCP Request:**
    - The client accepts the offered IP and requests it formally.
    - Broadcasts a request to the server to confirm the lease.
4. **DHCP Acknowledge:**
    - The DHCP server confirms and assigns the IP address.
    - The client now has a valid network configuration.




Administrator: Command Prompt
Microsoft Windows [Version 10.0.22621.4317]
(c) Microsoft Corporation. All rights reserved.
C:\Windows\System32>ipconfig /release
Windows IP Configuration
No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.
Ethernet adapter Ethernet:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Ethernet adapter Ethernet 2:
Connection-specific DNS Suffix . :
Link-local IPv6 Address . . . . . : fe80::8784:1a18:faf3:5d35%5
IPv4 Address. . . . . : 192.168.56.1
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :
Wireless LAN adapter Local Area Connection* 1:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Wireless LAN adapter Local Area Connection* 2:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Wireless LAN adapter Wi-Fi:
Connection-specific DNS Suffix . :
IPv6 Address. . . . . : 2409:4072:6e0a:9a70:bf61:9c4e:c3cb:ea23
Temporary IPv6 Address. . . . . : 2409:4072:6e0a:9a70:cc3c:d30f:4a06:a1fa
Link-local IPv6 Address . . . . . : fe80::2cda:cd14:5d44:e80f%20
Default Gateway . . . . . : fe80::745f:18ff:fe7e:33e8%20
C:\Windows\System32>ipconfig /renew
ENG
IN
11:34
16-03-2025


Administrator: Command Prompt
Default Gateway . . . . . : fe80::745f:18ff:fe7e:33e8%20
C:\Windows\System32>ipconfig /renew
Windows IP Configuration
No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.
Ethernet adapter Ethernet:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Ethernet adapter Ethernet 2:
Connection-specific DNS Suffix . :
Link-local IPv6 Address . . . . . : fe80::8784:1a18:faf3:5d35%5
IPv4 Address. . . . . : 192.168.56.1
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . :
Wireless LAN adapter Local Area Connection* 1:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Wireless LAN adapter Local Area Connection* 2:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Wireless LAN adapter Wi-Fi:
Connection-specific DNS Suffix . :
IPv6 Address. . . . . : 2409:4072:6e0a:9a70:bf61:9c4e:c3cb:ea23
Temporary IPv6 Address. . . . . : 2409:4072:6e0a:9a70:cc3c:d30f:4a06:a1fa
Link-local IPv6 Address . . . . . : fe80::2cda:cd14:5d44:e80f%20
IPv4 Address. . . . . : 192.168.157.47
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::745f:18ff:fe7e:33e8%20
192.168.157.91
ENG
IN
11:34
16-03-2025

Analysis of Captured DHCP Request Packet

Packet Summary:

- **Packet Number:** 13275
- **Timestamp:** 1195.248774 seconds
- **Source IP:** 192.168.157.47 (Client requesting an IP)
- **Destination IP:** 192.168.157.91 (DHCP Server)
- **Protocol:** DHCP
- **Length:** 342 bytes
- **Transaction ID:** 0xf6181b03

Breakdown of the DHCP Request Packet

1. Purpose of the DHCP Request Message

- This is the **third step** in the **DORA process**.
- The client (192.168.157.47) **formally requests** the offered IP from the DHCP server (192.168.157.91).
- The request is broadcast to ensure other DHCP servers (if any) know the client has chosen this IP.

2. Key Fields in the Packet

Field	Value/Explanation
Transaction ID	`0xf6181b03` – Identifies this specific DHCP session.
Client MAC	The client's MAC address (needed for IP binding).
Requested IP	`192.168.157.47` – The client is requesting this IP officially.
Server Identifier	`192.168.157.91` – The DHCP server responding.
Broadcast Flag	Set if the client doesn't know its IP yet.
Parameter List	Requests subnet mask, gateway, DNS, lease time, etc.