Q10. Explain how a DHCP server assigns IP addresses to devices in your network.

A **DHCP (Dynamic Host Configuration Protocol) server** automates the assignment of **IP addresses** to devices on a network, ensuring efficient IP management and preventing conflicts. The process follows a structured **DORA (Discover, Offer, Request, Acknowledge) handshake**, ensuring seamless network communication.

### ****1. DHCP Discovery (Discover Message)****

When a new device (client) connects to the network and does not have a static IP, it sends a **DHCPDISCOVER** message as a broadcast (destination: 255.255.255.255, UDP port 67). This request is meant to locate an available DHCP server.

### ****2. DHCP Offer (Offer Message)****

The DHCP server responds with a **DHCPOFFER** message, providing an available IP address, subnet mask, default gateway, lease duration, and DNS server details. This response is also broadcasted, allowing multiple DHCP servers to compete in case of redundancy.

### ****3. DHCP Request (Request Message)****

The client evaluates the received offers and selects one (usually the first received). It then sends a **DHCPREQUEST** message, confirming acceptance of the offered IP and requesting lease assignment. This message is broadcasted to inform all DHCP servers, ensuring others withdraw their offers.

### ****4. DHCP Acknowledge (ACK Message)****

The DHCP server finalizes the process by sending a **DHCPACK** (acknowledgment), confirming the lease and providing network configuration details. The client now configures its interface accordingly and begins using the assigned IP.