Dynamic Host Configuration Protocol (DHCP) —

- In a network, every device needs a unique IP address to communicate. Manually setting these addresses can be slow and lead to mistakes, especially in large network.
- DHCP solves this by automatically assigning IP addresses and other settings like the subnet mask, default gateway and DNS servers.
- DHCP makes the network management easier by reducing manual work and preventing IP conflicts. It also reuses IP addresses when devices disconnect, helping to use the address pool efficiently.

- How DHCP works —

DHCP assigns IP addresses automatically through a process called DORA which stands for Discover, Offer, Request and Acknowledge.

Roles —

- DHCP server : A device (like a router or server) that gives out IP addresses from a pool.
- DHCP client : Any device that connects to the network and asks for an IP address.

DORA steps —

1. Discover — The client broadcasts a message to find DHCP servers.
2. Offer — Servers reply with an IP offer.
3. Request — The client accepts by sending a request for the offered IP.
4. Acknowledge — The server confirms and assigns the IP address.

After these steps, the device can use the IP address to communicate on the network.

Public vs Private IP address —

• **Public IP Address —**
- A public IP address is a globally unique identifier given to your device or network by your Internet Service Provider.
- These IPs are routable on the Internet, meaning data can be sent directly to them over global networks.
- Public IPs are necessary for hosting websites, remote access
or any service meant to be reachable from outside your local network.

Example:
- 8.8.8.8 is Google public DNS server
- 142.251.46.174 is one of Google's web server.

• **Private IP Address —**
- A Private IP address is used inside a local network — like in homes, offices or schools.
- These addresses are not routable on the internet.
Routers on the internet will drop any packets with private IPs because they're meant for internal use only.
- Devices on the same private network use these IPs
to communicate with each other locally.
- Define by RFC 1918 common IPv4 private addresses ranges from
  1. 10.0.0.0 — 10.255.255.255
  2. 172.16.0.0 — 172.31.255.255
  3. 192.168.0.0 — 192.168.255.255