

## Dynamic Host configuration protocol (DHCP)

- DHCP is a network protocol used to automate the process of assigning IP Addresses and other network configuration parameters to devices (such as computers, smartphones, and printers) on a network. Instead of manually configuring each device with an IP address, DHCP allows devices to connect to a network and receive all necessary network information like IP address, subnet mask, default gateway and DNS server addresses, automatically from a DHCP server.
- uses UDP on port 67 for client, port 68 for server.
- It is an application layer protocol. It is based on Client-server model.
- DHCP helps in maintaining a unique IP address for a host using the server.
- DHCP servers maintain information on TCP/IP configuration and provide configuration of address to DHCP enabled clients in form of a Lease offer.

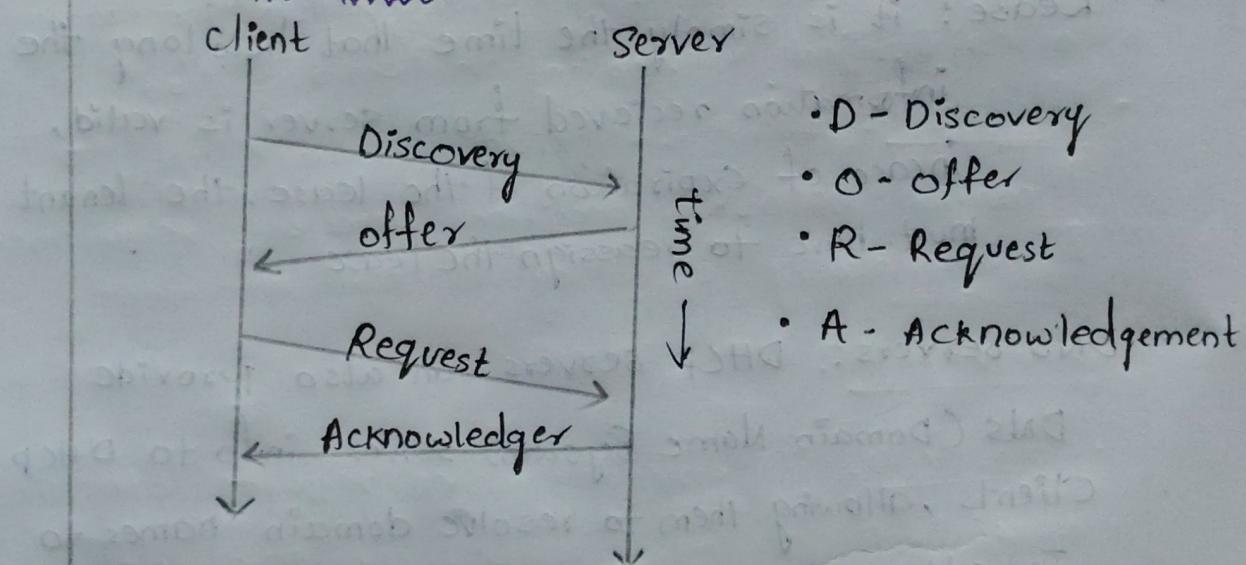
### Components of DHCP

- DHCP server: It is a server that holds IP Addresses and other info related to configuration.
- DHCP client: It is a device that receives configuration info from server. It can be any electronic device that requires a connection.

- **DHcp Relay:** DHCP Relays Basically work as a communication channel between DHCP Client and server.
- **IP address pool:** it is the pool or container of IP addresses possessed by the DHCP server. it has a range of addresses that can be allocated to devices
- **Subnets :** These are smaller portions of IP network partitioned to keep networks under control.
- **Lease:** it is simply the time that how long the information received from server is valid, in case of expiration of the lease, the tenant must have to reassign the lease.
- **DNS Servers:** DHCP servers can also provide DNS (Domain Name System) server info to DHCP clients, allowing them to resolve domain names to IP addresses.
- **Default Gateways:** DHCP servers can also provide information about the default gateway, which is the device that packets are sent to when the destination is outside the local network
- **options:** DHCP servers can provide additional configuration options to clients, such as the Subnet mask, domain name, and time server information

- Renewal: DHCP clients can request to renew their lease before it expires to ensure that they have to continue with valid IP address and configuration information.
- Dynamic updates: DHCP servers can also be configured to dynamically update DNS records with the IP address of DHCP clients, allowing for easier management of network resources.

⇒ How DHCP works?



**DHCP DISCOVER:** Client broadcast to locate available servers.

**DHCP OFFER:** Server to client in Response to DHCP DISCOVER with offer of configuration parameters.

**DHCP REQUEST:** Client message to server requesting offered parameters from one server and implicitly declining offers from all others.

DHCP ACK: Server to client with configuration parameters, including committed network address.

DHCPNAK: Server to client indicating client's notion of network address is incorrect.

DHCP DECLINE: Client to server indicating network address is already in use.

DHCP RELEASE: Client to server Releasing network address and cancelling remaining lease.

Architecture:

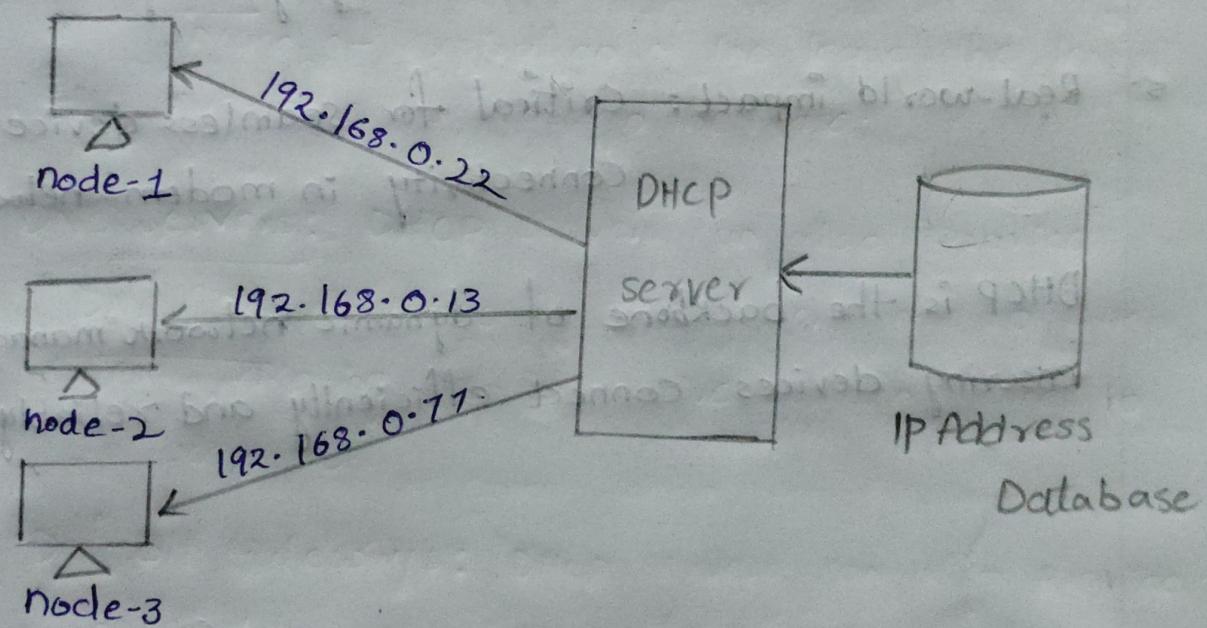


Fig: Working of DHCP protocol

## key takeaways on DHCP:

1. purpose: DHCP simplifies IP address management by automating the assignment process
2. Efficiency: Ensures efficient use of IP addresses and reduces configuration errors.
3. Four-step process: Discover, Offer, Request, Acknowledge (DORA)
4. Scalability: Essential for managing large networks
5. Real-world impact: Critical for seamless device connectivity in modern networks.

DHCP is the backbone of dynamic network management ensuring devices connect efficiently and reliably.