

A **DHCP server** (Dynamic Host Configuration Protocol server) is a network server that automatically assigns **IP addresses** and other **network configuration parameters** (like subnet mask, default gateway, and DNS server) to client devices. This eliminates the need for manual configuration of IP settings, making it easier and faster to manage networks — especially large ones with many devices.

When a client device connects to a network, it broadcasts a request for IP configuration. The DHCP server responds with an available IP address and related settings. This temporary IP assignment is known as a **lease**.

<i>Component</i>	<i>Explanation</i>
<i>DHCP Server</i>	Assigns IP addresses and network settings to clients automatically.
<i>DHCP Client</i>	Device that requests IP and config from DHCP server.
<i>DHCP Delay</i>	Time it takes for the client to get an IP address.
<i>IP Address Pool</i>	Range of IPs available for assignment.
<i>Subnets</i>	Divisions of the network using subnet masks.
<i>Lease</i>	Duration an IP is assigned to a client.
<i>DNS Server</i>	Resolves domain names to IP addresses.
<i>Default Gateway</i>	Router address to connect to other networks.
<i>Options</i>	Additional settings sent with the IP (like DNS, gateway).
<i>Renewal</i>	Process of extending the lease time for an IP.
<i>Failover</i>	Backup DHCP server for high availability.
<i>Dynamic Updates</i>	Auto-updating DNS when IP changes.
<i>Auto Logging</i>	Automatic record-keeping of DHCP activities.

**DHCP Packet Format:**

<i>Field</i>	<i>Size (Bytes)</i>	<i>Description</i>
<i>op</i>	1	Message type: 1 = request, 2 = reply
<i>htype</i>	1	Hardware type: 1 = Ethernet
<i>hlen</i>	1	Hardware address length (e.g., 6 for MAC)
<i>hops</i>	1	Relay agent hops (usually 0)
<i>xid</i>	4	Transaction ID – used to match requests/replies
<i>secs</i>	2	Seconds since client started the request
<i>flags</i>	2	Flags (e.g., broadcast bit)
<i>ciaddr</i>	4	Client IP address (if already assigned)
<i>yiaddr</i>	4	"Your" IP address – the IP assigned to the client
<i>siaddr</i>	4	Server IP address
<i>giaddr</i>	4	Gateway IP address (used by relay agents)
<i>chaddr</i>	16	Client hardware address (MAC)
<i>sname</i>	64	Optional server host name
<i>file</i>	128	Boot file name (optional)