

# Dynamic Host Configuration Protocol

Each device has to have an IP address to communicate with other devices in the network. There are two ways of setting IP addresses: static and dynamic. When a static IP is used, the IP addresses are assigned manually. The subnet mask, the default gateway, and the DNS servers should also be added manually. This method was laborious, and there was a risk of using the same IP twice, which could result in a conflict. In contrast, the dynamic IP is assigned its IP address, subnet mask, default gateway, and DNS server automatically. When the device is set to obtain an IP address automatically, it broadcasts an IP address request. When the DHCP receives the request, it assigns the device an IP address from its pool and delivers it to the computer. DHCP assigns IP addresses as a lease, which is the time an IP address is assigned to a host. It is used to ensure that the DHCP server does not run out of IP addresses. When the IP addresses have not been leased, the removal of a host device would tighten the scope of IP addresses. When using a while, the hosts send a DHCP request to renew their IP address. If the renewal request is not sent, the IP address of that host is sent to be added to the pool and can be assigned to another host. There are cases when network administrators want to issue the same IP address to a specific host every time. For that, they create an address reservation, which ensures that a device with the MAC address is always assigned the same MAC address. Reservations are usually granted to special devices like printers, servers, routers, etc. The DHCP is a service that typically runs on a server, but many routers can also function as DHCP servers.

There are two types of DHCP technologies: DHCPv4 and DHCPv6. They are used for assigning IPv4 and IPv6 addresses, respectively.

DHCP leases IP addresses in a 4-step process abbreviated as DORA

- DHCP Discover- the client broadcasts a message indicating its need for an IP address to find a DHCP server nearby.
- DHCP Offer- after the DHCP server receives that broadcast message, it offers an IP address from its pool. It binds that IP from the pool with the MAC address of the client.
- DHCP Request- when the client receives the offer message and still needs the IP address, it sends a DHCP Request message indicating that it will accept the offered IP.
- DHCP Acknowledgement- after the DHCP server receives the request message, it pings the to-be-assigned IP address to make sure it is not used, and if it is not assigns it to the new host.

However, the process of renewing a lease takes fewer steps. It consists of only the DHCP Request and the DHCP Acknowledgement messages. DHCP runs in the application layer of the OSI model. It uses UDP port number 67 for servers and UDP port number 68 for clients.