

## 5.3.9 DHCP Configuration Facts

The dynamic host configuration protocol (DHCP) centralizes management of IP addressing in a network by allowing a server to dynamically assign IP addresses to clients. DHCP also allows mobile users, who move from network to network, to easily obtain an IP address appropriate for each network they connect to.

### Obtain an Address from a DHCP Server

Because a DHCP client doesn't have an IP address when it initially boots, it must use broadcast frames to communicate with a DHCP server. The table below describes the method used to obtain an address from a DHCP server.

Broadcast	Description
DHCP Discover (D)	The client begins by sending out a DHCP Discover frame to identify DHCP servers on the network.
DHCP Offer (O)	A DHCP server that receives a Discover request from a client responds with a DHCP Offer advertisement, which contains an available IP address. If more than one DHCP server responds with an offer, the client usually responds to the first offer that it receives.
DHCP Request (R)	The client accepts the offered address by sending a DHCP request back to the DHCP server. If multiple offers were sent, the DHCP request message from the client also informs the other DHCP servers that their offers were not accepted and the IP addresses contained in their offers can be made available to other clients.
DHCP ACK (A)	The DHCP server responds to the request by sending a DHCP ACK (acknowledgement). At this point, the IP address is leased to and configured on the DHCP client.

If the DHCP server is on a different subnet, additional configuration steps are required, since network routers drop the DHCP broadcast frames by default.

### Configuring a DHCP Server

Keep in mind the following when configuring a DHCP Server:

- The DHCP service needs to auto-start when the server boots.
- The server must have a static IP address.
- A MAC reservation is an association of a MAC address with a specific IP address. In other words, the client with the specified MAC address is assigned the same IP address each time it requests an address.
- An IP reservation means you program MAC addresses into the DHCP server. When the DHCP server sees a certain host requesting an IP address based on its MAC, it will give you a specific IP address.

For a DHCP server to deliver IP addresses, it must have a scope configured. A *scope* is the range of IP addresses that the DHCP server can assign to clients. A scope can also be called a *pool*. When working with scopes, remember the following:

- There should be only one scope per network segment.
- The scope must be activated before the DHCP server can assign addresses to clients. After you activate a scope, you should not change it.
- A scope has a subnet mask that determines the subnet for a given IP address. You cannot change the subnet mask of an existing DHCP scope; to change the subnet mask used by a scope, you must delete and recreate the scope.
- Lease duration values are part of the scope properties, and they determine the length of time a client can use an IP address leased through DHCP.

The DHCP server can also be configured with exclusions, which are specific addresses in the range that should not be assigned.

### DHCP Server Functions

In addition to providing IP addresses, a DHCP server can also provide clients with additional IP configuration parameters using *options*. Commonly used DHCP options include the subnet mask, the default gateway address, and a DNS server address. The following levels of options can be configured:

- Server options are applied to all computers that get an IP address from the DHCP server, regardless of which scope they obtain the address from (for example, if your organization has only one DNS server, then all DHCP clients need the same DNS server address.)
- Scope options are applied to all computers that get an IP address from a particular scope on the DHCP server (for example, because scopes are associated with specific subnets, each scope needs to be configured with the appropriate default gateway address option.)
- Client options are applied to a specific DHCP client. The client's MAC address is used to identify which system receives the option.

The DHCP console provides context-sensitive icons to reflect DHCP server status as follows:

- A check mark in a green circle indicates that the DHCP server is connected and authorized.
- A red down arrow indicates that the DHCP server is connected, but not authorized.
- A horizontal white line inside a red circle indicates that the DHCP server is connected, but the current user does not have the administrative credentials necessary to manage the server.
- An exclamation point inside a yellow triangle indicates that 90% of available addresses for server scopes are either in use or leased.
- An exclamation point inside a blue circle indicates that 100% of available addresses for server scopes are either in use or leased.