



Implementing DHCP for IPv6

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This module describes how to configure Dynamic Host Configuration Protocol (DHCP) for IPv6 prefix delegation on your networking devices.

- [Finding Feature Information, page 1](#)
- [Information About Implementing DHCP for IPv6, page 1](#)
- [How to Implement DHCP for IPv6, page 8](#)
- [Configuration Examples for Implementing DHCPv6, page 35](#)
- [Additional References, page 37](#)
- [Feature Information for Implementing DHCP for IPv6, page 39](#)

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Information About Implementing DHCP for IPv6

- [DHCPv6 Prefix Delegation, page 1](#)

DHCPv6 Prefix Delegation

The DHCPv6 Prefix Delegation feature can be used to manage link, subnet, and site addressing changes. DHCPv6 can be used in environments to deliver stateful and stateless information:

- **Stateful**—Address assignment is centrally managed and clients must obtain configuration information not available through protocols such as address autoconfiguration and neighbor discovery.



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- Stateless—Stateless configuration parameters do not require a server to maintain any dynamic state for individual clients, such as Domain Name System (DNS) server addresses and domain search list options.

Extensions to DHCPv6 also enable prefix delegation, through which an Internet service provider (ISP) can automate the process of assigning prefixes to a customer for use within the customer's network. Prefix delegation occurs between a provider edge (PE) device and customer premises equipment (CPE), using the DHCPv6 prefix delegation option. Once the ISP has delegated prefixes to a customer, the customer may further subnet and assign prefixes to the links in the customer's network.

- [Configuring Nodes Without Prefix Delegation, page 2](#)
- [Client and Server Identification, page 2](#)
- [Rapid Commit, page 2](#)
- [DHCPv6 Client Server and Relay Functions, page 2](#)
- [DHCPv6 Server and Relay—MPLS VPN Support, page 8](#)

Configuring Nodes Without Prefix Delegation

Stateless DHCPv6 allows DHCPv6 to be used for configuring a node with parameters that do not require a server to maintain any dynamic state for the node. The use of stateless DHCP is controlled by router advertisement (RA) messages multicasted by routers. The Cisco IOS DHCPv6 client will invoke stateless DHCPv6 when it receives an appropriate RA. The Cisco IOS XE DHCPv6 server will respond to a stateless DHCPv6 request with the appropriate configuration parameters, such as the DNS servers and domain search list options.

Client and Server Identification

Each DHCPv6 client and server is identified by a DHCP unique identifier (DUID). The DUID is carried in the client identifier and server identifier options. The DUID is unique across all DHCP clients and servers, and it is stable for any specific client or server. DHCPv6 uses DUIDs based on link-layer addresses for both the client and server identifier. The device uses the MAC address from the lowest-numbered interface to form the DUID. The network interface is assumed to be permanently attached to the device.

When an IPv6 DHCP client requests two prefixes with the same DUID but different IAIDs on two different interfaces, these prefixes are considered to be for two different clients, and interface information is maintained for both.

Rapid Commit

The DHCPv6 client can obtain configuration parameters from a server either through a rapid two-message exchange (solicit, reply) or through a normal four-message exchange (solicit, advertise, request, reply). By default, the four-message exchange is used. When the rapid-commit option is enabled by both client and server, the two-message exchange is used.

DHCPv6 Client Server and Relay Functions

The DHCPv6 client, server, and relay functions are mutually exclusive on an interface. When one of these functions is already enabled and a user tries to configure a different function on the same interface, one of the following messages is displayed: "Interface is in DHCP client mode," "Interface is in DHCP server mode," or "Interface is in DHCP relay mode."

The following sections describe these functions:

- [Client Function, page 3](#)
- [Server Function, page 3](#)
- [DHCP Relay Agent, page 6](#)

Client Function

The DHCPv6 client function can be enabled on individual IPv6-enabled interfaces.

The DHCPv6 client can request and accept those configuration parameters that do not require a server to maintain any dynamic state for individual clients, such as DNS server addresses and domain search list options. The DHCPv6 client will configure the local Cisco IOS XE stack with the received information.

The DHCPv6 client can also request the delegation of prefixes. The prefixes acquired from a delegating router will be stored in a local IPv6 general prefix pool. The prefixes in the general prefix pool can then be referred to from other applications; for example, the general prefix pools can be used to number router downstream interfaces.

Server Selection

A DHCPv6 client builds a list of potential servers by sending a solicit message and collecting advertise message replies from servers. These messages are ranked based on preference value, and servers may add a preference option to their advertise messages explicitly stating their preference value. If the client needs to acquire prefixes from servers, only servers that have advertised prefixes are considered.

IAPD and IAID

An Identity Association for Prefix Delegation (IAPD) is a collection of prefixes assigned to a requesting router. A requesting router may have more than one IAPD; for example, one for each of its interfaces.

Each IAPD is identified by an identity association identification (IAID). The IAID is chosen by the requesting router and is unique among the IAPD IAIDs on the requesting router. IAIDs are made consistent across reboots by using information from the associated network interface, which is assumed to be permanently attached to the device.

Server Function

The DHCPv6 server function can be enabled on individual IPv6-enabled interfaces.

The DHCPv6 server can provide those configuration parameters that do not require the server to maintain any dynamic state for individual clients, such as DNS server addresses and domain search list options. The DHCPv6 server may be configured to perform prefix delegation.

All the configuration parameters for clients are independently configured into DHCPv6 configuration pools, which are stored in NVRAM. A configuration pool can be associated with a particular DHCPv6 server on an interface when it is started. Prefixes to be delegated to clients may be specified either as a list of preassigned prefixes for a particular client or as IPv6 local prefix pools that are also stored in NVRAM. The list of manually configured prefixes or IPv6 local prefix pools can be referenced and used by DHCPv6 configuration pools.

The DHCPv6 server maintains an automatic binding table in memory to track the assignment of some configuration parameters, such as prefixes between the server and its clients. The automatic bindings can be stored permanently in the database agent, which can be, for example, a remote TFTP server or local NVRAM file system.

Configuration Information Pool

A DHCPv6 configuration information pool is a named entity that includes information about available configuration parameters and policies that control assignment of the parameters to clients from the pool. A pool is configured independently of the DHCPv6 service and is associated with the DHCPv6 service through the command-line interface (CLI).

Each configuration pool can contain the following configuration parameters and operational information:

- Prefix delegation information, which could include:
 - A prefix pool name and associated preferred and valid lifetimes
 - A list of available prefixes for a particular client and associated preferred and valid lifetimes
- A list of IPv6 addresses of DNS servers
- A domain search list, which is a string containing domain names for DNS resolution

Prefix Assignment

A prefix-delegating router (DHCPv6 server) selects prefixes to be assigned to a requesting router (DHCPv6 client) upon receiving a request from the client. The server can select prefixes for a requesting client using static assignment and dynamic assignment mechanisms. Administrators can manually configure a list of prefixes and associated preferred and valid lifetimes for an IAPD of a specific client that is identified by its DUID.

When the delegating router receives a request from a client, it checks if there is a static binding configured for the IAPD in the client's message. If a static binding is present, the prefixes in the binding are returned to the client. If no such a binding is found, the server attempts to assign prefixes for the client from other sources.

The Cisco IOS XE DHCPv6 server can assign prefixes dynamically from an IPv6 local prefix pool. When the server receives a prefix request from a client, it attempts to obtain unassigned prefixes from the pool. After the client releases the previously assigned prefixes, the server returns them to the pool for reassignment.

An IPv6 prefix delegating router can also select prefixes for a requesting router based on an external authority such as a RADIUS server using the Framed-IPv6-Prefix attribute.

Automatic Binding

Each DHCPv6 configuration pool has an associated binding table. The binding table contains the records about all the prefixes in the configuration pool that have been explicitly delegated to clients. Each entry in the binding table contains the following information:

- Client DUID
- Client IPv6 address
- A list of IAPDs associated with the client
- A list of prefixes delegated to each IAPD
- Preferred and valid lifetimes for each prefix
- The configuration pool to which this binding table belongs
- The network interface on which the server that is using the pool is running

A binding table entry is automatically created whenever a prefix is delegated to a client from the configuration pool, and it is updated when the client renews, rebinds, or confirms the prefix delegation. A binding table entry is deleted when the client releases all the prefixes in the binding voluntarily, all prefixes' valid lifetimes have expired, or administrators run the **clear ipv6 dhcp binding** command.

Binding Database

Each permanent storage to which the binding database is saved is called the database agent. A database agent can be a remote host such as an FTP server or a local file system such as NVRAM.

The automatic bindings are maintained in RAM and can be saved to some permanent storage so that the information about configuration such as prefixes assigned to clients is not lost after a system reload or power down. The bindings are stored as text records for easy maintenance. Each record contains the following information:

- DHCPv6 pool name from which the configuration was assigned to the client
- Interface identifier from which the client requests were received
- The client IPv6 address
- The client DUID
- IAID of the IAPD
- Prefix delegated to the client
- The prefix length
- The prefix preferred lifetime in seconds
- The prefix valid lifetime in seconds
- The prefix expiration time stamp
- Optional local prefix pool name from which the prefix was assigned

At the beginning of the file, before the text records, a time stamp records the time when the database is written and a version number, which helps differentiate between newer and older databases. At the end of the file, after the text records, the text string “*end*” is stored to detect file truncation.

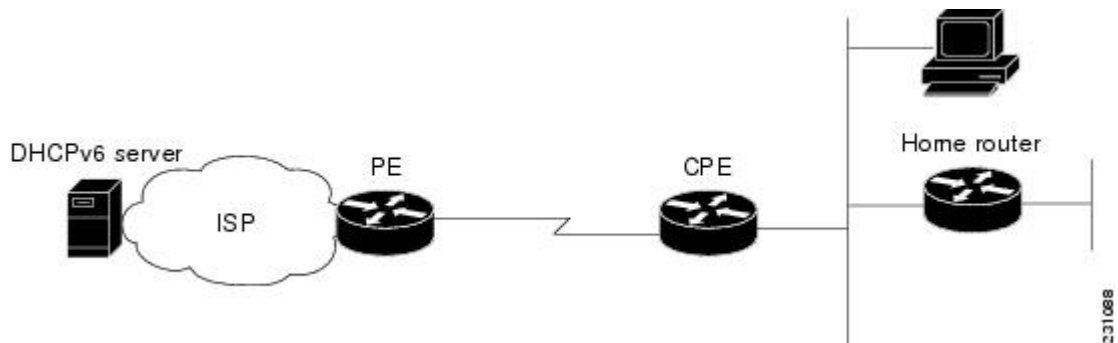
The permanent storage to which the binding database is saved is called the database agent. Database agents include FTP and TFTP servers, RCP, flash file system, and NVRAM.

DHCPv6 Server Stateless Autoconfiguration

Hierarchical DHCPv6 for stateless configuration parameters allows a stateless or stateful DHCPv6 client to export configuration parameters (DHCPv6 options) to a local DHCPv6 server pool. The local DHCPv6 server can then provide the imported configuration parameters to other DHCPv6 clients.

The figure below shows a typical broadband deployment.

Figure 1 **Broadband Topology**



The CPE interface toward the PE can be a stateless or stateful DHCPv6 client. In either case, the ISP-side DHCPv6 server may provide configuration parameters such as DNS server addresses, domain names, and Simple Network Time Protocol (SNTP) servers to the DHCP client on the CPE. These information can be specific to an ISP and may change.

In addition to being a DHCPv6 client (for example, toward the ISP), the CPE may act as a DHCPv6 server to the home network. For example, Neighbor Discovery followed by stateless or stateful DHCPv6 can occur on the link between CPE and the home devices (for example, the home router or PC). In some cases, the information to be provided to the home network is the same information obtained from the ISP-side DHCPv6 server. Because this information can be dynamically changed, it cannot be hard-configured in the CPE's configuration. Therefore, the DHCPv6 component on the CPE allows automatic importing of configuration parameters from the DHCPv6 client to the DHCPv6 server pool.

DHCPv6 provides support of the options for IPv6 on the server described in the following section:

Information Refresh Server Option

The DHCPv6 information refresh option can specify an upper boundary for the length of time a client should wait before refreshing information retrieved from DHCPv6. This option is used with stateless DHCPv6, because there are no addresses or other entities with lifetimes that can tell the client when to contact the DHCPv6 server to refresh its configuration.

NIS- and NIS+-Related Server Options

Users can configure the network information service (NIS) or NIS plus (NIS+) address or domain name of a DHCPv6 server using NIS- and NIS+-related options, and then import that information to the DHCPv6 client.

SIP Server Options

Session initiation protocol (SIP) server options contain either a list of domain names or IPv6 addresses that can be mapped to one or more SIP outbound proxy servers. One option carries a list of domain names, and the other option carries a list of 128-bit IPv6 addresses.

SIP is an application-layer control protocol that can establish, modify and terminate multimedia sessions or calls. A SIP system has several logical components: user agents, proxy servers, redirect servers, and registrars. User agents may contain SIP clients; proxy servers always contain SIP clients.

SNTP Server Option

The SNTP server option provides a list of one or more IPv6 addresses of SNTP servers available to the client for synchronization. The clients use these SNTP servers to synchronize their system time to that of the standard time servers. The server may list the SNTP servers in decreasing order of preference, but clients must treat the list of SNTP servers as an ordered list.

DHCP Relay Agent

A DHCP relay agent, which may reside on the client's link, is used to relay messages between the client and server. DHCP relay agent operation is transparent to the client. A client locates a DHCP server using a reserved, link-scoped multicast address. Therefore, it is a requirement for direct communication between the client and the server that the client and the server be attached to the same link. However, in some situations in which ease of management, economy, or scalability is a concern, it is desirable to allow a DHCP client to send a message to a DHCP server that is not connected to the same link.

DHCPv6 Relay Agent Notification for Prefix Delegation

DHCPv6 relay agent notification for prefix delegation allows the router working as a DHCPv6 relay agent to find prefix delegation options by reviewing the contents of a DHCPv6 RELAY-REPLY packet that is being relayed by the relay agent to the client. When a prefix delegation option is found by the relay agent, the relay agent extracts the information about the prefix being delegated and inserts an IPv6 static route

matching the prefix delegation information onto the relay agent. Future packets destined to that prefix via relay will be forwarded based on the information contained in the prefix delegation. The IPv6 static route is then left in the routing table until the prefix delegation lease time expires or the relay agent receives a release packet from the client releasing the prefix delegation.

No user configuration is required for this feature. Static route management is done automatically by the relay agent.

The IPv6 routes are added when the relay agent relays a RELAY-REPLY packet, and the IPv6 routes are deleted when the prefix delegation lease time expires or the relay agent receives a release message. An IPv6 static route in the routing table of the relay agent can be updated when the prefix delegation lease time is extended.

This feature leaves a static IPv6 route on the routing table of the relay agent. This registered IPv6 address allows unicast reverse packet forwarding (uRPF) to work by allowing the router doing the reverse lookup to confirm that the IPv6 address on the relay agent is not malformed or spoofed. The static route left in the routing table of the relay agent can be redistributed to other routing protocols to advertise the subnets to other nodes. The static routes will be removed when an DHCP_DECLINE message is sent by the client.

DHCPv6 Relay Options: Remote-ID for GigabitEthernet and FastEthernet Interfaces

This feature adds the remote identification (remote-ID) option to relayed (RELAY-FORWARD) DHCPv6 packets.

The remote-ID option provides information to the DHCPv6 server, including port information, the system's DUID, and the VLAN ID. Collectively, this information can be used to uniquely identify both the relay and the port on the relay through which the client's packet arrived. The DHCPv6 server uses this information to select parameters specific to a particular user, host, or subscriber modem.

This feature introduces no user configuration. Because the addition of the remote-ID option to the RELAY-FORWARD packet occurs automatically, no user configuration is necessary.

The DHCPv6 server does not need to echo the remote-ID option in the RELAY-REPLY packet. Internet Assigned Numbers Authority (IANA) has assigned the DHCPv6 option code 37 for the relay agent remote-ID option.

If the remote-ID option is included in the RELAY-REPLY packet, the option is stripped out of the packet before the packet is relayed to the client.

DHCPv6 Relay Options: Reload Persistent Interface-ID

This feature makes the interface-ID option, which is used by relay agents to decide which interface should be used when forwarding a RELAY-REPLY packet, persistent. A persistent interface-ID option will not change if the router acting as a relay agent goes offline (such as during a reload or a power outage). When the router acting as a relay agent returns online, it is possible that changes to the internal interface index of the relay agent may have occurred in certain scenarios (such as cases where the relay agent reboots and has a change in the number of interfaces in the interface index, or the relay agents boots up and has more virtual interfaces than it did before the reboot). This feature prevents this scenario from causing any problems.

This feature changes the DHCPv6 interface-ID option to be expressed as simply the short form of the interface name. This syntax helps avoid potential problems that could arise due to physical or logical interfaces changing on the relay agent after a reload.

DHCPv6 Relay Chaining

DHCPv6 messages can be relayed through multiple relay agents. This configuration is called *relay chaining*. Such a configuration can be supported only when each relay agent adds certain information to

DHCPv6 messages before relaying them. The additional information helps in relaying the DHCPv6 reply back to the DHCPv6 client through the same path.

The delegated IPv6 prefix must be routable in order to be useful. The actual DHCPv6 Prefix Delegation (PD) client may not be permitted to inject routes into the delegating network. In service-provider (SP) networks, for example, an edge router typically acts as a DHCPv6 relay agent, and this edge router often has the responsibility to maintain routes within the SP network for clients' PD bindings. In the event that DHCPv6 requests and responses are relayed through a chain of DHCPv6 relays, there may be a need to introduce appropriate routes (particularly with DHCPv6 PD) in the Forwarding Information Base (FIB) so that routing is handled transparently.

DHCPv6 Server and Relay—MPLS VPN Support

To facilitate managed central services in a Multiprotocol Label Switching (MPLS)-based network, DHCPv6 must be made MPLS-aware so a single resource can be used to serve multiple virtual private networks (VPNs) instead of dedicating a resource to a single VPN.

The DHCPv6 server implementation of MPLS VPN support allows a per-pool configuration so DHCPv6 pools can be associated with a VPN routing and forwarding (VRF) instance. The DHCPv6 server differentiates clients from various VRFs and assigns an IPv6 prefix accordingly from the respective VRF pools. Meanwhile, the DHCPv6 bindings store clients' VRF information.

The DHCPv6 relay implementation allows the configuration of the destination VRF instance to which the relay messages will be forwarded. The relay adds the client's VPN information while forwarding the client's DHCPv6 requests toward the server, and the relay then processes the client's VPN information in reply packets from server.

The relay adds IPv6 static routes for delegated prefixes in corresponding clients' VRF, and the relay's high availability (HA) functionality synchronizes the VRF information while synchronizing static routes created by the relay process.

The DHCPv6 relay and server VRF-aware features are disabled by default for backward compatibility.

How to Implement DHCP for IPv6

- [Configuring the DHCPv6 Server Function, page 8](#)
- [Configuring the DHCPv6 Client Function, page 11](#)
- [Configuring the DHCPv6 Relay Agent, page 12](#)
- [Configuring Route Addition for Relay/Server, page 13](#)
- [Configuring the Stateless DHCPv6 Function, page 14](#)
- [Configuring the DHCPv6 Server Options, page 18](#)
- [Defining a General Prefix with the DHCPv6 Prefix Delegation Client Function, page 26](#)
- [Configuring a VRF-Aware Relay and Server for MPLS VPN Support, page 27](#)
- [Restarting the DHCPv6 Client on an Interface, page 30](#)
- [Deleting Automatic Client Bindings from the DHCPv6 Binding Table, page 30](#)
- [Troubleshooting DHCPv6, page 31](#)
- [Verifying DHCPv6 Configuration and Operation, page 32](#)

Configuring the DHCPv6 Server Function

The tasks in the following sections explain how to configure DHCPv6 server function:

- [Creating and Configuring the DHCPv6 Configuration Pool, page 9](#)
- [Configuring a Binding Database Agent for the Server Function, page 10](#)

Creating and Configuring the DHCPv6 Configuration Pool

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 dhcp pool** *poolname*
4. **domain-name** *domain*
5. **dns-server** *ipv6-address*
6. **prefix-delegation** *ipv6-prefix / prefix-length client-DUID* [**iaid** *iaid*] [*lifetime*]
7. **prefix-delegation pool** *poolname* [**lifetime** { *valid-lifetime* | *preferred-lifetime* }]
8. **exit**
9. **interface** *type number*
10. **ipv6 dhcp server** *poolname* [**rapid-commit**] [**preference** *value*] [**allow-hint**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	ipv6 dhcp pool <i>poolname</i> Example: Router(config)# ipv6 dhcp pool pool1	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
Step 4	domain-name <i>domain</i> Example: Router(config-dhcp)# domain-name example.com	Configures a domain name for a DHCPv6 client.

	Command or Action	Purpose
Step 5	<p>dns-server <i>ipv6-address</i></p> <p>Example:</p> <pre>Router(config-dhcp)# dns-server 2001:DB8:3000:3000::42</pre>	Specifies the DNS IPv6 servers available to a DHCPv6 client.
Step 6	<p>prefix-delegation <i>ipv6-prefix / prefix-length client-DUID [iaid iaaid] [lifetime]</i></p> <p>Example:</p> <pre>Router(config-dhcp)# prefix-delegation 2001:DB8:1263::/48 0005000400F1A4D070D03</pre>	Specifies a manually configured numeric prefix to be delegated to a specified client's IAPD.
Step 7	<p>prefix-delegation pool <i>poolname [lifetime {valid-lifetime preferred-lifetime}]</i></p> <p>Example:</p> <pre>Router(config-dhcp)# prefix-delegation pool pool1 lifetime 1800 60</pre>	Specifies a named IPv6 local prefix pool from which prefixes are delegated to DHCPv6 clients.
Step 8	<p>exit</p> <p>Example:</p> <pre>Router(config-dhcp)# exit</pre>	Exits DHCPv6 pool configuration mode configuration mode, and returns the router to global configuration mode.
Step 9	<p>interface <i>type number</i></p> <p>Example:</p> <pre>Router(config)# interface serial 3</pre>	Specifies an interface type and number, and places the router in interface configuration mode.
Step 10	<p>ipv6 dhcp server <i>poolname [rapid-commit] [preference value] [allow-hint]</i></p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp server pool1</pre>	Enables DHCPv6 on an interface.

Configuring a Binding Database Agent for the Server Function

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 dhcp database agent** [*write-delay seconds*] [*timeout seconds*]

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 ipv6 dhcp database agent [<i>write-delay seconds</i>] [<i>timeout seconds</i>] Example: <pre>Router(config)# ipv6 dhcp database tftp://10.0.0.1/dhcp-binding</pre>	Specifies DHCPv6 binding database agent parameters.

Configuring the DHCPv6 Client Function

General prefixes can be defined dynamically from a prefix received by a DHCPv6 prefix delegation client. The delegated prefix is stored in a general prefix.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ipv6 dhcp client pd** {*prefix-name* | *hint ipv6-prefix*} [**rapid-commit**]

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>interface type number</code></p> <p>Example:</p> <pre>Router(config)# interface fastethernet 0/0/0</pre>	<p>Specifies an interface type and number, and places the router in interface configuration mode.</p>
<p>Step 4 <code>ipv6 dhcp client pd {prefix-name hint ipv6-prefix} [rapid-commit]</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp client pd dhcp-prefix</pre>	<p>Enables the DHCPv6 client process and enables a request for prefix delegation through a specified interface.</p>

Configuring the DHCPv6 Relay Agent

SUMMARY STEPS

- `enable`
- `configure terminal`
- `interface type number`
- `ipv6 dhcp relay destination ipv6-address [interface-type interface-number]`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>interface type number</code></p> <p>Example:</p> <pre>Router(config)# interface gigabitethernet 4/2/0</pre>	<p>Specifies an interface type and number, and places the router in interface configuration mode.</p>
<p>Step 4 <code>ipv6 dhcp relay destination ipv6-address [interface-type interface-number]</code></p> <p>Example:</p> <pre>Router(config-if) ipv6 dhcp relay destination FE80::250:A2FF:FEBF:A056 gigabitethernet 4/3/0</pre>	<p>Specifies a destination address to which client packets are forwarded and enables DHCPv6 relay service on the interface.</p>

Configuring Route Addition for Relay/Server

To enable route addition by Dynamic Host Configuration Protocol for IPv6 (DHCPv6) relay and server for the delegated prefix, use the `ipv6 dhcp iapd-route-add` command in global configuration mode.

To add routes for individually assigned IPv6 addresses on relay/server, use the `ipv6 dhcp iana-route-add` command in global configuration mode.

How to Implement DHCP for IPv6

- [Configuring the DHCPv6 Server Function, page 8](#)
- [Configuring the DHCPv6 Client Function, page 11](#)
- [Configuring the DHCPv6 Relay Agent, page 12](#)
- [Configuring Route Addition for Relay/Server, page 13](#)
- [Configuring the Stateless DHCPv6 Function, page 14](#)
- [Configuring the DHCPv6 Server Options, page 18](#)
- [Defining a General Prefix with the DHCPv6 Prefix Delegation Client Function, page 26](#)

- [Configuring a VRF-Aware Relay and Server for MPLS VPN Support, page 27](#)
- [Restarting the DHCPv6 Client on an Interface, page 30](#)
- [Deleting Automatic Client Bindings from the DHCPv6 Binding Table, page 30](#)
- [Troubleshooting DHCPv6, page 31](#)
- [Verifying DHCPv6 Configuration and Operation, page 32](#)

Configuring the Stateless DHCPv6 Function

The server maintains no state related to clients; for example, no prefix pools and records of allocation are maintained. Therefore, this function is "stateless" DHCPv6.

- [Configuring the Stateless DHCPv6 Server, page 14](#)
- [Enabling Processing of Packets with Source Routing Header Options, page 17](#)

Configuring the Stateless DHCPv6 Server

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ipv6 dhcp pool poolname`
4. `dns-server ipv6-address`
5. `domain-name domain`
6. `exit`
7. `interface type number`
8. `ipv6 dhcp server poolname [rapid-commit] [preference value] [allow-hint]`
9. `ipv6 nd other-config-flag`

DETAILED STEPS

Command or Action	Purpose
Step 1 <code>enable</code> Example: Router> <code>enable</code>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 <code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.

Command or Action	Purpose
<p>Step 3 <code>ipv6 dhcp pool <i>poolname</i></code></p> <p>Example:</p> <pre>Router(config)# ipv6 dhcp pool dhcp-pool</pre>	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
<p>Step 4 <code>dns-server <i>ipv6-address</i></code></p> <p>Example:</p> <pre>Router(config-dhcp) dns-server 2001:DB8:3000:3000::42</pre>	Specifies the DNS IPv6 servers available to a DHCPv6 client.
<p>Step 5 <code>domain-name <i>domain</i></code></p> <p>Example:</p> <pre>Router(config-dhcp)# domain-name domain1.com</pre>	Configures a domain name for a DHCPv6 client.
<p>Step 6 <code>exit</code></p> <p>Example:</p> <pre>Router(config-dhcp)# exit</pre>	Exits DHCPv6 pool configuration mode configuration mode, and returns the router to global configuration mode.
<p>Step 7 <code>interface <i>type number</i></code></p> <p>Example:</p> <pre>Router(config)# interface serial 3</pre>	Specifies an interface type and number, and places the router in interface configuration mode.
<p>Step 8 <code>ipv6 dhcp server <i>poolname</i> [rapid-commit] [preference <i>value</i>] [allow-hint]</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp server dhcp-pool</pre>	Enables DHCPv6 on an interface.
<p>Step 9 <code>ipv6 nd other-config-flag</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 nd other-config-flag</pre>	Sets the "other stateful configuration" flag in IPv6 RAs.

Configuring the Stateless DHCPv6 Server

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 dhcp pool** *poolname*
4. **dns-server** *ipv6-address*
5. **domain-name** *domain*
6. **exit**
7. **interface** *type number*
8. **ipv6 dhcp server** *poolname* [**rapid-commit**] [**preference** *value*] [**allow-hint**]
9. **ipv6 nd other-config-flag**

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 ipv6 dhcp pool <i>poolname</i> Example: <pre>Router(config)# ipv6 dhcp pool dhcp-pool</pre>	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
Step 4 dns-server <i>ipv6-address</i> Example: <pre>Router(config-dhcp) dns-server 2001:DB8:3000:3000::42</pre>	Specifies the DNS IPv6 servers available to a DHCPv6 client.
Step 5 domain-name <i>domain</i> Example: <pre>Router(config-dhcp)# domain-name domain1.com</pre>	Configures a domain name for a DHCPv6 client.

Command or Action	Purpose
<p>Step 6 <code>exit</code></p> <p>Example:</p> <pre>Router(config-dhcp)# exit</pre>	<p>Exits DHCPv6 pool configuration mode configuration mode, and returns the router to global configuration mode.</p>
<p>Step 7 <code>interface type number</code></p> <p>Example:</p> <pre>Router(config)# interface serial 3</pre>	<p>Specifies an interface type and number, and places the router in interface configuration mode.</p>
<p>Step 8 <code>ipv6 dhcp server poolname [rapid-commit] [preference value] [allow-hint]</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp server dhcp-pool</pre>	<p>Enables DHCPv6 on an interface.</p>
<p>Step 9 <code>ipv6 nd other-config-flag</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 nd other-config-flag</pre>	<p>Sets the "other stateful configuration" flag in IPv6 RAs.</p>

Enabling Processing of Packets with Source Routing Header Options

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ipv6 source-route`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.

	Command or Action	Purpose
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	ipv6 source-route Example: Router(config)# ipv6 source-route	Enables processing of the IPv6 type 0 routing header.

Configuring the DHCPv6 Server Options

- [Configuring the Information Refresh Server Option, page 18](#)
- [Importing the Information Refresh Server Option, page 19](#)
- [Configuring NIS- and NISP-Related Server Options, page 20](#)
- [Importing NIS- and NIS+-Related Server Options, page 21](#)
- [Importing SIP Server Options, page 22](#)
- [Configuring the SNTP Server Option, page 23](#)
- [Importing the SNTP Server Option, page 24](#)
- [Importing Stateless DHCPv6 Server Options, page 25](#)

Configuring the Information Refresh Server Option

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 dhcp pool** *poolname*
4. **information refresh** {*days* [*hours minutes*] | **infinity**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.

Command or Action	Purpose
Step 2 <code>configure terminal</code> Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 <code>ipv6 dhcp pool <i>poolname</i></code> Example: <pre>Router(config)# ipv6 dhcp pool pool1</pre>	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
Step 4 <code>information refresh {<i>days</i> [<i>hours minutes</i>] infinity}</code> Example: <pre>Router(config-dhcp)# information refresh 1 1 1</pre>	Specifies the information refresh time to be sent to the client.

Importing the Information Refresh Server Option

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ipv6 dhcp pool poolname`
4. `import information refresh`

DETAILED STEPS

Command or Action	Purpose
Step 1 <code>enable</code> Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 <code>configure terminal</code> Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.

Command or Action	Purpose
Step 3 <code>ipv6 dhcp pool <i>poolname</i></code> Example: <pre>Router(config)# ipv6 dhcp pool pool1</pre>	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
Step 4 <code>import information refresh</code> Example: <pre>Router(config-dhcp)# import information refresh</pre>	Imports the information refresh time option to a DHCPv6 client.

Configuring NIS- and NISP-Related Server Options

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ipv6 dhcp pool poolname`
4. `nis address ipv6-address`
5. `nis domain-name domain-name`
6. `nisp address ipv6-address`
7. `nisp domain-name domain-name`

DETAILED STEPS

Command or Action	Purpose
Step 1 <code>enable</code> Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 <code>configure terminal</code> Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.

Command or Action	Purpose
<p>Step 3 <code>ipv6 dhcp pool <i>poolname</i></code></p> <p>Example:</p> <pre>Router(config)# ipv6 dhcp pool pool1</pre>	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
<p>Step 4 <code>nis address <i>ipv6-address</i></code></p> <p>Example:</p> <pre>Router(config-dhcp)# nis address 2001:DB8:1000:1000::30</pre>	Specifies the NIS address of an IPv6 server to be sent to the client.
<p>Step 5 <code>nis domain-name <i>domain-name</i></code></p> <p>Example:</p> <pre>Router(config-dhcp)# nis domain-name domain1</pre>	Enables a server to convey a client's NIS domain name information to the client.
<p>Step 6 <code>nisp address <i>ipv6-address</i></code></p> <p>Example:</p> <pre>Router(config-dhcp)# nisp address 2001:DB8:3000:3000::42</pre>	Specifies the NIS+ address of an IPv6 server to be sent to the DHCPv6 client.
<p>Step 7 <code>nisp domain-name <i>domain-name</i></code></p> <p>Example:</p> <pre>Router(config-dhcp)# nisp domain-name domain2</pre>	Enables a server to convey a client's NIS+ domain name information to the DHCPv6 client.

Importing NIS- and NIS+-Related Server Options

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ipv6 dhcp pool poolname`
4. `import nis address`
5. `import nis domain-name`
6. `import nisp address`
7. `import nisp domain-name`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>ipv6 dhcp pool poolname</code></p> <p>Example:</p> <pre>Router(config)# ipv6 dhcp pool pool1</pre>	<p>Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.</p>
<p>Step 4 <code>import nis address</code></p> <p>Example:</p> <pre>Router(config-dhcp)# import nis address</pre>	<p>Imports the NIS servers option to a DHCPv6 client.</p>
<p>Step 5 <code>import nis domain-name</code></p> <p>Example:</p> <pre>Router(config-dhcp)# import nis domain-name</pre>	<p>Imports the NIS domain name option to a DHCPv6 client.</p>
<p>Step 6 <code>import nisp address</code></p> <p>Example:</p> <pre>Router(config-dhcp)# import nisp address</pre>	<p>Imports the NISP address option to a DHCPv6 client.</p>
<p>Step 7 <code>import nisp domain-name</code></p> <p>Example:</p> <pre>Router(config-dhcp)# import nisp domain-name</pre>	<p>Imports the NISP domain name option to a DHCPv6 client.</p>

Importing SIP Server Options

SUMMARY STEPS

1. enable
2. configure terminal
3. ipv6 dhcp pool *poolname*
4. import sip address
5. import sip domain-name

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3 ipv6 dhcp pool <i>poolname</i> Example: Router(config)# ipv6 dhcp pool pool1	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
Step 4 import sip address Example: Router(config-dhcp)# import sip address	Imports the SIP server IPv6 address list option to the outbound SIP proxy server.
Step 5 import sip domain-name Example: Router(config-dhcp)# import sip domain-name	Imports a SIP server domain-name list option to the outbound SIP proxy server.

Configuring the SNTP Server Option

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 dhcp pool *poolname***
4. **sntp address *ipv6-address***

DETAILED STEPS

Command or Action	Purpose
Step 1 enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2 configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 ipv6 dhcp pool <i>poolname</i> Example: <pre>Router(config)# ipv6 dhcp pool pool1</pre>	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
Step 4 sntp address <i>ipv6-address</i> Example: <pre>Router(config-dhcp)# sntp address 2001:DB8:2000:2000::33</pre>	Specifies the SNTP server list to be sent to the client.

Importing the SNTP Server Option**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. **ipv6 dhcp pool *poolname***
4. **import sntp address *ipv6-address***

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>ipv6 dhcp pool <i>poolname</i></code></p> <p>Example:</p> <pre>Router(config)# ipv6 dhcp pool pool1</pre>	<p>Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.</p>
<p>Step 4 <code>import sntp address <i>ipv6-address</i></code></p> <p>Example:</p> <pre>Router(config-dhcp)# import sntp address 2001:DB8:2000:2000::33</pre>	<p>Imports the SNTP server option to a DHCPv6 client.</p>

Importing Stateless DHCPv6 Server Options

SUMMARY STEPS

- `enable`
- `configure terminal`
- `ipv6 dhcp pool poolname`
- `import dns-server`
- `import domain-name`

DETAILED STEPS

Command or Action	Purpose
Step 1 <code>enable</code> Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2 <code>configure terminal</code> Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 <code>ipv6 dhcp pool <i>poolname</i></code> Example: <pre>Router(config)# ipv6 dhcp pool pool1</pre>	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.
Step 4 <code>import dns-server</code> Example: <pre>Router(config-dhcp)# import dns-server</pre>	Imports the DNS recursive name server option to a DHCPv6 client.
Step 5 <code>import domain-name</code> Example: <pre>Router(config-dhcp)# import domain-name</pre>	Imports the domain search list option to a DHCPv6 client.

Defining a General Prefix with the DHCPv6 Prefix Delegation Client Function

Perform this task to configure the DHCPv6 client function on an interface and enable prefix delegation on an interface. The delegated prefix is stored in a general prefix.

SUMMARY STEPS

- `enable`
- `configure terminal`
- `interface type number`
- `ipv6 dhcp client pd {prefix-name | hint ipv6-prefix} [rapid-commit]`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>interface type number</code></p> <p>Example:</p> <pre>Router(config)# interface gigabitethernet 0/0/0</pre>	<p>Specifies an interface type and number, and places the router in interface configuration mode.</p>
<p>Step 4 <code>ipv6 dhcp client pd {prefix-name hint ipv6-prefix} [rapid-commit]</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp client pd dhcp-prefix</pre>	<p>Enables the DHCPv6 client process and enables a request for prefix delegation through a specified interface.</p> <ul style="list-style-type: none"> The delegated prefix is stored in the general prefix <i>prefix-name</i> argument.

Configuring a VRF-Aware Relay and Server for MPLS VPN Support

- [Configuring a VRF-Aware Relay, page 27](#)
- [Configuring a VRF-Aware Server, page 29](#)

Configuring a VRF-Aware Relay

Note that you do not have to configure this feature on specified interfaces. If you want the feature to be enabled globally on the router only, perform steps 1, 2, and 3.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 dhcp-relay option vpn**
4. **interface *type number***
5. **ipv6 dhcp relay option vpn**
6. **ipv6 dhcp relay destination *ipv6-address* [*interface-type interface-number* | **vrf** *vrf-name* | **global**]**

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 enable</p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 configure terminal</p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 ipv6 dhcp-relay option vpn</p> <p>Example:</p> <pre>Router(config)# ipv6 dhcp-relay option vpn</pre>	<p>Enables the DHCP for IPv6 relay VRF-aware feature globally.</p>
<p>Step 4 interface <i>type number</i></p> <p>Example:</p> <pre>Router(config)# interface gigabitethernet 0/0/0</pre>	<p>Specifies an interface type and number, and places the router in interface configuration mode.</p>
<p>Step 5 ipv6 dhcp relay option vpn</p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp relay option vpn</pre>	<p>Enables the DHCP for IPv6 relay VRF-aware feature on the specified interface. Enabling this command supersedes configuration using the ipv6 dhcp-relay option vpn command.</p>

Command or Action	Purpose
<p>Step 6 <code>ipv6 dhcp relay destination <i>ipv6-address</i> [<i>interface-type interface-number</i> <i>vrf vrf-name</i> global]</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp relay destination FE80::250:A2FF:FEBF:A056 ethernet 0/0</pre>	<p>Specifies a destination address to which client messages are forwarded.</p>

Configuring a VRF-Aware Server

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `interface type number`
4. `ipv6 dhcp server vrf enable`

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 <code>configure terminal</code></p> <p>Example:</p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
<p>Step 3 <code>interface <i>type number</i></code></p> <p>Example:</p> <pre>Router(config)# interface gigabitethernet 0/0</pre>	<p>Specifies an interface type and number, and places the router in interface configuration mode.</p>
<p>Step 4 <code>ipv6 dhcp server vrf enable</code></p> <p>Example:</p> <pre>Router(config-if)# ipv6 dhcp server vrf enable</pre>	<p>Enables the DHCPv6 server VRF-aware feature on an interface.</p>

Restarting the DHCPv6 Client on an Interface

Perform this task to restart the DHCPv6 client on a specified interface after first releasing and unconfiguring previously acquired prefixes and other configuration options.

SUMMARY STEPS

1. `enable`
2. `clear ipv6 dhcp client interface-type interface-number`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<p><code>clear ipv6 dhcp client interface-type interface-number</code></p> <p>Example:</p> <pre>Router# clear ipv6 dhcp client GigabitEthernet 1/0/0</pre>	<p>Restarts DHCPv6 client on an interface.</p>

Deleting Automatic Client Bindings from the DHCPv6 Binding Table

SUMMARY STEPS

1. `enable`
2. `clear ipv6 dhcp binding [ipv6-address] [vrf vrf-name]`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.

Command or Action	Purpose
<p>Step 2 <code>clear ipv6 dhcp binding [ipv6-address] [vrf vrf-name]</code></p> <p>Example:</p> <pre>Router# clear ipv6 dhcp binding</pre>	<p>Deletes automatic client bindings from the DHCPv6 binding table.</p>

Troubleshooting DHCPv6

SUMMARY STEPS

1. enable
2. debug ipv6 dhcp [detail
3. debug ipv6 dhcp database
4. debug ipv6 dhcp relay

DETAILED STEPS

Command or Action	Purpose
<p>Step 1 <code>enable</code></p> <p>Example:</p> <pre>Router> enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
<p>Step 2 <code>debug ipv6 dhcp [detail</code></p> <p>Example:</p> <pre>Router# debug ipv6 dhcp</pre>	<p>Enables debugging for DHCPv6.</p>
<p>Step 3 <code>debug ipv6 dhcp database</code></p> <p>Example:</p> <pre>Router# debug ipv6 dhcp database</pre>	<p>Enables debugging for the DHCPv6 binding database.</p>
<p>Step 4 <code>debug ipv6 dhcp relay</code></p> <p>Example:</p> <pre>Router# debug ipv6 dhcp relay</pre>	<p>Enables DHCPv6 relay agent debugging.</p>

Verifying DHCPv6 Configuration and Operation

SUMMARY STEPS

1. **enable**
2. **show ipv6 dhcp**
3. **show ipv6 dhcp binding** [*ipv6-address*]
4. **show ipv6 dhcp database** [*agent-URL*]
5. **show ipv6 dhcp interface** [*type number*]
6. **show ipv6 dhcp pool** [*poolname*]
7. **show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router# enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	show ipv6 dhcp Example: Router# show ipv6 dhcp	Displays the DUID on a specified device.
Step 3	show ipv6 dhcp binding [<i>ipv6-address</i>] Example: Router# show ipv6 dhcp binding	Displays automatic client bindings from the DHCPv6 database.
Step 4	show ipv6 dhcp database [<i>agent-URL</i>] Example: Router# show ipv6 dhcp database	Displays the DHCPv6 binding database agent information.
Step 5	show ipv6 dhcp interface [<i>type number</i>] Example: Router# show ipv6 dhcp interface	Displays DHCPv6 interface information.

	Command or Action	Purpose
Step 6	show ipv6 dhcp pool [<i>poolname</i>] Example: Router# show ipv6 dhcp pool	Displays DHCPv6 configuration pool information.
Step 7	show running-config Example: Router# show running-config	Displays the current configuration running on the router.

- [Examples, page 33](#)

Examples

Sample Output from the show ipv6 dhcp Command

The following example from the **show ipv6 dhcp** command shows the DUID of the device:

```
Router# show ipv6 dhcp
This device's DHCPv6 unique identifier(DUID): 000300010002FCA5DC1C
```

Sample Output from the show ipv6 dhcp binding Command

In the following example, the **show ipv6 dhcp binding** command shows information about two clients, including their DUIDs, IAPDs, prefixes, and preferred and valid lifetimes:

```
Router# show ipv6 dhcp binding
Client: FE80::202:FCFF:FEA5:DC39 (GigabitEthernet2/1/0)
  DUID: 000300010002FCA5DC1C
  IA PD: IA ID 0x00040001, T1 0, T2 0
  Prefix: 3FFE:C00:C18:11::/68
         preferred lifetime 180, valid lifetime 12345
         expires at Nov 08 2002 02:24 PM (12320 seconds)
Client: FE80::202:FCFF:FEA5:C039 (GigabitEthernet2/1/0)
  DUID: 000300010002FCA5C01C
  IA PD: IA ID 0x00040001, T1 0, T2 0
  Prefix: 3FFE:C00:C18:1::/72
         preferred lifetime 240, valid lifetime 54321
         expires at Nov 09 2002 02:02 AM (54246 seconds)
  Prefix: 3FFE:C00:C18:2::/72
         preferred lifetime 300, valid lifetime 54333
         expires at Nov 09 2002 02:03 AM (54258 seconds)
  Prefix: 3FFE:C00:C18:3::/72
         preferred lifetime 280, valid lifetime 51111
```

Sample Output from the show ipv6 dhcp database Command

In the following example, the **show ipv6 dhcp database** command provides information on the binding database agents TFTP, NVRAM, and flash:

```
Router# show ipv6 dhcp database
```

```

Database agent tftp://172.19.216.133/db.tftp:
  write delay: 69 seconds, transfer timeout: 300 seconds
  last written at Jan 09 2003 01:54 PM,
    write timer expires in 56 seconds
  last read at Jan 06 2003 05:41 PM
  successful read times 1
  failed read times 0
  successful write times 3172
  failed write times 2
Database agent nvram:/dhcpv6-binding:
  write delay: 60 seconds, transfer timeout: 300 seconds
  last written at Jan 09 2003 01:54 PM,
    write timer expires in 37 seconds
  last read at never
  successful read times 0
  failed read times 0
  successful write times 3325
  failed write times 0
Database agent flash:/dhcpv6-db:
  write delay: 82 seconds, transfer timeout: 3 seconds
  last written at Jan 09 2003 01:54 PM,
    write timer expires in 50 seconds
  last read at never
  successful read times 0
  failed read times 0
  successful write times 2220
  failed write times 614

```

Sample Output from the show ipv6 dhcp interface Command

The following is sample output from the **show ipv6 dhcp interface** command. In the first example, the command is used on a router that has an interface acting as a DHCPv6 server. In the second example, the command is used on a router that has an interface acting as a DHCPv6 client:

```

Router1# show ipv6 dhcp interface
GigabitEthernet2/1/0 is in server mode
  Using pool: svr-p1
  Preference value: 20
  Rapid-Commit is disabled
Router2# show ipv6 dhcp interface
GigabitEthernet2/1/0 is in client mode
  State is OPEN (1)
  List of known servers:
    Address: FE80::202:FCFF:FEA1:7439, DUID 000300010002FCA17400
    Preference: 20
      IA PD: IA ID 0x00040001, T1 120, T2 192
        Prefix: 3FFE:C00:C18:1::/72
          preferred lifetime 240, valid lifetime 54321
          expires at Nov 08 2002 09:10 AM (54319 seconds)
        Prefix: 3FFE:C00:C18:2::/72
          preferred lifetime 300, valid lifetime 54333
          expires at Nov 08 2002 09:11 AM (54331 seconds)
        Prefix: 3FFE:C00:C18:3::/72
          preferred lifetime 280, valid lifetime 51111
          expires at Nov 08 2002 08:17 AM (51109 seconds)
      DNS server: 2001:DB8:1001::1
      DNS server: 2001:DB8:1001::2
      Domain name: example1.net
      Domain name: example2.net
      Domain name: example3.net
      Prefix name is cli-p1
      Rapid-Commit is enabled

```

Sample Output from the show ipv6 dhcp pool Command

In the following example, the **show ipv6 dhcp pool** command provides information on the configuration pool named svr-p1, including the static bindings, prefix information, the DNS server, and the domain names found in the svr-p1 pool:

```

Router# show ipv6 dhcp pool

```

```

DHCPv6 pool: svr-pl
Static bindings:
  Binding for client 000300010002FCA5C01C
    IA PD: IA ID 00040002,
      Prefix: 3FFE:C00:C18:3::/72
        preferred lifetime 604800, valid lifetime 2592000
    IA PD: IA ID not specified; being used by 00040001
      Prefix: 3FFE:C00:C18:1::/72
        preferred lifetime 240, valid lifetime 54321
      Prefix: 3FFE:C00:C18:2::/72
        preferred lifetime 300, valid lifetime 54333
      Prefix: 3FFE:C00:C18:3::/72
        preferred lifetime 280, valid lifetime 51111
    Prefix from pool: local-pl, Valid lifetime 12345, Preferred lifetime 180
    DNS server: 2001:DB8:1001::1
    DNS server: 2001:DB8:1001::2
    Domain name: example1.net
    Domain name: example2.net
    Domain name: example3.net
Active clients: 2
Current configuration : 22324 bytes
!
! Last configuration change at 14:59:38 PST Tue Jan 16 2001
! NVRAM config last updated at 04:25:39 PST Tue Jan 16 2001 by bird
!
hostname Router
!
ip cef
ipv6 unicast-routing
ipv6 cef
ipv6 cef accounting prefix-length
!
!
interface GigabitEthernet0/0/0
 ip address 10.4.9.11 255.0.0.0
 media-type 10BaseT
 ipv6 address 2001:DB8:C18:1::/64 eui-64

```

Configuration Examples for Implementing DHCPv6

- [Example Configuring the DHCPv6 Server Function, page 35](#)
- [Example Configuring the DHCPv6 Client Function, page 36](#)
- [Example Configuring a Database Agent for the Server Function, page 36](#)
- [Example Configuring the Stateless DHCPv6 Function, page 36](#)

Example Configuring the DHCPv6 Server Function

DHCPv6 clients are connected to this server on GigabitEthernet 0/0/0. The server is configured to use parameters from the DHCP pool called dhcp-pool. This pool provides clients with the IPv6 address of a DNS server and the domain name to be used. It also specifies that prefixes can be delegated from the prefix pool called client-prefix-pool1. The prefixes delegated will have valid and preferred lifetimes of 1800 and 600 seconds. The prefix pool named client-prefix-pool1 has a prefix of length /40 from which it will delegate (sub)prefixes of length /48.

```

ipv6 dhcp pool dhcp-pool
 prefix-delegation pool client-prefix-pool1 lifetime 1800 600
 dns-server 2001:DB8:3000:3000::42
 domain-name example.com
!
interface GigabitEthernet0/0/0
 description downlink to clients

```

```

ipv6 address FEC0:240:104:2001::139/64
ipv6 dhcp server dhcp-pool
!
ipv6 local pool client-prefix-pool1 2001:DB8:1200::/40 48

```

Example Configuring the DHCPv6 Client Function

This DHCPv6 client has three interfaces: GigabitEthernet interface 0/0/0 is the upstream link to a service provider, which has a DHCPv6 server function enabled. The FastEthernet interfaces 0/0/0 and 0/1/0 are links to local networks.

The upstream interface, GigabitEthernet interface 0/0/0, has the DHCPv6 client function enabled. Prefixes delegated by the provider are stored in the general prefix called prefix-from-provider.

The local networks, FastEthernet interfaces 0/0/0 and 0/1/0, both assign interface addresses based on the general prefix called prefix-from-provider. The leftmost bits of the addresses come from the general prefix, and the rightmost bits are specified statically.

```

interface GigabitEthernet 0/0/0
description uplink to provider DHCP IPv6 server
ipv6 dhcp client pd prefix-from-provider
!
interface FastEthernet 0/0/0
description local network 0
ipv6 address prefix-from-provider ::5:0:0:0:100/64
!
interface FastEthernet 0/1/0
description local network 1
ipv6 address prefix-from-provider ::6:0:0:0:100/64

```

Example Configuring a Database Agent for the Server Function

The DHCPv6 server is configured to store table bindings to the file named dhcp-binding on the server at address 10.0.0.1 using the TFTP protocol. The bindings are saved every 120 seconds.

```

ipv6 dhcp database tftp://10.0.0.1/dhcp-binding write-delay 120

```

The following example specifies DHCP for IPv6 binding database agent parameters and stores binding entries in bootflash:

```

ipv6 dhcp database bootflash

```

Example Configuring the Stateless DHCPv6 Function

This example uses the DHCPv6 function to configure clients with information about the name lookup system. The server is configured with a DHCP pool, which contains name lookup information to be passed to clients. It does not need to contain a prefix pool. This DHCP pool is attached to the access link to customers (GigabitEthernet0/0/0) using the **ipv6 dhcp server** command. The access link also has the **ipv6 nd other-config-flag** command enabled. RA messages sent from this interface will inform clients that they should use DHCPv6 for “other” (for example, nonaddress) configuration information.

```

ipv6 dhcp pool dhcp-pool
dns-server 2001:DB8:A:B::1
dns-server 2001:DB8:3000:3000::42
domain-name example.com
!
interface GigabitEthernet0/0/0
description Access link down to customers
ipv6 address 2001:DB8:1234:42::1/64

```

```
ipv6 nd other-config-flag
ipv6 dhcp server dhcp-pool
```

The client has no obvious DHCPv6 configuration. However, the **ipv6 address autoconfig** command on the uplink to the service provider (GigabitEthernet 0/0/0) causes two events to happen:

- Addresses are autoconfigured on the interface, based on prefixes in RA messages received from the server.
- If received RA messages have the “other configuration” flag set, the interface will attempt to acquire other (for example, nonaddress) configuration from any DHCPv6 servers.

Additional References

Related Documents

Related Topic	Document Title
IPv6 supported feature list	“Start Here: Cisco IOS XE Software Release Specifics for IPv6 Features,” <i>Cisco IOS XE IPv6 Configuration Guide</i>
IPv6 basic connectivity	“Implementing IPv6 Addressing and Basic Connectivity,” <i>Cisco IOS XE IPv6 Configuration Guide</i>
IPv6 prefix delegation	<ul style="list-style-type: none"> • “Implementing IPv6 Addressing and Basic Connectivity,” <i>Cisco IOS XE IPv6 Configuration Guide</i> • “Implementing ADSL and Deploying Dial Access for IPv6,” <i>Cisco IOS XE IPv6 Configuration Guide</i>
IPv6 commands: complete command syntax, command mode, defaults, usage guidelines, and examples	<i>Cisco IOS IPv6 Command Reference</i>
Cisco IOS master command list, all releases	Cisco IOS Master Command List, All Releases

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
RFC 3315	<i>Dynamic Host Configuration Protocol for IPv6</i>
RFC 3319	<i>Dynamic Host Configuration Protocol (DHCPv6) Options for Session Initiation Protocol (SIP) Servers</i>
RFC 3633	<i>IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) Version 6</i>
RFC 3646	<i>DNS Configuration Options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</i>
RFC 3898	<i>Network Information Service (NIS) Configuration Options for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</i>
RFC 4075	<i>Simple Network Time Protocol (SNTP) Configuration Option for DHCPv6</i>
RFC 4242	<i>Information Refresh Time Option for Dynamic Host Configuration Protocol for IPv6 (DHCPv6)</i>
RFC 4649	<i>Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Relay Agent Remote-ID Option</i>

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Implementing DHCP for IPv6

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1 Feature Information for Implementing DHCP for IPv6

Feature Name	Releases	Feature Information
IPv6 Access Services—DHCPv6 Prefix Delegation	Cisco IOS XE Release 2.1	<p>The DHCPv6 prefix delegation feature can be used to manage link, subnet, and site addressing changes. DHCPv6 can be used in environments to deliver stateful and stateless information.</p> <p>The following commands were modified by this feature: clear ipv6 dhcp binding, clear ipv6 dhcp client, debug ipv6 dhcp, debug ipv6 dhcp database, dns-server (IPv6), domain-name (IPv6), ipv6 dhcp client pd, ipv6 dhcp database, ipv6 dhcp pool, ipv6 dhcp server, prefix-delegation, prefix-delegation pool, show ipv6 dhcp, show ipv6 dhcp binding, show ipv6 dhcp database, show ipv6 dhcp interface, show ipv6 dhcp pool</p>

Feature Name	Releases	Feature Information
IPv6 Access Services—Stateless DHCPv6	Cisco IOS XE Release 2.5	<p>The stateless DHCPv6 feature allows DHCPv6 to be used for configuring a node with parameters that do not require a server to maintain any dynamic state for the node.</p> <ul style="list-style-type: none"> The following commands were modified by this feature: dns-server, domain-name, ipv6 dhcp pool, import dns-server, import domain-name, import information refresh, import nis address, importnis domain-name, import nisp address, import nisp domain-name, import sip address, import sip domain-name, import sntp address, information refresh, ipv6 dhcp server, ipv6 nd other-config-flag, nis address, nis domain-name, nisp address, nisp domain-name, show ipv6 dhcp interface, show ipv6 dhcp pool, sntp address
IPv6 Access Services—DHCP for IPv6 Relay Agent	Cisco IOS XE Release 2.1	<p>A DHCP relay agent, which may reside on the client's link, is used to relay messages between the client and server.</p> <p>The following commands were modified by this feature: debug ipv6 dhcp relay, ipv6 dhcp relay destination, show ipv6 dhcp interface</p>
DHCP—DHCPv6 Relay Agent Notification for Prefix Delegation	Cisco IOS XE Release 2.1	<p>DHCPv6 relay agent notification for prefix delegation allows the router working as a DHCPv6 relay agent to find prefix delegation options by reviewing the contents of a DHCPv6 packet that is being relayed by the relay agent to the client.</p>

Feature Name	Releases	Feature Information
DHCPv6 Ethernet Remote ID Option	Cisco IOS XE Release 2.1	This feature adds the remote-ID option to relayed (RELAY-FORWARD) DHCPv6 packets.
DHCPv6 - Relay - Reload Persistent Interface ID Option	Cisco IOS XE Release 2.1	This feature makes the interface-ID option, which is used by relay agents to decide which interface should be used when forwarding a RELAY-REPLY packet, persistent.
DHCPv6 Server—MPLS VPN Support	Cisco IOS XE Release 3.3S	The DHCPv6 server implementation of MPLS VPN support allows a per-pool configuration so DHCPv6 pools can be associated with a VRF instance. The DHCPv6 relay implementation allows the configuration of the destination VRF instance to which the relay messages will be forwarded.

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