



# IPv6 Access Services: DHCPv6 Prefix Delegation

The Dynamic Host Configuration Protocol for IPv6 (DHCPv6) prefix delegation feature can be used to manage link, subnet, and site addressing changes.

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## Restrictions for IPv6 Access Services: DHCPv6 Prefix Delegation

- DHCPv6 Reconfigure message type is not supported on the Cisco ASR920 Series routers.
- The **service dhcp** and **no service dhcp** commands are not applicable for DHCPv6.
- The **clear ipv6 dhcp statistics** command is not supported on the Cisco ASR920 Series routers.
- In case of IPv6, details of the default gateway are received from router advertisements (RA) and not DHCP.
- The `ipv6 dhcp server automatic` should be used only with IANA and not IA\_PD.

## Information About IPv6 Access Services: DHCPv6 Prefix Delegation

### DHCPv6 Prefix Delegation

The IPv6 Access Services—DHCPv6 Prefix Delegation feature can be used to manage link, subnet, and site addressing changes. Dynamic Host Configuration Protocol for IPv6 (DHCPv6) can be used in environments to deliver stateful and stateless information, which are defined as follows:

- Stateful prefix delegation—Address assignment is centrally managed and clients must obtain configuration information such as address autoconfiguration and neighbor discovery that is not available through protocols.
- Stateless prefix delegation—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 ISP can automate the process of assigning prefixes to a customer for use within the customer's network. The 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

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 XE DHCPv6 client will invoke stateless DHCPv6 when it receives an RA. The Cisco IOS XE DHCPv6 server will respond to a stateless DHCPv6 request with 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 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 a DHCPv6 client requests two prefixes with the same DUID but with different identity association identifiers (IAIDs) on two different interfaces, these prefixes are considered to be for two different clients, and the 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 four-message exchange (solicit, advertise, request, and reply). By default, the four-message exchange is used. When the rapid-commit option is enabled by both the client and the 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 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

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



**Note** You need APPX license package to enable the DHCPv6 client function on the device.

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 can also request the delegation of prefixes. The prefixes acquired from a delegating device 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 pool can be used to number device downstream interfaces.

For IPv6, the details of the default gateway are received from router advertisement (RA) and not from the DHCP server. The details of the default gateway obtained from the DHCP server are not added in the client server. Hence, the following IPv6 commands must be configured on the client interface:

- `pv6 nd autoconfig prefix`
- `ipv6 nd autoconfig default`

### Server Selection

A DHCPv6 client builds a list of potential servers by sending a solicit message and by collecting advertise message replies from servers. These messages are ranked based on the 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 device. A requesting device may have more than one IAPD; for example, one for each of its interfaces.

Each IAPD is identified by an IAID. The IAID is chosen by the requesting device and is unique among the IAPD IAIDs on the requesting device. 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 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 the NVRAM. A configuration pool can be associated with a particular DHCPv6 server on an interface when it is started. Prefixes that are 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 the 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. Automatic bindings can be stored permanently in the database agent, such as a remote TFTP server or a 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 the control assignment of the parameters to clients from the pool. A pool is configured independently and is associated with the DHCPv6 service through the CLI.

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

- Prefix delegation information, which includes:
  - 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 the DNS resolution

### DHCP for IPv6 Address Assignment

DHCPv6 enables DHCP servers to pass configuration parameters, such as IPv6 network addresses, to IPv6 clients. The DHCPv6 Individual Address Assignment feature manages nonduplicate address assignment in the correct prefix based on the network where the host is connected. Assigned addresses can be from one or multiple prefix pools. Additional options, such as the default domain and DNS name-server address, can be passed back to the client. Address pools can be assigned for use on a specific interface or on multiple interfaces, or the server can automatically find the appropriate pool.

### 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 by using static 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 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 records of all 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 the entry is updated when the client renews, rebinds, or confirms the prefix delegation. A binding table entry is deleted when the client voluntarily releases all the prefixes in the binding, the valid lifetimes of all prefixes 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 the NVRAM.

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

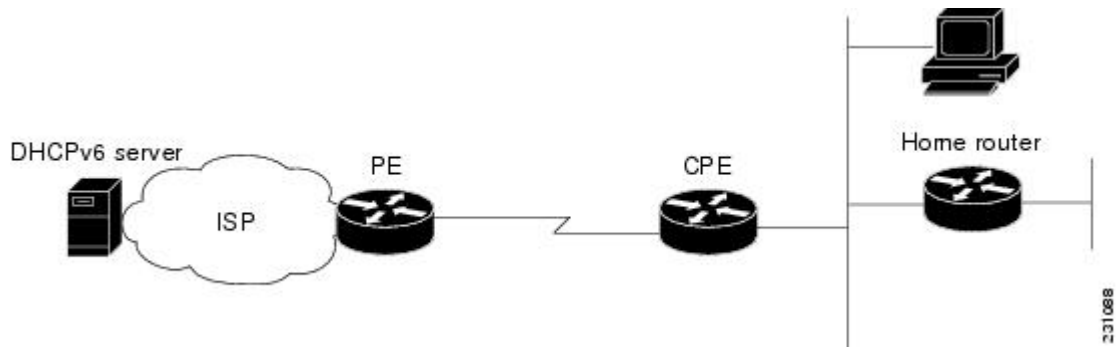
- DHCPv6 pool name from which the configuration was assigned to the client.
- Interface identifier from which the client requests were received.
- The client IPv6 address.
- The client DUID.
- IAID of the IAPD.
- Prefix delegated to the client.
- The prefix length.
- The prefix preferred lifetime in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

### 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 towards 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. Such information can be specific to ISPs.

In addition to being a DHCPv6 client (for example, towards the ISP), the CPE may act as a DHCPv6 server to the home network. For example, neighbor discovery followed by a stateless or stateful DHCPv6 client can occur on the link between the CPE and the home devices (such as the home router or PC). In some cases, the information to be provided to the home network is the same as that 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 supports the following options for IPv6 on the server:

### Information Refresh Server Option

The DHCPv6 information refresh option can specify a maximum limit for the length of time a client should wait before refreshing the 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 a list of 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. Clients use these SNTP servers to synchronize their system time to that of the standard

time servers. The DHCPv6 server may list the SNTP servers in decreasing order of preference, but clients treat the list of SNTP servers as an ordered list.

## Relay Function

A DHCPv6 relay agent, which may reside on the link of the DHCP client, is used to relay messages between the client and the server. The DHCPv6 relay agent operation is transparent to the client. A DHCPv6 client locates a DHCPv6 server using a reserved, link-scoped multicast address. For direct communication between the DHCPv6 client and the DHCPv6 server, both of them must be attached to the same link. However, in some situations where ease of management, economy, or scalability is a concern, it is desirable to allow a DHCPv6 client to send a message to a DHCPv6 server that is not connected to the same line.

DHCPv6 messages can be relayed through multiple relay agents. This configuration is called relay chaining. A relay-chaining configuration can be supported only when each relay agent adds information to the DHCPv6 messages before relaying them. This information helps in relaying the DHCPv6 reply back to the DHCPv6 client through the same path.

For more information on *Configuring the DHCPv6 Relay Agent*, see IPv6 Access Services: DHCPv6 Relay Agent chapter.

# How to Configure IPv6 Access Services: DHCPv6 Prefix Delegation

## Configuring the DHCPv6 Server Function

### 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**]
11. **end**

#### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b>	Enables privileged EXEC mode.  • Enter your password if prompted.

	Command or Action	Purpose
	Device> enable	
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>ipv6 dhcp pool <i>poolname</i></b> <b>Example:</b> Device(config)# ipv6 dhcp pool pool1	Configures a DHCPv6 configuration information pool and enters DHCPv6 pool configuration mode.  The <i>pool name</i> can be a string, such as "abcd" or an integer value, such as 0. During execution, the configuration mode changes to DHCPv6 pool configuration mode. In this mode, you can configure pool parameters, such as prefixes to be delegated, DNS servers, and so on.
<b>Step 4</b>	<b>domain-name <i>domain</i></b> <b>Example:</b> Device(config-dhcp)# domain-name example.com	Configures a domain name for a DHCPv6 client.
<b>Step 5</b>	<b>dns-server <i>ipv6-address</i></b> <b>Example:</b> Device(config-dhcp)# dns-server 2001:DB8:3000:3000::42	Specifies the DNS IPv6 servers available to a DHCPv6 client.
<b>Step 6</b>	<b>prefix-delegation <i>ipv6-prefix / prefix-length client-duid</i></b> <b>[<i>iaid iaid</i>] [<i>lifetime</i>]</b> <b>Example:</b> Device(config-dhcp)# prefix-delegation 2001:DB8:1263::/48 0005000400F1A4D070D03	Specifies a manually configured numeric prefix to be delegated to a specified client's IAPD.
<b>Step 7</b>	<b>prefix-delegation pool <i>poolname</i> [<b>lifetime</b> <i>valid-lifetime</i> <i>preferred-lifetime</i>]</b> <b>Example:</b> Device(config-dhcp)# prefix-delegation pool pool1 lifetime 1800 60	Specifies a named IPv6 local prefix pool from which prefixes are delegated to DHCPv6 clients.  The lifetime values are <i>valid-lifetime</i> and <i>preferred-lifetime</i> . These are referred to as T1 and T2. When the T2 expires, a renew request is sent to the particular server and if the client does not get a response within T1, the client sends a REBIND request to all available servers.  The value of <b>lifetime</b> can be specified as: <ul style="list-style-type: none"> <li>• a fixed duration that remains constant across consecutive advertisements</li> </ul>



	Command or Action	Purpose
		<ul style="list-style-type: none"> <li>absolute expiration time in the future, so that the advertised lifetime decrements in real time and is equal to zero at the specified time.</li> </ul> <p>The specified duration is between 60 and 4294967295 seconds or infinity if the keyword <b>infinite</b> is specified. If the lifetimes are not specified, by default, the <i>valid-lifetime</i> is 2592000 seconds (or 30 days) and the <i>preferred-lifetime</i> is 604800 seconds (or 7 days).</p>
<b>Step 8</b>	<b>exit</b> <b>Example:</b> <pre>Device(config-dhcp)# exit</pre>	Exits DHCPv6 pool configuration mode, and returns the device to global configuration mode.
<b>Step 9</b>	<b>interface</b> <i>type number</i> <b>Example:</b> <pre>Device(config)# interface serial 3</pre>	Specifies an interface type and number, and enters interface configuration mode.
<b>Step 10</b>	<b>ipv6 dhcp server</b> <i>poolname</i> [ <b>rapid-commit</b> ] [ <b>preference value</b> ] [ <b>allow-hint</b> ] <b>Example:</b> <pre>Device(config-if)# ipv6 dhcp server pool1</pre>	<p>Enables or disables DHCPv6 service on an interface.</p> <ul style="list-style-type: none"> <li>If specified, <b>rapid-commit</b> enables the use of the two-message exchange for prefix delegation and other configuration. If the <b>rapid-commit</b> option is used in the Solicit message and <b>rapid-commit</b> is enabled for the server, the server responds to the Solicit with a Reply message. By default, <b>rapid-commit</b> is disabled.</li> <li>Default value of <b>preference</b> is 0.</li> <li>If the <b>allow-hint</b> option is specified, is a valid prefix in the associated local prefix pool and is not assigned to anybody, the server delegates the client-suggested prefix in the Solicit and Request messages. Otherwise, the hint is ignored and a prefix is delegated from the free list in the pool.</li> </ul> <p><b>Note</b> By default, DHCPv6 service on an interface is disabled.</p>
<b>Step 11</b>	<b>end</b> <b>Example:</b> <pre>Device(config-if)# end</pre>	Returns to privileged EXEC mode.

## 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]**
4. **end**

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>ipv6 dhcp database agent [write-delay seconds] [timeout seconds]</b> <b>Example:</b> Device(config)# ipv6 dhcp database tftp://10.0.0.1/dhcp-binding	Specifies DHCPv6 binding database agent parameters. <ul style="list-style-type: none"> <li>•</li> <li>• <b>agent-URL</b>—flash, NVRAM, FTP, TFTP, or RCP uniform resource locator.</li> <li>• <b>write-delay</b>—specifies how often DHCP sends database updates. By default, DHCPv6 server waits 300 seconds before transmitting database changes. The minimum delay is 60 seconds.</li> <li>• <b>timeout</b>—specifies the time to wait for a database transfer. Infinity is defined as zero seconds. Transfers that exceed the timeout period are aborted. Default value is 300 seconds.</li> </ul>
<b>Step 4</b>	<b>end</b> <b>Example:</b> Device(config)# end	Returns to privileged EXEC mode.

## 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**]
5. **ipv6 nd autoconfig prefix**
6. **ipv6 nd autoconfig default-router**
7. **end**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters global configuration mode.
Step 3	<b>interface</b> <i>type number</i> <b>Example:</b> Device(config)# interface fastethernet 0/0/0	Specifies an interface type and number, and enters interface configuration mode.
Step 4	<b>ipv6 dhcp client pd</b> { <i>prefix-name</i>   <b>hint</b> <i>ipv6-prefix</i> } <b>[rapid-commit]</b> <b>Example:</b> Device(config-if)# ipv6 dhcp client pd dhcp-prefix	Enables the DHCPv6 client process and enables a request for prefix delegation through a specified interface. <p><b>Note</b> The <b>ipv6 dhcp client pd hint</b> command should always be used along with the <b>ipv6 dhcp client pd pd-name</b> command.</p>
Step 5	<b>ipv6 nd autoconfig prefix</b> <b>Example:</b> Device(config-if)# ipv6 nd autoconfig prefix	Allows Neighbor Discovery to install all valid on-link prefixes from router advertisements (RAs) received on the interface.
Step 6	<b>ipv6 nd autoconfig default-router</b> <b>Example:</b> Device(config-if)# ipv6 nd autoconfig default-router	Allows Neighbor Discovery to install a default route to the Neighbor Discovery-derived default router.
Step 7	<b>end</b> <b>Example:</b> Device(config-if)# end	Returns to privileged EXEC mode.

**Example**

The following example depicts the usage of **ipv6 dhcp client pd hint** command along with the **ipv6 dhcp client pd *pd-name*** command.

```
interface GigabitEthernet0/10
no ip address
media-type auto-select
negotiation auto
ipv6 address prefix-from-provider ::1/48
ipv6 enable
ipv6 dhcp client pd hint 2001:DB8:43::/48
ipv6 dhcp client pd prefix-from-provider
```

## 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
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"><li>• Enter your password if prompted.</li></ul>
<b>Step 2</b>	<b>clear ipv6 dhcp binding</b> [ <i>ipv6-address</i> ] [ <b>vrf</b> <i>vrf-name</i> ] <b>Example:</b> Device# clear ipv6 dhcp binding	Deletes automatic client bindings from the DHCPv6 binding table.

## Removing Previously-Acquired Prefixes

**SUMMARY STEPS**

1. **enable**
2. **clear ipv6 dhcp client** *interface*

**DETAILED STEPS**

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

	Command or Action	Purpose
	Device> enable	
<b>Step 2</b>	<b>clear ipv6 dhcp client interface</b> <b>Example:</b> Device# clear ipv6 dhcp client	Restarts DHCPv6 client on an interface after releasing and un-configuring previously-acquired prefixes and other configuration options.

## Debugging DHCPv6 Binding Database

### SUMMARY STEPS

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

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>debug ipv6 dhcp database</b> <b>Example:</b> Device# debug ipv6 dhcp database	Enables or disables debugging of DHCPv6 binding database.
<b>Step 3</b>	<b>debug ipv6 dhcp detail</b> <b>Example:</b> Device# debug ipv6 dhcp detail	Displays the client and server packet details.
<b>Step 4</b>	<b>debug ipv6 dhcp relay</b> <b>Example:</b> Device# debug ipv6 dhcp relay	Displays the relay details.

# Configuration Examples for IPv6 Access Services: DHCPv6 Prefix Delegation

## Example: Configuring the DHCPv6 Server Function

DHCPv6 clients are connected to the DHCPv6 server on Gigabit Ethernet interface 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 respectively. 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
  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
```

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
```

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
```

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

```

## Example: Configuring the DHCPv6 Configuration Pool

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-p1
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-p1, 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

```

**Example: Configuring the DHCPv6 Client Function**

```

!
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

```

**Example: Configuring the DHCPv6 Client Function**

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

The upstream interface, Gigabit Ethernet 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, Fast Ethernet interfaces 0/0/0 and 0/1/0, both assign interface addresses based on the general prefix called prefix-from-provider. The bits on the left of the addresses come from the general prefix, and the bits on the right of the addresses 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 shows how to specify DHCP for IPv6 binding database agent parameters and store binding entries in bootflash:

```

ipv6 dhcp database bootflash

```



## Example: Displaying DHCP Server and Client Information on the Interface

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

GigabitEthernet2/0 is in server mode
  Using pool: svr-pl
  Preference value: 20
  Rapid-Commit is disabled

Router2# show ipv6 dhcp interface

GigabitEthernet2/0 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-pl
      Rapid-Commit is enabled
```

## Example: Debugging DHCPv6

The following is sample output from the **debug ipv6 dhcp detail** command. If the keyword **detail** is specified, a detailed DHCPv6 message decoding report is displayed.

Client Debug Logs:

```
Mar 19 12:47:25.830 IST: IPv6 DHCP: DHCPv6 changes state from IDLE to SOLICIT (START) on
GigabitEthernet0/1
Mar 19 12:47:25.879 IST: %SYS-5-CONFIG_I: Configured from console by console
Mar 19 12:47:28.582 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:28.582 IST: src FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:28.582 IST: dst FF02::1:2 (GigabitEthernet0/1)
Mar 19 12:47:28.583 IST: type SOLICIT(1), xid 1602672
Mar 19 12:47:28.583 IST: option ELAPSED-TIME(8), len 2
Mar 19 12:47:28.583 IST: elapsed-time 0
Mar 19 12:47:28.583 IST: option CLIENTID(1), len 10
Mar 19 12:47:28.583 IST: 00030001001FC2AD9D80
Mar 19 12:47:28.583 IST: option ORO(6), len 6
```

## Example: Debugging DHCPv6

```

Mar 19 12:47:28.583 IST: IA-PD,DNS-SERVERS,DOMAIN-LIST
Mar 19 12:47:28.583 IST: option IA-PD(25), len 12
Mar 19 12:47:28.583 IST: IAID 0x00120001, T1 0, T2 0
Mar 19 12:47:28.583 IST: IPv6 DHCP: Sending SOLICIT to FF02::1:2 src FE80::21F:C2FF:FEAD:9D8C
  on GigabitEthernet0/1
Mar 19 12:47:29.720 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.720 IST: src FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:29.720 IST: dst FF02::1:2 (GigabitEthernet0/1)
Mar 19 12:47:29.720 IST: type SOLICIT(1), xid 1602672
Mar 19 12:47:29.720 IST: option ELAPSED-TIME(8), len 2
Mar 19 12:47:29.720 IST: elapsed-time 113
Mar 19 12:47:29.720 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.720 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.720 IST: option ORO(6), len 6
Mar 19 12:47:29.720 IST: IA-PD,DNS-SERVERS,DOMAIN-LIST
Mar 19 12:47:29.720 IST: option IA-PD(25), len 12
Mar 19 12:47:29.720 IST: IAID 0x00120001, T1 0, T2 0
Mar 19 12:47:29.720 IST: IPv6 DHCP: Sending SOLICIT to FF02::1:2 src FE80::21F:C2FF:FEAD:9D8C
  on GigabitEthernet0/1
Mar 19 12:47:29.746 IST: IPv6 DHCP: Received ADVERTISE message
Mar 19 12:47:29.746 IST: IPv6 DHCP: Received ADVERTISE from FE80::1EE8:5DFF:FEC5:3883 on
  GigabitEthernet0/1
Mar 19 12:47:29.746 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.746 IST: src FE80::1EE8:5DFF:FEC5:3883 (GigabitEthernet0/1)
Mar 19 12:47:29.746 IST: dst FE80::21F:C2FF:FEAD:9D8C (GigabitEthernet0/1)
Mar 19 12:47:29.746 IST: type ADVERTISE(2), xid 1602672
Mar 19 12:47:29.746 IST: option SERVERID(2), len 10
Mar 19 12:47:29.746 IST: 00030001F41FC2ADA080
Mar 19 12:47:29.746 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.746 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.746 IST: option IA-PD(25), len 41
Mar 19 12:47:29.746 IST: IAID 0x00120001, T1 300, T2 480
Mar 19 12:47:29.746 IST: option IAPREFIX(26), len 25
Mar 19 12:47:29.746 IST: preferred 600, valid 1800, prefix 2001:DB8:43::/48
Mar 19 12:47:29.746 IST: option DNS-SERVERS(23), len 16
Mar 19 12:47:29.747 IST: 2001:DB8::58
Mar 19 12:47:29.747 IST: option DOMAIN-LIST(24), len 10
Mar 19 12:47:29.747 IST: nour.com
Mar 19 12:47:29.747 IST: IPv6 DHCP: Adding server FE80::1EE8:5DFF:FEC5:3883
Mar 19 12:47:29.747 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.747 IST: src FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:29.747 IST: dst FF02::1:2 (GigabitEthernet0/1)
Mar 19 12:47:29.747 IST: type REQUEST(3), xid 1606592
Mar 19 12:47:29.747 IST: option ELAPSED-TIME(8), len 2
Mar 19 12:47:29.747 IST: elapsed-time 0
Mar 19 12:47:29.747 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.747 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.747 IST: option ORO(6), len 6
Mar 19 12:47:29.747 IST: IA-PD,DNS-SERVERS,DOMAIN-LIST
Mar 19 12:47:29.747 IST: option SERVERID(2), len 10
Mar 19 12:47:29.747 IST: 00030001F41FC2ADA080
Mar 19 12:47:29.747 IST: option IA-PD(25), len 41
Mar 19 12:47:29.747 IST: IAID 0x00120001, T1 0, T2 0
Mar 19 12:47:29.747 IST: option IAPREFIX(26), len 25
Mar 19 12:47:29.747 IST: preferred 0, valid 0, prefix 2001:DB8:43::/48
Mar 19 12:47:29.747 IST: IPv6 DHCP: Sending REQUEST to FF02::1:2 src FE80::21F:C2FF:FEAD:9D8C
  on GigabitEthernet0/1
Mar 19 12:47:29.747 IST: IPv6 DHCP: DHCPv6 changes state from SOLICIT to REQUEST
  (ADVERTISE_RECEIVED) on GigabitEthernet0/1
Mar 19 12:47:29.754 IST: IPv6 DHCP: Received REPLY message
Mar 19 12:47:29.754 IST: IPv6 DHCP: Received REPLY from FE80::1EE8:5DFF:FEC5:3883 on
  GigabitEthernet0/1
Mar 19 12:47:29.754 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.754 IST: src FE80::1EE8:5DFF:FEC5:3883 (GigabitEthernet0/1)

```

```

Mar 19 12:47:29.754 IST: dst FE80::21F:C2FF:FEAD:9D8C (GigabitEthernet0/1)
Mar 19 12:47:29.754 IST: type REPLY(7), xid 1606592
Mar 19 12:47:29.754 IST: option SERVERID(2), len 10
Mar 19 12:47:29.754 IST: 00030001F41FC2ADA080
Mar 19 12:47:29.754 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.754 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.754 IST: option IA-PD(25), len 41
Mar 19 12:47:29.754 IST: IAID 0x00120001, T1 300, T2 480
Mar 19 12:47:29.754 IST: option IAPREFIX(26), len 25
Mar 19 12:47:29.754 IST: preferred 600, valid 1800, prefix 2001:DB8:43::/48
Mar 19 12:47:29.754 IST: option DNS-SERVERS(23), len 16
Mar 19 12:47:29.754 IST: 2001:DB8::58
Mar 19 12:47:29.754 IST: option DOMAIN-LIST(24), len 10
Mar 19 12:47:29.754 IST: nour.com
Mar 19 12:47:29.754 IST: IPv6 DHCP: Processing options
Mar 19 12:47:29.754 IST: IPv6 DHCP: Adding prefix 2001:DB8:43::/48 to prefix-from-provider
Mar 19 12:47:29.755 IST: IPv6 DHCP: T1 set to expire in 300 seconds
Mar 19 12:47:29.755 IST: IPv6 DHCP: T2 set to expire in 480 seconds
Mar 19 12:47:29.755 IST: IPv6 DHCP: Configuring DNS server 2001:DB8::58
Mar 19 12:47:29.755 IST: IPv6 DHCP: Configuring domain name nour.com
Mar 19 12:47:29.755 IST: IPv6 DHCP: DHCPv6 changes state from REQUEST to OPEN (REPLY_RECEIVED)
on GigabitEthernet0/1

```

### Server Debug Logs:

```

IPv6 DHCP: Add IAPD routes, pool LPDCONF, idb GigabitEthernet0/4/4
Mar 19 12:47:25.744 IST: IPv6 DHCP: Add IANA routes, pool LPDCONF, idb GigabitEthernet0/4
Mar 19 12:47:29.733 IST: IPv6 DHCP: Received RELAY-FORWARD from FE80::1EE8:5DFF:FEC5:3884
on GigabitEthernet0/4
Mar 19 12:47:29.733 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.733 IST: src FE80::1EE8:5DFF:FEC5:3884 (GigabitEthernet0/4)
Mar 19 12:47:29.733 IST: dst 2001:DB8:12::1 (GigabitEthernet0/4)
Mar 19 12:47:29.733 IST: type RELAY-FORWARD(12), hop 0
Mar 19 12:47:29.733 IST: link ::
Mar 19 12:47:29.733 IST: peer FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:29.733 IST: option RELAY-MSG(9), len 50
Mar 19 12:47:29.733 IST: type SOLICIT(1), xid 1602672
Mar 19 12:47:29.733 IST: option ELAPSED-TIME(8), len 2
Mar 19 12:47:29.733 IST: elapsed-time 113
Mar 19 12:47:29.733 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.733 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.734 IST: option ORO(6), len 6
Mar 19 12:47:29.734 IST: IA-PD,DNS-SERVERS,DOMAIN-LIST
Mar 19 12:47:29.734 IST: option IA-PD(25), len 12
Mar 19 12:47:29.734 IST: IAID 0x00120001, T1 0, T2 0
Mar 19 12:47:29.734 IST: option CLIENT-LINKLAYER-ADDRESS(79), len 8
Mar 19 12:47:29.734 IST: 001f.c2ad.9d8c
Mar 19 12:47:29.734 IST: option INTERFACE-ID(18), len 7
Mar 19 12:47:29.734 IST: 0x4769302F302F33
Mar 19 12:47:29.734 IST: option REMOTEID(37), len 22
Mar 19 12:47:29.734 IST: 0x000000902000300000000000A000300011CE85DC53880
Mar 19 12:47:29.734 IST: IPv6 DHCP: Using interface pool LPDCONF
Mar 19 12:47:29.734 IST: IPv6 DHCP_AAA: Retrieved subblock; It has AAA DNS_SERVERS=0
Mar 19 12:47:29.734 IST: IPv6 DHCP: Option CLIENT-LINKLAYER-ADDRESS(79) in Relay-forward
ignored: 0001001FC2AD9D8C
Mar 19 12:47:29.734 IST: IPv6 DHCP: Option REMOTEID(37):
000000090200030000000000A000300011CE85DC53880
Mar 19 12:47:29.734 IST: IPv6 DHCP: SAS returned Null falling to link local
Mar 19 12:47:29.734 IST: IPv6 DHCP: Returning Link local address FE80::F61F:C2FF:FEAD:A0A8
Mar 19 12:47:29.734 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.734 IST: src FE80::F61F:C2FF:FEAD:A0A8
Mar 19 12:47:29.734 IST: dst FE80::1EE8:5DFF:FEC5:3884 (GigabitEthernet0/4)
Mar 19 12:47:29.735 IST: type RELAY-REPLY(13), hop 0
Mar 19 12:47:29.735 IST: link ::

```

## Example: Debugging DHCPv6

```

Mar 19 12:47:29.735 IST: peer FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:29.735 IST: option RELAY-MSG(9), len 111
Mar 19 12:47:29.735 IST: type ADVERTISE(2), xid 1602672
Mar 19 12:47:29.735 IST: option SERVERID(2), len 10
Mar 19 12:47:29.735 IST: 00030001F41FC2ADA080
Mar 19 12:47:29.735 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.735 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.735 IST: option IA-PD(25), len 41
Mar 19 12:47:29.735 IST: IAID 0x00120001, T1 300, T2 480
Mar 19 12:47:29.735 IST: option IAPREFIX(26), len 25
Mar 19 12:47:29.735 IST: preferred 600, valid 1800, prefix 2001:DB8:43::/48
Mar 19 12:47:29.735 IST: option DNS-SERVERS(23), len 16
Mar 19 12:47:29.735 IST: 2001:DB8::58
Mar 19 12:47:29.735 IST: option DOMAIN-LIST(24), len 10
Mar 19 12:47:29.735 IST: nour.com
Mar 19 12:47:29.735 IST: option INTERFACE-ID(18), len 7
Mar 19 12:47:29.735 IST: 0x4769302F302F33
Mar 19 12:47:29.735 IST: IPv6 DHCP: Sending RELAY-REPLY to FE80::1EE8:5DFF:FEC5:3884 src
FE80::F61F:C2FF:FEAD:A0A8 on GigabitEthernet0/4
Mar 19 12:47:29.750 IST: IPv6 DHCP: Received RELAY-FORWARD from FE80::1EE8:5DFF:FEC5:3884
on GigabitEthernet0/4
Mar 19 12:47:29.750 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.750 IST: src FE80::1EE8:5DFF:FEC5:3884 (GigabitEthernet0/4)
Mar 19 12:47:29.750 IST: dst 2001:DB8:12::1 (GigabitEthernet0/4)
Mar 19 12:47:29.750 IST: type RELAY-FORWARD(12), hop 0
Mar 19 12:47:29.750 IST: link ::
Mar 19 12:47:29.750 IST: peer FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:29.750 IST: option RELAY-MSG(9), len 93
Mar 19 12:47:29.750 IST: type REQUEST(3), xid 1606592
Mar 19 12:47:29.750 IST: option ELAPSED-TIME(8), len 2
Mar 19 12:47:29.750 IST: elapsed-time 0
Mar 19 12:47:29.750 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.750 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.750 IST: option ORO(6), len 6
Mar 19 12:47:29.750 IST: IA-PD,DNS-SERVERS,DOMAIN-LIST
Mar 19 12:47:29.750 IST: option SERVERID(2), len 10
Mar 19 12:47:29.750 IST: 00030001F41FC2ADA080
Mar 19 12:47:29.751 IST: option IA-PD(25), len 41
Mar 19 12:47:29.751 IST: IAID 0x00120001, T1 0, T2 0
Mar 19 12:47:29.751 IST: option IAPREFIX(26), len 25
Mar 19 12:47:29.751 IST: preferred 0, valid 0, prefix 2001:DB8:43::/48
Mar 19 12:47:29.751 IST: option CLIENT-LINKLAYER-ADDRESS(79), len 8
Mar 19 12:47:29.751 IST: 001f.c2ad.9d8c
Mar 19 12:47:29.751 IST: option INTERFACE-ID(18), len 7
Mar 19 12:47:29.751 IST: 0x4769302F302F33
Mar 19 12:47:29.751 IST: option REMOTEID(37), len 22
Mar 19 12:47:29.751 IST: 0x00000009020003000000000A000300011CE85DC53880
Mar 19 12:47:29.751 IST: IPv6 DHCP: Using interface pool LPDCONF
Mar 19 12:47:29.751 IST: IPv6 DHCP: Creating binding for FE80::21F:C2FF:FEAD:9D8C in pool
LPDCONF
Mar 19 12:47:29.751 IST: IPv6 DHCP: Allocating IA_PD 00120001 in binding for
FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:29.751 IST: IPv6 DHCP: Allocating prefix 2001:DB8:43::/48 in binding for
FE80::21F:C2FF:FEAD:9D8C, IAID 00120001
Mar 19 12:47:29.751 IST: IPv6 DHCP: Added Prefix 2001:DB8:43::/48 to Radix tree
Mar 19 12:47:29.752 IST: IPv6 DHCP: Route added: 2001:DB8:43::/48 via
FE80::1EE8:5DFF:FEC5:3884 dist 1 iaid 00120001 vrf default
Mar 19 12:47:29.752 IST: IPv6 DHCP AAA: Retrieved subblock; It has AAA DNS_SERVERS=0
Mar 19 12:47:29.752 IST: IPv6 DHCP: Option CLIENT-LINKLAYER-ADDRESS(79) in Relay-forward
ignored: 0001001FC2AD9D8C
Mar 19 12:47:29.752 IST: IPv6 DHCP: Option REMOTEID(37):
00000009020003000000000A000300011CE85DC53880
Mar 19 12:47:29.752 IST: IPv6 DHCP: SAS returned Null falling to link local
Mar 19 12:47:29.752 IST: IPv6 DHCP: Returning Link local address FE80::F61F:C2FF:FEAD:A0A8

```

```

Mar 19 12:47:29.752 IST: IPv6 DHCP: detailed packet contents
Mar 19 12:47:29.752 IST: src FE80::F61F:C2FF:FEAD:A0A8
Mar 19 12:47:29.752 IST: dst FE80::1EE8:5DFF:FEC5:3884 (GigabitEthernet0/4)
Mar 19 12:47:29.752 IST: type RELAY-REPLY(13), hop 0
Mar 19 12:47:29.752 IST: link ::
Mar 19 12:47:29.752 IST: peer FE80::21F:C2FF:FEAD:9D8C
Mar 19 12:47:29.752 IST: option RELAY-MSG(9), len 111
Mar 19 12:47:29.752 IST: type REPLY(7), xid 1606592
Mar 19 12:47:29.752 IST: option SERVERID(2), len 10
Mar 19 12:47:29.752 IST: 00030001F41FC2ADA080
Mar 19 12:47:29.752 IST: option CLIENTID(1), len 10
Mar 19 12:47:29.752 IST: 00030001001FC2AD9D80
Mar 19 12:47:29.752 IST: option IA-PD(25), len 41
Mar 19 12:47:29.752 IST: IAID 0x00120001, T1 300, T2 480
Mar 19 12:47:29.752 IST: option IAPREFIX(26), len 25
Mar 19 12:47:29.752 IST: preferred 600, valid 1800, prefix 2001:DB8:43::/48
Mar 19 12:47:29.752 IST: option DNS-SERVERS(23), len 16
Mar 19 12:47:29.752 IST: 2001:DB8::58
Mar 19 12:47:29.752 IST: option DOMAIN-LIST(24), len 10
Mar 19 12:47:29.752 IST: nour.com
Mar 19 12:47:29.752 IST: option INTERFACE-ID(18), len 7
Mar 19 12:47:29.752 IST: 0x4769302F302F33
Mar 19 12:47:29.752 IST: IPv6 DHCP: Sending RELAY-REPLY to FE80::1EE8:5DFF:FEC5:3884 src
FE80::F61F:C2FF:FEAD:A0A8 on GigabitEthernet0/4

```

## Additional References

### Related Documents

Related Topic	Document Title
IPv6 addressing and connectivity	<a href="#">IPv6 Configuration Guide</a>
Cisco IOS commands	<a href="#">Cisco IOS Master Commands List, All Releases</a>
IPv6 commands	<a href="#">Cisco IOS IPv6 Command Reference</a>
Cisco IOS IPv6 features	<a href="#">Cisco IOS IPv6 Feature Mapping</a>

### Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	<a href="#">IPv6 RFCs</a>

**MIBs**

<b>MIB</b>	<b>MIBs Link</b>
	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**Technical Assistance**

<b>Description</b>	<b>Link</b>
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.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Feature Information for IPv6 Access Services: DHCPv6 Prefix Delegation

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](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Table 1: Feature Information for IPv6 Access Services: DHCPv6 Prefix Delegation**

<b>Feature Name</b>	<b>Releases</b>	<b>Feature Information</b>
IPv6 Access Services: DHCPv6 Prefix Delegation	Cisco IOS XE Release 3.15.0S	This feature was introduced on the Cisco ASR 920 Series Aggregation Services Router (ASR-920-12CZ-A, ASR-920-12CZ-D, ASR-920-4SZ-A, ASR-920-4SZ-D, ASR-920-10SZ-PD, ASR-920-24SZ-IM, ASR-920-24SZ-M, ASR-920-24TZ-M).