Contents

DHCPv6 overview

DHCPv6 provides a framework to assign IPv6 prefixes, IPv6 addresses, and other configuration parameters to hosts.

DHCPv6 address/prefix assignment

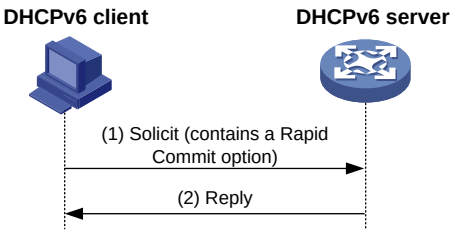
An address/prefix assignment process involves two or four messages.

Rapid assignment involving two messages

As shown in Figure 1, rapid assignment operates in the following steps:

1. The DHCPv6 client sends to the DHCPv6 server a Solicit message that contains a Rapid Commit option to prefer rapid assignment.
2. If the DHCPv6 server supports rapid assignment, it responds with a Reply message containing the assigned IPv6 address/prefix and other configuration parameters. If the DHCPv6 server does not support rapid assignment, Assignment involving four messages is performed.

Figure 1 Rapid assignment involving two messages

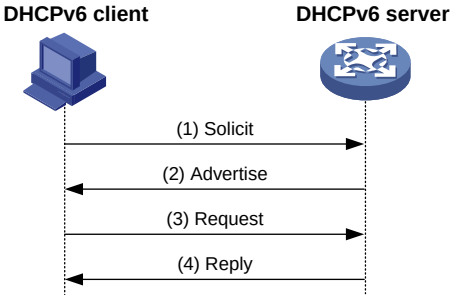


Assignment involving four messages

As shown in Figure 2, four-message assignment operates using the following steps:

1. The DHCPv6 client sends a Solicit message to request an IPv6 address/prefix and other configuration parameters.
2. The DHCPv6 server responds with an Advertise message that contains the assignable address/prefix and other configuration parameters if either of the following conditions exists:
   - The Solicit message does not contain a Rapid Commit option.
   - The DHCPv6 server does not support rapid assignment even though the Solicit message contains a Rapid Commit option.
3. The DHCPv6 client might receive multiple Advertise messages offered by different DHCPv6 servers. It selects an offer according to the receiving sequence and server priority, and sends a Request message to the selected server for confirmation.
4. The DHCPv6 server sends a Reply message to the client, confirming that the address/prefix and other configuration parameters are assigned to the client.

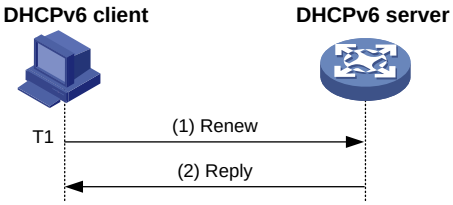
Figure 2 Assignment involving four messages



Address/prefix lease renewal

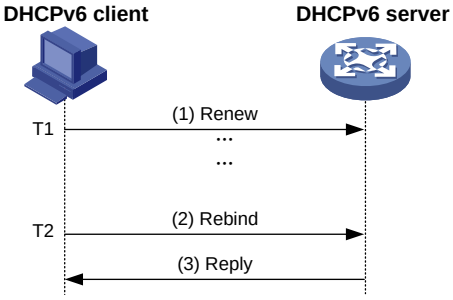
An IPv6 address/prefix assigned by a DHCPv6 server has a valid lifetime. After the valid lifetime expires, the DHCPv6 client cannot use the IPv6 address/prefix. To use the IPv6 address/prefix, the DHCPv6 client must renew the lease time.

Figure 3 Using the Renew message for address/prefix lease renewal



As shown in Figure 3, at T1, the DHCPv6 client sends a Renew message to the DHCPv6 server. The recommended value of T1 is half the preferred lifetime. The DHCPv6 server responds with a Reply message, informing the client whether the lease is renewed.

Figure 4 Using the Rebind message for address/prefix lease renewal



As shown in Figure 4:

- If the DHCPv6 client does not receive a response from the DHCPv6 server after sending a Renew message at T1, it multicasts a Rebind message to all DHCPv6 servers at T2. Typically, the value of T2 is 0.8 times the preferred lifetime.
- The DHCPv6 server responds with a Reply message, informing the client whether the lease is renewed.
- If the DHCPv6 client does not receive a response from any DHCPv6 server before the valid lifetime expires, the client stops using the address/prefix.

For more information about the valid lifetime and the preferred lifetime, see "Configuring basic IPv6 settings."

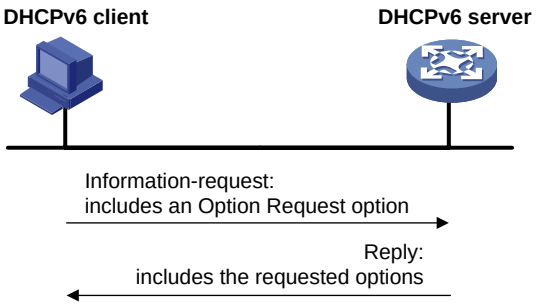
Stateless DHCPv6

Stateless DHCPv6 enables a device that has obtained an IPv6 address/prefix to get other configuration parameters from a DHCPv6 server.

The device performs stateless DHCPv6 if an RA message with the following flags is received from the router during stateless address autoconfiguration:

- The managed address configuration flag (M flag) is set to 0.
- The other stateful configuration flag (O flag) is set to 1.

Figure 5 Stateless DHCPv6 operation



As shown in Figure 5, stateless DHCPv6 operates in the following steps:

1. The DHCPv6 client sends an Information-request message to the multicast address of all DHCPv6 servers and DHCPv6 relay agents. The Information-request message contains an Option Request option that specifies the requested configuration parameters.
2. The DHCPv6 server returns to the client a Reply message containing the requested configuration parameters.
3. The client checks the Reply message. If the obtained configuration parameters match those requested in the Information-request message, the client uses these parameters to complete configuration. If not, the client ignores the configuration parameters. If the client receives multiple replies with configuration parameters matching those requested in the Information-request message, it uses the first received reply.

DHCPv6 options

Option 18

Option 18, also called the interface-ID option, is used by the DHCPv6 relay agent to determine the interface to use to forward RELAY-REPLY message.

The DHCPv6 snooping device adds Option 18 to the received DHCPv6 request message before forwarding it to the DHCPv6 server. The server then assigns IP address to the client based on the client information in Option 18.

Figure 6 Option 18 format

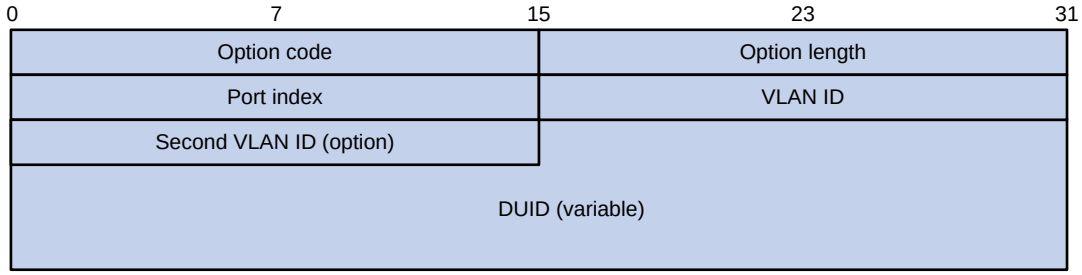


Figure 6 shows the Option 18 format, which includes the following fields:

- **Option code**—Option code. The value is 18.
- **Option length**—Size of the option data.
- **Port index**—Port that receives the DHCPv6 request from the client.
- **VLAN ID**—ID of the outer VLAN.
- **Second VLAN ID**—ID of the inner VLAN. This field is optional. If the received DHCPv6 request does not contain a second VLAN, Option 18 also does not contain it.
- **DUID**—DUID of the DHCPv6 client.

Option 37

Option 37, also called the remote-ID option, is used to identify the client.

The DHCPv6 snooping device adds Option 37 to the received DHCPv6 request message before forwarding it to the DHCPv6 server. This option provides client information about address allocation.

Figure 7 Option 37 format

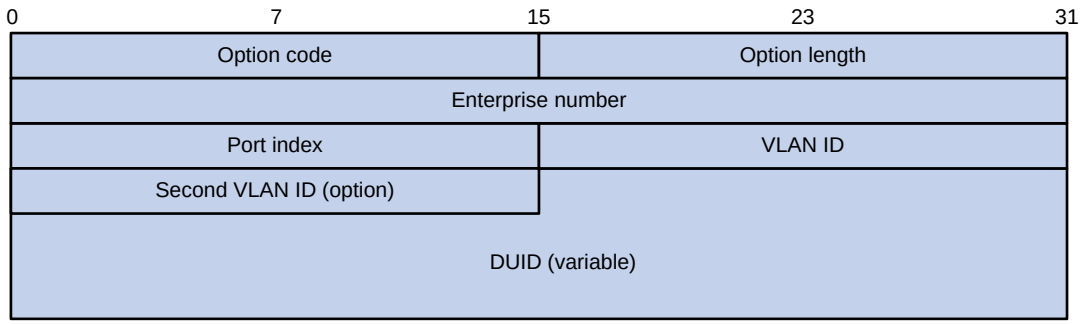


Figure 7 shows the Option 37 format, which includes the following fields:

- **Option code**—Option code. The value is 37.
- **Option length**—Size of the option data.
- **Enterprise number**—Enterprise number.
- **Port index**—Port that receives the DHCPv6 request from the client.
- **VLAN ID**—ID of the outer VLAN.
- **Second VLAN ID**—ID of the inner VLAN. This field is optional. If the received DHCPv6 request does not contain a second VLAN, Option 37 also does not contain it.
- **DUID**—DUID of the DHCPv6 client.

Option 79

Option 79, also called the client link-layer address option, is used to record the MAC address of the DHCPv6 client. The first relay agent that a DHCPv6 request passes learns the MAC address of the client and encapsulates this address into Option 79 in the Relay-Forward message for the request. The DHCPv6 server verifies the client or assigns IPv6 address/prefix to the client based on the MAC address of the client.

Figure 8 Option 79 format

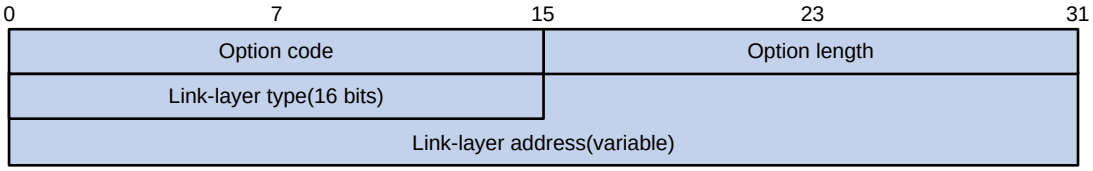


Figure 8 shows the Option 79 format, which includes the following fields:

- **Option code**—Option code. The value is 79.
- **Option length**—Size of the option data.
- **Link-layer type**—Link-layer address type of the client.
- **Link-layer address**—Link-layer address of the client.

Protocols and standards

- RFC 3736, *Stateless Dynamic Host Configuration Protocol (DHCP) Service for IPv6*
- RFC 3315, *Dynamic Host Configuration Protocol for IPv6 (DHCPv6)*
- RFC 2462, *IPv6 Stateless Address Autoconfiguration*
- RFC 3633, *IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6*
- RFC 6939, *Client Link-Layer Address Option in DHCPv6*

Configuring the DHCPv6 server

About DHCPv6 server

A DHCPv6 server can assign IPv6 addresses, IPv6 prefixes, and other configuration parameters to DHCPv6 clients.

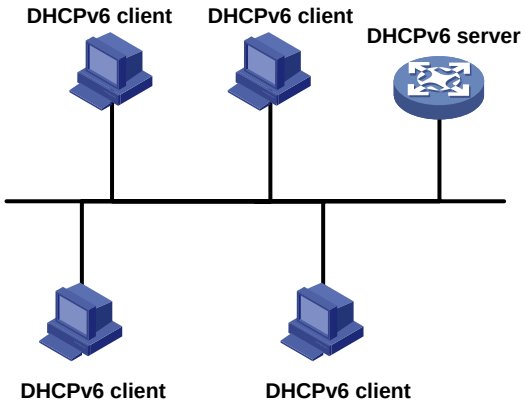
IPv6 address assignment

As shown in Figure 9, the DHCPv6 server assigns IPv6 addresses, domain name suffixes, DNS server addresses, and other configuration parameters to DHCPv6 clients.

The IPv6 addresses assigned to the clients include the following types:

- **Temporary IPv6 addresses**—Frequently changed without lease renewal.
- **Non-temporary IPv6 addresses**—Correctly used by DHCPv6 clients, with lease renewal.

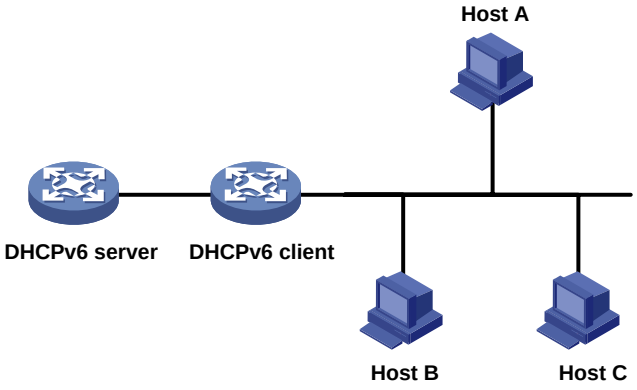
Figure 9 IPv6 address assignment



IPv6 prefix assignment

As shown in Figure 10, the DHCPv6 server assigns an IPv6 prefix to the DHCPv6 client. The client advertises the prefix information in a multicast RA message so that hosts on the subnet can automatically configure their IPv6 addresses by using the prefix.

Figure 10 IPv6 prefix assignment



Concepts

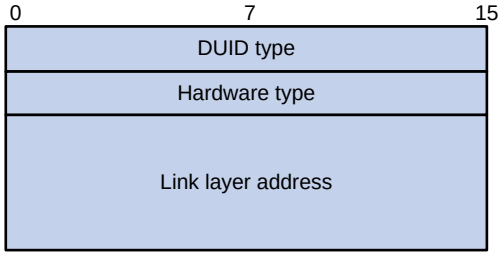
Multicast addresses used by DHCPv6

DHCPv6 uses the multicast address FF05::1:3 to identify all site-local DHCPv6 servers. It uses the multicast address FF02::1:2 to identify all link-local DHCPv6 servers and relay agents.

DUID

A DHCP unique identifier (DUID) uniquely identifies a DHCPv6 device (DHCPv6 client, server, or relay agent). A DHCPv6 device adds its DUID in a sent packet.

Figure 11 DUID-LL format



The device supports the DUID format based on link-layer address (DUID-LL) defined in RFC 3315. Figure 11 shows the DUID-LL format, which includes the following fields:

- **DUID type**—The device supports the DUID type of DUID-LL with the value of 0x0003.
- **Hardware type**—The device supports the hardware type of Ethernet with the value of 0x0001.
- **Link layer address**—Takes the value of the bridge MAC address of the device.

IA

Identified by an IAID, an identity association (IA) provides a construct through which a client manages the obtained addresses, prefixes, and other configuration parameters. A client can have multiple IAs, for example, one for each of its interfaces.

IAID

An IAID uniquely identifies an IA. It is chosen by the client and must be unique on the client.

PD

The DHCPv6 server creates a prefix delegation (PD) for each assigned prefix to record the following details:

- IPv6 prefix.
- Client DUID.
- IAID.
- Valid lifetime.
- Preferred lifetime.
- Lease expiration time.
- IPv6 address of the requesting client.

DHCPv6 address pool

The DHCP server selects IPv6 addresses, IPv6 prefixes, and other parameters from an address pool, and assigns them to the DHCP clients.

Address allocation mechanisms

DHCPv6 supports the following address allocation mechanisms:

- **Static address allocation**—To implement static address allocation for a client, create a DHCPv6 address pool, and manually bind the DUID and IAID of the client to an IPv6 address in the DHCPv6 address pool. When the client requests an IPv6 address, the DHCPv6 server assigns the IPv6 address in the static binding to the client.
- **Dynamic address allocation**—To implement dynamic address allocation for clients, create a DHCPv6 address pool, specify a subnet for the pool, and divide the subnet into temporary and non-temporary IPv6 address ranges. Upon receiving a DHCP request, the DHCPv6 server selects an IPv6 address from the temporary or non-temporary IPv6 address range based on the address type in the client request.

Prefix allocation mechanisms

DHCPv6 supports the following prefix allocation mechanisms:

- **Static prefix allocation**—To implement static prefix allocation for a client, create a DHCPv6 address pool, and manually bind the DUID and IAID of the client to an IPv6 prefix in the DHCPv6 address pool. When the client requests an IPv6 prefix, the DHCPv6 server assigns the IPv6 prefix in the static binding to the client.
- **Dynamic prefix allocation**—To implement dynamic prefix allocation for clients, create a DHCPv6 address pool and a prefix pool, specify a subnet for the address pool, and apply the prefix pool to the address pool. Upon receiving a DHCP request, the DHCPv6 server dynamically selects an IPv6 prefix from the prefix pool in the address pool.

Address pool selection

The DHCPv6 server observes the following principles when selecting an IPv6 address or prefix for a client:

1. If there is an address pool where an IPv6 address is statically bound to the DUID or IAID of the client, the DHCPv6 server selects this address pool. It assigns the statically bound IPv6 address or prefix and other configuration parameters to the client.
2. If the receiving interface has an address pool applied, the DHCP server selects an IPv6 address or prefix and other configuration parameters from this address pool.
3. If the receiving interface has a DHCP policy and the DHCP client matches a user class, the DHCP server selects the address pool that is bound to the matching user class. If no matching user class is found, the server assigns an IP address and other parameters from the default DHCP address pool. If no default address pool is specified or the default address pool does not have assignable IP addresses, the address assignment fails.
4. If the above conditions are not met, the DHCPv6 server selects an address pool depending on the client location.
    - **Client on the same subnet as the server**—The DHCPv6 server compares the IPv6 address of the receiving interface with the subnets of all address pools. It selects the address pool with the longest-matching subnet.
    - **Client on a different subnet than the server**—The DHCPv6 server compares the IPv6 address of the DHCPv6 relay agent interface closest to the client with the subnets of all address pools. It also selects the address pool with the longest-matching subnet.

    To make sure IPv6 address allocation functions correctly, keep the subnet used for dynamic assignment consistent with the subnet where the interface of the DHCPv6 server or DHCPv6 relay agent resides.

IPv6 address/prefix allocation sequence

The DHCPv6 server selects an IPv6 address/prefix for a client in the following sequence:

1. IPv6 address/prefix statically bound to the client's DUID and IAID and expected by the client.

2. IPv6 address/prefix statically bound to the client's DUID and IAID.
3. IPv6 address/prefix statically bound to the client's DUID and expected by the client.
4. IPv6 address/prefix statically bound to the client's DUID.
5. IPv6 address/prefix that was ever assigned to the client.
6. EUI-64 IPv6 address generated based on the client MAC address if EUI-64 address allocation is enabled.
7. Assignable IPv6 address/prefix in the address pool/prefix pool expected by the client.
8. Assignable IPv6 address/prefix in the address pool/prefix pool.
9. IPv6 address/prefix that was a conflict or passed its lease duration. If no IPv6 address/prefix is assignable, the server does not respond.

If a client moves to another subnet, the DHCPv6 server selects an IPv6 address/prefix from the address pool that matches the new subnet.

Conflicted IPv6 addresses can be assigned to other DHCPv6 clients only after the addresses are in conflict for one hour.

DHCPv6 server tasks at a glance

To configure the DHCPv6 server, perform the following tasks:

1. Configuring the DHCPv6 server to assign IPv6 prefixes, IPv6 addresses, and other network parameters

   Choose the following tasks as needed:
   - Configuring IPv6 prefix assignment
   - Configuring IPv6 address assignment
   - Configuring network parameters assignment
2. Modifying the address pool selection method on the DHCPv6 server

   Choose the following tasks as needed:
   - Configuring the DHCPv6 server on an interface
   - Configuring a DHCPv6 policy for IPv6 address and prefix assignment
3. (Optional.) Setting the DSCP value for DHCPv6 packets sent by the DHCPv6 server
4. (Optional.) Configuring DHCPv6 binding auto backup
5. (Optional.) Enabling the DHCPv6 server to advertise IPv6 prefixes
6. (Optional.) Applying a DHCPv6 address pool to a VPN instance
7. (Optional.) Enabling IPv6 address binding conversion for IP source guard
8. (Optional.) Enabling DHCPv6 logging on the DHCPv6 server

Configuring IPv6 prefix assignment

About IPv6 prefix assignment

Use the following methods to configure IPv6 prefix assignment:

- **Configure a static IPv6 prefix binding in an address pool**—If you bind a DUID and an IAID to an IPv6 prefix, the DUID and IAID in a request must match those in the binding before the DHCPv6 server can assign the IPv6 prefix to the DHCPv6 client. If you only bind a DUID to an IPv6 prefix, the DUID in the request must match the DUID in the binding before the DHCPv6 server can assign the IPv6 prefix to the DHCPv6 client.
- **Apply a prefix pool to an address pool**—The DHCPv6 server dynamically assigns an IPv6 prefix from the prefix pool in the address pool to a DHCPv6 client.

Restrictions and guidelines

When you configure IPv6 prefix assignment, follow these restrictions and guidelines:

- An IPv6 prefix can be bound to only one DHCPv6 client. You cannot modify bindings that have been created. To change the binding for a DHCPv6 client, you must delete the existing binding first.
- One address pool can have only one prefix pool applied. You cannot modify prefix pools that have been applied. To change the prefix pool for an address pool, you must remove the prefix pool application first.
- You can apply a prefix pool that has not been created to an address pool. The setting takes effect after the prefix pool is created.

Procedure

1. Enter system view.

   system-view

2. (Optional.) Specify the IPv6 prefixes excluded from dynamic assignment.

   ipv6 dhcp server forbidden-prefix *start-prefix*/*prefix-len* [*end-prefix*/*prefix-len*] [**vpn-instance** *vpn-instance-name*]

   By default, no IPv6 prefixes in the prefix pool are excluded from dynamic assignment.

   If the excluded IPv6 prefix is in a static binding, the prefix still can be assigned to the client.

3. Create a prefix pool.

   ipv6 dhcp prefix-pool *prefix-pool-number* **prefix** { *prefix-number* | *prefix*/*prefix-len* } **assign-len** *assign-len* [**vpn-instance** *vpn-instance-name*]

   This step is required for dynamic prefix assignment.

   If you specify an IPv6 prefix by its ID, make sure the IPv6 prefix is in effect. Otherwise, the configuration does not take effect.

4. Enter DHCP address pool view.

   ipv6 dhcp pool *pool-name*

5. Specify an IPv6 subnet for dynamic assignment.

   network { *prefix/prefix-length* | **prefix** *prefix-number* [*sub-prefix/sub-prefix-length*] } [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

   By default, no IPv6 subnet is specified for dynamic assignment.

   The IPv6 subnets cannot be the same in different address pools.

   If you specify an IPv6 prefix by its ID, make sure the IPv6 prefix is in effect. Otherwise, the configuration does not take effect.

6. Configure the prefix assignment. Choose the options to configure as needed:

   - Configure a static prefix binding:

     static-bind prefix *prefix*/*prefix-len* **duid** *duid* [**iaid** *iaid*] [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

     By default, no static prefix binding is configured.

     To add multiple static IPv6 prefix bindings, repeat this step.

   - Apply the prefix pool to the address pool:

     prefix-pool *prefix-pool-number* [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

     By default, static or dynamic prefix assignment is not configured for an address pool.

Configuring IPv6 address assignment

About IPv6 address assignment

Use one of the following methods to configure IPv6 address assignment:

- Configure a static IPv6 address binding in an address pool.

  If you bind a DUID and an IAID to an IPv6 address, the DUID and IAID in a request must match those in the binding before the DHCPv6 server can assign the IPv6 address to the requesting client. If you only bind a DUID to an IPv6 address, the DUID in a request must match the DUID in the binding before the DHCPv6 server can assign the IPv6 address to the requesting client.

- Specify a subnet and address ranges in an address pool.
  - **Non-temporary address assignment**—The server selects addresses from the non-temporary address range specified by the **address range** command. If no non-temporary address range is specified, the server selects addresses on the subnet specified by the **network** command.
  - **Temporary address assignment**—The server selects addresses from the temporary address range specified by the **temporary address range** command. If no temporary address range is specified in the address pool, the DHCPv6 server cannot assign temporary addresses to clients.

Restrictions and guidelines

- You can specify only one non-temporary address range and one temporary address range in an address pool.
- The address ranges specified by the **address range** and **temporary address range** commands must be on the subnet specified by the **network** command. Otherwise, the addresses are unassignable.
- An IPv6 address can be bound to only one DHCPv6 client. You cannot modify bindings that have been created. To change the binding for a DHCPv6 client, you must delete the existing binding first.
- Only one subnet can be specified in an address pool. If you use the **network** command multiple times in a DHCPv6 address pool, the most recent configuration takes effect. If you use this command to specify only new lifetimes, the settings do not affect existing leases. The IPv6 addresses assigned after the modification will use the new lifetimes.

Procedure

1. Enter system view.

   system-view

2. (Optional.) Specify the IPv6 addresses excluded from dynamic assignment.

   ipv6 dhcp server forbidden-address *start-ipv6-address* [*end-ipv6-address*] [**vpn-instance** *vpn-instance-name*]

   By default, all IPv6 addresses except for the DHCPv6 server's IP address in a DHCPv6 address pool are assignable.

   If the excluded IPv6 address is in a static binding, the address still can be assigned to the client.

3. Enter DHCPv6 address pool view.

   ipv6 dhcp pool *pool-name*

4. Specify an IPv6 subnet for dynamic assignment.

   network { *prefix/prefix-length* | **prefix** *prefix-number* [*sub-prefix/sub-prefix-length*] } [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

   By default, no IPv6 address subnet is specified.

The IPv6 subnets cannot be the same in different address pools.

If you specify an IPv6 prefix by its ID, make sure the IPv6 prefix is in effect. Otherwise, the configuration does not take effect.

5. (Optional.) Specify a non-temporary IPv6 address range.

   address range *start-ipv6-address end-ipv6-address* [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

   By default, no non-temporary IPv6 address range is specified, and all unicast addresses on the subnet are assignable.

6. (Optional.) Specify a temporary IPv6 address range.

   temporary address range *start-ipv6-address end-ipv6-address* [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

   By default, no temporary IPv6 address range is specified, and the DHCPv6 server cannot assign temporary IPv6 addresses.

7. (Optional.) Enable EUI-64 address allocation mode.

   address-alloc-mode eui-64

   By default, EUI-64 address allocation mode is disabled.

   This feature enables the DHCPv6 server to obtain the client MAC address in the DHCP request and generates an EUI-64 IPv6 address to assign to the client.

8. (Optional.) Create a static binding.

   static-bind address *ipv6-address*/*addr-prefix-length* **duid** *duid* [**iaid** *iaid*] [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

   By default, no static binding is configured.

   To add more static bindings, repeat this step.

Configuring network parameters assignment

About network parameters assignment

In addition to IPv6 prefixes and IPv6 addresses, you can configure the following network parameters in an address pool:

- A maximum of eight DNS server addresses.
- One domain name.
- A maximum of eight SIP server addresses.
- A maximum of eight SIP server domain names.

You can configure network parameters on a DHCPv6 server by using one of the following methods:

- Configure network parameters in a DHCPv6 address pool.
- Configure network parameters in a DHCPv6 option group, and specify the option group for a DHCPv6 address pool.

Network parameters configured in a DHCPv6 address pool take precedence over those configured in a DHCPv6 option group.

Configuring network parameters in a DHCPv6 address pool

1. Enter system view.

system-view

2. Enter DHCPv6 address pool view.
   ipv6 dhcp pool *pool-name*
3. Specify an IPv6 subnet for dynamic assignment.
   network { *prefix/prefix-length* | **prefix** *prefix-number* [*sub-prefix/sub-prefix-length*] } [**preferred-lifetime** *preferred-lifetime* **valid-lifetime** *valid-lifetime*]

   By default, no IPv6 subnet is specified.

   The IPv6 subnets cannot be the same in different address pools.

   If you specify an IPv6 prefix by its ID, make sure the IPv6 prefix is in effect. Otherwise, the configuration does not take effect.
4. Specify a DNS server address.
   dns-server *ipv6-address*

   By default, no DNS server address is specified.
5. Specify a domain name.
   domain-name *domain-name*

   By default, no domain name is specified.
6. Specify a SIP server address or domain name.
   sip-server { **address** *ipv6-address* | **domain-name** *domain-name* }

   By default, no SIP server address or domain name is specified.
7. Configure a self-defined DHCPv6 option.
   option *code* **hex** *hex-string*

   By default, no self-defined DHCPv6 option is configured.

Configuring network parameters in a DHCPv6 option group

About network parameters assignment in a DHCPv6 option group

A DHCPv6 option group can be created by using the following methods:

- Create a static DHCPv6 option group by using the **ipv6 dhcp option-group** command. The static DHCPv6 option group takes precedence over the dynamic DHCPv6 option group.
- When the device acts as a DHCPv6 client, it automatically creates a dynamic DHCPv6 option group for saving the obtained parameters. For more information about creating a dynamic DHCPv6 option group, see "Configuring the DHCPv6 client."

Procedure

1. Enter system view.
   system-view
2. Create a static DHCPv6 option group and enter its view.
   ipv6 dhcp option-group *option-group-number*
3. Specify a DNS server address.
   dns-server *ipv6-address*

   By default, no DNS server address is specified.
4. Specify a domain name suffix.
   domain-name *domain-name*

   By default, no domain name suffix is specified.
5. Specify a SIP server address or domain name.

sip-server { **address** *ipv6-address* | **domain-name** *domain-name* }

By default, no SIP server address or domain name is specified.

6. Configure a self-defined DHCPv6 option.

   option *code* **hex** *hex-string*

   By default, no self-defined DHCPv6 option is configured.

7. Return to system view.

   quit

8. Enter DHCPv6 address pool view.

   ipv6 dhcp pool *pool-name*

9. Specify a DHCPv6 option group.

   option-group *option-group-number*

   By default, no DHCPv6 option group is specified.

Configuring the DHCPv6 server on an interface

About configuring the DHCPv6 server on an interface

Enable the DHCP server and configure one of the following address/prefix assignment methods on an interface:

- **Apply an address pool on the interface**—The DHCPv6 server selects an IPv6 address/prefix from the applied address pool for a requesting client. If there is no assignable IPv6 address/prefix in the address pool, the DHCPv6 server cannot assign an IPv6 address/prefix to a client.
- **Configure global address assignment on the interface**—The DHCPv6 server selects an IPv6 address/prefix in the global DHCPv6 address pool that matches the server interface address or the DHCPv6 relay agent address for a requesting client.

If you configure both methods on an interface, the DHCPv6 server uses the specified address pool for address assignment without performing global address assignment.

Restrictions and guidelines

- An interface cannot act as a DHCPv6 server and DHCPv6 relay agent at the same time.
- Do not enable DHCPv6 server and DHCPv6 client on the same interface.
- You can apply an address pool that has not been created to an interface. The setting takes effect after the address pool is created.

Procedure

1. Enter system view.

   system-view

2. Enter interface view.

   interface *interface-type interface-number*

3. Enable the DHCPv6 server on the interface.

   ipv6 dhcp select server

   By default, the interface does not act as a DHCP server or a DHCP relay agent, and discards DHCPv6 packets from DHCPv6 clients.

4. Configure an assignment method.
   - Configure global address assignment.

     ipv6 dhcp server { **allow-hint** | **preference** *preference-value* | **rapid-commit** } *

By default, desired address/prefix assignment and rapid assignment are disabled, and the default preference is 0.

- Apply a DHCPv6 address pool to the interface.

  ipv6 dhcp server apply pool *pool-name* [**allow-hint** | **preference** *preference-value* | **rapid-commit**] *

Configuring a DHCPv6 policy for IPv6 address and prefix assignment

About DHCPv6 policy for IPv6 address and prefix assignment

In a DHCPv6 policy, each DHCPv6 user class has a bound DHCPv6 address pool. Clients matching different user classes obtain IPv6 addresses, IPv6 prefixes, and other parameters from different address pools. When receiving a DHCPv6 request, the DHCPv6 server compares the packet against the user classes in the order that they are configured.

If a match is found and the bound address pool has assignable IPv6 addresses or prefixes, the server uses the address pool for assignment. If the bound address pool does not have assignable IPv6 addresses or prefixes, the assignment fails.

If no match is found, the server uses the default DHCPv6 address pool for assignment. If no default address pool is specified or the default address pool does not have assignable IPv6 addresses or prefixes, the assignment fails.

For successful assignment, make sure the applied DHCPv6 policy and the bound address pools exist.

A match rule cannot match an option added by the DHCPv6 device, for example, Option 18 or Option 37.

Procedure

1. Enter system view.

   system-view

2. Create a DHCPv6 user class and enter DHCPv6 user class view.

   ipv6 dhcp class *class-name*

3. Configure a match rule for the DHCPv6 user class.

   if-match rule *rule-number* { **option** *option-code* [**ascii** *ascii-string* [**offset** *offset* | **partial**] | **hex** *hex-string* [**mask** *mask* | **offset** *offset* **length** *length* | **partial**]] | **relay-agent** *gateway-ipv6-address* }

   By default, no match rule is configured for a DHCPv6 user class.

4. Return to system view.

   quit

5. Create a DHCPv6 policy and enter DHCPv6 policy view.

   ipv6 dhcp policy *policy-name*

   The DHCPv6 policy takes effect only after it is applied to the interface that acts as the DHCPv6 server.

6. Specify a DHCPv6 address pool for a DHCPv6 user class.

   class *class-name* **pool** *pool-name*

   By default, no address pool is specified for a user class.

7. (Optional.) Specify the default DHCPv6 address pool.

   default pool *pool-name*

   By default, the default address pool is not specified.

8. Return to system view.

   quit

9. Enter interface view.

   interface *interface-type interface-number*

10. Apply the DHCPv6 policy to the interface.

    ipv6 dhcp apply-policy *policy-name*

    By default, no DHCPv6 policy is applied to an interface.

Setting the DSCP value for DHCPv6 packets sent by the DHCPv6 server

About setting the DSCP value for DHCPv6 packets sent by the DHCPv6 server

The DSCP value of a packet specifies the priority level of the packet and affects the transmission priority of the packet.

Procedure

1. Enter system view.

   system-view

2. Set the DSCP value for DHCPv6 packets sent by the DHCPv6 server.

   ipv6 dhcp dscp *dscp-value*

   By default, the DSCP value in DHCPv6 packets sent by the DHCPv6 server is 56.

Configuring DHCPv6 binding auto backup

About DHCPv6 binding auto backup

The auto backup feature saves DHCPv6 bindings to a backup file, and allows the DHCPv6 server to download the bindings from the backup file at the server reboot. The bindings include the lease bindings and conflicted IPv6 addresses. They cannot survive a reboot on the DHCPv6 server.

The DHCPv6 server does not provide services during the download process. If a connection error occurs during the process and cannot be repaired in a short amount of time, you can terminate the download operation. Manual interruption allows the DHCPv6 server to provide services without waiting for the connection to be repaired.

Procedure

1. Enter system view.

   system-view

2. Configure the DHCPv6 server to back up the bindings to a file.

   ipv6 dhcp server database filename { *filename* | **url** *url* [**username** *username* [**password** { **cipher** | **simple** } *string*]] }

   By default, the DHCPv6 server does not back up the DHCPv6 bindings.

   With this command executed, the DHCPv6 server backs up its bindings immediately and runs auto backup.

3. (Optional.) Manually save the DHCPv6 bindings to the backup file.

   ipv6 dhcp server database update now

4. (Optional.) Set the waiting time after a DHCPv6 binding change for the DHCPv6 server to update the backup file.

ipv6 dhcp server database update interval *interval*

By default, the DHCP server waits 300 seconds to update the backup file after a DHCP binding change. If no DHCP binding changes, the backup file is not updated.

5. (Optional.) Terminate the download of DHCPv6 bindings from the backup file.

   ipv6 dhcp server database update stop

   This command only triggers one termination.

Enabling the DHCPv6 server to advertise IPv6 prefixes

About IPv6 prefixes advertisement

A DHCPv6 client can obtain an IPv6 prefix through DHCPv6 and use this IPv6 prefix to assign IPv6 addresses for clients in a downstream network. If the IPv6 prefix is in a different subnet than the IPv6 address of the DHCPv6 client's upstream interface, the clients in the downstream network cannot access the external network. If the DHCPv6 server is on the same link as the DHCPv6 client, enable the DHCPv6 server to advertise the IPv6 prefix.

Procedure

1. Enter system view.

   system-view

2. Enable the DHCPv6 server to advertise IPv6 prefixes.

   ipv6 dhcp advertise pd-route

   By default, the DHCPv6 server does not advertise IPv6 prefixes.

Applying a DHCPv6 address pool to a VPN instance

About DHCPv6 address pool application to a VPN instance

If a DHCPv6 address pool is applied to a VPN instance, the DHCPv6 server assigns IPv6 addresses in this address pool to clients in the VPN instance. Addresses in this address pool will not be assigned to clients on the public network.

The DHCPv6 server can obtain the VPN instance to which a DHCPv6 client belongs from the following information:

- The client's VPN information stored in authentication modules.
- The VPN information of the DHCPv6 server's interface that receives DHCPv6 packets from the client.

The VPN information from authentication modules takes priority over the VPN information of the receiving interface.

An MCE acting as the DHCP server can assign IP addresses not only to clients on public networks, but also to clients on private networks. The IP address ranges of public and private networks or those of private networks on the DHCP server cannot overlap. For more information about MCE, see *MPLS Configuration Guide*.

Procedure

1. Enter system view.

   system-view

2. Enter DHCP address pool view.
   ipv6 dhcp pool *pool-name*
3. Apply the address pool to a VPN instance.
   vpn-instance *vpn-instance-name*
   By default, the address pool is not applied to any VPN instance.

Enabling IPv6 address binding conversion for IP source guard

About enabling IPv6 address binding conversion for IP source guard

In a VXLAN network, the VXLAN IP gateway acts as the DHCPv6 server to assign IPv6 addresses to users and reports user information to the controller. The user information report supports only IP source guard entries based on which the controller manages and monitors users. For the DHCPv6 server to report information about all online DHCP users, use this feature to convert user IPv6 address bindings to dynamic IP source guard bindings.

For more information about IP source guard, see *Security Configuration Guide*.

Restrictions and guidelines

If the device does not have enough storage space, execute the **undo ipv6 dhcp server entry-convert enable** command to disable this feature. The system does not delete IP source guard bindings that have been converted before you disable this feature.

Procedure

1. Enter system view.
   system-view
2. Enable IPv6 address binding conversion for IP source guard.
   ipv6 dhcp server entry-convert enable
   By default, IPv6 address binding conversion for IP source guard is disabled.

Enabling DHCPv6 logging on the DHCPv6 server

About DHCPv6 server logging

The DHCPv6 logging feature enables the DHCPv6 server to generate DHCPv6 logs and send them to the information center. The information helps administrators locate and solve problems. For information about the log destination and output rule configuration in the information center, see *Network Management and Monitoring Configuration Guide*.

Restrictions and guidelines

As a best practice, disable this feature if the log generation affects the device performance or reduces the address and prefix allocation efficiency. For example, this situation might occur when a large number of clients frequently come online or go offline.

Procedure

1. Enter system view.
   system-view
2. Enable DHCPv6 logging.
   ipv6 dhcp log enable
   By default, DHCPv6 logging is disabled.

Display and maintenance commands for DHCPv6 server

Execute **display** commands in any view and **reset** commands in user view.

Task	Command
Display the DUID of the local device.	**display ipv6 dhcp duid**
Display information about a DHCPv6 option group.	**display ipv6 dhcp option-group** [*option-group-number*]
Display DHCPv6 address pool information.	**display ipv6 dhcp pool** [*pool-name* | **vpn-instance** *vpn-instance-name*]
Display prefix pool information.	**display ipv6 dhcp prefix-pool** [*prefix-pool-number*] [**vpn-instance** *vpn-instance-name*]
Display DHCPv6 server information on an interface.	**display ipv6 dhcp server** [**interface** *interface-type interface-number*]
Display information about IPv6 address conflicts.	**display ipv6 dhcp server conflict** [**address** *ipv6-address*] [**vpn-instance** *vpn-instance-name*]
Display information about DHCPv6 binding auto backup	**display ipv6 dhcp server database**
Display information about expired IPv6 addresses.	**display ipv6 dhcp server expired** [[**address** *ipv6-address*] [**vpn-instance** *vpn-instance-name*] | **pool** *pool-name*]
Display information about IPv6 address bindings.	**display ipv6 dhcp server ip-in-use** [[**address** *ipv6-address*] [**vpn-instance** *vpn-instance-name*] | **pool** *pool-name*]
Display information about IPv6 prefix bindings.	**display ipv6 dhcp server pd-in-use** [**pool** *pool-name* | [**prefix** *prefix/prefix-len*] [**vpn-instance** *vpn-instance-name*]]
Display packet statistics on the DHCPv6 server.	**display ipv6 dhcp server statistics** [**pool** *pool-name* | **vpn-instance** *vpn-instance-name*]
Clear information about IPv6 address conflicts.	**reset ipv6 dhcp server conflict** [**address** *ipv6-address*] [**vpn-instance** *vpn-instance-name*]
Clear information about expired IPv6 address bindings.	**reset ipv6 dhcp server expired** [[**address** *ipv6-address*] [**vpn-instance** *vpn-instance-name*] | **pool** *pool-name*]
Clear information about IPv6 address bindings.	**reset ipv6 dhcp server ip-in-use** [[**address** *ipv6-address*] [**vpn-instance** *vpn-instance-name*] | **pool** *pool-name*]
Clear information about IPv6 prefix bindings.	**reset ipv6 dhcp server pd-in-use** [**pool** *pool-name* | [**prefix** *prefix/prefix-len*] [**vpn-instance** *vpn-instance-name*]]

Task	Command
Clear packets statistics on the DHCPv6 server.	**reset ipv6 dhcp server statistics** [**vpn-instance** *vpn-instance-name*]

DHCPv6 server configuration examples

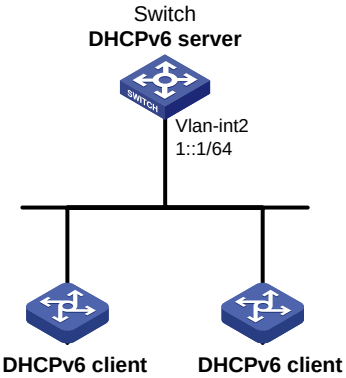
Example: Configuring dynamic IPv6 prefix assignment

Network configuration

As shown in Figure 12, the switch acts as a DHCPv6 server to assign an IPv6 prefix, a DNS server address, a domain name, a SIP server address, and a SIP server name to each DHCPv6 client.

The switch assigns prefix 2001:0410:0201::/48 to the client whose DUID is 00030001CA0006A40000, and assigns prefixes in the range of 2001:0410::/48 to 2001:0410:FFFF::/48 (excluding 2001:0410:0201::/48) to other clients. The DNS server address is 2::2:3. The DHCPv6 clients reside in the domain **aaa.com**. The SIP server address is 2:2::4, and the SIP server name is **bbb.com**.

Figure 12 Network diagram



Procedure

Specify an IPv6 address for VLAN-interface 2.

```
<Switch> system-view
[Switch] interface vlan-interface 2
[Switch-Vlan-interface2] ipv6 address 1::1/64
```

Disable RA message suppression on VLAN-interface 2.

```
[Switch-Vlan-interface2] undo ipv6 nd ra halt
```

Set the M flag to 1 in RA advertisements to be sent on VLAN-interface 2. Hosts that receive the RA advertisements will obtain IPv6 addresses through DHCPv6.

```
[Switch-Vlan-interface2] ipv6 nd autoconfig managed-address-flag
```

Set the O flag to 1 in RA advertisements to be sent on VLAN-interface 2. Hosts that receive the RA advertisements will obtain information other than IPv6 address through DHCPv6.

```
[Switch-Vlan-interface2] ipv6 nd autoconfig other-flag
[Switch-Vlan-interface2] quit
```

Create prefix pool 1, and specify the prefix 2001:0410::/32 with the assigned prefix length 48.

```
[Switch] ipv6 dhcp prefix-pool 1 prefix 2001:0410::/32 assign-len 48
```

Create address pool 1.

```
[Switch] ipv6 dhcp pool 1
```

In address pool 1, configure subnet 1::/64 where VLAN interface-2 resides.

```
[Switch-dhcp6-pool-1] network 1::/64
```

Apply prefix pool 1 to address pool 1, and set the preferred lifetime to one day, and the valid lifetime to three days.

```
[Switch-dhcp6-pool-1] prefix-pool 1 preferred-lifetime 86400 valid-lifetime 259200
```

In address pool 1, bind prefix 2001:0410:0201::/48 to the client DUID 00030001CA0006A40000, and set the preferred lifetime to one day, and the valid lifetime to three days.

```
[Switch-dhcp6-pool-1] static-bind prefix 2001:0410:0201::/48 duid 00030001CA0006A40000
preferred-lifetime 86400 valid-lifetime 259200
```

Configure the DNS server address 2:2::3.

```
[Switch-dhcp6-pool-1] dns-server 2:2::3
```

Configure the domain name as aaa.com.

```
[Switch-dhcp6-pool-1] domain-name aaa.com
```

Configure the SIP server address as 2:2::4, and the SIP server name as bbb.com.

```
[Switch-dhcp6-pool-1] sip-server address 2:2::4
[Switch-dhcp6-pool-1] sip-server domain-name bbb.com
[Switch-dhcp6-pool-1] quit
```

Enable the DHCPv6 server on VLAN-interface 2, enable desired prefix assignment and rapid prefix assignment, and set the preference to the highest.

```
[Switch] interface vlan-interface 2
[Switch-Vlan-interface2] ipv6 dhcp select server
[Switch-Vlan-interface2] ipv6 dhcp server allow-hint preference 255 rapid-commit
```

Verifying the configuration

Display DHCPv6 server configuration on VLAN-interface 2.

```
[Switch-Vlan-interface2] display ipv6 dhcp server interface vlan-interface 2
Using pool: global
Preference value: 255
Allow-hint: Enabled
Rapid-commit: Enabled
```

Display information about address pool 1.

```
[Switch-Vlan-interface2] display ipv6 dhcp pool 1
DHCPv6 pool: 1
  Network: 1::/64
    Preferred lifetime 604800 seconds, valid lifetime 2592000 seconds
  Prefix pool: 1
    Preferred lifetime 86400 seconds, valid lifetime 259200 seconds
  Static bindings:
    DUID: 00030001ca0006a40000
    IAID: Not configured
    Prefix: 2001:410:201::/48
      Preferred lifetime 86400 seconds, valid lifetime 259200 seconds
  DNS server addresses:
    2:2::3
  Domain name:
    aaa.com
```

```
  SIP server addresses:
    2:2::4
  SIP server domain names:
    bbb.com
```

Display information about prefix pool 1.

```
[Switch-Vlan-interface2] display ipv6 dhcp prefix-pool 1
Prefix: 2001:410::/32
Assigned length: 48
Total prefix number: 65536
Available: 65535
In-use: 0
Static: 1
```

After the client with the DUID 00030001CA0006A40000 obtains an IPv6 prefix, display the binding information on the DHCPv6 server.

```
[Switch-Vlan-interface2] display ipv6 dhcp server pd-in-use
Pool: 1
 IPv6 prefix                              Type      Lease expiration
 2001:410:201::/48                        Static(C) Jul 10 19:45:01 2009
```

After the other client obtains an IPv6 prefix, display binding information on the DHCPv6 server.

```
[Switch-Vlan-interface2] display ipv6 dhcp server pd-in-use
Pool: 1
 IPv6 prefix                              Type      Lease expiration
 2001:410:201::/48                        Static(C) Jul 10 19:45:01 2009
 2001:410::/48                            Auto(C)   Jul 10 20:44:05 2009
```

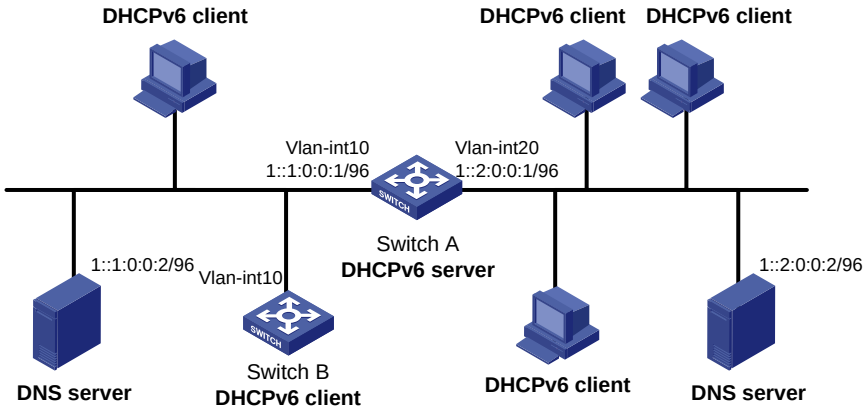
Example: Configuring dynamic IPv6 address assignment

Network configuration

As shown in Figure 13, Switch A acts as a DHCPv6 server to assign IPv6 addresses to the clients on subnets 1::1:0:0:0/96 and 1::2:0:0:0/96.

On Switch A, configure the IPv6 address 1::1:0:0:1/96 for VLAN-interface 10 and 1::2:0:0:1/96 for VLAN-interface 20. The lease duration of the addresses on subnet 1::1:0:0:0/96 is 172800 seconds (two days), the valid time is 345600 seconds (four days), the domain name suffix is aabbcc.com, and the DNS server address is 1::1:0:0:2/96. The lease duration of the addresses on subnet 1::2:0:0:0/96 is 432000 seconds (five days), the valid time is 864000 seconds (ten days), the domain name is aabbcc.com, and the DNS server address is 1::2:0:0:2/96.

Figure 13 Network diagram



Procedure

1. Configure the interfaces on the DHCPv6 server:

   # Specify an IPv6 address for VLAN-interface 10.

   ```
   <SwitchA> system-view
   [SwitchA] interface vlan-interface 10
   [SwitchA-Vlan-interface10] ipv6 address 1::1:0:0:1/96
   ```

   # Disable RA message suppression on VLAN-interface 10.

   ```
   [SwitchA-Vlan-interface10] undo ipv6 nd ra halt
   ```

   # Set the M flag to 1 in RA advertisements to be sent on VLAN-interface 10. Hosts that receive the RA advertisements will obtain IPv6 addresses through DHCPv6.

   ```
   [SwitchA-Vlan-interface10] ipv6 nd autoconfig managed-address-flag
   ```

   # Set the O flag to 1 in RA advertisements to be sent on VLAN-interface 10. Hosts that receive the RA advertisements will obtain information other than IPv6 address through DHCPv6.

   ```
   [SwitchA-Vlan-interface10] ipv6 nd autoconfig other-flag
   [SwitchA-Vlan-interface10] quit
   ```

   # Specify an IPv6 address for VLAN-interface 20.

   ```
   [SwitchA] interface vlan-interface 20
   [SwitchA-Vlan-interface20] ipv6 address 1::2:0:0:1/96
   ```

   # Disable RA message suppression on VLAN-interface 20.

   ```
   [SwitchA-Vlan-interface20] undo ipv6 nd ra halt
   ```

   # Set the M flag to 1 in RA advertisements to be sent on VLAN-interface 20. Hosts that receive the RA advertisements will obtain IPv6 addresses through DHCPv6.

   ```
   [SwitchA-Vlan-interface20] ipv6 nd autoconfig managed-address-flag
   ```

   # Set the O flag to 1 in RA advertisements to be sent on VLAN-interface 20. Hosts that receive the RA advertisements will obtain information other than IPv6 address through DHCPv6.

   ```
   [SwitchA-Vlan-interface20] ipv6 nd autoconfig other-flag
   [SwitchA-Vlan-interface20] quit
   ```

2. Enable DHCPv6:

   # Enable DHCPv6 server on VLAN-interface 10 and VLAN-interface 20.

   ```
   [SwitchA] interface vlan-interface 10
   [SwitchA-Vlan-interface10] ipv6 dhcp select server
   [SwitchA-Vlan-interface10] quit
   [SwitchA] interface vlan-interface 20
   [SwitchA-Vlan-interface20] ipv6 dhcp select server
   ```

```
[SwitchA-Vlan-interface20] quit
```

Exclude the DNS server addresses from dynamic assignment.

```
[SwitchA] ipv6 dhcp server forbidden-address 1::1:0:0:2
[SwitchA] ipv6 dhcp server forbidden-address 1::2:0:0:2
```

Configure the DHCPv6 address pool 1 to assign IPv6 addresses and other configuration parameters to clients on subnet 1::1:0:0:0/96.

```
[SwitchA] ipv6 dhcp pool 1
[SwitchA-dhcp6-pool-1] network 1::1:0:0:0/96 preferred-lifetime 172800
valid-lifetime 345600
[SwitchA-dhcp6-pool-1] domain-name aabbcc.com
[SwitchA-dhcp6-pool-1] dns-server 1::1:0:0:2
[SwitchA-dhcp6-pool-1] quit
```

Configure the DHCPv6 address pool 2 to assign IPv6 addresses and other configuration parameters to clients on subnet 1::2:0:0:0/96.

```
[SwitchA] ipv6 dhcp pool 2
[SwitchA-dhcp6-pool-2] network 1::2:0:0:0/96 preferred-lifetime 432000
valid-lifetime 864000
[SwitchA-dhcp6-pool-2] domain-name aabbcc.com
[SwitchA-dhcp6-pool-2] dns-server 1::2:0:0:2
[SwitchA-dhcp6-pool-2] quit
```

Verifying the configuration

Verify that the clients on subnets 1::1:0:0:0/96 and 1::2:0:0:0/96 can obtain IPv6 addresses and all other configuration parameters from the DHCPv6 server (Switch A). (Details not shown.)

On the DHCPv6 server, display IPv6 addresses assigned to the DHCPv6 clients.

```
[SwitchA] display ipv6 dhcp server ip-in-use
```

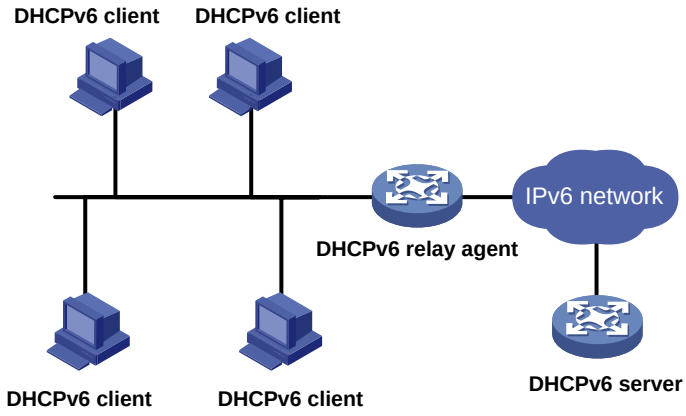
Configuring the DHCPv6 relay agent

About DHCPv6 relay agent

Typical application

A DHCPv6 client usually uses a multicast address to contact the DHCPv6 server on the local link to obtain an IPv6 address and other configuration parameters. As shown in Figure 14, if the DHCPv6 server resides on another subnet, the DHCPv6 clients need a DHCPv6 relay agent to contact the server. The relay agent feature avoids deploying a DHCPv6 server on each subnet.

Figure 14 Typical DHCPv6 relay agent application

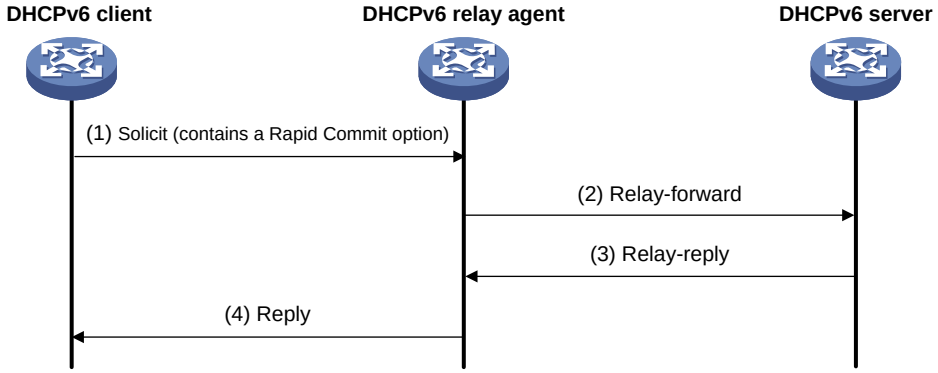


DHCPv6 relay agent operating process

As shown in Figure 15, a DHCPv6 client obtains an IPv6 address and other network configuration parameters from a DHCPv6 server through a DHCPv6 relay agent. The following example uses rapid assignment to describe the process:

- The DHCPv6 client sends a Solicit message containing the Rapid Commit option to the multicast address FF02::1:2 of all the DHCPv6 servers and relay agents.
- After receiving the Solicit message, the DHCPv6 relay agent encapsulates the message into the Relay Message option of a Relay-forward message, and sends the message to the DHCPv6 server.
- After obtaining the Solicit message from the Relay-forward message, the DHCPv6 server performs the following tasks:
  - Selects an IPv6 address and other required parameters.
  - Adds them to a reply that is encapsulated within the Relay Message option of a Relay-reply message.
  - Sends the Relay-reply message to the DHCPv6 relay agent.
- The DHCPv6 relay agent obtains the reply from the Relay-reply message and sends the reply to the DHCPv6 client.
- The DHCPv6 client uses the IPv6 address and other network parameters assigned by the DHCPv6 server to complete network configuration.

Figure 15 Operating process of a DHCPv6 relay agent



DHCPv6 relay agent tasks at a glance

To configure a DHCPv6 relay agent, perform the following tasks:

1. Enabling the DHCPv6 relay agent on an interface
2. Specifying DHCPv6 servers on the relay agent
3. (Optional.) Specifying a gateway address for DHCPv6 clients
4. (Optional.) Setting the DSCP value for DHCPv6 packets sent by the DHCPv6 relay agent
5. (Optional.) Specifying a padding mode for the Interface-ID option
6. (Optional.) Enabling the DHCPv6 relay agent to support Option 79
7. (Optional.) Enabling the DHCPv6 relay agent to advertise IPv6 prefixes
8. (Optional.) Enabling the DHCPv6 relay agent to advertise host routes for assigned IPv6 addresses
9. (Optional.) Specifying the source IPv6 address for relayed DHCPv6 requests
10. (Optional.) Configuring DHCPv6 relay security features
11. (Optional.) Discarding DHCPv6 requests that are delivered from VXLAN tunnels

Enabling the DHCPv6 relay agent on an interface

Restrictions and guidelines

As a best practice, do not enable DHCPv6 relay agent and DHCPv6 client on the same interface.

Procedure

1. Enter system view.
   `system-view`
2. Enter interface view.
   `interface` *`interface-type interface-number`*
3. Enable DHCPv6 relay agent on the interface.
   `ipv6 dhcp select relay`
   By default, the DHCPv6 relay agent is disabled on the interface.

Specifying DHCPv6 servers on the relay agent

Specifying DHCPv6 server IP addresses

Restrictions and guidelines

- You can use the **ipv6 dhcp relay server-address** command to specify a maximum of eight DHCPv6 servers on the DHCPv6 relay agent interface. The DHCPv6 relay agent forwards DHCP requests to all the specified DHCPv6 servers.
- If a DHCPv6 server address is a link-local address or multicast address, you must specify an outgoing interface by using the **interface** keyword in this command. Otherwise, DHCPv6 packets might fail to reach the DHCPv6 server.

Procedure

1. Enter system view.

   system-view
2. Enter interface view.

   interface *interface-type interface-number*
3. Specify a DHCPv6 server.

   ipv6 dhcp relay server-address *ipv6-address* [**interface** *interface-type interface-number*] [**public** | **vpn-instance** *vpn-instance-name*]

   By default, no DHCPv6 server is specified.

Specifying DHCPv6 servers for a DHCPv6 address pool on the DHCPv6 relay agent

About specifying DHCPv6 servers for a DHCPv6 address pool on the DHCPv6 relay agent

This feature allows DHCPv6 clients of the same type to obtain IPv6 addresses, IPv6 prefixes, and other configuration parameters from the DHCPv6 servers in the matching DHCPv6 address pool.

It applies to scenarios where the DHCPv6 relay agent connects to clients of the same access type but classified into different types by their locations. In this case, the relay interface typically has no IPv6 address configured. You can use the **gateway-list** command to specify the gateway addresses for clients matching the same DHCPv6 address pool.

Upon receiving a DHCPv6 Solicit or Request from a client that matches a DHCPv6 address pool, the relay agent processes the packet as follows:

- Fills the **link-address** field of the packet with a specified gateway address.
- Forwards the packet to all DHCPv6 servers in the matching DHCPv6 address pool.

The DHCPv6 servers select a DHCPv6 address pool according to the gateway address.

Restrictions and guidelines

- You can specify a maximum of eight DHCPv6 servers for one DHCPv6 address pool for high availability. The relay agent forwards DHCPv6 Solicit and Request packets to all DHCPv6 servers in the DHCPv6 address pool.

Procedure

1. Enter system view.

   system-view
2. Create a DHCPv6 address pool and enter its view.

ipv6 dhcp pool *pool-name*

3. Specify gateway addresses for the clients matching the DHCPv6 address pool.

   gateway-list *ipv6-address*&<1-8>

   By default, no gateway address is specified.

4. Specify DHCPv6 servers for the DHCPv6 address pool.

   remote-server *ipv6-address* [**interface** *interface-type interface-number*]

   By default, no DHCPv6 server is specified for the DHCPv6 address pool.

Specifying a gateway address for DHCPv6 clients

About specifying a gateway address for DHCPv6 client

By default, the DHCPv6 relay agent fills the **link-address** field of DHCPv6 Solicit and Request packets with the first IPv6 address of the relay interface. You can specify a gateway address on the relay agent for DHCPv6 clients. The DHCPv6 relay agent uses the specified gateway address to fill the **link-address** field of DHCPv6 Solicit and Request packets.

Procedure

1. Enter system view.

   system-view

2. Enter interface view.

   interface *interface-type interface-number*

3. Specify a gateway address for DHCPv6 clients.

   ipv6 dhcp relay gateway *ipv6-address*

   By default, the DHCPv6 relay agent uses the first IPv6 address of the relay interface as the clients' gateway address.

Setting the DSCP value for DHCPv6 packets sent by the DHCPv6 relay agent

About setting the DSCP value for DHCPv6 packets

The DSCP value of a packet specifies the priority level of the packet and affects the transmission priority of the packet.

Procedure

1. Enter system view.

   system-view

2. Set the DSCP value for DHCPv6 packets sent by the DHCPv6 relay agent.

   ipv6 dhcp dscp *dscp-value*

   The default DSCP value is 56.

Specifying a padding mode for the Interface-ID option

About specifying a padding mode for the Interface-ID option

This feature enables the relay agent to fill the Interface-ID option in the specified mode. When receiving a DHCPv6 packet from a client, the relay agent fills the Interface-ID option in the mode and then forwards the packet to the DHCPv6 server.

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Specify a padding mode for the Interface-ID option.
   ipv6 dhcp relay interface-id { **bas** | **interface** }
   By default, the relay agent fills the Interface-ID option with the interface index of the interface.

Enabling the DHCPv6 relay agent to support Option 79

About enabling the DHCPv6 relay agent to support Option 79

If DHCPv6 relay agents exist in the network, the DHCPv6 server needs the MAC address of the DHCPv6 client for authentication or for IPv6 address or prefix assignment. To meet the requirement, enable the DHCPv6 relay agent that the client first passes to support Option 79. This feature allows the DHCPv6 relay agent to learn the MAC address in the client request. When the relay agent generates a Relay-Forward packet for the request, it fills the MAC address of the client in Option 79. The Relay-Forward packet is then forwarded to the DHCPv6 server.

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Enable the DHCPv6 relay agent to support Option 79.
   ipv6 dhcp relay client-link-address enable
   By default, the DHCPv6 relay agent does not support Option 79.

Enabling the DHCPv6 relay agent to advertise IPv6 prefixes

About enabling the DHCPv6 relay agent to advertise IPv6 prefixes

A DHCPv6 client can obtain an IPv6 prefix through DHCPv6 and use this IPv6 prefix to assign IPv6 address to clients in a downstream network. If the IPv6 prefix is in a different subnet than the IPv6 address of the DHCPv6 client's upstream interface, the clients in the downstream network cannot

access the external network. You can enable the DHCPv6 relay agent that is on the same link as the DHCPv6 client to advertise the IPv6 prefix.

Procedure

1. Enter system view.

   system-view

2. Enable the DHCPv6 relay agent to advertise IPv6 prefixes.

   ipv6 dhcp advertise pd-route

   By default, the DHCPv6 relay agent does not advertise IPv6 prefixes.

   Before using this command, make sure the DHCPv6 relay agent is enabled to record DHCPv6 relay entries.

Enabling the DHCPv6 relay agent to advertise host routes for assigned IPv6 addresses

About enabling the DHCPv6 relay agent to advertise host routes for assigned IPv6 addresses

In a network where ND cannot resolve global unicast addresses, network devices cannot generate ND entries for all global unicast addresses. If a DHCPv6 client obtains a global unicast address, the neighboring devices do not have the ND entries for this global unicast address, thus cannot forward the packets destined for the client. To resolve this problem, enable the DHCPv6 relay agent to advertise host routes for assigned IPv6 addresses in DHCPv6 replies. The advertised route information is as follows:

- The destination IP address is the assigned IPv6 address.
- The next hop is the link-local address of the DHCPv6 client.
- The output interface is the interface that forwards the reply.

After the relay agent receives a packet destined for the assigned IPv6 address, the relay agent looks up the routing table for the next hop. ND resolution can succeed because the next hop is the link-local address of the client. The relay agent searches the ND table for the MAC address of the client based on the next hop and then forwards the packet.

Restrictions and guidelines

Before using this feature on the DHCPv6 relay agent, enable the DHCPv6 relay agent to record DHCPv6 relay entries first.

Procedure

1. Enter system view.

   system-view

2. Enable the DHCPv6 relay agent to advertise host routes for IPv6 addresses assigned to DHCPv6 clients.

   ipv6 dhcp advertise address-route

   By default, the DHCPv6 relay agent does not advertise host routes for IPv6 addresses assigned to DHCPv6 clients.

Specifying the source IPv6 address for relayed DHCPv6 requests

About specifying the source IPv6 address for relayed DHCPv6 requests

This task is required if a relay interface does not have routes to DHCPv6 servers. You can specify a global unicast address or the IPv6 address of another interface (typically the loopback interface) as the source IPv6 address for DHCPv6 requests. The relay interface inserts the source IPv6 address in the source IPv6 address field of DHCPv6 requests.

Procedure

1. Enter system view.

   system-view
2. Enter interface view.

   interface *interface-type interface-number*
3. Specify the source IPv6 address for relayed DHCPv6 requests.

   ipv6 dhcp relay source-address { *ipv6-address* | **interface** *interface-type interface-number* }

   By default, the DHCPv6 relay agent uses the IPv6 global unicast address of the interface that connects to the DHCPv6 server as the source IPv6 address for relayed DHCPv6 requests.

   If the specified interface does not have an IPv6 global unicast address, the IPv6 address of the output interface is used as the source address for relayed DHCPv6 requests.

Configuring DHCPv6 relay security features

Enabling the DHCPv6 relay agent to record relay entries

About enabling the DHCPv6 relay agent to record relay entries

This feature enables the DHCPv6 relay agent to automatically record DHCPv6 relay entries after DHCPv6 clients obtain IPv6 addresses or prefixes through DHCPv6. A DHCPv6 relay entry contains the binding between a client's hardware address and IPv6 address or prefix.

Some security features, such as IP source guard, use DHCPv6 relay entries to check incoming packets and block packets that do not match any entry. Hosts using manually configured IPv6 addresses are denied to access external networks through the relay agent. For more information about IP source guard, see *Security Configuration Guide*.

Procedure

1. Enter system view.

   system-view
2. Enter interface view.

   interface *interface-type interface-number*
3. Enable the recording of DHCPv6 relay entries.

   ipv6 dhcp relay client-information record

   By default, the DHCPv6 relay agent does not record relay entries.

Enabling IPv6 release notification

About IPv6 release notification

This feature enables the DHCPv6 relay agent to send a Release message to the DHCPv6 server after it deletes a DHCPv6 relay entry. After the DHCPv6 server receives the message, it reclaims the IPv6 address or prefix and marks the lease as expired.

If you do not enable this feature, the DHCPv6 relay agent will not send a Release message after it deletes a relay entry.

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Enable IPv6 release notification.
   ipv6 dhcp relay release-agent
   By default, IPv6 release notification is disabled.

Enabling client offline detection

About client offline detection

This feature enables the DHCPv6 relay agent to detect the status of ND entries. After an ND entry ages out, the DHCPv6 relay agent considers the client offline and deletes the relay entry for the client. For more information about ND, see "Configuring basic IPv6 settings."

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Enable client offline detection.
   ipv6 dhcp client-detect
   By default, client offline detection is disabled.

Discarding DHCPv6 requests that are delivered from VXLAN tunnels

About discarding DHCPv6 requests that are delivered from VXLAN tunnels

In a VXLAN network, the DHCPv6 relay agent feature can be configured on the VSI interface of a VTEP.

When the DHCPv6 relay agent receives a DHCPv6 request from an AC mapped to the VSI interface, the relay agent forwards this request to the DHCPv6 servers and broadcasts this request to other VTEPs. If those VTEPs also function as the DHCPv6 relay agents, each will forward the DHCPv6 request to the DHCPv6 servers they are connecting to. To prevent a DHCPv6 server from receiving the same DHCPv6 request from different VTEPs, you can configure this command on the VSI interface of the VTEPs that are not directly connecting to DHCPv6 clients.

Procedure

1. Enter system view.

   system-view

2. Enter interface view.

   interface *vsi-interface vsi-number*

3. Configure the DHCP relay agent to discard the DHCP requests that are delivered from VXLAN tunnels.

   ipv6 dhcp relay request-from-tunnel discard

   By default, the DHCPv6 relay agent can forward the DHCPv6 requests that are delivered from VXLAN tunnels.

   If you configure this command on a device that acts as both the distributed and centralized VXLAN IP gateways, make sure the gateways do not use the same VSI interface to provide the gateway services.

Display and maintenance commands for DHCPv6 relay agent

Execute **display** commands in any view and **reset** commands in user view.

Task	Command
Display the DUID of the local device.	**display ipv6 dhcp duid**
Display DHCPv6 relay entries that record clients' IPv6 address information.	**display ipv6 dhcp relay client-information address** [**interface** *interface-type interface-number* | **ipv6** *ipv6-address*] [**vpn-instance** *vpn-instance-name*]
Display DHCPv6 relay entries that record clients' IPv6 prefix information.	**display ipv6 dhcp relay client-information pd** [**interface** *interface-type interface-number* | **prefix** *prefix/prefix-len*] [**vpn-instance** *vpn-instance-name*]
Display DHCPv6 server addresses specified on the DHCPv6 relay agent.	**display ipv6 dhcp relay server-address** [**interface** *interface-type interface-number*]
Display packet statistics on the DHCPv6 relay agent.	**display ipv6 dhcp relay statistics** [**interface** *interface-type interface-number*]
Clear DHCPv6 relay entries that record clients' IPv6 address information.	**reset ipv6 dhcp relay client-information address** [**interface** *interface-type interface-number* | **ipv6** *ipv6-address*] [**vpn-instance** *vpn-instance-name*]
Clear DHCPv6 relay entries that record clients' IPv6 prefix information.	**reset ipv6 dhcp relay client-information pd** [**interface** *interface-type interface-number* | **prefix** *prefix/prefix-len*] [**vpn-instance** *vpn-instance-name*]

Task	Command
Clear packets statistics on the DHCPv6 relay agent.	**reset ipv6 dhcp relay statistics** [**interface** *interface-type interface-number*]

DHCPv6 relay agent configuration examples

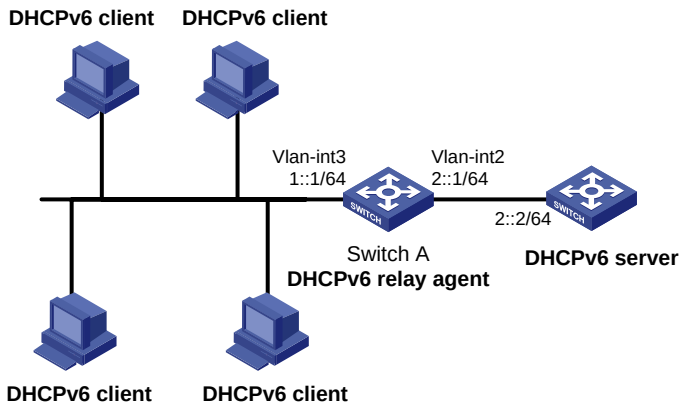
Example: Configuring DHCPv6 relay agent

Network configuration

As shown in Figure 16, configure the DHCPv6 relay agent on Switch A to relay DHCPv6 packets between DHCPv6 clients and the DHCPv6 server.

Switch A acts as the gateway of network 1::/64. It sends RA messages to notify the hosts to obtain IPv6 addresses and other configuration parameters through DHCPv6. For more information about RA messages, see "Configuring basic IPv6 settings."

Figure 16 Network diagram



Procedure

Specify IPv6 addresses for VLAN-interface 2 and VLAN-interface 3.

```
<SwitchA> system-view
[SwitchA] interface vlan-interface 2
[SwitchA-Vlan-interface2] ipv6 address 2::1 64
[SwitchA-Vlan-interface2] quit
[SwitchA] interface vlan-interface 3
[SwitchA-Vlan-interface3] ipv6 address 1::1 64
```

Disable RA message suppression on VLAN-interface 3.

```
[SwitchA-Vlan-interface3] undo ipv6 nd ra halt
```

Set the M flag to 1 in RA advertisements to be sent on VLAN-interface 3. Hosts that receive the RA advertisements will obtain IPv6 addresses through DHCPv6.

```
[SwitchA-Vlan-interface3] ipv6 nd autoconfig managed-address-flag
```

Set the O flag to 1 in RA advertisements to be sent on VLAN-interface 3. Hosts that receive the RA advertisements will obtain information other than IPv6 address through DHCPv6.

```
[SwitchA-Vlan-interface3] ipv6 nd autoconfig other-flag
```

Enable the DHCPv6 relay agent on VLAN-interface 3 and specify the DHCPv6 server on the relay agent.

```
[SwitchA-Vlan-interface3] ipv6 dhcp select relay
[SwitchA-Vlan-interface3] ipv6 dhcp relay server-address 2::2
```

Verifying the configuration

Display DHCPv6 server address information on Switch A.

```
[SwitchA-Vlan-interface3] display ipv6 dhcp relay server-address
Interface: Vlan-interface3
 Server address      Outgoing Interface         Public/VRF name
 2::2                                           --/--
```

Display packet statistics on the DHCPv6 relay agent.

```
[SwitchA-Vlan-interface3] display ipv6 dhcp relay statistics
Packets dropped               :  0
Packets received              :  14
    Solicit                   :  0
    Request                   :  0
    Confirm                   :  0
    Renew                     :  0
    Rebind                    :  0
    Release                   :  0
    Decline                   :  0
    Information-request       :  7
    Relay-forward             :  0
    Relay-reply               :  7
Packets sent                  :  14
    Advertise                 :  0
    Reconfigure               :  0
    Reply                     :  7
    Relay-forward             :  7
    Relay-reply               :  0
```

Configuring the DHCPv6 client

About the DHCPv6 client

With DHCPv6 client configured, an interface can obtain configuration parameters from the DHCPv6 server.

A DHCPv6 client can use DHCPv6 to complete the following functions:

- Obtain an IPv6 address, an IPv6 prefix, or both, and obtain other configuration parameters. If DHCPv6 server is enabled on the device, the client can automatically save the obtained parameters to a DHCPv6 option group. With the obtained IPv6 prefix, the client can generate its global unicast address.
- Support stateless DHCPv6 to obtain configuration parameters except IPv6 address and IPv6 prefix. The client obtains an IPv6 address through stateless IPv6 address autoconfiguration. If the client receives an RA message with the M flag set to 0 and the O flag set to 1 during address acquisition, stateless DHCPv6 starts.

Restrictions and guidelines: DHCPv6 client configuration

Do not configure the DHCPv6 client on the same interface as the DHCPv6 server or the DHCPv6 relay agent.

DHCPv6 client tasks at a glance

To configure a DHCPv6 client, perform the following tasks:

1. (Optional.) Configuring the DHCPv6 client DUID
2. Configuring the DHCPv6 client to obtain IPv6 addresses, IPv6 prefixes and other network parameters

   Choose the following tasks as needed:

   - Configuring IPv6 address acquisition
   - Configuring IPv6 prefix acquisition
   - Configuring IPv6 address and prefix acquisition
   - Configuring acquisition of configuration parameters except IP addresses and prefixes
3. (Optional.) Setting the DSCP value for DHCPv6 packets sent by the DHCPv6 client

Configuring the DHCPv6 client DUID

About the DHCPv6 client DUID

The DUID of a DHCPv6 client is the globally unique identifier of the client. The client pads its DUID into Option 1 of the DHCPv6 packet that it sends to the DHCPv6 server. The DHCPv6 server can assign specific IPv6 addresses or prefixes to DHCPv6 clients with specific DUIDs.

Restrictions and guidelines

Make sure the DUID that you configure is unique.

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Configure the DHCPv6 client DUID.
   ipv6 dhcp client duid { **ascii** *string* | **hex** *string* | **mac** *interface-type interface-number* }
   By default, the interface uses the device bridge MAC address to generate its DHCPv6 client DUID.

Configuring IPv6 address acquisition

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Configure the interface to use DHCPv6 to obtain an IPv6 address and other configuration parameters.
   ipv6 address dhcp-alloc [**option-group** *group-number* | **rapid-commit**] *
   By default, the interface does not use DHCPv6 for IPv6 address acquisition.

Configuring IPv6 prefix acquisition

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Configure the interface to use DHCPv6 to obtain an IPv6 prefix and other configuration parameters.
   ipv6 dhcp client pd *prefix-number* [**option-group** *group-number* | **rapid-commit**] *
   By default, the interface does not use DHCPv6 for IPv6 prefix acquisition.

Configuring IPv6 address and prefix acquisition

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Configure the interface to use DHCPv6 to obtain an IPv6 address, an IPv6 prefix, and other configuration parameters.
   ipv6 dhcp client stateful prefix *prefix-number* [**option-group** *option-group-number* | **rapid-commit**] *
   By default, the interface does not use DHCPv6 for IPv6 address and prefix acquisition.

Configuring acquisition of configuration parameters except IP addresses and prefixes

About acquisition of configuration parameters except IP addresses and prefixes

When a DHCPv6 client has obtained an IPv6 address and prefix, you can configure the following methods for the client to obtain other network configuration parameters:

- Execute the **ipv6 address auto** command to enable an interface to automatically generate an IPv6 global unicast address and a link-local address. Then stateless DHCPv6 will be triggered when the M flag is set to 0 and the O flag is set to 1 in a received RA message. For more information about the commands, see *Layer 3—IP services Command Reference*.
- Executing the **ipv6 dhcp client stateless enable** command on an interface to enable the interface to act as a DHCPv6 client to obtain configuration parameters from a DHCPv6 server.

If you execute both the **ip address auto** and **ipv6 dhcp client stateless enable** commands, the interface acts as follows:

- Generate a global unicast address and a link-local address.
- Obtain other configuration parameters from a DHCPv6 server.

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Configure the interface to support stateless DHCPv6. Choose the options to configure as needed:
   - Enable stateless IPv6 address autoconfiguration:
     ipv6 address auto
   - Configure the client to obtain network parameters from DHCPv6 servers:
     ipv6 dhcp client stateless enable

   By default, the interface does not support stateless DHCPv6.

Setting the DSCP value for DHCPv6 packets sent by the DHCPv6 client

About setting the DSCP value for DHCPv6 packets

The DSCP value of a packet specifies the priority level of the packet and affects the transmission priority of the packet.

Procedure

1. Enter system view.
   system-view
2. Set the DSCP value for DHCPv6 packets sent by the DHCPv6 client.
   ipv6 dhcp client dscp *dscp-value*

   By default, the DSCP value in DHCPv6 packets sent by the DHCPv6 client is 56.

Display and maintenance commands for DHCPv6 client

Execute the **display** commands in any view, and execute the **reset** command in user view.

Task	Command
Display the DHCPv6 client information.	**display ipv6 dhcp client** [**interface** *interface-type interface-number*]
Display the DHCPv6 client statistics.	**display ipv6 dhcp client statistics** [**interface** *interface-type interface-number*]
Clear the DHCPv6 client statistics.	**reset ipv6 dhcp client statistics** [**interface** *interface-type interface-number*]

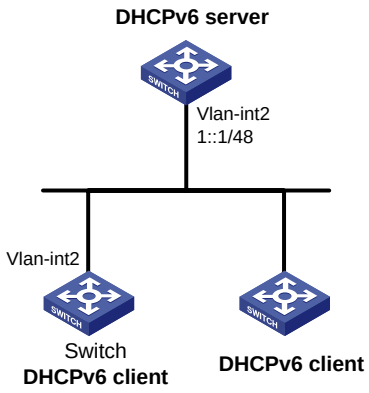
DHCPv6 client configuration examples

Example: Configuring IPv6 address acquisition

Network configuration

As shown in Figure 17, configure the switch to use DHCPv6 to obtain configuration parameters from the DHCPv6 server. The parameters include IPv6 address, DNS server address, domain name suffix, SIP server address, and SIP server domain name.

Figure 17 Network diagram



Procedure

You must configure the DHCPv6 server first before configuring the DHCPv6 client. For information about configuring DHCPv6 server, see "Configuring the DHCPv6 server."

Configure VLAN-interface 2 as a DHCPv6 client for IPv6 address acquisition. Configure the DHCPv6 client to support DHCPv6 rapid address assignment. Configure the DHCPv6 client to create a dynamic DHCPv6 option group for saving configuration parameters.

```
<Switch> system-view
[Switch] interface vlan-interface 2
[Switch-Vlan-interface2] ipv6 address dhcp-alloc rapid-commit option-group 1
```

```
[Switch-Vlan-interface2] quit
```

Verifying the configuration

Verify that the client has obtained an IPv6 address and other configuration parameters from the server.

```
[Switch] display ipv6 dhcp client
Vlan-interface2:
  Type: Stateful client requesting address
    State: OPEN
    Client DUID: 0003000100e002000000
    Preferred server:
      Reachable via address: FE80::2E0:1FF:FE00:18
      Server DUID: 0003000100e001000000
    IA_NA: IAID 0x00000642, T1 50 sec, T2 80 sec
      Address: 1:1::2/128
       Preferred lifetime 100 sec, valid lifetime 200 sec
       Will expire on Mar 27 2014 at 08:06:57 (198 seconds left)
    DNS server addresses:
      2000::FF
    Domain name:
      example.com
    SIP server addresses:
      2:2::4
    SIP server domain names:
      bbb.com
```

After DHCPv6 server is enabled on the device, verify that configuration parameters are saved in a dynamic DHCPv6 option group.

```
[Switch] display ipv6 dhcp option-group 1
DHCPv6 option group: 1
  DNS server addresses:
    Type: Dynamic (DHCPv6 address allocation)
    Interface: Vlan-interface2
    2000::FF
  Domain name:
    Type: Dynamic (DHCPv6 address allocation)
    Interface: Vlan-interface2
    example.com
  SIP server addresses:
    Type: Dynamic (DHCPv6 address allocation)
    Interface: Vlan-interface2
    2:2::4
  SIP server domain names:
    Type: Dynamic (DHCPv6 address allocation)
    Interface: Vlan-interface2
    bbb.com
```

Verify that the DHCPv6 client has obtained an IPv6 address..

```
[Switch] display ipv6 interface brief
*down: administratively down
(s): spoofing
```

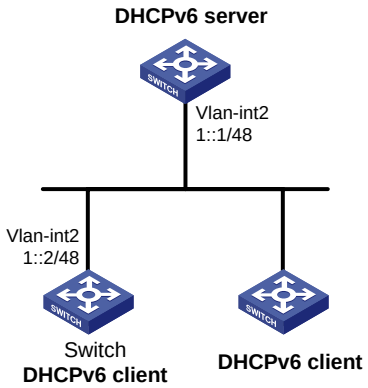
```
Interface                          Physical   Protocol   IPv6 Address
Vlan-interface2                    up         up         1:1::2
```

Example: Configuring IPv6 prefix acquisition

Network configuration

As shown in Figure 18, configure the switch to use DHCPv6 to obtain configuration parameters from the DHCPv6 server. The parameters include IPv6 prefix, DNS server address, domain name suffix, SIP server address, and SIP server domain name.

Figure 18 Network diagram



Procedure

You must configure the DHCPv6 server first before configuring the DHCPv6 client. For information about configuring DHCPv6 server, see "Configuring the DHCPv6 server."

Configure an IPv6 address for VLAN-interface 2 that is connected to the DHCPv6 server.

```
<Switch> system-view
[Switch] interface vlan-interface 2
[Switch-Vlan-interface2] ipv6 address 1::2/48
```

Configure VLAN-interface 2 as a DHCPv6 client for IPv6 prefix acquisition. Configure the DHCPv6 client to support DHCPv6 rapid prefix assignment. Configure the DHCPv6 client to assign an ID to the obtained IPv6 prefix and create a dynamic DHCPv6 option group for saving configuration parameters.

```
[Switch-Vlan-interface2] ipv6 dhcp client pd 1 rapid-commit option-group 1
[Switch-Vlan-interface2] quit
```

Verifying the configuration

Verify that the DHCPv6 client has obtained an IPv6 prefix and other configuration parameters from the DHCPv6 server.

```
[Switch] display ipv6 dhcp client
Vlan-interface2:
  Type: Stateful client requesting prefix
    State: OPEN
    Client DUID: 0003000100e002000000
    Preferred server:
      Reachable via address: FE80::2E0:1FF:FE00:18
      Server DUID: 0003000100e001000000
    IA_PD: IAID 0x00000642, T1 50 sec, T2 80 sec
      Prefix: 12:34::/48
```

```
        Preferred lifetime 100 sec, valid lifetime 200 sec
        Will expire on Feb 4 2014 at 15:37:20(80 seconds left)
    DNS server addresses:
      2000::FF
    Domain name:
      example.com
    SIP server addresses:
      2:2::4
    SIP server domain names:
      bbb.com
```

Verify that the client has obtained an IPv6 prefix.

```
[Switch] display ipv6 prefix 1
Number: 1
Type  : Dynamic
Prefix: 12:34::/48
Preferred lifetime 100 sec, valid lifetime 200 sec
```

After DHCPv6 server is enabled on the device, verify that configuration parameters are saved in a dynamic DHCPv6 option group.

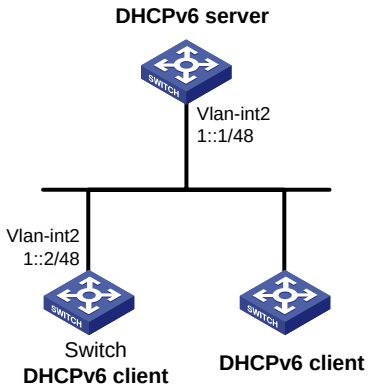
```
[Switch] display ipv6 dhcp option-group 1
DHCPv6 option group: 1
  DNS server addresses:
    Type: Dynamic (DHCPv6 prefix allocation)
    Interface: Vlan-interface2
    2000::FF
  Domain name:
    Type: Dynamic (DHCPv6 prefix allocation)
    Interface: Vlan-interface2
    example.com
  SIP server addresses:
    Type: Dynamic (DHCPv6 prefix allocation)
    Interface: Vlan-interface2
    2:2::4
  SIP server domain names:
    Type: Dynamic (DHCPv6 prefix allocation)
    Interface: Vlan-interface2
    bbb.com
```

Example: Configuring IPv6 address and prefix acquisition

Network configuration

As shown in Figure 19, configure the switch to use DHCPv6 to obtain configuration parameters from the DHCPv6 server. The parameters include IPv6 address, IPv6 prefix, DNS server address, domain name suffix, SIP server address, and SIP server domain name.

Figure 19 Network diagram



Procedure

You must configure the DHCPv6 server before configuring the DHCPv6 client. For information about configuring the DHCPv6 server, see "Configuring the DHCPv6 server."

Configure an IPv6 address for VLAN-interface 2 that is connected to the DHCPv6 server.

```
<Switch> system-view
[Switch] interface vlan-interface 2
[Switch-Vlan-interface2] ipv6 address 1::2/48
```

Configure VLAN-interface 2 as a DHCPv6 client for IPv6 address and prefix acquisition. Specify IDs for the dynamic IPv6 prefix and dynamic DHCPv6 option group, and configure the client to support rapid address and prefix assignment.

```
[Switch-Vlan-interface2] ipv6 dhcp client stateful prefix 1 rapid-commit option-group 1
[Switch-Vlan-interface2] quit
```

Verifying the configuration

Verify that the DHCPv6 client has obtained an IPv6 address, an IPv6 prefix, and other configuration parameters from the DHCPv6 server.

```
[Switch] display ipv6 dhcp client
Vlan-interface2:
  Type: Stateful client requesting address and prefix
    State: OPEN
    Client DUID: 0003000100e002000000
    Preferred server:
      Reachable via address: FE80::2E0:1FF:FE00:18
      Server DUID: 0003000100e001000000
    IA_NA: IAID 0x00000642, T1 50 sec, T2 80 sec
      Address: 1:1::2/128
        Preferred lifetime 100 sec, valid lifetime 200 sec
        Will expire on Mar 27 2014 at 08:02:00 (199 seconds left)
    IA_PD: IAID 0x00000642, T1 50 sec, T2 80 sec
      Prefix: 12:34::/48
        Preferred lifetime 100 sec, valid lifetime 200 sec
        Will expire on Mar 27 2014 at 08:02:00 (199 seconds left)
    DNS server addresses:
      2000::FF
    Domain name:
      example.com
```

```
    SIP server addresses:
      2:2::4
    SIP server domain names:
      bbb.com
```

Verify that the DHCPv6 client has obtained an IPv6 address.

```
[Switch] display ipv6 interface brief
*down: administratively down
(s): spoofing
Interface                          Physical   Protocol   IPv6 Address
Vlan-interface2                    up         up         1:1::2
```

Verify that the client has obtained an IPv6 prefix.

```
[Switch] display ipv6 prefix 1
Number: 1
Type  : Dynamic
Prefix: 12:34::/48
Preferred lifetime 100 sec, valid lifetime 200 sec
```

After DHCPv6 server is enabled on the device, verify that configuration parameters are saved in a dynamic DHCPv6 option group.

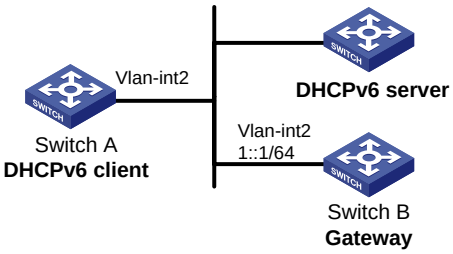
```
[Switch] display ipv6 dhcp option-group 1
DNS server addresses:
    Type: Dynamic (DHCPv6 address and prefix allocation)
    Interface: Vlan-interface2
    2000::FF
  Domain name:
    Type: Dynamic (DHCPv6 address and prefix allocation)
    Interface: Vlan-interface2
    example.com
  SIP server addresses:
    Type: Dynamic (DHCPv6 address and prefix allocation)
    Interface: Vlan-interface2
    2:2::4
  SIP server domain names:
    Type: Dynamic (DHCPv6 address and prefix allocation)
    Interface: Vlan-interface2
    bbb.com
```

Example: Configuring stateless DHCPv6

Network configuration

As shown in Figure 20, configure Switch A to use stateless DHCPv6 to obtain configuration parameters except IPv6 address and IPv6 prefix. Switch B acts as the gateway and advertises RA messages periodically.

Figure 20 Network diagram



Procedure

You must configure the DHCPv6 server first before configuring the DHCPv6 client. For information about configuring DHCPv6 server, see "Configuring the DHCPv6 server."

1. Configure the gateway Switch B.

   # Configure an IPv6 address for VLAN-interface 2.

   ```
   <SwitchB> system-view
   [SwitchB] interface vlan-interface 2
   [SwitchB-Vlan-interface2] ipv6 address 1::1 64
   ```

   # Set the O flag to 1 in RA advertisements to be sent on VLAN-interface 2. Hosts that receive the RA advertisements will obtain information other than IPv6 address through DHCPv6.

   ```
   [SwitchB-Vlan-interface2] ipv6 nd autoconfig other-flag
   ```

   # Disable RA message suppression on GigabitEthernet 1/0/1.

   ```
   [SwitchB-Vlan-interface2] undo ipv6 nd ra halt
   ```

2. Configure the DHCPv6 client Switch A.

   # Enable stateless IPv6 address autoconfiguration on VLAN-interface 2.

   ```
   <SwitchA> system-view
   [SwitchA] interface vlan-interface 2
   [SwitchA-Vlan-interface2] ipv6 address auto
   ```

   With stateless IPv6 address autoconfiguration enabled, but no IPv6 address configured for VLAN-interface 2, Switch A automatically generates a link local address. It sends an RS message to Switch B to request configuration information for IPv6 address generation. Upon receiving the RS message, Switch B sends back an RA message. After receiving an RA message with the M flag set to 0 and the O flag set to 1, Switch A performs stateless DHCPv6 to get other configuration parameters.

Verifying the configuration

Display the DHCPv6 client information.

```
[SwitchA-Vlan-interface2] display ipv6 dhcp client interface vlan-interface 2
Vlan-interface2:
 Type: Stateless client
    State: OPEN
    Client DUID: 00030001000fe2ff0000
    Preferred server:
      Reachable via address: FE80::213:7FFF:FEF6:C818
      Server DUID: 0003000100137ff6c818
    DNS server addresses:
      1:2:4::5
      1:2:4::7
    Domain name:
      abc.com
```

Display the DHCPv6 client statistics.

```
[SwitchA-Vlan-interface2] display ipv6 dhcp client statistics
Interface                     :  Vlan-interface2
Packets received              :  1
        Reply                 :  1
        Advertise             :  0
        Reconfigure           :  0
        Invalid               :  0
Packets sent                  :  5
        Solicit               :  0
        Request               :  0
        Renew                 :  0
        Rebind                :  0
        Information-request   :  5
        Release               :  0
        Decline               :  0
```

Configuring DHCPv6 snooping

About DHCPv6 snooping

It guarantees that DHCPv6 clients obtain IPv6 addresses or prefixes from authorized DHCPv6 servers. Also, it records IP-to-MAC bindings of DHCPv6 clients (called DHCPv6 snooping address entries) and prefix-to-port bindings of DHCPv6 clients (called DHCPv6 snooping prefix entries) for security purposes.

DHCPv6 snooping defines trusted and untrusted ports to make sure that clients obtain IPv6 addresses only from authorized DHCPv6 servers.

- **Trusted**—A trusted port can forward DHCPv6 messages correctly to make sure the clients get IPv6 addresses from authorized DHCPv6 servers.
- **Untrusted**—An untrusted port discards received messages sent by DHCPv6 servers to prevent unauthorized servers from assigning IPv6 addresses.

DHCPv6 snooping reads DHCP-ACK messages received from trusted ports and DHCP-REQUEST messages to create DHCPv6 snooping entries. A DHCPv6 snooping entry can be an address entry or a prefix entry.

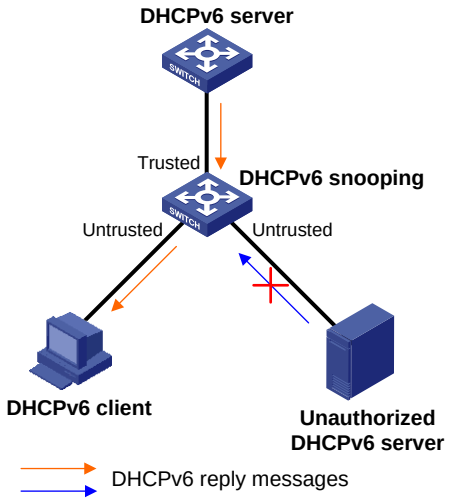
- A DHCPv6 address entry includes the MAC and IP addresses of a client, the port that connects to the DHCPv6 client, and the VLAN. You can use the **`display ipv6 dhcp snooping binding`** command to display the IP addresses of users for management.
- A DHCPv6 prefix entry includes the prefix and lease information assigned to the client, the port that connects to the DHCPv6 client, and the VLAN. You can use the **`display ipv6 dhcp snooping pd binding`** command to display the prefixes of the users for management.

Application of trusted and untrusted ports

Configure ports facing the DHCPv6 server as trusted ports, and configure other ports as untrusted ports.

As shown in Figure 21, configure the DHCPv6 snooping device's port that is connected to the DHCPv6 server as a trusted port. The trusted port forwards response messages from the DHCPv6 server to the client. The untrusted port connected to the unauthorized DHCPv6 server discards incoming DHCPv6 response messages.

Figure 21 Trusted and untrusted ports



Restrictions and guidelines: DHCPv6 snooping configuration

DHCPv6 snooping works between the DHCPv6 client and server, or between the DHCPv6 client and DHCPv6 relay agent.

DHCPv6 snooping does not work between the DHCPv6 server and DHCPv6 relay agent.

To make sure DHCPv6 clients can obtain valid IPv6 addresses, specify the ports connected to authorized DHCPv6 servers as trusted ports. The trusted ports and the ports connected to DHCPv6 clients must be in the same VLAN.

If you configure DHCPv6 snooping settings on a Layer 2 Ethernet interface that is a member port of a Layer 2 aggregate interface, the settings do not take effect unless the interface is removed from the aggregation group.

DHCPv6 snooping tasks at a glance

To configure DHCPv6 snooping, perform the following tasks:

1. Configuring basic DHCPv6 snooping features
2. (Optional.) Configuring DHCP snooping support for Option 18
3. (Optional.) Configuring DHCP snooping support for Option 37
4. (Optional.) Configuring DHCPv6 snooping entry auto backup
5. (Optional.) Setting the maximum number of DHCPv6 snooping entries
6. (Optional.) Configuring DHCPv6 packet rate limit
7. (Optional.) Enabling DHCPv6-REQUEST check
8. (Optional.) Configuring a DHCPv6 packet blocking port
9. (Optional.) Enabling DHCPv6 snooping logging
10. (Optional.) Disabling DHCPv6 snooping on an interface

Configuring basic DHCPv6 snooping features

Configuring basic DHCPv6 snooping features in a common network

About basic DHCPv6 snooping features in a common network

Basic DHCPv6 snooping features include enabling DHCPv6 snooping, configuring trusted ports, and enabling recording DHCPv6 snooping entries.

When you enable DHCPv6 snooping globally on a device, DHCPv6 snooping is also enabled in all VLANs on the device. Enable snooping in specific VLANs if you do not need to enable DHCPv6 snooping globally in some networks. You can also other basic DHCP snooping features in these VLANs.

Restrictions and guidelines

If the basic DHCPv6 snooping features are configured globally, you can only use the undo form of the global configuration commands to disable the settings globally. The VLAN-specific configuration commands cannot disable the settings.

If the basic DHCPv6 snooping features are configured in a VLAN, you can only use the undo form of the VLAN-specific configuration commands to disable the settings in the VLAN. The global configuration command cannot disable the settings.

Configuring basic DHCPv6 snooping features globally

1. Enter system view.
   system-view
2. Enable DHCPv6 snooping globally.
   ipv6 dhcp snooping enable
   By default, DHCPv6 snooping is disabled globally.
3. Enter interface view.
   interface *interface-type interface-number*
   This interface must connect to the DHCPv6 server.
4. Specify the port as a trusted port.
   ipv6 dhcp snooping trust
   By default, all ports are untrusted ports after DHCPv6 snooping is enabled.
5. Enable recording DHCPv6 snooping entries.
   a. Return to system view.
      quit
   b. Enter interface view.
      interface *interface-type interface-number*
      This interface must connect to the DHCPv6 client.
   c. Enable recording DHCPv6 snooping entries. Choose the following tasks as needed:
      - Enable recording DHCPv6 snooping address entries.
        ipv6 dhcp snooping binding record
        By default, recording of DHCPv6 snooping address entries is disabled.
      - Enable recording DHCPv6 snooping prefix entries.
        ipv6 dhcp snooping pd binding record
        By default, recording of DHCPv6 snooping prefix entries is disabled.

Configuring basic DHCPv6 snooping features for VLANs

1. Enter system view.
   system-view
2. Enable DHCPv6 snooping for VLANs.
   ipv6 dhcp snooping enable vlan *vlan-id-list*
   By default, DHCPv6 snooping is disabled in all VLANs.
3. Enter VLAN view.
   vlan *vlan-id*
   Make sure DHCP snooping is enabled for the VLAN.
4. Specify a port as a trusted port.
   ipv6 dhcp snooping trust interface *interface-type interface-number*
   By default, all ports are untrusted ports after DHCPv6 snooping is enabled.
5. (Optional.) Enable recording DHCPv6 snooping entries in the VLAN. Choose the following tasks as needed:
   - Enable recording DHCPv6 snooping address entries.
     ipv6 dhcp snooping binding record
     By default, recording of DHCPv6 snooping address entries is disabled in a VLAN.
   - Enable recording DHCPv6 snooping prefix entries.
     ipv6 dhcp snooping pd binding record
     By default, recording of DHCPv6 snooping prefix entries is disabled in a VLAN.

Configuring DHCP snooping support for Option 18

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Enable DHCP snooping support for Option 18.
   ipv6 dhcp snooping option interface-id enable
   By default, DHCP snooping support for Option 18 is disabled.
4. (Optional.) Specify the content as the interface ID.
   ipv6 dhcp snooping option interface-id [**vlan** *vlan-id*] **string** *interface-id*
   By default, the DHCPv6 snooping device uses its DUID as the content for Option 18.

Configuring DHCP snooping support for Option 37

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Enable DHCP snooping support for Option 37.
   ipv6 dhcp snooping option remote-id enable
   By default, DHCP snooping support for Option 37 is disabled.

4. (Optional.) Specify the content as the remote ID.

   ipv6 dhcp snooping option remote-id [**vlan** *vlan-id*] **string** *remote-id*

   By default, the DHCPv6 snooping device uses its DUID as the content for Option 37.

Configuring DHCPv6 snooping entry auto backup

About DHCPv6 snooping entry auto backup

The auto backup feature saves DHCPv6 snooping entries to a backup file, and allows the DHCPv6 snooping device to download the entries from the backup file at reboot. The entries on the DHCPv6 snooping device cannot survive a reboot. The auto backup helps the security features provide services if these features (such as IP source guard) must use DHCPv6 snooping entries for user authentication.

Restrictions and guidelines

- If you disable DHCPv6 snooping with the **undo ipv6 dhcp snooping enable** command, the device deletes all DHCPv6 snooping entries, including those stored in the backup file.
- If you execute the **ipv6 dhcp snooping binding database filename** command, the DHCPv6 snooping device backs up DHCPv6 snooping entries immediately and runs auto backup. This command automatically creates the file if you specify a non-existent file.
- The waiting period starts when a DHCPv6 snooping entry is learned, updated, or removed. The DHCPv6 snooping device updates the backup file when the specified waiting period is reached. All changed entries during the period will be saved to the backup file. If no DHCPv6 snooping entry changes, the backup file is not updated.

Procedure

1. Enter system view.

   system-view

2. Configure the DHCPv6 snooping device to back up DHCPv6 snooping entries to a file.

   ipv6 dhcp snooping binding database filename { *filename* | **url** *url* [**username** *username* [**password** { **cipher** | **simple** } *string*]] }

   By default, the DHCPv6 snooping device does not back up the DHCPv6 snooping entries.

3. (Optional.) Manually save DHCPv6 snooping entries to the backup file.

   ipv6 dhcp snooping binding database update now

4. (Optional.) Set the waiting time after a DHCPv6 snooping entry change for the DHCPv6 snooping device to update the backup file.

   ipv6 dhcp snooping binding database update interval *interval*

   By default, the DHCP snooping device waits 300 seconds to update the backup file after a DHCP snooping entry change. If no DHCP snooping entry changes, the backup file is not updated.

Setting the maximum number of DHCPv6 snooping entries

About setting the maximum number of DHCPv6 snooping entries

Perform this task to prevent the system resources from being overused.

Procedure

1. Enter system view.

system-view

2. Enter interface view.
   interface *interface-type interface-number*
3. Set the maximum number of DHCPv6 snooping entries for the interface to learn.
   ipv6 dhcp snooping max-learning-num *max-number*
   By default, the number of DHCPv6 snooping entries for an interface to learn is not limited.

Configuring DHCPv6 packet rate limit

About DHCPv6 packet rate limit

This DHCPv6 packet rate limit feature discards exceeding DHCPv6 packets to prevent attacks that send large numbers of DHCPv6 packets.

Restrictions and guidelines

The rate set on the Layer 2 aggregate interface applies to all members of the aggregate interface. If a member interface leaves the aggregation group, it uses the rate set in its Ethernet interface view.

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Set the maximum rate at which an interface can receive DHCPv6 packets.
   ipv6 dhcp snooping rate-limit *rate*
   By default, incoming DHCPv6 packets on an interface are not rate limited.

Enabling DHCPv6-REQUEST check

About DHCPv6-REQUEST check

Perform this task to use the DHCPv6-REQUEST check feature to protect the DHCPv6 server against DHCPv6 client spoofing attacks. Attackers can forge DHCPv6-RENEW messages to renew leases for legitimate DHCPv6 clients that no longer need the IP addresses. The forged messages disable the victim DHCPv6 server from releasing the IP addresses. Attackers can also forge DHCPv6-DECLINE or DHCPv6-RELEASE messages to terminate leases for legitimate DHCPv6 clients that still need the IP addresses.

The DHCPv6-REQUEST check feature enables the DHCPv6 snooping device to check every received DHCPv6-RENEW, DHCPv6-DECLINE, or DHCPv6-RELEASE message against DHCPv6 snooping entries.

- If any criterion in an entry is matched, the device compares the entry with the message information.
  - If they are consistent, the device considers the message valid and forwards it to the DHCPv6 server.
  - If they are different, the device considers the message forged and discards it.
- If no matching entry is found, the device forwards the message to the DHCPv6 server.

Procedure

1. Enter system view.
   system-view

2. Enter interface view.
   interface *interface-type interface-number*
3. Enable DHCPv6-REQUEST check.
   ipv6 dhcp snooping check request-message
   By default, DHCPv6-REQUEST check is disabled.

Configuring a DHCPv6 packet blocking port

About DHCPv6 packet blocking port

Perform this task to configure a port as a DHCPv6 packet blocking port. The DHCPv6 packet blocking port drops all incoming DHCP requests.

Procedure

1. Enter system view.
   system-view
2. Enter interface view.
   interface *interface-type interface-number*
3. Configure the port to block DHCPv6 requests.
   ipv6 dhcp snooping deny
   By default, the port does not block DHCPv6 requests.

Enabling DHCPv6 snooping logging

About DHCPv6 snooping logging

The DHCPv6 snooping logging feature enables the DHCPv6 snooping device to generate DHCPv6 snooping logs and send them to the information center. The information helps administrators locate and solve problems. For information about the log destination and output rule configuration in the information center, see *Network Management and Monitoring Configuration Guide*.

Restrictions and guidelines

As a best practice, disable this feature if the log generation affects the device performance.

Procedure

1. Enter system view.
   system-view
2. Enable DHCPv6 snooping logging.
   ipv6 dhcp snooping log enable
   By default, DHCPv6 snooping logging is disabled.

Disabling DHCPv6 snooping on an interface

About disabling DHCPv6 snooping on an interface

This feature allows you to narrow down the interface range where DHCPv6 snooping takes effect. For example, to enable DHCP snooping globally except for a specific interface, you can enable DHCPv6 snooping globally and disable DHCPv6 snooping on the target interface.

Procedure

1. Enter system view.
   system-view
2. Enter interface view
   interface *interface-type interface-number*
3. Disable DHCPv6 snooping on the interface.
   ipv6 dhcp snooping disable
   By default:
   - If you enable DHCPv6 snooping globally or for a VLAN, DHCPv6 snooping is enabled on all interfaces on the device or on all interfaces in the VLAN.
   - If you do not enable DHCPv6 snooping globally or for a VLAN, DHCPv6 snooping is disabled on all interfaces on the device or on all interfaces in the VLAN.

Display and maintenance commands for DHCPv6 snooping

Execute **display** commands in any view, and **reset** commands in user view.

Task	Command
Display DHCPv6 snooping address entries.	**display ipv6 dhcp snooping binding** [**address** *ipv6-address* [**vlan** *vlan-id*]]
Display information about the file that stores DHCPv6 snooping entries.	**display ipv6 dhcp snooping binding database**
Display DHCPv6 packet statistics for DHCPv6 snooping.	**display ipv6 dhcp snooping packet statistics** [**slot** *slot-number*]
Display DHCPv6 snooping prefix entries.	**display ipv6 dhcp snooping pd binding** [**prefix** *prefix/prefix-length* [**vlan** *vlan-id*]]
Display information about trusted ports.	**display ipv6 dhcp snooping trust**
Clear DHCPv6 snooping address entries.	**reset ipv6 dhcp snooping binding** { **all** | **address** *ipv6-address* [**vlan** *vlan-id*] }

Task	Command
Clear DHCPv6 packet statistics for DHCPv6 snooping.	**reset ipv6 dhcp snooping packet statistics** [**slot** *slot-number*]
Clear DHCPv6 snooping prefix entries.	**reset ipv6 dhcp snooping pd binding** { **all** | **prefix** *prefix/prefix-length* [**vlan** *vlan-id*] }

DHCPv6 snooping configuration examples

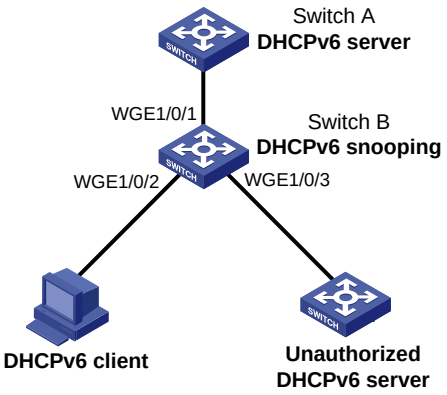
Example: Configuring DHCPv6 snooping globally

Network configuration

As shown in Figure 22, Switch B is connected to the authorized DHCPv6 server through Twenty-FiveGigE 1/0/1, to the unauthorized DHCPv6 server through Twenty-FiveGigE 1/0/3, and to the DHCPv6 client through Twenty-FiveGigE 1/0/2.

Configure only the port connected to the authorized DHCPv6 server to forward the responses from the DHCPv6 server. Enable the DHCPv6 snooping device to record DHCPv6 snooping address entries.

Figure 22 Network diagram



Procedure

Enable DHCPv6 snooping.

```
<SwitchB> system-view
[SwitchB] ipv6 dhcp snooping enable
```

Specify Twenty-FiveGigE 1/0/1 as a trusted port.

```
[SwitchB] interface twenty-fivegige 1/0/1
```

```
[SwitchB-Twenty-FiveGigE1/0/1] ipv6 dhcp snooping trust
[SwitchB-Twenty-FiveGigE1/0/1] quit
```

Enable recording DHCPv6 snooping address entries on Twenty-FiveGigE 1/0/2.

```
[SwitchB]interface twenty-fivegige 1/0/2
[SwitchB-Twenty-FiveGigE1/0/2] ipv6 dhcp snooping binding record
[SwitchB-Twenty-FiveGigE1/0/2] quit
```

Verifying the configuration

Verify that the DHCPv6 client obtains an IPv6 address and all other configuration parameters only from the authorized DHCPv6 server. (Details not shown.)

Display DHCPv6 snooping address entries on the DHCPv6 snooping device.

```
[SwitchB] display ipv6 dhcp snooping binding
```

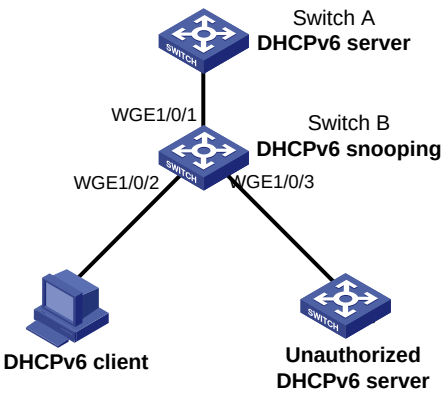
Example: Configuring DHCPv6 snooping for a VLAN

Network configuration

As shown in Figure 23, Switch B is connected to the authorized DHCPv6 server through Twenty-FiveGigE 1/0/1, to the unauthorized DHCPv6 server through Twenty-FiveGigE 1/0/3, and to the DHCPv6 client through Twenty-FiveGigE 1/0/2.

In VLAN 100, configure only the port connected to the authorized DHCPv6 server to forward the responses from the DHCPv6 server. Enable the DHCPv6 snooping device to record DHCPv6 snooping address entries.

Figure 23 Network diagram



Procedure

Assign access ports Twenty-FiveGigE 1/0/1, Twenty-FiveGigE 1/0/2, and Twenty-FiveGigE 1/0/3 to VLAN 100.

```
<SwitchB> system-view
[SwitchB] vlan 100
[SwitchB-vlan100] port twenty-fivegige 1/0/1 to twenty-fivegige 1/0/3
[SwitchB-vlan100] quit
```

Enable DHCPv6 snooping for VLAN 100.

```
[SwitchB] ipv6 dhcp snooping enable vlan 100
```

Configure Twenty-FiveGigE 1/0/1 as a trusted port in VLAN 100.

```
[SwitchB] vlan 100
[SwitchB-vlan100] ipv6 dhcp snooping trust interface twenty-fivegige 1/0/1
```

Enable recording DHCPv6 snooping entries in VLAN 100.

```
[SwitchB-vlan100] ipv6 dhcp snooping binding record
[SwitchB-vlan100] quit
```

Verifying the configuration

Verify that the DHCPv6 client obtains an IPv6 address and all other configuration parameters only from the authorized DHCPv6 server. (Details not shown.)

Display DHCPv6 snooping address entries on the DHCPv6 snooping device.

```
[SwitchB] display ipv6 dhcp snooping binding
```

Configuring DHCPv6 guard

About DHCPv6 guard

The DHCPv6 guard feature filters DHCPv6 Advertise and Reply messages by using DHCPv6 guard policies to make sure DHCPv6 clients obtain addresses/prefixes from authorized DHCPv6 servers. To provide finer level of filtering granularity, you can specify the following parameters for a DHCPv6 guard policy:

- Device role of the device that attached to the target interface or VLAN. The interface or VLAN to which the DHCPv6 guard policy is applied is called the target interface or VLAN.
- DHCPv6 server match criterion.
- Match criterion for IPv6 addresses/prefixes assigned by DHCPv6 servers.
- Allowed DHCPv6 server preference range.

To meet requirements of DHCPv6 clients in different locations, apply DHCPv6 guard policies to different interfaces or VLANs on the same device.

DHCPv6 guard operating mechanism

Upon receiving a DHCPv6 Solicit or Request message, the DHCPv6 guard device forwards the message without performing the DHCPv6 guard policy check.

When receiving a DHCPv6 reply, the DHCPv6 guard device performs the DHCPv6 guard policy check in the following order:

1. Examines whether the receiving port is a trusted port. The device forwards the message if the message is from the a trusted port.

   Configure trusted ports in a DHCPv6 guard policy only in one of the following conditions:

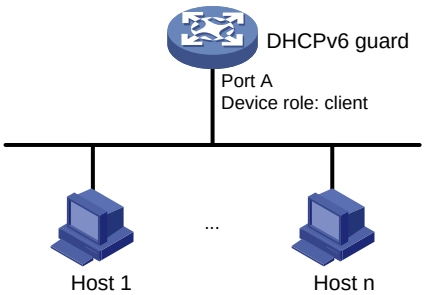
   - The port to which the DHCPv6 guard policy applies is connected to an authorized server.
   - All ports in the VLAN to which the DHCPv6 guard policy applies are connected to authorized servers.

2. Examines the message based on the device role:

   - If the message is received from the device with the DHCPv6 client device role, the device drops the message.

     If the interface to which the DHCPv6 guard policy applies is not connected to any authorized DHCPv6 servers, set the device role to **client** for the policy, as shown in Figure 24.

     Figure 24 Setting the device role to client

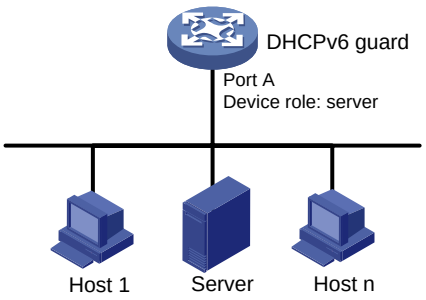
     

   - If the message is received from the device with the DHCPv6 server device role, the device examines the message as follows:

- For an Advertise message, the message passes the policy check if the source IP address in the message is permitted by the ACL and the server preference is in the match range.
- For a Reply message, the message passes the policy check if the assigned IPv6 addresses/prefixes in the message are permitted by the ACL.

If the interface to which the DHCPv6 guard policy applies is connected to an authorized DHCPv6 server, set the device role to **server** for the policy, as shown in Figure 25.

Figure 25 Setting the device role to server



The device forwards the reply after the message passes the DHCPv6 guard policy check.

Restrictions and guidelines: DHCPv6 guard configuration

The DHCPv6 guard feature operates correctly only when the device is located between the DHCPv6 client and the DHCPv6 server or between the DHCPv6 client and the DHCPv6 relay agent. If the device is located between the DHCPv6 server and the DHCPv6 relay agent, the DHCPv6 guard feature cannot operate correctly.

When the DHCPv6 guard feature is configured on a DHCPv6 snooping device, both features can take effect. The device forwards DHCPv6 reply packets received on a DHCPv6 snooping trusted port only if they pass the DHCPv6 guard check. These packets are dropped if they fail the DHCPv6 guard check.

DHCPv6 guard tasks at a glance

To configure DHCPv6 guard, perform the following tasks:

1. Configuring a DHCPv6 guard policy
2. Applying the DHCPv6 guard policy

   Choose the following tasks as needed:

   - Applying a DHCPv6 guard policy to an interface
   - Applying a DHCPv6 guard policy to a VLAN

   If DHCPv6 guard polices are applied to both an interface and the VLAN of the interface, the interface-specific policy is used on the interface.

Configuring a DHCPv6 guard policy

1. Enter system view.

   ```
   system-view
   ```

2. Create a DHCPv6 guard policy and enter its view.
   ipv6 dhcp guard policy *policy-name*
3. Specify the role of the device attached to the target interface or VLAN.
   device-role { **client** | **server** }
   By default, the device role is DHCPv6 client for the device attached to the target interface or VLAN.
4. Configure a DHCPv6 guard policy.
   - Configure a DHCPv6 server match criterion.
     if-match server acl { *acl-number* | **name** *acl-name* }
     By default, no DHCPv6 server match criterion is configured, and all DHCPv6 servers are authorized.
   - Configure a match criterion for the assigned IPv6 addresses/prefixes.
     if-match reply acl { *acl-number* | **name** *acl-name* }
     By default, no match criterion is configured for the assigned IPv6 addresses/prefixes, and all assigned IPv6 addresses/prefixes can pass the address/prefix check.
   - Configure an allowed DHCPv6 server preference range.
     preference { **max** *max-value* | **min** *min-value* } *
     By default, no DHCPv6 server preference range is configured, and DHCPv6 servers with preferences 1 to 255 can pass the preference check.
   - Configure the port to which the policy applies as a trusted port for the policy.
     trust port
     By default, no trusted port is configured for a DHCPv6 guard policy.

Applying a DHCPv6 guard policy to an interface

1. Enter system view.
   system-view
2. Enter Layer 2 interface view.
   interface *interface-type interface-number*
3. Apply a DHCPv6 guard policy to the interface.
   ipv6 dhcp guard apply policy *policy-name*
   By default, no DHCPv6 guard policy is applied to the interface.

Applying a DHCPv6 guard policy to a VLAN

1. Enter system view.
   system-view
2. Create a VLAN and enter its view.
   vlan *vlan-number*
3. Apply a DHCPv6 guard policy to the VLAN.
   ipv6 dhcp guard apply policy *policy-name*
   By default, no DHCPv6 guard policy is applied to the VLAN.

Display and maintenance commands for DHCPv6 guard

Execute **display** commands in any view.

Task	Command
Display information about DHCPv6 guard policies.	**display ipv6 dhcp guard policy** [*policy-name*]

DHCPv6 guard configuration examples

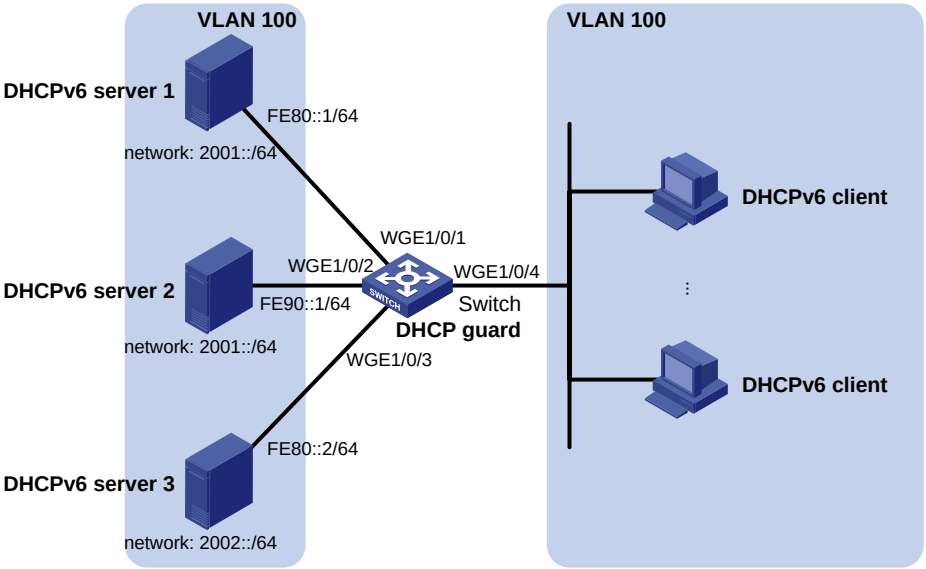
Example: Configuring DHCPv6 guard

Network configuration

As shown in Figure 26, all DHCPv6 servers and clients are in VLAN 100. The assignable IPv6 address ranges on the DHCPv6 server 1, server 2, and server 3 are 2001::/64, 2001::/64, and 2002::/64, respectively.

Configure DHCPv6 guard on the switch, so that the switch forwards only DHCPv6 replies with the source IPv6 address in the range of FE80::/12 and assigned prefixes in the range of 2001::/16.

Figure 26 Network diagram



Procedure

Before you configure DHCPv6 guard, complete the configuration on DHCPv6 servers.

Create VLAN 100, and assign Twenty-FiveGigE 1/0/1, Twenty-FiveGigE 1/0/2, Twenty-FiveGigE 1/0/3, and Twenty-FiveGigE 1/0/4 to VLAN 100.

```
<Switch> system-view
[Switch] vlan 100
[Switch-vlan100] port twenty-fivegige 1/0/1 to twenty-fivegige 1/0/4
[Switch-vlan100] quit
```

Create an IPv6 basic ACL numbered 2001.

```
[Switch] acl ipv6 number 2001
```

Create rule **1** to permit only packets with source IPv6 addresses in the range of FE80::/12.

```
[Switch-acl-ipv6-basic-2001] rule 1 permit source fe80:: 12
[Switch-acl-ipv6-basic-2001] quit
```

Create an IPv6 basic ACL numbered 2002.

```
[Switch] acl ipv6 number 2002
```

Create rule **1** to permit only packets with source IPv6 addresses in the range of 2001::/16.

```
[Switch-acl-ipv6-basic-2002] rule 1 permit source 2001:: 16
[Switch-acl-ipv6-basic-2002] quit
```

Create DHCPv6 guard policy named **p1**.

```
[Switch] ipv6 dhcp guard policy p1
```

Set the device role to the DHCPv6 server for the device attached to the target VLAN.

```
[Switch-dhcp6-guard-policy-p1] device-role server
```

Specify ACL 2001 to match DHCPv6 servers.

```
[Switch-dhcp6-guard-policy-p1] if-match server acl 2001
```

Specify ACL 2002 to match IPv6 addresses/prefixes assigned by DHCPv6 servers.

```
[Switch-dhcp6-guard-policy-p1] if-match reply acl 2002
[Switch-dhcp6-guard-policy-p1] quit
```

Create DHCPv6 guard policy named **p2**.

```
[Switch] ipv6 dhcp guard policy p2
```

Set the device role to the DHCPv6 client for the device attached to the target interface.

```
[Switch-dhcp6-guard-policy-p2] device-role client
[Switch-dhcp6-guard-policy-p2] quit
```

Apply DHCPv6 guard policy **p1** to VLAN 100.

```
[Switch] vlan 100
[Switch-vlan100] ipv6 dhcp guard apply policy p1
[Switch-vlan100] quit
```

Apply DHCPv6 guard policy **p2** to Twenty-FiveGigE 1/0/4.

```
[Switch]interface twenty-fivegige 1/0/4
[Switch-Twenty-FiveGigE1/0/4] ipv6 dhcp guard apply policy p2
[Switch-Twenty-FiveGigE1/0/4] quit
```

Verifying the configuration

Verify that the switch forwards DHCPv6 replies with the source IPv6 address in the range of FE80::/12 and the assigned IPv6 prefixes in the range of 2001::/16. The switch forwards DHCPv6 replies from the DHCPv6 server 1 and drops replies from DHCPv6 server 2 and server 3.