Implementing DHCP

This module describes the concepts and tasks you will use to configure Dynamic Host Configuration Protocol (DHCP).

Introduction to DHCP Relay

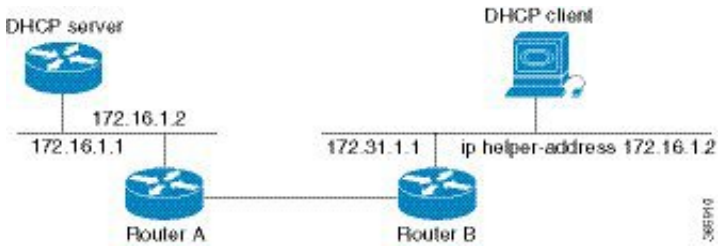
A DHCP relay agent is a host that forwards DHCP packets between clients and servers that do not reside on a shared physical subnet. Relay agent forwarding is distinct from the normal forwarding of an IP router where the IP datagrams switch between networks transparently.

DHCP clients use User Datagram Protocol (UDP) broadcasts to send DHCPDISCOVER messages when they lack information about the network to which they belong.

If a client is on a network segment that does not include a server, the network segment needs a relay agent. Presence of the relay agent ensures that DHCP packets reach the servers on another network segment. Routers do not forward UDP broadcast packets, because most routers are not configured to forward broadcast traffic. You can configure a DHCP relay agent to forward DHCP packets to a remote server. You can configure a DHCP relay profile on the DHCP relay agent and configure one or more helper addresses in it. You can assign the profile to an interface or a VRF.

The following figure demonstrates the process. The DHCP client broadcasts a request for an IP address and other configuration parameters on its local LAN. Acting as a DHCP relay agent, Router B picks up the broadcast. It changes the destination address to the DHCP server's address and sends the message out on another interface. The relay agent inserts the IP address of the interface, which recieves the DHCP client’s packets, into the gateway address (giaddr) field of the DHCP packet. The giaddr enables the DHCP server to determine which subnet receives the offer and identify the appropriate IP address range. The relay agent unicasts the messages to the server address, in this case 172.16.1.2 (which is specified by the helper address in the relay profile).

Figure 1: Forwarding UDP Broadcasts to a DHCP Server Using a Helper Address



Prerequisites for Configuring DHCP Relay Agent

The following are the prerequisites to configure a DHCP relay agent:

- You must be in a user group that is associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect that a user group assignment is preventing you from using a command, contact your AAA administrator for assistance.
- A configured and running DHCP client and DHCP server.
- Connectivity between the relay agent and DHCP server

Limitations for DHCP Relay Feature

The limitations for implementing DHCP relay feature are as follows:

- DHCP relay profile does not support multicast addresses. The **helper-address** command in a DHCP relay profile submode supports a global unicast IP address only as the helper address.
- Relay agents add only interface-id and remote-id DHCP option code while forwarding the packet to a DHCP server.

Note DHCP relay profile submode does not support the configuration of DHCP option code.

How to Configure and Enable DHCP Relay Agent

This section contains the following tasks:

Configuring and Enabling the DHCP Relay Agent

Configuration Example

```
Router# configure
/* Enters the global configuration mode */
```

```
Router(config)# dhcp ipv4
/* Configures DHCP for IPv4 and enters the DHCPv4 configuration submode. */

Router(config-dhcpv4)# profile r1 relay
/* Enables DHCP relay profile */

Router(config-dhcpv4-relay-profile)# helper-address vrf A 10.10.7.1 giaddr 10.10.7.2
Router(config-dhcpv4-relay-profile)# broadcast-flag policy check
/* Configures VRF addresses for forwarding UDP broadcasts, including DHCP. */

Router(config-dhcpv4-relay-profile)# relay information option vpn
Router(config-dhcpv4-relay-profile)# relay information option vpn-mode rfc
/* Inserts the DHCP relay agent information option (option-82 field) in forwarded BOOTREQUEST
 messages to a DHCP server. */


Router(config-dhcpv4-relay-profile)# relay information option allow-untrusted
/* (Optional) Configures the DHCP IPv4 Relay not to discard BOOTREQUEST packets
that have an existing relay information option and the giaddr set to zero. */

Router(config-dhcpv4-relay-profile)# exit
Router(config-dhcpv4)# interface BVI 1 relay profile r1
Router(config-dhcpv4)# commit
/* Configures DHCP relay on a BVI interface and commits the configuration */
```

Running Configuration

```
Router#show running-config
Tue May 23 10:56:14.463 IST
Building configuration...
!! IOS XR Configuration 0.0.0
!! Last configuration change at Tue May 23 10:56:08 2017 by annseque
!
dhcp ipv4
 vrf vrf1 relay profile client
 profile r1 relay
  helper-address vrf A 10.10.7.1 giaddr 10.10.7.2
  broadcast-flag policy check
  relay information option vpn
  relay information option vpn-mode rfc
  relay information option allow-untrusted
 !
```

Enabling a DHCP Relay Agent on an Interface

This section describes how to enable the Cisco IOS XR DHCP relay agent on an interface.

Configuration Example

The DHCP relay agent is disabled by default.

```
Router#configure

Router(config)#dhcp ipv4
/* Configures DHCP for IPv4 and enters the DHCPv4 configuration submode. */

Router(config-dhcpv4)#interface HundredGigE 0/2/0/2 relay profile client
/* Attaches a relay profile to an interface.
```

```
To disable the DHCP relay on the interface, use the 'no interface HundredGigE 0/2/0/2 none'
 command. */

Router(config-dhcpv4-if)#commit
```

Running Configuration

```
Router#show running-config dhcp ipv4
dhcp ipv4
interface HundredGigE 0/2/0/2 relay profile client
!
```

Disabling DHCP Relay on an Interface

This task describes how to disable the DHCP relay on an interface by using the **no** keyword on the interface.

```
Router# configure terminal
Router(config)# dhcp ipv6
Router(config-dhcpv6)# no interface type name relay profile profile-nameRouter(config-dhcpv6)#
 no interface type name none
Router(config-dhcpv6-if)# commit
```

Configuring and Enabling DHCP Relay Agent with DHCP MAC Address Verification

This section discusses how to configure and enable DHCP Relay Agent with DHCP MAC address verification.

Configuration Example

```
Router# configure

Router(config)# dhcp ipv4
/* Configures DHCP for IPv4 and enters the DHCPv4 configuration submode. */

Router(config-dhcpv4)# profile client relay
/* Enables DHCP relay profile */

Router(config-dhcpv4)# client-mac-mismatch action drop
/* Enables MAC address verification. If MAC address in the DHCPv4 protocol header does not
 match the L2 header source MAC address in the DHCPv4 relay profile,
 the frame is dropped  */

Router(config-dhcpv4-relay-profile)# relay information option
/* Inserts the DHCP relay agent information option (option-82 field) in forwarded
BOOTREQUEST messages to a DHCP server. */

Router(config-dhcpv4-relay-profile)# relay information check
/* (Optional) Configures DHCP to check the validity of the relay agent information
option in forwarded BOOTREPLY messages. */

Router(config-dhcpv4-relay-profile)# relay information policy drop
/* (Optional) Configures the reforwarding policy for a DHCP relay agent;
that is, whether the relay agent will drop or keep (using the 'keep' keyword)
 the relay information. */

Router(config-dhcpv4-relay-profile)# relay information option allow-untrusted
/* (Optional) Configures the DHCP IPv4 Relay not to discard BOOTREQUEST packets that have
an existing
```

```
relay information option and the giaddr set to zero. */

Router(config-dhcpv4-relay-profile)# giaddr policy drop
/* Drops the packet that has an existing nonzero giaddr value. Use the 'replace' keyword
 to replace the existing giaddr value with a value that it generates (the default behavior).
  */

Router(config-dhcpv4-relay-profile)# helper-address vrf vrf1 10.1.1.1
/* Forwards UDP broadcasts, including DHCP. */

Router(config-dhcpv4-relay-profile)# commit

Router(config-dhcpv4-relay-profile)# exit
Router(config-dhcpv4)# vrf vrf1 relay profile client
Router(config-dhcpv4)# commit
/* Configures DHCP Relay on a VRF and commits the entire configuration. */
```

Running Configuration

Confirm your configuration.

```
Router# show run
Thu May 11 09:00:57.839 IST
Building configuration...
!! IOS XR Configuration 0.0.0
!! Last configuration change at Thu May 11 09:00:54 2017 by annseque
!
dhcp ipv4
vrf vrf1 relay profile client
profile client relay
client-mac-match action drop
helper-address vrf vrf1 10.1.1.1
giaddr policy drop
relay information check
relay information option
relay information policy drop
relay information option allow-untrusted
!
!
```

DHCP MAC Address Verification

Use the following show command to check if DHCP MAC addresses are verified on the router.

```
Router# show dhcp ipv4 relay statistics raw all
packet_drop_mac_mismatch                      :         0
```

The output validates the verified DHCP MAC address of the packets is verified.

Configuring the DHCPv6 (Stateless) Relay Agent

Use the following steps:

- To specify a destination address for client messages.
- To enable DHCP IPv6 relay service on the interface.

Configuration Example

To configure the DHCPv6 (stateless) relay agent, you must complete the following configurations:

1. Enable the DHCP IPv6 configuration mode.
2. Configure the DHCPv6 relay profile.
3. Configure helper addresses.
4. Specify the interface for the relay profile.

Configuration

```
/* Enter the global configuration mode, and then enter the DHCP IPv6 configuration mode */
Router# configure terminal
Router(config)# dhcp ipv6
Router(config-dhcpv6)# profile test relay
Router(config-dhcpv6-relay-profile)# helper-address vrf default 2001:1::1
Router(config-dhcpv6-relay-profile)# !
Router(config-dhcpv6-relay-profile)# interface TenGigE0/0/0/0 relay profile test
Router(config-dhcpv6)# !
```

Enabling DHCP Relay on a VRF

This task describes how to enable DHCP relay on a VRF.

```
/CPU0:router# configure terminal
Router(config)# dhcp ipv6
Router(config-dhcpv6)# vrf vrf-name relay profile profile-name
Router(config-dhcpv6-if)# commit
```

Configure a DHCP Relay Profile with Multiple Helper Addresses

You can configure up to 16 helper IPv4 and IPv6 addresses for a DHCPv4 or DHCPv6 relay profile.

1. Enter the DHCPv4 or DHCPv6 configuration mode.

   ```
   Router(config)# dhcp ipv6
   ```

2. Configure the DHCPv4 or DHCPv6 relay profile.

   ```
   Router(config-dhcpv6)# profile helper relay
   ```

3. Configure helper addresses.

   Note You can configure up to 16 IPv4 and IPv6 addresses.

   ```
   Router(config-dhcpv6-relay-profile)# helper-address vrf default 2001:1:1::2
   ```

4. Confirm your configuration.

   ```
   Router(config-dhcpv6-relay-profile)# show configuration

   !! IOS XR Configuration 0.0.0
   dhcp ipv6
   ```

```
 profile helper relay
  helper-address vrf default 2001:1:1::2
 !
!
end
```

5. Commit your configuration.

```
Router(config-dhcpv6-relay-profile)# commit
```

6. Exit the configuration mode and verify the configured helper addresses.

```
Router# show dhcp ipv6 relay profile name helper

Profile: helper
Helper Addresses:
        2001:1:1::2, vrf default
Information Option: Disabled
Information Option Allow Untrusted: Disabled
Information Option VPN: Disabled
Information Option VPN Mode: RFC
Information Option Policy: Replace
Information Option Check: Disabled
GIADDR Policy: Keep
Broadcast-flag Policy: Ignore
VRF References:
Interface References:
```

You have successfully configured the DHCPv6 relay helper address.

DHCP Relay Agent Notification for Prefix Delegation

DHCP relay agent notification for prefix delegation allows the router working as a DHCPv6 relay agent to find prefix delegation options. The notifications allow you to review the contents of a DHCP RELAY-REPLY packet that is sent to the client. When the relay agent finds the prefix delegation option, it extracts the information about the delegated prefix. After extracting the information, the relay agent inserts an IPv4 or IPv6 subscriber route matching the prefix delegation information onto the relay agent. A relay agent forwards future packets that are destined to that prefix based on the information that is contained in the prefix delegation.

The relay agent automatically does the subscriber route management.

The IPv4 or IPv6 routes are added when the relay agent relays a RELAY-REPLY packet. The IPv4 or IPv6 routes are deleted when the prefix delegation lease time expires or the relay agent receives a release message. An IPv4 or IPv6 subscriber route in the routing table of the relay agent is updated when the prefix delegation lease time is extended.

This feature leaves an IPv4 or IPv6 route on the routing table of the relay agent. This registered IPv4 or IPv6 address allows a unicast reverse packet forwarding (uRPF) to work by allowing the router doing the reverse lookup. The reverse lookup enables you to confirm that the IPv4 or IPv6 address on the relay agent is not malformed or spoofed. The IPv6 route in the routing table of the relay agent can be redistributed to other routing protocols to advertise the subnets to other nodes. When the client sends a DHCP_DECLINE message, the routes are removed.

DHCPv6 Relay Over BVI for IANA Address Allocation

DHCPv6 relay agents relay all packets that are coming from DHCPv6 clients over the access-interfaces toward external DHCPv6 servers. DHCPv6 relay agents request IP addresses (::/128) through IANA allocation for

the DHCPv6 clients. DHCPv6 relay agents also receive response packets from the DHCPv6 servers and forward the packets toward DHCPv6 clients over BVI interfaces. DHCPv6 relay agents act as stateless, by default, for DHCPv6 clients. DHCPv6 clients do not maintain any DHCPv6 binding and respective route entry for the allocated IP addresses. You can enable a DHCPv6 client to get a particular IPv6 address assigned by the DHCPv6 server over a Bridge Virtual Interface (BVI) through Internet Assigned Numbers Authority (IANA) address allocation. Therefore, the DHCPv6 relay agent acts as a stateful relay agents and maintains DHCPv6 binding and respective route entry for the allocated IPv6 addresses.

Restrictions

- You can configure up to 500 client sessions over a BVI interface for DHCP relay.
- You can configure up to 8 DHCPv6 server addresses for each DHCPv6 relay profile.

Configuration Example

To configure DHCPv6 Relay Over BVI for IANA Address Allocation, use the following steps.

1. Enter the interface configuration mode and configure a BVI interface.
2. Assign an IPv6 address to the BVI interface.
3. Route the L2 access interface to the L3 BVI interface of the relay agent.
4. Enter the DHCP IPv6 configuration mode and then create a DHCP IPv6 Stateful relay profile.
5. Attach the relay profile to a server address.
6. Configure a stateful relay agent by enabling route allocation through IANA.
7. Attach the BVI Interface to the DHCPv6 relay profile.

Configuration

```
/* Enter the interface configuration mode and configure a BVI interface. */
Router# configure
Router(config)# interface BVI1

Assign an IPv6 address to the BVI interface.
Router(config-if)# ipv6 address 2001:db8::2/64
Router(config-if)# commit
Router(config-if)# exit

/* Route the L2 access interface to the L3 BVI interface of the relay agent. */
Router(config)# l2vpn bridge group 1
Router(config-l2vpn-bg)# bridge-domain 1
Router(config-l2vpn-bg-bd)# interface hundredGigE 0/0/0/1.100
Router(config-l2vpn-bg-bd-ac)# commit
Router(config-l2vpn-bg-bd-ac)# exit
Router(config-l2vpn-bg-bd)# routed interface BVI1
Router(config-l2vpn-bg-bd)# exit
Router(config-l2vpn-bg)# exit
Router(config-l2vpn-bg)# exit
Router(config-l2vpn)# exit
Router(config)#

/* Enter the DHCP IPv6 configuration mode and then create a DHCP IPv6 Stateful relay profile.
 */
Router(config)# dhcp ipv6
```

```
Router(config-dhcpv6)# profile RELAY1 relay

/* Attach the relay profile to a server address. */
Router(config-dhcpv6-relay-profile)# helper-address vrf default 2001:DB8::1

/* Configure a stateful relay agent by enabling route allocation through IANA. */
Router(config-dhcpv6-relay-profile)# iana-route-add
Router(config-dhcpv6-relay-profile)# exit


/* Attach the BVI Interface to the DHCPv6 relay profile. */
Router(config-dhcpv6-relay-profile)# interface BVI1 relay profile RELAY1
Router(config-dhcpv6-relay-profile)# commit
```

Running Configuration

```
Router# show running configuration
interface BVI1
 ipv6 address 2001:db8::2/64
!
l2vpn
 bridge group 1
  bridge-domain 1
   interface HundredGigE0/0/0/1.100
   !
   routed interface BVI1
   !
  !
 !
!
dhcp ipv6
 profile RELAY1 relay
  helper-address vrf default 2001:db8::1
  iana-route-add
  !
 interface BVI1 relay profile RELAY1
!
```

Verification

Use the following command to verify that more than one DHCP client is bridged over BVI:

```
Router# show dhcp ipv6 relay binding
Thu Nov 21 05:48:38.463 UTC

Summary:
Total number of clients: 500

IPv6 Address: 2000::418f/128 (BVI31)
    Client DUID: 000100015dcf28de001094003295
    MAC Address: 0010.9400.3295
    IAID: 0x0
    VRF: default
    Lifetime: 600 secs (00:10:00)
    Expiration: 533 secs (00:08:53)
    L2Intf AC: Bundle-Ether3.1
    SERG State: NONE
    SERG Intf State: SERG-NONE
```

```
IPv6 Address: 2000::4190/128 (BVI31)
    Client DUID: 000100015dcf28de001094003296
    MAC Address: 0010.9400.3296
    IAID: 0x0
    VRF: default
    Lifetime: 600 secs (00:10:00)
    Expiration: 531 secs (00:08:51)
    L2Intf AC: Bundle-Ether3.1
    SERG State: NONE
    SERG Intf State: SERG-NONE
IPv6 Address: 2000::4191/128 (BVI31)
    Client DUID: 000100015dcf28de001094003297
    MAC Address: 0010.9400.3297
    IAID: 0x0
    VRF: default
    Lifetime: 600 secs (00:10:00)
    Expiration: 448 secs (00:07:28)
    L2Intf AC: Bundle-Ether3.1
    SERG State: NONE
    SERG Intf State: SERG-NONE
IPv6 Address: 2000::4192/128 (BVI31)
    Client DUID: 000100015dcf28de001094003298
    MAC Address: 0010.9400.3298
    IAID: 0x0
    VRF: default
    Lifetime: 600 secs (00:10:00)
    Expiration: 439 secs (00:07:19)
    L2Intf AC: Bundle-Ether3.1
    SERG State: NONE
    SERG Intf State: SERG-NONE
```

Use the following command to verify that a unique IPv6 address is assigned to a client due to IANA allocation:

```
Router# show route ipv6
Mon Oct 21 06:16:43.617 UTC

Codes: C - connected, S - static, R - RIP, B - BGP, (>) - Diversion path
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
       U - per-user static route, o - ODR, L - local, G  - DAGR, l - LISP
       A - access/subscriber, a - Application route
       M - mobile route, r - RPL, t - Traffic Engineering, (!) - FRR Backup path

Gateway of last resort is not set

A    2000::/64
      [1/0] via fe80::1, 00:00:37, BVI700
A    2000::1/128
      [1/0] via fe80::210:94ff:fe00:8, 00:00:12, BVI700
C    2007:3019::/64 is directly connected,
      00:00:37, Loopback1
L    2007:3019::1/128 is directly connected,
      00:00:37, Loopback1
C    7001:6018::/64 is directly connected,
      00:00:37, BVI700
L    7001:6018::1/128 is directly connected,
      00:00:37, BVI700
C    7001:6019::/64 is directly connected,
      00:00:37, TenGigE0/0/0/2.2
L    7001:6019::1/128 is directly connected,
      00:00:37, TenGigE0/0/0/2.2
```

Configuring the Relay Agent Information Feature

You can configure the DHCP relay agent information option. A DHCP relay agent may receive a message from another DHCP relay agent that already contains relay information. By default, the relay information from the previous relay agent is replaced (using the replace option).

Configuration

Use the following steps to configure the DHCP relay agent information option:

1. Enter DHCP IPv4 configuration submode.
2. Enter DHCP IPv4 profile relay submode.
3. Configure the system to insert the DHCP relay agent information option (option-82 field) in forwarded BOOTREQUEST messages to a DHCP server.

Note

- This option is injected by the relay agent while forwarding client-originated DHCP packets to the server. Servers recognizing this option can use the information to implement IP address or other parameter assignment policies. When replying, the DHCP server echoes the option back to the relay agent. The relay agent removes the option before forwarding the reply to the client.
- The relay agent information is organized as a single DHCP option that contains one or more suboptions. These options contain the information known by the relay agent. The supported suboptions are:
  - Remote ID
  - Circuit ID
- This function is disabled by default. The port field of the default circuit-ID denotes the configured bundle-ID of the bundle. If circuit IDs require that bundles be unique, and because the port field is 8 bits, the low-order 8 bits of configured bundle IDs must be unique. To achieve this, configure bundle-IDs within the range from 0 to 255.

4. (Optional) Configure DHCP to check the validity of the relay agent information option in forwarded BOOTREPLY messages.

Note

- If an invalid message is received, the relay agent drops the message. If a valid message is received, the relay agent removes the relay agent information option field and forwards the packet.
- By default, DHCP does not check the validity of the relay agent information option field in DHCP reply packets, received from the DHCP server.

5. (Optional) Configure the reforwarding policy for a DHCP relay agent; that is, whether the relay agent will drop or keep the relay information.

Note By default, the DHCP relay agent replaces the relay information option.

6. (Optional) Configure the DHCP IPv4 Relay not to discard BOOTREQUEST packets that have an existing relay information option and the giaddr set to zero.

Configuration Example

```
/* Enter DHCP IPv4 configuration submode. */
Router# Configure
Router(config)# dhcp ipv4

/* Enter DHCP IPv4 profile relay submode. */
Router(config-dhcpv4)# profile RELAY relay

/* Configure the system to insert the DHCP relay agent information option. */
Router(config-dhcpv4-relay-profile)# relay information option

/* (Optional) Configure DHCP to check the validity of the relay agent information option.
*/
Router(config-dhcpv4-relay-profile)# relay information check

/* (Optional) Configure the reforwarding policy for a DHCP relay agent. */
Router(config)# dhcp ipv4 profile TEST relay relay information policy drop
Router(config)# commit
```

Configuring Relay Agent Giaddr Policy

You can configure the DHCP relay agent's processing capabilities for the BOOTREQUEST packets that already contain a nonzero giaddr attribute. Use the `giaddr policy replace` command to replace the existing giaddr value with a value that it generates. Use the `giaddr policy drop` command to drop the packet that has an existing nonzero giaddr value.

Configuration

To configure a relay agent giaddr policy, use the following steps:

- Enter the DHCP IPv4 configuration submode.
- Enter the relay profile submode.
- Configure the giaddr policy.

Configuration Example

```
/* Enter the DHCP IPv4 configuration submode. */
Router# configure
Router(config)# dhcp ipv4

/* Enter the relay profile submode. */
Router(config-dhcpv4)# profile client relay

/* Configure the giaddr policy. */
Router(config-dhcpv4-relay-profile)# giaddr policy drop
Router(config-dhcpv4-relay-profile)# commit
```

Implementing DHCP Snooping

Prerequisites for Configuring DHCP Snooping

The following prerequisites are required example shows how to configure DHCP IPv4 snooping relay agent broadcast flag policy:

- You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.
- A Cisco 8000 Series Router running Cisco IOS XR software.
- A configured and running DHCP client and DHCP server.

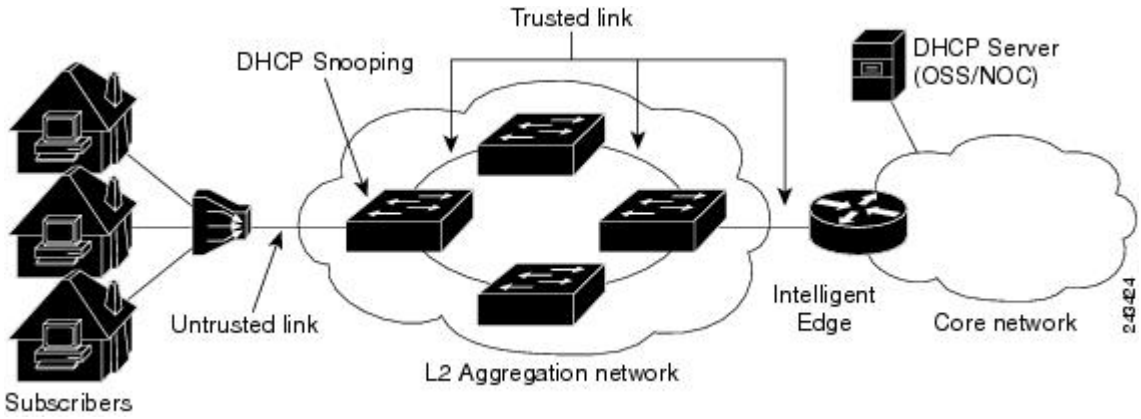
Information about DHCP Snooping

DHCP Snooping features are focused on the edge of the aggregation network. Security features are applied at the first point of entry for subscribers. Relay agent information option information is used to identify the subscriber's line, which is either the DSL line to the subscriber's home or the first port in the aggregation network.

The central concept for DHCP snooping is that of trusted and untrusted links. A trusted link is one providing secure access for traffic on that link. On an untrusted link, subscriber identity and subscriber traffic cannot be determined. DHCP snooping runs on untrusted links to provide subscriber identity. Figure 2: DHCP Snooping in an Aggregation Network, on page 14 shows an aggregation network. The link from the DSLAM to the aggregation network is untrusted and is the point of presence for DHCP snooping. The links connecting the switches in the aggregation network and the link from the aggregation network to the intelligent edge is considered trusted.

Note Enabling both DHCP relay on a BVI and DHCP snooping in a bridge domain that has a BVI can result in duplicate DHCP messages from the DHCP client to the DHCP server.

Figure 2: DHCP Snooping in an Aggregation Network



Trusted and Untrusted Ports

On trusted ports, DHCP BOOTREQUEST packets are forwarded by DHCP snooping. The client's address lease is not tracked and the client is not bound to the port. DHCP BOOTREPLY packets are forwarded.

When the first DHCP BOOTREQUEST packet from a client is received on an untrusted port, DHCP snooping binds the client to the bridge port and tracks the clients's address lease. When that address lease expires, the client is deleted from the database and is unbound from the bridge port. Packets from this client received on this bridge port are processed and forwarded as long as the binding exists. Packets that are received on another bridge port from this client are dropped while the binding exists. DHCP snooping only forwards DHCP BOOTREPLY packets for this client on the bridge port that the client is bound to. DHCP BOOTREPLY packets that are received on untrusted ports are not forwarded.

DHCP Snooping in a Bridge Domain

To enable DHCP snooping in a bridge domain, there must be at least two profiles, a trusted profile and an untrusted profile. The untrusted profile is assigned to the client-facing ports, and the trusted profile is assigned to the server-facing ports. In most cases, there are many client facing ports and few server-facing ports. The simplest example is two ports, a client-facing port and a server-facing port, with an untrusted profile explicitly assigned to the client-facing port and a trusted profile assigned to the server-facing port.

Assigning Profiles to a Bridge Domain

Because there are normally many client-facing ports and a small number of server-facing ports, the operator assigns the untrusted profile to the bridge domain. This configuration effectively assigns an untrusted profile to every port in the bridge domain. This action saves the operator from explicitly assigning the untrusted profile to all of the client-facing ports. Because there also must be server-facing ports that have trusted DHCP snooping profiles, in order for DHCP snooping to function properly, this untrusted DHCP snooping profile assignment is overridden to server-facing ports by specifically configuring trusted DHCP snooping profiles on the server-facing ports. For ports in the bridge domain that do not require DHCP snooping, all should have the **none** profile assigned to them to disable DHCP snooping on those ports.

Relay Information Options

You can configure a DHCP snooping profile to insert the relay information option (option 82) into DHCP client packets only when it is assigned to a client port. The **relay information option allow-untrusted** command addresses what to do with DHCP client packets when there is a null giaddr and a relay-information

option already in the client packet when it is received. This is a different condition than a DHCP snooping trusted/untrusted port. The **relay information option allow-untrusted** command determines how the DHCP snooping application handles untrusted relay information options.

How to Configure DHCP Snooping

This section contains the following tasks:

Enabling DHCP Snooping in a Bridge Domain

The following configuration creates two ports, a client-facing port and a server-facing port. In Step 1 through Step 8, an untrusted DHCP snooping profile is assigned to the client bridge port and trusted DHCP snooping profile is assigned to the server bridge port. In Step 9 through Step 18, an untrusted DHCP snooping profile is assigned to the bridge domain and trusted DHCP snooping profiles are assigned to server bridge ports.

Procedure

Step 1 Enter the DHCP IPv4 profile configuration submode using the **dhcp ipv4** command.

Example:

```
Router(config)# dhcp ipv4
```

Step 2 Configure an untrusted DHCP snooping profile for the client port using the **profile** *untrusted-profile-name* **snoop** command.

Example:

```
Router(config-dhcpv4)# profile untrustedClientProfile snoop
```

Step 3 Exit the DHCP IPv4 profile configuration mode using the **exit** command.

Example:

```
Router(config-dhcpv4)# exit
```

Step 4 Enable DHCP for IPv4 and entersDHCP IPv4 profile configuration mode using the **dhcp ipv4** command.

Example:

```
Router(config)# dhcp ipv4
```

Step 5 Configure a trusted DHCP snooping profile for the server port using the **profile** *profile-name* **snoop** command.

Example:

```
Router(config-dhcpv4)# profile trustedServerProfile snoop
```

Step 6 Configure a DHCP snoop profile to be trusted using the **trusted** command.

Example:

```
Router(config-dhcv4)# trusted
```

Step 7 Exit the DHCP IPv4 profile configuration mode using the **exit** command.

Example:

```
Router(config-dhcv4)# exit
```

Step 8 Enter the l2vpn configuration mode using the **l2vpn** command.

Example:

```
Router(config)# l2vpn
```

Step 9 Create a bridge group to contain bridge domains and enter l2vpn bridge group configuration submode using the **bridge group** *group-name* command.

Example:

```
Router(config-l2vpn)# bridge group ccc
```

Step 10 Establish a bridge domain using the **bridge-domain** *bridge-domain-name* command.

Example:

```
Router(config-l2vpn-bg)# bridge-domain ddd
```

Step 11 Identify the interface using the **interface** *type interface-path-id* command.

Example:

```
Router(config-l2vpn-bg-bd)# interface gigabitethernet 0/1/0/0
```

Step 12 Attach an untrusted DHCP snoop profile to the bridge port using the **dhcp ipv4 snoop profile** *untrusted-profile-name* command.

Example:

```
Router(config-l2vpn-bg-bd-ac)# dhcp ipv4 snoop profile untrustedClientProfile
```

Step 13 Identify the interface using the **interface** *type interface-path-id* command.

Example:

```
Router(config-l2vpn-bg-bd-ac)# gigabitethernet 0/1/0/1
```

Step 14 Attache a trusted DHCP snoop profile to the bridge port using the **dhcp ipv4 snoop profile** *trusted-profile-name* command.

Example:

```
Router(config-l2vpn-bg-bd-ac)# dhcp ipv4 snoop profile trustedServerProfile
```

Step 15 Exit the l2vpn bridge group bridge-domain interface configuration submode using the **exit** command.

Example:

```
Router(config-l2vpn-bg-bd-ac)# exit
```

Step 16 Exit the l2vpn bridge group bridge-domain configuration submode using the **exit** command.

Example:

```
Router(config-l2vpn-bg-bd)# exit
```

Step 17 Commit the configuration changes on the router.

Example:

```
Router(config)# commit
```

Disabling DHCP Snooping on a Specific Bridge Port

The following configuration enables DHCP to snoop packets on all bridge ports in the bridge domain ISP1 except for bridge port GigabitEthernet 0/1/0/1 and GigabitEthernet 0/1/0/2. DHCP snooping is disabled on bridge port GigabitEthernet 0/1/0/1. Bridge port GigabitEthernet 0/1/0/2 is the trusted port that connects to the server. In this example, no additional features are enabled, so only DHCP snooping is running.

Procedure

Step 1 Enter l2vpn configuration submode using the **l2vpn** command.

Example:

```
Router(config)# l2vpn
```

Step 2 Create a bridge group to contain bridge domains and enter l2vpn bridge group configuration submode using the **bridge group** *group-name* command.

Example:

```
Router(config-l2vpn)# bridge group GRP1
```

Step 3 Establish a bridge domain and enter l2vpn bridge group bridge-domain configuration submode. **bridge-domain** *bridge-domain-name*

Example:

```
Router(config-l2vpn-bg)# bridge-domain ISP1
```

Step 4 Attach the untrusted DHCP snooping profile to the bridge domain using the **dhcp ipv4 snoop profile** *profile-name* command.

Example:

```
Router(config-l2vpn-bg-bd)# dhcp ipv4 snoop profile untrustedClientProfile
```

Step 5 Identify an interface and enter l2vpn bridge group bridge-domain interface configuration submode using the **interface** *type interface-path-id* command.

Example:

```
Router(config-l2vpn-bg-bd)# interface gigabitethernet 0/1/0/1
```

Step 6 Disable DHCP snooping on the port using the **dhcp ipv4 none** command.

Example:

```
Router(config-l2vpn-bg-bd-if)# dhcp ipv4 none
```

Step 7 Identify an interface and enter l2vpn bridge group bridge-domain interface configuration submode using the **interface** *type interface-path-id* command.

Example:

```
Router(config-l2vpn-bg-bd)# interface gigabitethernet 0/1/0/2
```

Step 8 Attach the trusted DHCP snooping profile to a port using the **dhcp ipv4 snoop profile** *profile-name* command.

Example:

```
Router(config-l2vpn-bg-bd)# dhcp ipv4 snoop profile trustedServerProfile
```

Step 9 Exit l2vpn bridge-domain bridge group interface configuration submode using the **exit** command.

Example:

```
Router(config-l2vpn-bd-bg)# exit
```

Step 10 Exit l2vpn bridge-domain submode using the **exit** command.

Example:

```
Router(config-l2vpn-bg)# exit
```

Step 11 Commit the configuration changes on the router.

Example:

```
Router(config)# commit
```

Using the Relay Information Option

This task shows how to use the relay information commands to insert the relay information option (option 82) into DHCP client packets and forward DHCP packets with untrusted relay information options.

Procedure

Step 1 Enter the DHCP IPv4 profile configuration submode using the **dhcp ipv4** command.

Example:

```
Router# config
Router(config)# dhcp ipv4
```

Step 2 Configure an untrusted DHCP snooping profile for the client port using the **profile** *profile-name* **snoop** command.

Example:

```
Router(config-dhcpv4)# profile untrustedClientProfile snoop
```

Step 3 Enable the system to insert the DHCP relay information option field in forwarded BOOTREQUEST messages to a DHCP server using the **relay information option** command.

Example:

```
Router(config-dhcpv4-snoop-profile)# relay information option
```

Step 4 Commit the configuration changes on the router.

Example:

```
Router(config-dhcpv4-snoop-profile)# commit
```