

# DHCP-SNOOPING Configuration

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# Chapter 1 DHCP-Snooping Configuration

## 1.1 IGMP-Snooping Configuration Tasks

DHCP-Snooping is to prevent the fake DHCP server from providing the DHCP service by judging the DHCP packets, maintaining the binding relationship between MAC address and IP address. The L2 switch can conduct the DAI function and the IP source guard function according to the binding relationship between MAC address and IP address. The DHCP-snooping is mainly to monitor the DHCP packets and dynamically maintain the MAC-IP binding list. The L2 switch filters the packets, which do not meet the MAC-IP binding relationship, to prevent the network attack from illegal users.

- Enabling/Disabling DHCP-Snooping
- Enabling DHCP-snooping in a VLAN
- Setting an Interface to a DHCP-Trusting Interface
- Enabling DAI in a VLAN
- Setting an Interface to an ARP-Trusting Interface
- Enabling Source IP Address Monitoring in a VLAN
- Setting A Trust Interface for Monitoring Source IP Address
- Binding DHCP Snooping to a Standby TFTP Server
- Configuring a file name for DHCP-snooping binding backup
- Configuring an interval for DHCP-snooping binding backup
- Configuring or adding the binding relationship manually
- Monitoring and Maintaining DHCP-Snooping
- DHCP-Snooping Example

### 1.1.1 Enabling/Disabling DHCP-Snooping

Run the following commands in global configuration mode.

Command	Purpose
<b>ip dhcp-relay snooping</b>	Enables DHCP-snooping.
<b>no ip dhcp-relay snooping</b>	Resumes the default settings.

This command is used to enable DHCP snooping in global configuration mode. After this command is run, the switch is to monitor all DHCP packets and form the corresponding binding relationship.

Note: If the client obtains the address of a switch before this command is run, the switch cannot add the corresponding binding relationship.

### 1.1.2 Enabling DHCP-snooping in a VLAN

If DHCP snooping is enabled in a VLAN, the DHCP packets which are received from all distrusted physical ports in a VLAN will be legally checked. The DHCP response packets which

are received from distrusted physical ports in a VLAN will then be dropped, preventing the faked or mis-configured DHCP server from providing address distribution services. For the DHCP request packet from distrusted ports, if the hardware address field in the DHCP request packet does not match the MAC address of this packet, the DHCP request packet is then thought as a fake packet which is used as the attack packet for DHCP DOS and then the switch will drop it.

The switch will drop the attack packets of DHCP DOS.

Run the following commands in global configuration mode.

Command	Purpose
<b>ip dhcp-relay snooping vlan <i>vlan_id</i></b>	Enables DHCP-snooping in a VLAN.
<b>no ip dhcp-snooping vlan <i>vlan_id</i></b>	Disables DHCP-snooping in a VLAN.

### 1. 1. 3 Enabling Maximum DHCP Clients in a VLAN

To enable attack prevention in a VLAN, you need to configure the allowable maximum DHCP clients in a specific VLAN and conduct the principle of “first come and first serve”. When the number of users in the specific VLAN reaches the maximum number, new clients are not allowed to be distributed.

Run the following commands in global configuration mode.

Command	Purpose
<b>ip dhcp-relay snooping vlan <i>vlan_id</i> max-client <i>number</i></b>	Enable DHCP anti-attack in a VLAN.
<b>no ip dhcp-snooping vlan <i>vlan_id</i> max-clientr</b>	Disables DHCP anti-attack in a VLAN.

### 1. 1. 4 Setting an Interface to a DHCP-Trusting Interface

If an interface is set to be a DHCP-trusting interface, the DHCP packets received from this interface will not be checked.

Run the following commands in physical interface configuration mode.

Command	Purpose
<b>dhcp snooping trust</b>	Sets an interface to a DHCP-trusting interface.
<b>no dhcp snooping trust</b>	Resumes an interface to a DHCP-distrusted interface.

The interface is a distrusted interface by default.

### 1. 1. 5 Enabling or Disabling the Fast Update Function of the Binding Table

This function is disabled by default. When this function is disabled and a port has been bound to client A, the DHCP request of the same MAC address on other ports will be regarded as a fake MAC attack even if client A is off line.

When this function is enabled, the above-mentioned case will not occur.

It is recommended to use this function in case that a client frequently changes its port and address lease, distributed by DHCP server, cannot be modified to a short period of time.

Command	Purpose
<b>ip dhcp-relay snooping rapid-refresh-bind</b>	Enables the fast update function of the binding table.
<b>no ip dhcp-relay snooping rapid-refresh-bind</b>	Disables the fast update function of the binding table.

### 1.1.6 Enabling DAI in a VLAN

When dynamic ARP monitoring is conducted in all physical ports of a VLAN, a received ARP packet will be rejected if the source MAC address and the source IP address of this packet do not match up with the configured MAC-IP binding relationship. The binding relationship on an interface can be dynamically bound by DHCP or configured manually. If no MAC addresses are bound to IP addresses on a physical interface, the switch rejects forwarding all ARP packets.

Command	Purpose
<b>ip arp inspection vlan <i>vlanid</i></b>	Enables dynamic ARP monitoring on all distrusted ports in a VLAN.
<b>no ip arp inspection vlan <i>vlanid</i></b>	Disables dynamic ARP monitoring on all distrusted ports in a VLAN.

### 1.1.7 Setting an Interface to an ARP-Trusting Interface

ARP monitoring is not enabled on those trusted interfaces. The interfaces are distrusted ones by default.

Run the following commands in interface configuration mode.

Command	Purpose
<b>arp inspection trust</b>	Sets an interface to an ARP-trusting interface.
<b>no arp inspection trust</b>	Resumes an interface to an ARP-distrusting interface.

### 1.1.8 Enabling Source IP Address Monitoring in a VLAN

After source IP address monitoring is enabled in a VLAN, IP packets received from all physical ports in the VLAN will be rejected if their source MAC addresses and source IP addresses do not match up with the configured MAC-to-IP binding relationship. The binding relationship on an interface can be dynamically bound by DHCP or configured manually. If no MAC addresses are bound to IP addresses on a physical interface, the switch rejects forwarding all IP packets received from the physical interface.

Run the following commands in global configuration mode.

Command	Purpose
<b>ip verify source vlan <i>vlanid</i></b>	Enables source IP address checkup on all distrusted interfaces in a VLAN.
<b>no ip verify source vlan <i>vlanid</i></b>	Disables source IP address checkup on all interfaces in a VLAN.

Note: If the DHCP packet (also the IP packet) is received, it will be forwarded because global snooping is configured.

### 1. 1. 9 Enabling VLAN Translation (requiring of an equipment supporting this function)

In a VLAN where vlan translation is enabled, the N-to-1 vlan translation will be conducted to the packets of all physical ports in this VLAN, that is, multiple VLANs can be translated into one VLAN.

Run the following commands in global configuration mode.

Command	Purpose
<b>ip vlan-translate vlan <i>vlanid</i></b>	Enables vlan translation on all interfaces of a VLAN.
<b>no ip vlan-translate vlan <i>vlanid</i></b>	Disables vlan translation on all interfaces of a VLAN.

Note: *vlanid* here shall be the translated VLAN. VLAN translation must be enabled through global DHCP snooping, and its validation must require to enable QinQ-related commands.

### 1. 1. 10 Setting an Interface to the One Which is Trusted by IP Source Address Monitoring

Source address checkup is not enabled on an interface if the interface has a trusted source IP address.

Run the following commands in interface configuration mode.

Command	Purpose
<b>ip-source trust</b>	Sets an interface to the one with a trusted source IP address.
<b>no ip-source trust</b>	Resumes an interface to the one with a distrusted source IP address.

### 1. 1. 11 Setting an Interface to Forbid VLAN Translation (Requiring to support VLAN translation)

It is to disable VLAN translation on an interface on which VLAN translation is forbidden.

Run the following commands in interface configuration mode.

Command	Purpose
<b>vlan-translate deny</b>	Sets an interface to be one of forbidding VLAN translation.

no vlan-translate deny	Sets an interface not to forbid VLAN translation (If this interface belongs to VLAN Translate Enable VLAN, VLAN translation works normally in this case).
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### 1. 1. 12 Setting DHCP-Snooping Option 82

Option 82 brings the local information to a server and helps the server to distribute addresses to clients.

Run the following commands in global configuration mode.

Command	Purpose
ip dhcp-relay snooping information option	Sets that option82, which is in the default format, is carried when DHCP-snooping forwards the DHCP packets.
no ip dhcp-relay snooping information option	Sets that option82 is not carried when DHCP-snooping forwards the DHCP packets.

To specify the format of option82, conduct the following settings in global mode.

Command	Purpose
ip dhcp-relay snooping information option format snmp-ifindex/manual/hn-type	Sets the format of option82 that the DHCP packets carry when they are forwarded by DHCP-Snooping.
no ip dhcp-relay snooping information option format snmp-ifindex/manual/hn-type	Sets that option82 is not carried when DHCP-snooping forwards the DHCP packets.

If a manual mode is set to enter in option82, conduct the following configurations in interface mode to set the circuit-id:

Command	Purpose
dhcp snooping information circuit-id string [STRING]	If option82 is set to be in the manual format, you need to set DHCP-snooping to forward DHCP packets with bearing of option82, whose content is the character string written by STRING. This command is set on the port that connects the client.
dhcp snooping information circuit-id hex [xx-xx-xx-xx-xx-xx]	If option82 is set to be in the manual format, you need to set DHCP-snooping to forward DHCP packets with bearing of option82, whose content is the Hex system. This command is set on the port that connects the client.
no dhcp snooping information circuit-id	Deletes the manually configured option82 circuit-id.

If a manual mode is set to enter in option82, conduct the following configurations in interface mode to set the remote-id:

Command	Purpose
<code>dhcp snooping information remote-id string [STRING]</code>	If option82 is set to be in the manual format, you need to set DHCP-snooping to forward DHCP packets with bearing of option82, whose content is the character string written by STRING. This command is set on the port that connects the client.
<code>dhcp snooping information remote-id hex [xx-xx-xx-xx-xx-xx]</code>	If option82 is set to be in the manual format, you need to set DHCP-snooping to forward DHCP packets with bearing of option82, whose content is the Hex system.. This command is set on the port that connects the client.
<code>no dhcp snooping information remote-id</code>	Deletes the manually configured option82 remote-id.

If a manual mode is set to enter in option82, conduct the following configurations in interface mode to set the remote-id:

Command	Purpose
<code>dhcp snooping information vendor-specific hex [xx-xx-xx-xx-xx-xx]</code>	If option82 is set to be in the manual format, you need to set DHCP-snooping to forward DHCP packets with bearing of option82, whose content is the Hex system.. This command is set on the port that connects the client.
<code>no dhcp snooping information vendor-specific</code>	Deletes the manually configured option82 vendor-specific.

### 1. 1. 13 Setting the Policy of DHCP-Snooping Option82 Packets

You can set the policy for the DHCP request packets, which carry with option82, after these packets are received. The policies include the following ones:

“Drop” policy: Run the following command in port mode to drop the request packets with option82.

Command	Purpose
<code>dhcp snooping information drop</code>	Drops the request packets that contain option82.

“Append” policy: Run the following command in port mode to add the request packets with option82.

Command	Purpose
<code>dhcp snooping information append</code>	Enables the function to add option82 on a port.
<code>dhcp snooping information append first-subop9-param hex [xx-xx-xx-xx-xx-xx]</code>	Stands for the Hex system of the first parameter carried by option82 vendor-specific (suboption9).



<b>dhcp snooping information append second-subop9-param hex [xx-xx-xx-xx-xx-xx]</b>	Stands for the Hex system of the second parameter carried by option82 vendor-specific (suboption9).
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#### 1.1.14 Configuring the TFTP Server for Backing up Interface Binding

After the switch configuration is rebooted, the previously-configured interface binding will be lost. In this case, there is no binding relationship on this interface. After source IP address monitoring is enabled, the switch rejected forwarding all IP packets. After the TFTP server is configured for interface binding backup, the binding relationship will be backed up to the server through the TFTP protocol. After the switch is restarted, the switch automatically downloads the binding list from the TFTP server, securing the normal running of the network.

Run the following commands in global configuration mode.

Command	Purpose
<code>ip dhcp-relay snooping database-agent <i>ip-address</i></code>	Configures the IP address of the TFTP server which is to back up interface binding.
<code>no ip dhcp-relay snooping database-agent</code>	Cancels the TFTP Server for backing up interface binding.

#### 1.1.15 Configuring a File Name for Interface Binding Backup

When backing up the interface binding relationship, the corresponding file name will be saved on the TFTP server. In this way, different switches can back up their own interface binding relationships to the same TFTP server.

Run the following commands in global configuration mode.

Command	Purpose
<code>ip dhcp-relay snooping db-file <i>name</i></code>	Configures a file name for interface binding backup.
<code>no ip dhcp-relay snooping db-file</code>	Cancels a file name for interface binding backup.

#### 1.1.16 Configuring the Interval for Checking Interface Binding Backup

The MAC-to-IP binding relationship on an interface changes dynamically. Hence, you need check whether the binding relationship updates after a certain interval. If the binding relationship updates, it need be backed up again. The default interval is 30 minutes.

Run the following commands in global configuration mode.

Command	Purpose
<code>ip dhcp-relay snooping write <i>num</i></code>	Configures the interval for checking interface binding backup.
<code>no ip dhcp-relay snooping write</code>	Resumes the interval of checking interface binding backup to the default settings.

### 1.1.17 Configures Interface Binding Manually

If a host does not obtain the address through DHCP, you can add the binding item on an interface of a switch to enable the host to access the network. You can run **no ip source binding MAC IP** to delete items from the corresponding binding list.

Note that the manually-configured binding items have higher priority than the dynamically-configured binding items. If the manually-configured binding item and the dynamically-configured binding item have the same MAC address, the manually-configured one updates the dynamically-configured one. The interface binding item takes the MAC address as the unique index.

Run the following commands in global configuration mode.

Command	Purpose
<b>ip source binding</b> <i>MAC IP</i> <i>interface name</i>	Configures interface binding manually.
<b>no ip source binding</b> <i>MAC IP</i>	Cancels an interface binding item.

### 1.1.18 L2 Switch Forwarding DHCP Packets

The following command can be used to forward the DHCP packets to the designated DHCP server to realize DHCP relay. The negative form of this command can be used to shut down DHCP relay.

Note: This command can only be used to enable DHCP relay on L2 switches, while on L3 switches, DHCP relay is realized by the DHCP server.

Run the following commands in global configuration mode.

Command	Purpose
<b>ip dhcp-relay agent</b>	Enables DHCP relay.
<b>ip dhcp-relay helper-address</b> <i>address</i> <b>vlan</b> <i>vlan-id</i>	Configures the destination address and VLAN of the relay.

### 1.1.19 Monitoring and Maintaining DHCP-Snooping

Run the following commands in EXEC mode:

Command	Purpose
<b>show ip dhcp-relay snooping</b>	Displays the information about DHCP-snooping configuration.
<b>show ip dhcp-relay snooping binding</b>	Displays the effective address binding items on an interface.
<b>show ip dhcp-relay snooping binding all</b>	Displays all binding items which are generated by DHCP snooping.
<b>[ no ] debug ip dhcp-relay [ snooping   binding   event   all ]</b>	Enables or disables the switch of DHCP relay snooping binding or event.

The following shows the information about the DHCP snooping configuration.

```
switch#show ip dhcp-relay snooping
ip dhcp-relay snooping vlan 3
ip arp inspection vlan 3
DHCP Snooping trust interface:
  FastEthernet0/1
ARP Inspect interface:
  FastEthernet0/11
```

The following shows the binding information about dhcp-relay snooping:

```
switch#show ip dhcp-relay snooping binding
Hardware Address   IP Address   remainder time Type           VLAN   interface
00-e0-0f-26-23-89 192.2.2.101 86400        DHCP_SN        3      FastEthernet0/3
```

The following shows the binding information about dhcp-relay snooping:

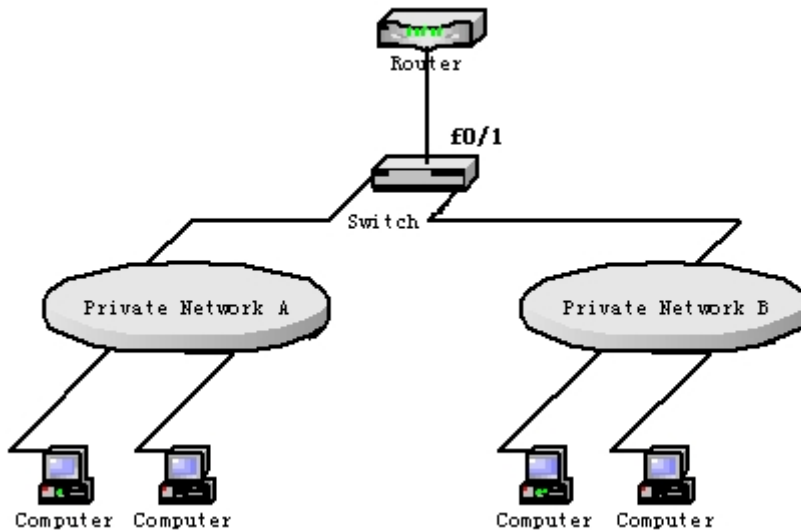
```
switch#show ip dhcp-relay snooping binding all
Hardware Address   IP Address   remainder time Type           VLAN   interface
00-e0-0f-32-1c-59 192.2.2.1   infinite    MANUAL        1      FastEthernet0/2
00-e0-0f-26-23-89 192.2.2.101 86400        DHCP_SN        3      FastEthernet0/3
```

The following shows the information about dhcp-relay snooping.

```
switch#debug ip dhcp-relay all
DHCP: receive l2 packet from vlan 3, diID: 3
DHCP: DHCP packet len 277
DHCP: add binding on interface FastEthernet0/3
DHCP: send packet continue
DHCP: receive l2 packet from vlan 3, diID: 1
DHCP: DHCP packet len 300
DHCP: send packet continue
DHCP: receive l2 packet from vlan 3, diID: 3
DHCP: DHCP packet len 289
DHCP: send packet continue
DHCP: receive l2 packet from vlan 3, diID: 1
DHCP: DHCP packet len 300
DHCP: update binding on interface FastEthernet0/3
DHCP: IP address: 192.2.2.101, lease time 86400 seconds
DHCP: send packet continue
```

### 1.1.20 Example of DHCP-Snooping Configuration

The network topology is shown in figure 1.



Configuring Switch:

- (1) Enable DHCP snooping in VLAN 1 which connects private network A.  

```
Switch_config#ip dhcp-relay snooping
Switch_config#ip dhcp-relay snooping vlan 1
```
- (2) Enable DHCP snooping in VLAN 2 which connects private network B.  

```
Switch_config#ip dhcp-relay snooping
Switch_config#ip dhcp-relay snooping vlan 2
```
- (3) Set the interface which connects the DHCP server to a DHCP-trusting interface.  

```
Switch_config_f0/1#dhcp snooping trust
```
- (4) Set the option82 instance manually:  

```
interface GigaEthernet0/1
  dhcp snooping information circuit-id hex 00-01-00-05
  dhcp snooping information remote-id hex 00-e0-0f-13-1a-50
  dhcp snooping information vendor-specific hex
  00-00-0c-f8-0d-01-0b-78-69-61-6f-6d-69-6e-37-31-31-34
  dhcp snooping information append
  dhcp snooping information append first-subop9-param hex
  61-62-63-61-62-63
  !
interface GigaEthernet0/2
  dhcp snooping trust
  arp inspection trust
  ip-source trust
  !
  !
  !
ip dhcp-relay snooping
ip dhcp-relay snooping vlan 1-100
```

```
ip arp inspection vlan 1
ip verify source vlan 1
ip dhcp-relay snooping information option format manual
```