Example: Configuring DHCP Snooping and DAI to Protect the Switch from ARP Spoofing Attacks

In an ARP spoofing attack, the attacker associates its own MAC address with the IP address of a network device connected to the switch. Traffic intended for that IP address is now sent to the attacker instead of being sent to the intended destination. The attacker can send faked, or "spoofed," ARP messages on the LAN.

This example describes how to configure DHCP snooping and dynamic ARP inspection (DAI), two port security features, to protect the switch against ARP spoofing attacks:

Requirements

This example uses the following hardware and software components:

- One EX 3200-24P switch
- JUNOS Release 9.0 or later for EX-series switches
- A DHCP server to provide IP addresses to network devices on the switch

Before you configure DHCP snooping and DAI, two port security features, to mitigate ARP spoofing attacks, be sure you have:

- Connected the DHCP server to the switch.
- Configured the VLAN employee-vlan on the switch.

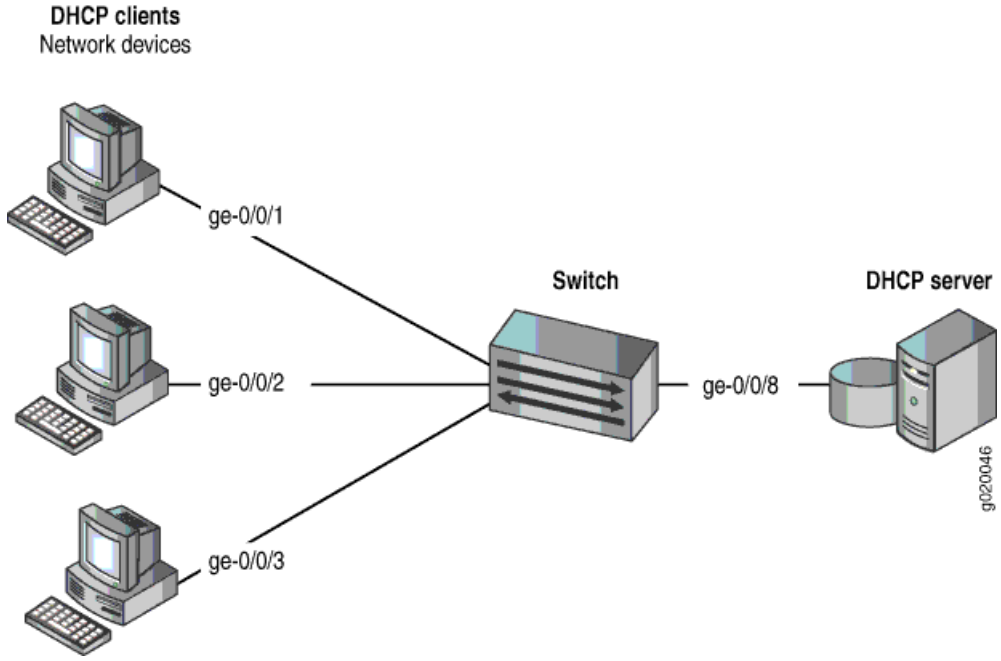
Overview and Topology

Ethernet LANs are vulnerable to address spoofing and DoS attacks on network devices. This example describes how to protect the switch against one common type of attack, an ARP spoofing attack.

In an ARP spoofing attack, the attacker sends faked ARP messages, thus creating various types of mischief on the LAN—for example, the attacker might launch a man-in-the middle attack.

This example shows how to configure port security features on an EX 3200-24P switch that is connected to a DHCP server. The setup for this example includes the VLAN employee-vlan on the switch. The procedure for creating that VLAN is described in the topic Example: Setting Up Bridging with Multiple VLANs for EX-series Switches. That procedure is not repeated here. Figure 1 illustrates the topology for this example.

Figure 1: Network Topology for Basic Port Security



The components of the topology for this example are shown in Table 1.

Table 1: Components of the Port Security Topology

Properties	Settings
Switch hardware	One EX 3200-24P, 24 ports (8 PoE ports)
VLAN name and ID	employee-vlan, tag 20
VLAN subnets	192.0.2.16/28 192.0.2.17 through 192.0.2.30 192.0.2.31 is subnet's broadcast address
Interfaces in employee-vlan	ge-0/0/1,ge-0/0/2, ge-0/0/3, ge-0/0/8
Interface for DHCP server	ge-0/0/8

In this example, the switch has already been configured as follows:

- Secure port access is activated on the switch.
- DHCP snooping is disabled on the VLAN employee-vlan.
- All access ports are untrusted, which is the default setting.

Configuration

To configure DHCP snooping and dynamic ARP inspection (DAI) to protect the switch against ARP attacks:

CLI Quick Configuration To quickly configure DHCP snooping and dynamic ARP inspection (DAI), copy the following commands and paste them into the switch terminal window:

```
[edit ethernet-switching-options secure-access-port]
set interface ge-0/0/8 dhcp-trusted
set vlan employee-vlan examine-dhcp
set vlan employee-vlan arp-inspection
```

Step-by-Step Procedure Configure DHCP snooping and dynamic ARP inspection (DAI) on the VLAN:

1. Set the ge-0/0/8 interface as trusted:

```
[edit ethernet-switching-options secure-access-port]
user@switch# set interface ge-0/0/8 dhcp-trusted
```

2. Enable DHCP snooping on the VLAN:

```
[edit ethernet-switching-options secure-access-port]
user@switch# set vlan employee-vlan examine-dhcp
```

3. Enable DAI on the VLAN:

```
[edit ethernet-switching-options secure-access-port]
user@switch# set vlan employee-vlan arp-inspection
```

Results Check the results of the configuration:

```
[edit ethernet-switching-options secure-access-port]
user@switch# show
interface ge-0/0/8.0 {
    dhcp-trusted;
}
vlan employee-vlan {
    arp-inspection
    examine-dhcp;
}
```

Verification

To confirm that the configuration is working properly:

- Verifying That DHCP Snooping Is Working Correctly on the Switch on page 4
- Verifying That DAI Is Working Correctly on the Switch on page 4

Verifying That DHCP Snooping Is Working Correctly on the Switch

Purpose Verify that DHCP snooping is working on the switch.

Action Send some DHCP requests from network devices (here they are DHCP clients) connected to the switch.

Display the DHCP snooping information when the port on which the DHCP server connects to the switch is trusted. The following output results when requests are sent from the MAC addresses and the server has provided the IP addresses and leases:

```
user@switch> show dhcp snooping binding
DHCP Snooping Information:
MAC Address         IP Address    Lease    Type     VLAN            Interface
-----------------   ----------    -----    ----     ----            ---------
00:05:85:3A:82:77    192.0.2.17    600    dynamic  employee-vlan   ge-0/0/1.0
00:05:85:3A:82:79    192.0.2.18    653    dynamic  employee-vlan   ge-0/0/1.0
00:05:85:3A:82:80    192.0.2.19    720    dynamic  employee-vlan   ge-0/0/2.0
00:05:85:3A:82:81    192.0.2.20    932    dynamic  employee-vlan   ge-0/0/2.0
00:05:85:3A:82:83    192.0.2.21   1230    dynamic  employee-vlan   ge-0/0/2.0
00:05:85:27:32:88    192.0.2.22   3200    dynamic  employee-vlan   ge-0/0/3.0
```

Meaning When the interface on which the DHCP server connects to the switch has been set to trusted, the output (see preceding sample) shows, for each MAC address, the assigned IP address and lease time—that is, the time, in seconds, remaining before the lease expires.

Verifying That DAI Is Working Correctly on the Switch

Purpose Verify that DAI is working on the switch.

Action Send some ARP requests from network devices connected to the switch.

Display the DAI information:

```
user@switch> show arp inspection statistics
ARP inspection statistics:
Interface        Packets received  ARP inspection pass   ARP inspection failed
---------------  ---------------   -------------------- ---------------------
ge-0/0/1.0                     7                     5                      2
ge-0/0/2.0                    10                    10                      0
ge-0/0/3.0                    12                    12                      0
```

Meaning The sample output shows the number of ARP packets received and inspected per interface, with a listing of how many packets passed and how many failed the inspection on each interface. The switch compares the ARP requests and replies against the entries in the DHCP snooping database. If a MAC address or IP address in the ARP packet does not match a valid entry in the database, the packet is dropped.

Related Topics

- Example: Configuring Port Security, with DHCP Snooping, DAI, MAC Limiting, and MAC Move Limiting, on an EX-series Switch
- Enabling DHCP Snooping (CLI Procedure)

- Enabling DHCP Snooping (J-Web Procedure)
- Enabling Dynamic ARP Inspection (CLI Procedure)
- Enabling Dynamic ARP Inspection (J-Web Procedure)