Introduction

The document describes how to configure a Cisco Adaptive Security Appliance (ASA) as a DHCPv6 relay agent and also covers some basic troubleshooting. In ASA Code Version 9.0 and later, the ASA supports

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- IPv6 basic concepts
- IPv6 addressing mechanism
- DHCPv6 packet flow
- DHCP relay concepts
Components Used

The information in this document is based on the ASA 5500 Version 9.1.2.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Stateful vs Stateless DHCPv6

If you understand the different method of address allocation in IPv6, it helps you understand how the DHCPv6 relay feature works on the ASA. Refer to Dynamic address assignment in IPv6 using SLAAC and DHCP for an introduction to Stateless Address Autoconfiguration (SLAAC) and DHCPv6.

Network Diagram

This sample configuration describes how to configure the ASA as a DHCPv6 relay agent. In this configuration, CLIENT is the interface where the IPv6 client is connected. SERVER is the interface through which the DHCPv6 server 2001:db8:200::1/64 is reachable.

DHCPv6 vs DHCPv4 Message Types

<table>
<thead>
<tr>
<th>DHCPv6 Message Type</th>
<th>DHCPv4 Message Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solicit (1)</td>
<td>DHCPDISCOVER</td>
</tr>
<tr>
<td>Advertise (2)</td>
<td>DHCPOFFER</td>
</tr>
<tr>
<td>Request (3, Renew (5), Rebind (6)</td>
<td>DHCPREQUEST</td>
</tr>
<tr>
<td>Reply (7)</td>
<td>DHCPACK / DHCPACKNA</td>
</tr>
<tr>
<td>Release (8)</td>
<td>DHCPRELEASE</td>
</tr>
<tr>
<td>Information-Request (9)</td>
<td>DHCPINFORM</td>
</tr>
<tr>
<td>Decline (9)</td>
<td>DHCPDECLINE</td>
</tr>
<tr>
<td>Confirm (10)</td>
<td>none</td>
</tr>
<tr>
<td>Reconfigure (16)</td>
<td>DHCPRECOVER</td>
</tr>
</tbody>
</table>
| Relay-Request (12), Relay-Reply (13) | none
Stateless DHCPv6 Relay

Configuration

Here is the basic configuration for Stateless DHCPv6 relay configuration on the ASA:

Packet Flow

With stateless DHCPv6, here is the packet flow from the client:

The ASA intercepts these packets and wraps them into the DHCP relay format:

Verify

Debugs

If you enable debug ipv6 dhcprelay and debug ipv6 dhcp, then relevant output prints to the screen. This output is taken from a working scenario:

In the INFORMATION-REQUEST request packet, the client only requests DNS-Server and Domain, which is expected since the client is configured for stateless DHCPv6.

Wireshark Snapshots

DHCP Client Request
DHCP Request Relayed by ASA

DHCP Reply From Server

Reply Forwarded to Client
Stateful DHCPv6

Configuration

Here is the basic configuration for Stateful DHCPv6 relay configuration on the ASA:

Packet Flow

With stateful DHCPv6, here is the packet flow from the client:

![Packet Flow Diagram]

The ASA intercepts these packets and wraps them into the DHCP relay format:

![ASA Diagram]

Verify

Debrids

Wireshark Snapshots

SOLICIT (1)

A DHCPv6 client sends a Solicit message in order to locate DHCPv6 servers.
The ASA relays the Solicit message.

ADVERTISE (2)

A server sends an Advertise message in order to indicate that it is available for DHCP service, in response to a Solicit message received from a client.

REQUEST (3)
A client sends a Request message in order to request configuration parameters, which include IP addresses or delegated prefixes, from a specific server.

**REPLY (7)**

A server sends a Reply message that contains assigned addresses and configuration parameters in response to a Solicit, Request, Renew, or Rebind message received from a client. A server sends a Reply message that contains configuration parameters in response to an Information-request message. A server sends a Reply message in response to a Confirm message that confirms or denies that the addresses assigned to the client are appropriate to the link to which the client is connected. A server sends a Reply message in order to acknowledge receipt of a Release or Decline message.

**Troubleshoot**

Confirm connectivity with DHCPv6 Server.

ciscoasa# show ipv6 neighbor
IPv6 Address    Age Link-layer Addr State Interface
2001:0db8:3000:11    3000    66a0:8475:8150:6e26    Active 2001:0db8:3000:12
2001:0db8:4000:11    4000    66a0:8475:8150:6e26    Active 2001:0db8:4000:12
Confirm that you receive packets from the client when it requests an IPv6 address. The packet sent by the client will depend on the address assignment settings (that is, stateful vs stateless).

When the client begins the DHCPv6 process, it sends a Router Solicit message in order to discover the presence of IPv6 routers on the link. It sends a multicast Router Solicitation message in order to prompt the IPv6 routers to respond. In the Ethernet header of the Router Solicitation message, these fields display:

- The Source Address field is the MAC address of the host that requests the IPv6 address.
- The Destination Address field is set to 33-33-00-00-00-02.

In the IPv6 header of the Router Solicitation message, these fields display:

- The Source Address field is set to either a link-local IPv6 address assigned to the sending interface or the IPv6 unspecified address (::).
- The Destination Address field is set to the link-local scope all-routers multicast address (FF02::2).
- The Hop Limit field is set to 255.

In Response, the IPv6 routers send unsolicited Router Advertisement messages. The Router Advertisement message contains the information required by hosts in order to determine the link prefixes, the link Maximum Transmission Unit (MTU), and specific routes.

ciscoasa(config)# show capture capin detail

fe80::c671:feff:fe93:b51a.546 > ff02::1:2.547:  [udp sum ok] udp 42
[hlim 255] (len 100)---->Request from client

fe80::219:7ff:fe24:2e44.547 > fe80::c671:feff:fe93:b51a.546:  [udp sum ok]
udp 75 [class 0xe0] (len 133, hlim 255)

ciscoasa(config)# show capture capout detail

2 packets captured

[class 0xe0]---->ASA forwards request to DHCPv6 router

[class 0xe0]----> Reply from DHCPv6 server.

**DHCP Relay Outputs**

ciscoasa# show ipv6 dhcprelay binding
1 in use, 1 most used

Client: fe80::c671:feff:fe93:b51a (CLIENT)
DUID: 00030001c471fe93b516, Timeout in 56 seconds

**Note:** The binding is deleted by the ASA after a short period. This is seen in **debug ipv6 dhcprelay**.

ciscoasa# show ipv6 dhcprelay binding
1 in use, 1 most used

Client: fe80::c671:feff:fe93:b51a (CLIENT)
DUID: 00030001c471fe93b516, Timeout in 56 seconds
ciscoasa# show ipv6 dhcprelay statistics
Release Addresses

Clients can release their DHCPv6 assigned address after they are done using it for the network. The next section shows the debug output associated with address release in Stateful DHCPv6.

Debugs

ciscoasa# show ipv6 dhcprelay statistics

Relay Messages:
- SOLICIT: 2
- ADVERTISE: 2
- REQUEST: 2
- CONFIRM: 0
- RENEW: 0
- REBIND: 0
- REPLY: 9
- RELEASE: 1
- DECLINE: 0
- RECONFIGURE: 0
- INFORMATION-REQUEST: 6
- RELAY-FORWARD: 11
- RELAY-REPLY: 11

Relay Errors:
- Malformed message: 0
- Block allocation/duplication failure: 0
- Hop count limit exceeded: 0
- Forward binding creation failure: 0
- Reply binding lookup failure: 0
- No output route: 0
- Conflict relay server route: 0
- Failed to add server input rule: 0
- Unit or context is not active: 0

Total Relay Bindings Created: 8
Conflict relay server route: 0
Failed to add server input rule: 0
Unit or context is not active: 0
Total Relay Bindings Created: 8

Related Information

Understanding Various DHCP Options

ASA DHCP Relay Configuration Example

Configure the ASA to Pass IPv6 Traffic

ASA Packet Captures with CLI and ASDM Configuration Example