

# ASA:DHCPv6 릴레이 구성 예 및 문제 해결

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## 소개

이 문서에서는 Cisco ASA(Adaptive Security Appliance)를 DHCPv6 릴레이 에이전트로 구성하는 방법에 대해 설명하고 몇 가지 기본적인 트러블슈팅도 다룹니다.ASA Code Version 9.0 이상에서 ASA는

## 사전 요구 사항

### 요구 사항

다음 주제에 대한 지식을 보유하고 있으면 유용합니다.

- IPv6 기본 개념
- IPv6 주소 지정 메커니즘

- DHCPv6 패킷 흐름
- DHCP 릴레이 개념

## 사용되는 구성 요소

이 문서의 정보는 ASA 5500 버전 9.1.2을 기반으로 합니다.

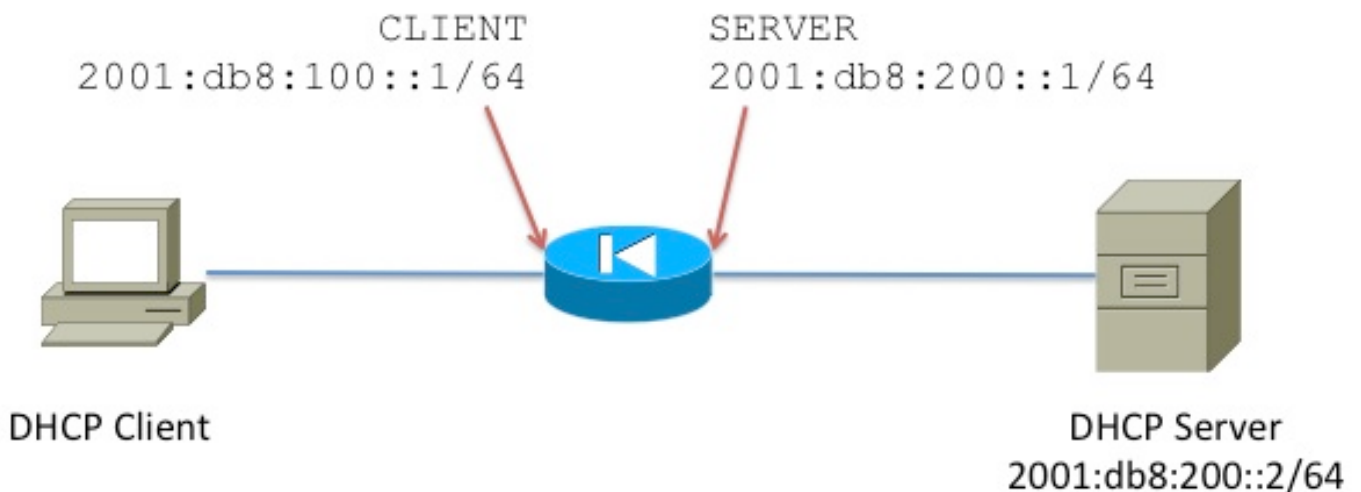
이 문서의 정보는 특정 랩 환경의 디바이스를 토대로 작성되었습니다. 이 문서에 사용된 모든 디바이스는 초기화된(기본) 컨피그레이션으로 시작되었습니다. 현재 네트워크가 작동 중인 경우, 모든 명령어의 잠재적인 영향을 미리 숙지하시기 바랍니다.

## 스태이트풀 대 스타이트리스 DHCPv6

IPv6에서 서로 다른 주소 할당 방법을 이해하면 DHCPv6 릴레이 기능이 ASA에서 어떻게 작동하는지 이해하는 데 도움이 됩니다. SLAAC([Stateless Address Autoconfiguration](#)) 및 DHCPv6에 대한 소개는 [SLAAC 및 DHCP를 사용하여 IPv6에서 동적 주소 할당](#)을 참조하십시오.

## 네트워크 다이어그램

이 샘플 컨피그레이션에서는 ASA를 DHCPv6 릴레이 에이전트로 구성하는 방법에 대해 설명합니다. 이 구성에서 **CLIENT**는 IPv6 클라이언트가 연결된 인터페이스입니다. **SERVER**는 DHCPv6 서버 2001:db8:200:2/64에 연결할 수 있는 인터페이스입니다.



## DHCPv6 대 DHCPv4 메시지 유형

DHCPv6 Message Type	DHCPv4 Message Type
Solicit (1)	DHCPDISCOVER
Advertise (2)	DHCPOFFER
Request (3), Renew (5), Rebind (6)	DHCPREQUEST
Reply (7)	DHCPACK / DHCPNAK
Release (8)	DHCPRELEASE
Information-Request (11)	DHCPINFORM
Decline (9)	DHCPDECLINE
Confirm (4)	none
Reconfigure (10)	DHCPFORCERENEW
Relay-Forw (12), Relay-Reply (13)	none

## 스테이트리스 DHCPv6 릴레이

### 구성

다음은 ASA의 스테이트리스 DHCPv6 릴레이 컨피그레이션에 대한 기본 컨피그레이션입니다.

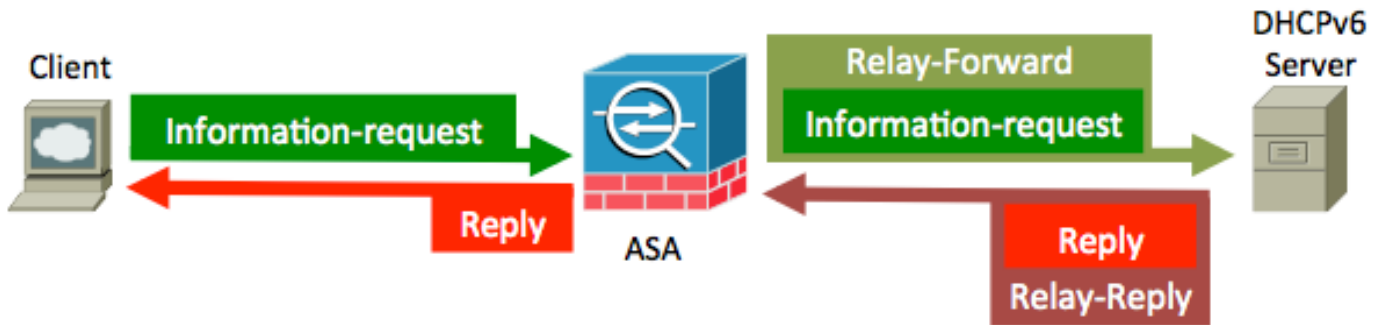
```
interface GigabitEthernet0/1
 nameif CLIENT
 security-level 100
 ipv6 address 2001:db8:100::1/64
 ipv6 enable
 ipv6 nd other-config-flag
!
interface GigabitEthernet0/0
 nameif SERVER
 security-level 0
 ipv6 address 2001:db8:200:1/64
 ipv6 enable
!
ipv6 dhcprelay server 2001:db8:200:2 inside
ipv6 dhcprelay enable outside
```

### 패킷 흐름

스테이트리스 DHCPv6를 사용하는 경우, 다음은 클라이언트의 패킷 흐름입니다.



ASA는 이러한 패킷을 인터셉트하여 DHCP 릴레이 형식으로 래핑합니다.



다음을 확인합니다.

## 디버깅

debug ipv6 dhcprelay 및 debug ipv6 dhcp를 활성화하면 관련 출력이 화면에 인쇄됩니다. 이 출력은 작업 시나리오에서 가져옵니다.

```
IPv6 DHCP: Received INFORMATION-REQUEST from fe80::c671:feff:fe93:b51a on CLIENT
```

```
IPv6 DHCP: detailed packet contents
src fe80::c671:feff:fe93:b51a (CLIENT)
dst ff02::1:2
type INFORMATION-REQUEST(11), xid 1588088
option ELAPSED-TIME(8), len 2
elapsed-time 0
option CLIENTID(1), len 10
00030001c471fe93b516
option ORO(6), len 6
DNS-SERVERS,DOMAIN-LIST,UNKNOWN
```

```
IPv6 DHCP_RELAY: Relaying INFORMATION-REQUEST from fe80::c671:feff:fe93:b51a on CLIENT
IPv6 DHCP_RELAY: Creating relay binding for fe80::c671:feff:fe93:b51a at interface CLIENT
IPv6 DHCP_RELAY: to 2001:db8:200::2 via 2001:db8:200::2 using SERVER
IPv6 DHCP: Sending RELAY-FORWARD to 2001:db8:200::2 on SERVER
```

```
IPv6 DHCP: detailed packet contents
src 2001:db8:200::1
dst 2001:db8:200::2 (SERVER)
type RELAY-FORWARD(12), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 34
type INFORMATION-REQUEST(11), xid 1588088
option ELAPSED-TIME(8), len 2
elapsed-time 0
```

```
option CLIENTID(1), len 10
  00030001c471fe93b516
option ORO(6), len 6
  DNS-SERVERS,DOMAIN-LIST,UNKNOWN
option INTERFACE-ID(18), len 4
  0x00000015
```

IPv6 DHCP: Received RELAY-REPLY from 2001:db8:200::2 on SERVER

IPv6 DHCP: detailed packet contents

```
src 2001:db8:200::2 (SERVER)
dst 2001:db8:200::1
type RELAY-REPLY(13), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 67
type REPLY(7), xid 1588088
option SERVERID(2), len 10
  00030001002414a33c94
option CLIENTID(1), len 10
  00030001c471fe93b516
option DNS-SERVERS(23), len 16
  2001:db8:1000::1
option DOMAIN-LIST(24), len 11
  cisco.com
option INTERFACE-ID(18), len 4
  0x00000015
```

IPv6 DHCP\_RELAY: Relaying RELAY-REPLY from 2001:db8:200::2 on SERVER

IPv6 DHCP\_RELAY: relayed msg: REPLY

IPv6 DHCP\_RELAY: to fe80::c671:feff:fe93:b51a

IPv6 DHCP: Sending REPLY to fe80::c671:feff:fe93:b51a on CLIENT

IPv6 DHCP: detailed packet contents

```
src fe80::219:7ff:fe24:2e44
dst fe80::c671:feff:fe93:b51a (CLIENT)
type REPLY(7), xid 1588088
option SERVERID(2), len 10
  00030001002414a33c94
option CLIENTID(1), len 10
  00030001c471fe93b516
option DNS-SERVERS(23), len 16
  2001:db8:1000::1
option DOMAIN-LIST(24), len 11
  cisco.com
```

INFORMATION-REQUEST 요청 패킷에서 클라이언트는 **DNS-Server** 및 **Domain**만 요청합니다. 이는 클라이언트가 스테이트리스 DHCPv6에 대해 구성되기 때문에 필요합니다.

## Wireshark 스냅샷

### DHCP 클라이언트 요청

No.	Time	Source	Destination	Protocol	Length	Identification	Info
1	0.000000	fe80::c671:feff:fe93:b51a	ff02::1:2	DHCPv6	100		Information-request XID: 0xfc3adf CID: 00030001c471fe93b516
2	0.005584	fe80::219:7ff:fe24:2e44	fe80::c671:feff:fe93:b51a	DHCPv6	133		Reply XID: 0xfc3adf CID: 00030001c471fe93b516

Payload length: 42  
Next header: UDP (17)  
Hop limit: 255

Source: fe80::c671:feff:fe93:b51a (fe80::c671:feff:fe93:b51a) → Src. Address field set to link-local IPv6 address assigned to the sending interface.  
[Source SA MAC: c4:71:fe:93:b5:1a (c4:71:fe:93:b5:1a)]  
Destination: ff02::1:2 (ff02::1:2) → Dst. Address set to link-local scope all-routers Multicast address (FF02::2).  
[Source GeoIP: Unknown]  
[Destination GeoIP: Unknown]

User Datagram Protocol, [Src Port: dhcpv6-client (546), Dst Port: dhcpv6-server (547)] UDP ports used for DHCPv6.

DHCPv6  
Message type: Information-request (11)  
Transaction ID: 0xfc3adf

Elapsed time  
Option: Elapsed time (8)  
Length: 2  
Value: 0000  
Elapsed-time: 0 ms

Client Identifier  
Option: Client Identifier (1)  
Length: 10  
Value: 00030001c471fe93b516  
DUID: 00030001c471fe93b516  
DUID Type: link-layer address (3)  
Hardware type: Ethernet (1)  
Link-layer address: c4:71:fe:93:b5:16

Option Request  
Option: Option Request (6)  
Length: 6  
Value: 001700180020

Requested option code: DNS recursive name server (23)  
Requested option code: Domain Search List (24)  
Requested option code: Lifetime (32)

Requested options.

## ASA에서 릴레이된 DHCP 요청

No.	Time	Source	Destination	Protocol	Length	Identification	Info
1	0.000000	2001:db8:200::1	2001:db8:200::2	DHCPv6	146		Relay-Forward: 2001:db8:100::1 Information-request XID: 0xfc3adf CID: 00030001c471fe93b516
2	0.004836	2001:db8:200::2	2001:db8:200::1	DHCPv6	179		Relay-reply L: 2001:db8:100::1 Reply XID: 0xfc3adf CID: 00030001c471fe93b516

User Datagram Protocol, [Src Port: dhcpv6-server (547), Dst Port: dhcpv6-server (547)] Ports used for DHCPv6 Relay

DHCPv6  
Message type: Relay-forward (12)  
Hopcount: 0  
Link address: 2001:db8:100::1 (2001:db8:100::1)  
Peer address: fe80::c671:feff:fe93:b51a (fe80::c671:feff:fe93:b51a)

Relay Message  
Option: Relay Message (9)  
Length: 34  
Value: 0bf3c3adf008000200000001000a00030001c471fe93b516...

DHCPv6  
Message type: Information-request (11)  
Transaction ID: 0xfc3adf

Elapsed time  
Option: Elapsed time (8)  
Length: 2  
Value: 0000  
Elapsed-time: 0 ms

Client Identifier  
Option: Client Identifier (1)  
Length: 10  
Value: 00030001c471fe93b516  
DUID: 00030001c471fe93b516  
DUID Type: link-layer address (3)  
Hardware type: Ethernet (1)  
Link-layer address: c4:71:fe:93:b5:16

Option Request  
Option: Option Request (6)  
Length: 6  
Value: 001700180020  
Requested option code: DNS recursive name server (23)  
Requested option code: Domain Search List (24)

## 서버에서 DHCP 회신

No.	Time	Source	Destination	Protocol	Length	Identification	Info
1	0.000000	2001:db8:200::1	2001:db8:200::2	DHCPv6	146		Relay-Forw L: 2001:db8:100::1 Information-request XID: 0xfc3adf CID: 00030001
2	0.004836	2001:db8:200::2	2001:db8:200::1	DHCPv6	179		Relay-reply L: 2001:db8:100::1 Reply XID: 0xfc3adf CID: 00030001c471fe93b516

**DHCPv6**

Message type: Relay-reply (13)

Hopcount: 0

Link address: 2001:db8:100::1 (2001:db8:100::1)

Peer address: fe80::c671:feff:fe93:b51a (fe80::c671:feff:fe93:b51a)

**Relay Message**

Option: Relay Message (9)

Length: 67

Value: 07fc3adf0002000a00030001002414a33c940001000a0003...

**DHCPv6**

Message type: Reply (7)

Transaction ID: 0xfc3adf

**Server Identifier**

Option: Server Identifier (2)

Length: 10

Value: 00030001002414a33c94

DUID: 00030001002414a33c94

DUID Type: link-layer address (3)

Hardware type: Ethernet (1)

Link-layer address: 00:24:14:a3:3c:94

**Client Identifier**

**DNS recursive name server**

Option: DNS recursive name server (23)

Length: 16

Value: 20010db8100000000000000000000001

DNS server address: 2001:db8:1000::1 (2001:db8:1000::1) **DNS Server Provided by DHCPv6 Server**

**Domain Search List**

Option: Domain Search List (24)

Length: 11

Value: 05636973636f03636f6d00

DNS Domain Search List

Domain: cisco.com **Domain name**

## 클라이언트에 전달된 회신

No.	Time	Source	Destination	Protocol	Length	Identification	Info
1	0.000000	fe80::c671:feff:fe93:b51a	ff02::1:2	DHCPv6	100		Information-request XID: 0xfc3adf CID: 00030001c471fe93b516
2	0.005584	fe80::219:7ff:fe24:2e44	fe80::c671:feff:fe93:b51a	DHCPv6	133		Reply XID: 0xfc3adf CID: 00030001c471fe93b516

**Internet Protocol Version 6, Src: fe80::219:7ff:fe24:2e44 (fe80::219:7ff:fe24:2e44), Dst: fe80::c671:feff:fe93:b51a (fe80::c671:feff:fe93:b51a)**

**User Datagram Protocol, Src Port: dhcpv6-server (547), Dst Port: dhcpv6-client (546) Ports used to reply clients**

**DHCPv6**

Message type: Reply (7)

Transaction ID: 0xfc3adf

**Server Identifier**

Option: Server Identifier (2)

Length: 10

Value: 00030001002414a33c94

DUID: 00030001002414a33c94

DUID Type: link-layer address (3)

Hardware type: Ethernet (1)

Link-layer address: 00:24:14:a3:3c:94

**Client Identifier**

Option: Client Identifier (1)

Length: 10

Value: 00030001c471fe93b516

DUID: 00030001c471fe93b516

DUID Type: link-layer address (3)

Hardware type: Ethernet (1)

Link-layer address: c4:71:fe:93:b5:16

**DNS recursive name server**

Option: DNS recursive name server (23)

Length: 16

Value: 20010db8100000000000000000000001

DNS server address: 2001:db8:1000::1 (2001:db8:1000::1) **Information forwarded to client**

**Domain Search List**

Option: Domain Search List (24)

Length: 11

Value: 05636973636f03636f6d00

DNS Domain Search List

Domain: cisco.com

## 상태 저장 DHCPv6

### 구성

다음은 ASA에서 상태 기반 DHCPv6 릴레이 컨피그레이션의 기본 컨피그레이션입니다.

```

interface GigabitEthernet0/1
 nameif CLIENT
 security-level 100
 ipv6 address 2001:db8:100::1/64
 ipv6 enable
!
interface GigabitEthernet0/0
 nameif SERVER
 security-level 0
 ipv6 address 2001:db8:200:1/64
 ipv6 enable

```

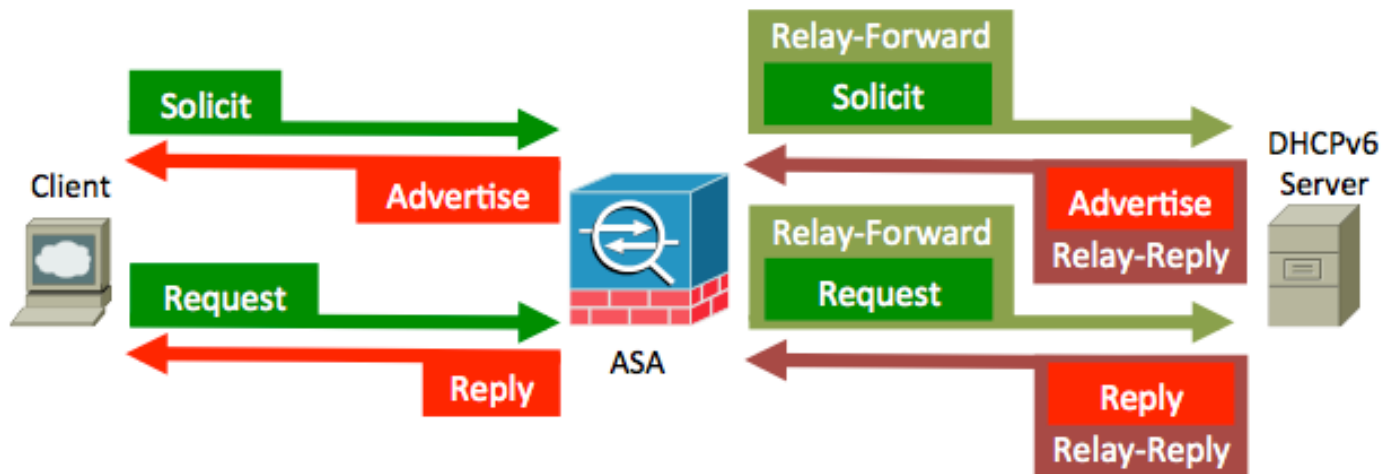
```
!
ipv6 dhcprelay server 2001:db8:200:2 inside
ipv6 dhcprelay enable outside
```

## 패킷 흐름

스테이트풀 DHCPv6에서는 클라이언트의 패킷 흐름을 다음과 같이 나타냅니다.



ASA는 이러한 패킷을 인터셉트하여 DHCP 릴레이 형식으로 래핑합니다.



다음을 확인합니다.

## 디버깅

```
IPv6 DHCP: Received SOLICIT from fe80::c671:feff:fe93:b51a on CLIENT
```

```
IPv6 DHCP: detailed packet contents
src fe80::c671:feff:fe93:b51a (CLIENT)
dst ff02::1:2
type SOLICIT(1), xid 2490681
option ELAPSED-TIME(8), len 2
elapsed-time 0
option CLIENTID(1), len 10
00030001c471fe93b516
option ORO(6), len 4
DNS-SERVERS,DOMAIN-LIST
option IA-NA(3), len 12
IAID 0x00040001, T1 0, T2 0
```

```
IPv6 DHCP_RELAY: Relaying SOLICIT from fe80::c671:feff:fe93:b51a on CLIENT
```



IPv6 DHCP\_RELAY: Creating relay binding for fe80::c671:feff:fe93:b51a at interface CLIENT

IPv6 DHCP\_RELAY: to 2001:db8:200::2 via 2001:db8:200::2 using SERVER

IPv6 DHCP: Sending RELAY-FORWARD to 2001:db8:200::2 on SERVER

IPv6 DHCP: detailed packet contents

```
src 2001:db8:200::1
dst 2001:db8:200::2 (SERVER)
type RELAY-FORWARD(12), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 48
type SOLICIT(1), xid 2490681
option ELAPSED-TIME(8), len 2
  elapsed-time 0
option CLIENTID(1), len 10
  00030001c471fe93b516
option ORO(6), len 4
  DNS-SERVERS,DOMAIN-LIST
option IA-NA(3), len 12
  IAID 0x00040001, T1 0, T2 0
option INTERFACE-ID(18), len 4
  0x00000015
```

IPv6 DHCP: Received RELAY-REPLY from 2001:db8:200::2 on SERVER

IPv6 DHCP: detailed packet contents

```
src 2001:db8:200::2 (SERVER)
dst 2001:db8:200::1
type RELAY-REPLY(13), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 111
type ADVERTISE(2), xid 2490681
option SERVERID(2), len 10
  00030001002414a33c94
option CLIENTID(1), len 10
  00030001c471fe93b516
option IA-NA(3), len 40
  IAID 0x00040001, T1 43200, T2 69120
option IAADDR(5), len 24
  IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
  preferred INFINITY, valid INFINITY
option DNS-SERVERS(23), len 16
  2001:db8:1000::1
option DOMAIN-LIST(24), len 11
  cisco.com
option INTERFACE-ID(18), len 4
  0x00000015
```

IPv6 DHCP\_RELAY: Relaying RELAY-REPLY from 2001:db8:200::2 on SERVER

IPv6 DHCP\_RELAY: relayed msg: ADVERTISE

IPv6 DHCP\_RELAY: to fe80::c671:feff:fe93:b51a

IPv6 DHCP: Sending ADVERTISE to fe80::c671:feff:fe93:b51a on CLIENT

IPv6 DHCP: detailed packet contents

```
src fe80::219:7ff:fe24:2e44
dst fe80::c671:feff:fe93:b51a (CLIENT)
type ADVERTISE(2), xid 2490681
option SERVERID(2), len 10
  00030001002414a33c94
option CLIENTID(1), len 10
  00030001c471fe93b516
option IA-NA(3), len 40
  IAID 0x00040001, T1 43200, T2 69120
option IAADDR(5), len 24
  IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
```

```
    preferred INFINITY, valid INFINITY
option DNS-SERVERS(23), len 16
2001:db8:1000::1
option DOMAIN-LIST(24), len 11
cisco.com
```

IPv6 DHCP: Received REQUEST from fe80::c671:feff:fe93:b51a on CLIENT

IPv6 DHCP: detailed packet contents

```
src fe80::c671:feff:fe93:b51a (CLIENT)
dst ff02::1:2
type REQUEST(3), xid 2492842
option ELAPSED-TIME(8), len 2
elapsed-time 0
option CLIENTID(1), len 10
00030001c471fe93b516
option ORO(6), len 4
DNS-SERVERS,DOMAIN-LIST
option SERVERID(2), len 10
00030001002414a33c94
option IA-NA(3), len 40
IAID 0x00040001, T1 0, T2 0
option IAADDR(5), len 24
    IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
    preferred INFINITY, valid INFINITY
```

IPv6 DHCP\_RELAY: Relaying REQUEST from fe80::c671:feff:fe93:b51a on CLIENT

IPv6 DHCP\_RELAY: to 2001:db8:200::2 via 2001:db8:200::2 using SERVER

IPv6 DHCP: Sending RELAY-FORWARD to 2001:db8:200::2 on SERVER

IPv6 DHCP: detailed packet contents

```
src 2001:db8:200::1
dst 2001:db8:200::2 (SERVER)
type RELAY-FORWARD(12), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 90
type REQUEST(3), xid 2492842
option ELAPSED-TIME(8), len 2
elapsed-time 0
option CLIENTID(1), len 10
00030001c471fe93b516
option ORO(6), len 4
DNS-SERVERS,DOMAIN-LIST
option SERVERID(2), len 10
00030001002414a33c94
option IA-NA(3), len 40
IAID 0x00040001, T1 0, T2 0
option IAADDR(5), len 24
    IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
    preferred INFINITY, valid INFINITY
option INTERFACE-ID(18), len 4
0x00000015
```

IPv6 DHCP: Received RELAY-REPLY from 2001:db8:200::2 on SERVER

IPv6 DHCP: detailed packet contents

```
src 2001:db8:200::2 (SERVER)
dst 2001:db8:200::1
type RELAY-REPLY(13), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 111
type REPLY(7), xid 2492842
option SERVERID(2), len 10
00030001002414a33c94
option CLIENTID(1), len 10
```

```

00030001c471fe93b516
option IA-NA(3), len 40
  IAID 0x00040001, T1 43200, T2 69120
option IAADDR(5), len 24
  IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
  preferred INFINITY, valid INFINITY
option DNS-SERVERS(23), len 16
  2001:db8:1000::1
option DOMAIN-LIST(24), len 11
  cisco.com
option INTERFACE-ID(18), len 4
  0x00000015
IPv6 DHCP_RELAY: Relaying RELAY-REPLY from 2001:db8:200::2 on SERVER
IPv6 DHCP_RELAY:   relayed msg: REPLY
IPv6 DHCP_RELAY:   to fe80::c671:feff:fe93:b51a
IPv6 DHCP: Sending REPLY to fe80::c671:feff:fe93:b51a on CLIENT

```

```

IPv6 DHCP: detailed packet contents
src fe80::219:7ff:fe24:2e44
dst fe80::c671:feff:fe93:b51a (CLIENT)
type REPLY(7), xid 2492842
option SERVERID(2), len 10
00030001002414a33c94
option CLIENTID(1), len 10
00030001c471fe93b516
option IA-NA(3), len 40
  IAID 0x00040001, T1 43200, T2 69120
option IAADDR(5), len 24
  IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
  preferred INFINITY, valid INFINITY
option DNS-SERVERS(23), len 16
  2001:db8:1000::1
option DOMAIN-LIST(24), len 11
  cisco.com

```

## Wireshark 스냅샷

### 간청(1)

DHCPv6 클라이언트는 DHCPv6 서버를 찾기 위해 간청 메시지를 보냅니다.

The screenshot shows a network traffic capture in Wireshark. The top part displays a list of packets with columns for Source, Destination, Protocol, Length, and Identification. The selected packet is a DHCPv6 SOLICIT message from fe80::c671:feff:fe93:b51a to ff02::1:2. The packet details pane is expanded to show the following structure:

- Internet Protocol Version 6, Src: fe80::c671:feff:fe93:b51a (fe80::c671:feff:fe93:b51a), Dst: ff02::1:2 (ff02::1:2)
- User Datagram Protocol, Src Port: dhcpv6-client (546), Dst Port: dhcpv6-server (547) **Ports used between clients and Relay Agent (ASA).**
- DHCPv6
  - Message type: sollicit (1) **DHCPv6 client sends a solicit message.**
  - Transaction ID: 0x260139
  - Elapsed time
    - Option: Elapsed time (8)
    - Length: 2
    - Value: 0000
    - Elapsed-time: 0 ms
  - Client Identifier
    - Option: Client Identifier (1)
    - Length: 10
    - Value: 00030001c471fe93b516
    - DUID: 00030001c471fe93b516 **Each DHCP client and server has a DUID. DHCP servers use DUIDs to identify clients for the selection of configuration parameters and in the association of IAs with clients.**
    - DUID Type: link-layer address (3)
    - Hardware type: Ethernet (1)
    - Link-layer address: c4:71:fe:93:b5:16
  - Option Request
    - Option: option Request (6)
    - Length: 4
    - Value: 00170018
    - Requested option code: DNS recursive name server (23)
    - Requested option code: Domain search List (24)
  - Identity Association for Non-temporary Address** **The client is responsible for creating IAs and requesting that a server assign IPv6 address to IA.**
    - Option: Identity Association for Non-temporary Address (3)
    - Length: 12
    - Value: 0004000100000000000000000000
    - IAID: 00040001
    - T1: 0
    - T2: 0

ASA는 간청 메시지를 릴레이합니다.

Source	Destination	Protocol	Length	Identification	Info
2001:db8:200::1	2001:db8:200::2	DHCPv6	160		Relay-Forw L: 2001:db8:100::1 Solicit XID: 0x260139 CID: 00030001c471fe93b
2001:db8:200::2	2001:db8:200::1	DHCPv6	223		Relay-reply L: 2001:db8:100::1 Advertise XID: 0x260139 CID: 00030001c471fe93b
2001:db8:200::1	2001:db8:200::2	DHCPv6	202		Relay-Forw L: 2001:db8:100::1 Request XID: 0x2609aa CID: 00030001c471fe93b
2001:db8:200::2	2001:db8:200::1	DHCPv6	223		Relay-reply L: 2001:db8:100::1 Reply XID: 0x2609aa CID: 00030001c471fe93b5

Frame 1: 160 bytes on wire (1280 bits), 160 bytes captured (1280 bits)

Ethernet II, Src: Cisco\_a3:3c:98 (00:19:07:24:2e:44), Dst: Cisco\_a3:3c:98 (00:24:14:a3:3c:98)

802.1Q Virtual LAN, PRI: 0, CFI: 0, ID: 901

Internet Protocol Version 6, Src: 2001:db8:200::1 (2001:db8:200::1), Dst: 2001:db8:200::2 (2001:db8:200::2)

User Datagram Protocol, Src Port: dhcpv6-server (547), Dst Port: dhcpv6-server (547) **Ports used between ASA and DHCPv6 server.**

DHCPv6

Message type: Relay-forw (12) **ASA relay's Solicit message**

Hopcount: 0

Link address: 2001:db8:100::1 (2001:db8:100::1)

Peer address: fe80::c671:feff:fe93:b51a (fe80::c671:feff:fe93:b51a)

Relay Message

Option: Relay Message (9)

Length: 48

Value: 012601390008000200000001000a00030001c471fe93b516...

DHCPv6

Message type: solicit (1)

Transaction ID: 0x260139

- Elapsed time
- Client Identifier
- Option Request
- Identity Association for Non-temporary Address

Interface-Id

## 광고(2)

서버는 클라이언트에서 받은 간청(Solicit) 메시지에 대한 응답으로 DHCP 서비스에 사용할 수 있음을 나타내기 위해 Advertise(알림) 메시지를 보냅니다.

Source	Destination	Protocol	Length	Identification	Info
2001:db8:200::1	2001:db8:200::2	DHCPv6	160		Relay-forw L: 2001:db8:100::1 Solicit XID: 0x260139 CID: 00030001c471fe93b
2001:db8:200::2	2001:db8:200::1	DHCPv6	223		Relay-reply L: 2001:db8:100::1 Advertise XID: 0x260139 CID: 00030001c471fe93b
2001:db8:200::1	2001:db8:200::2	DHCPv6	202		Relay-Forw L: 2001:db8:100::1 Request XID: 0x2609aa CID: 00030001c471fe93b
2001:db8:200::2	2001:db8:200::1	DHCPv6	223		Relay-reply L: 2001:db8:100::1 Reply XID: 0x2609aa CID: 00030001c471fe93b5

Frame 2: 223 bytes on wire (1784 bits), 223 bytes captured (1784 bits)

Ethernet II, Src: Cisco\_a3:3c:98 (00:24:14:a3:3c:98), Dst: Cisco\_24:2e:44 (00:19:07:24:2e:44)

802.1Q Virtual LAN, PRI: 6, CFI: 0, ID: 901

Internet Protocol Version 6, Src: 2001:db8:200::2 (2001:db8:200::2), Dst: 2001:db8:200::1 (2001:db8:200::1)

User Datagram Protocol, Src Port: dhcpv6-server (547), Dst Port: dhcpv6-server (547)

DHCPv6

Message type: Relay-reply (13)

Hopcount: 0

Link address: 2001:db8:100::1 (2001:db8:100::1)

Peer address: fe80::c671:feff:fe93:b51a (fe80::c671:feff:fe93:b51a)

Relay Message

Option: Relay Message (9)

Length: 111

Value: 022601390002000a00030001002414a33c940001000a0003...

DHCPv6

Message type: Advertise (2) **Server sends an Advertise message to indicate that it is available for DHCPv6 service.**

Transaction ID: 0x260139

- Server Identifier
- Client Identifier
- Identity Association for Non-temporary Address
- DNS recursive name server
- Domain Search List

Interface-Id

Message type: Advertise (2)

Transaction ID: 0x260139

- Server Identifier
  - Option: Server Identifier (2)
  - Length: 10
  - Value: 00030001002414a33c94
  - Server DUID**
  - DUID: 00030001002414a33c94
  - DUID Type: Link-layer address (3)
  - Hardware type: Ethernet (1)
  - Link-layer address: 00:24:14:a3:3c:94
- Client Identifier
- Identity Association for Non-temporary Address
  - Option: Identity Association for Non-temporary Address (3)
  - Length: 40
  - Value: 000400010000a8c000010e000005001820010db803000000...
  - IAID: 00040001
  - T1: 43200
  - T2: 69120
- IA Address
  - Option: IA Address (5)
  - Length: 24
  - Value: 20010db80300000048ae5f5d8290e926ffffffffffffffff
  - Offered IP Address**
  - IPv6 address: 2001:db8:300:0:48ae:5f5d:8290:e926 (2001:db8:300:0:48ae:5f5d:8290:e926)
  - Preferred lifetime: infinity
  - Preferred lifetime: infinity
- DNS recursive name server
  - Option: DNS recursive name server (23)
  - Length: 16
  - Value: 2001:db8:1:0:0:0:0:0
  - DNS Server IP Address**
  - DNS server address: 2001:db8:1000::1 (2001:db8:1000::1)
- Domain Search List
  - Option: Domain Search List (24)
  - Length: 11
  - Value: 05636973636f03636fd00
  - Domain Name Provided**
  - DNS Domain Search List
  - Domain: cisco.com

Interface-Id

## 요청(3)

클라이언트는 특정 서버에서 IP 주소 또는 위임된 접두사를 포함하는 컨피그레이션 매개변수를 요청하기 위해 요청 메시지를 전송합니다.

```

Source          Destination      Protocol Length Identification  Info
fe80::c671:feff:fe93:b51a  ff02::1:2      DHCPv6  114      Solicit XID: 0x260139 CID: 00030001c471fe93b516
fe80::219:7ff:fe24:2e44    fe80::c671:feff:fe93:b51a  DHCPv6  177      Advertise XID: 0x260139 CID: 00030001c471fe93b516 IAA: 2001:db8:300:0:48ae:5f5d:8290:e926
fe80::c671:feff:fe93:b51a  ff02::1:2      DHCPv6  156      Request XID: 0x2609aa CID: 00030001c471fe93b516 IAA: 2001:db8:300:0:48ae:5f5d:8290:e926

```

```

DHCPv6
  Message type: Request (3)
  Transaction ID: 0x2609aa
  Elapsed time
    Option: Elapsed time (8)
    Length: 2
    Value: 0000
    Elapsed-time: 0 ms
  Client Identifier
  Option Request
    Option: Option Request (6)
    Length: 4
    Value: 00170018
    Requested option code: DNS recursive name server (23)
    Requested option code: Domain Search List (24)
  Server Identifier
  Identity Association for Non-temporary Address
    Option: Identity Association for Non-temporary Address (3)
    Length: 40
    Value: 000400010000000000000000000000005001820010db803000000...
    IAID: 00040001
    T1: 0
    T2: 0
  IA Address
    Option: IA Address (5)
    Length: 24
    Value: 20010db80300000048ae5f5d8290e926ffffffffffffffff
    IPv6 address: 2001:db8:300:0:48ae:5f5d:8290:e926 (2001:db8:300:0:48ae:5f5d:8290:e926)
    Preferred lifetime: infinity
    Preferred lifetime: infinity

```

Client request for IPv6 Address, DNS Server, Domain name.

## 회신(7)

서버는 클라이언트에서 받은 간청, 요청, 갱신 또는 재바인딩 메시지에 대한 응답으로 할당된 주소 및 컨피그레이션 매개변수를 포함하는 회신 메시지를 전송합니다. 서버는 정보 요청 메시지에 대한 응답으로 컨피그레이션 매개변수를 포함하는 회신 메시지를 전송합니다. 서버는 클라이언트에 할당된 주소가 클라이언트가 연결된 링크에 적합한지 여부를 확인 또는 거부 하는 확인 메시지에 대한 응답 메시지를 보냅니다. 서버가 릴리스 또는 거부 메시지의 수신을 확인하기 위해 회신 메시지를 보냅니다.

```

Source          Destination      Protocol Length Identification  Info
2001:db8:200::1  2001:db8:200::2  DHCPv6  160      Relay-Forw L: 2001:db8:100::1 Solicit XID: 0x260139 CID: 00030001c471fe93b516
2001:db8:200::2  2001:db8:200::1  DHCPv6  223      Relay-reply L: 2001:db8:100::1 Advertise XID: 0x260139 CID: 00030001c471fe93b516
2001:db8:200::1  2001:db8:200::2  DHCPv6  202      Relay-Forw L: 2001:db8:100::1 Request XID: 0x2609aa CID: 00030001c471fe93b516
2001:db8:200::2  2001:db8:200::1  DHCPv6  223      Relay-reply L: 2001:db8:100::1 Reply XID: 0x2609aa CID: 00030001c471fe93b516

```

```

DHCPv6
  Message type: Reply (7)
  Transaction ID: 0x2609aa
  Server Identifier
  Client Identifier
  Identity Association for Non-temporary Address
    Option: Identity Association for Non-temporary Address (3)
    Length: 40
    Value: 000400010000a8c000010e000005001820010db803000000...
    IAID: 00040001
    T1: 43200
    T2: 69120
  IA Address
    Option: IA Address (5)
    Length: 24
    Value: 20010db80300000048ae5f5d8290e926ffffffffffffffff
    IPv6 address: 2001:db8:300:0:48ae:5f5d:8290:e926 (2001:db8:300:0:48ae:5f5d:8290:e926)
    Preferred lifetime: infinity
    Preferred lifetime: infinity
  DNS recursive name server
    Option: DNS recursive name server (23)
    Length: 16
    Value: 20010db8100000000000000000000001
    DNS server address: 2001:db8:1000::1 (2001:db8:1000::1)
  Domain Search List
    Option: Domain Search List (24)
    Length: 11
    Value: 05636973636f03636fd00
    DNS Domain Search List
    Domain: cisco.com

```

## 문제 해결

DHCPv6 서버와의 연결을 확인합니다.

```
ciscoasa# show ipv6 neighbor
```

```

IPv6 Address                               Age Link-layer Addr State Interface
2001:db8:200::2                            0 0024.14a3.3c98 REACH SERVER

```

IPv6 주소를 요청할 때 클라이언트에서 패킷을 수신하는지 확인합니다. 클라이언트에서 보낸 패킷

은 주소 할당 설정(상태 저장 및 상태 비저장)에 따라 달라집니다.

클라이언트가 DHCPv6 프로세스를 시작하면 링크에 IPv6 라우터가 있는지 확인하기 위해 Router Solicit 메시지를 보냅니다. IPv6 라우터가 응답하도록 프롬프트를 표시하기 위해 멀티캐스트 라우터 요청 메시지를 전송합니다. 라우터 요청 메시지의 이더넷 헤더에 다음 필드가 표시됩니다.

- Source Address 필드는 IPv6 주소를 요청하는 호스트의 MAC 주소입니다.
- Destination Address 필드는 33-33-00-00-00-02로 설정됩니다.

라우터 요청 메시지의 IPv6 헤더에 이러한 필드가 표시됩니다.

- Source Address 필드는 전송 인터페이스에 할당된 링크-로컬 IPv6 주소 또는 IPv6 미지정 주소 (::)로 설정됩니다.
- Destination Address 필드는 link-local scope all-routers 멀티캐스트 주소(FF02::2)로 설정됩니다.
- Hop Limit(홉제한) 필드는 255로 설정됩니다.

응답에서 IPv6 라우터는 원치 않는 라우터 알림 메시지를 보냅니다. 라우터 알림 메시지는 링크 접두사, MTU(Maximum Transmission Unit) 링크 및 특정 경로를 확인하는 데 필요한 정보가 포함되어 있습니다.

```
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
```

```
1: 12:06:52.700799      2001:db8:200:1.547 > 2001:db8:200:2.547:  udp 88
[class 0xe0]---->ASA forwards request to DHCPv6 router

2: 12:06:53.289047      2001:db8:200:2.547 > 2001:db8:200:1.547:  udp 121
[class 0xe0]----> Reply from DHCPV6 server.
```

## DHCP 릴레이 출력

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

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

**참고:** 짧은 기간 후에 ASA에서 바인딩을 삭제합니다. 이는 debug ipv6 dhcprelay에서 확인할 수 있습니다.

```
IPv6 DHCP_RELAY: Deleting binding for fe80::c671:feff:fe93:b51a at interface CLIENT
```

```
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

## 릴리스 주소

클라이언트는 네트워크에 대해 DHCPv6 할당 주소를 사용한 후 해당 주소를 해제할 수 있습니다. 다음 섹션에서는 스테이트풀 DHCPv6의 주소 릴리스와 관련된 디버그 출력을 보여줍니다.

## 디버깅

IPv6 DHCP: Received RELEASE from fe80::c671:feff:fe93:b51a on CLIENT

IPv6 DHCP: detailed packet contents

```
src fe80::c671:feff:fe93:b51a (CLIENT)
dst ff02::1:2
type RELEASE(8), xid 3180815
option ELAPSED-TIME(8), len 2
  elapsed-time 0
option CLIENTID(1), len 10
  00030001c471fe93b516
option SERVERID(2), len 10
  00030001002414a33c94
option IA-NA(3), len 40
  IAID 0x00040001, T1 0, T2 0
option IAADDR(5), len 24
  IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
  preferred INFINITY, valid INFINITY
```

IPv6 DHCP\_RELAY: Relaying RELEASE from fe80::c671:feff:fe93:b51a on CLIENT

IPv6 DHCP\_RELAY: Creating relay binding for fe80::c671:feff:fe93:b51a at interface CLIENT

IPv6 DHCP\_RELAY: to 2001:db8:200::2 via 2001:db8:200::2 using SERVER

IPv6 DHCP: Sending RELAY-FORWARD to 2001:db8:200::2 on SERVER

IPv6 DHCP: detailed packet contents

```
src 2001:db8:200::1
dst 2001:db8:200::2 (SERVER)
type RELAY-FORWARD(12), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 82
type RELEASE(8), xid 3180815
option ELAPSED-TIME(8), len 2
  elapsed-time 0
option CLIENTID(1), len 10
  00030001c471fe93b516
option SERVERID(2), len 10
  00030001002414a33c94
option IA-NA(3), len 40
  IAID 0x00040001, T1 0, T2 0
  option IAADDR(5), len 24
    IPv6 address 2001:db8:300:0:48ae:5f5d:8290:e926
    preferred INFINITY, valid INFINITY
option INTERFACE-ID(18), len 4
  0x00000015
```

IPv6 DHCP: Received RELAY-REPLY from 2001:db8:200::2 on SERVER

IPv6 DHCP: detailed packet contents

```
src 2001:db8:200::2 (SERVER)
dst 2001:db8:200::1
type RELAY-REPLY(13), hop 0
link 2001:db8:100::1
peer fe80::c671:feff:fe93:b51a
option RELAY-MSG(9), len 45
type REPLY(7), xid 3180815
option SERVERID(2), len 10
  00030001002414a33c94
option CLIENTID(1), len 10
  00030001c471fe93b516
option STATUS-CODE(13), len 9
  status code SUCCESS(0)
  status message: SUCCESS
option INTERFACE-ID(18), len 4
  0x00000015
```

IPv6 DHCP\_RELAY: Relaying RELAY-REPLY from 2001:db8:200::2 on SERVER

IPv6 DHCP\_RELAY: relayed msg: REPLY

IPv6 DHCP\_RELAY: to fe80::c671:feff:fe93:b51a

IPv6 DHCP: Sending REPLY to fe80::c671:feff:fe93:b51a on CLIENT

IPv6 DHCP: detailed packet contents

```
src fe80::219:7ff:fe24:2e44
dst fe80::c671:feff:fe93:b51a (CLIENT)
type REPLY(7), xid 3180815
option SERVERID(2), len 10
  00030001002414a33c94
option CLIENTID(1), len 10
  00030001c471fe93b516
option STATUS-CODE(13), len 9
  status code SUCCESS(0)
  status message: SUCCESS
```

## 관련 정보

[다양한 DHCP 옵션 이해](#)



[ASA DHCP 릴레이 컨피그레이션 예](#)

[IPv6 트래픽을 전달하도록 ASA 구성](#)

[CLI 및 ASDM을 사용한 ASA 패킷 캡처 컨피그레이션 예](#)